**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**
**An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak**

**Ref. No. GITAM/AC/003/2025/**101-124 **Dated: 18/06/2025**

To

All the members of the
Academic Council,
Ganga Institute of Technology and Management, Jhajjar

**Subject: Agenda for the 3rd meeting of the Academic Council**

Sir/Madam,

It is to inform you that 3rd meeting of the Academic Council will be held on Thursday, the 03rd July, 2025 at 11:00 A.M. in the Board Room of the Institute. A copy of the agenda is enclosed.

You are requested kindly to make it convenient to attend the meeting.

**Encl: As above.**

**Member Secretary**
**Academic Council**

**Endst. No. GITAM/AC/003/2025/**125 Dated: 18/06/2025

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**Member Secretary**
**Academic Council**

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR
**An Autonomous Institute| NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak**

## 3rd MEETING OF THE ACADEMIC COUNCIL
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# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR

## AGENDA OF THE 3RD MEETING OF THE ACADEMIC COUNCIL TO BE HELD ON 03.07. 2025 AT 11.00 AM IN THE BOARD ROOM OF THE INSTITUTE

**AC 3.1** **Confirmation of the minutes of meeting of the Academic Council held on 25.01.2025.**

To confirm the minutes of meeting of the Academic Council held on 25.01.2025 **(Annexure 3.1 Pages 1-6, already circulated).**

**AC 3.2** **Follow-up action report on the decisions taken in the meeting of the Academic Council held on 25.01.2025.**

To note the follow-up action on the decisions taken by the Academic Council in the meeting held on 25.01.2025 **(Annexure 3.2 Pages 7-9, already circulated)**.

**AC 3.3** **To consider the recommendations of the Board of Studies of Fire Technology and Safety Department in its meeting held on 26.05.2025.**

The Board of Studies of Fire Technology and Safety Department vide Reso. No. 2.3 and 2.5 of its meeting held on 26.05.2025 **(Annexure 3.3 Pages 10-12, already circulated)** approved

(A) Scheme of Examinations and Syllabus of 2nd year B.Tech Fire Technology and Safety for A.Y 2025-26 **(Annexure 3.4 Pages 13-59, already circulated)**.

(B) Proposal to start the certificate course on Environmental, Social and Governance (ESG) **(Annexure 3.5 Pages 60-62, already circulated)**.

The Academic Council may consider the recommendations of the Board of Studies of Fire Technology and Safety Department for approval.

**AC 3.4** **To consider the recommendations made by the Board of Studies of Mechanical Engineering in in its meeting held on 24.05.2025.**

The Board of Studies of Mechanical Engineering Department vide Reso. 2.3, 2.4, 2.5. 2.6, 2.7 and 2.8 of its meeting held on 24.05.2025 **(Annexure 3.6 Pages 63-66, already circulated)** approved

(A) Minor changes in the Scheme of Examinations and Syllabus of 1st Year M.Tech Machine Design and M.Tech Manufacturing and Automation *w.e.f.* 2025-26

**(a) M.Tech Machine Design 1st Year**

| Name of the Course | Existing Course Code | Amended Course Code |
|---|---|---|
| Materials Management | PEC-MTMD-114A | PEC-MTME-116A |
| Finite Element Methods | PEC-MTMD-118A | PEC-MTME-118A |
| Design of Pressure Vessels | PEC-MTMD-116A | PEC-MTME-114A |
| Seminar-I | SM-MT-115A | SM-MTMD-115A |
| Seminar-II | SM-MT-110A | SM-MTMD-110A |

**b) M.Tech Manufacturing and Automation 1st Year**

| Name of the Course | Existing Course Code | Amended Course Code |
|---|---|---|
| Artificial Intelligence in Manufacturing | PEC-MTMA-116A | PEC-MTMA-114A |
| Finite Element Methods | PEC-MTMA-114A | PEC-MTME-118A |
| Seminar-I | SM-MT-115A | SM-MTMA-115A |
| Seminar-II | SM-MT-110A | SM-MTMA-110A |

(B) Addition of one Professional Elective Course on *"Materials Management"* in 2nd Semester of M.Tech Manufacturing and Automation *w.e.f.* 2025-26 **(Annexure 3.7 Pages 67-68, already circulated)**

(C) Scheme of Examinations and Syllabus of 2nd year M.Tech Manufacturing & Automation for *w.e.f.* 2025-26 **(Annexure 3.8 Pages 69-89, already circulated)**

(D) Scheme of Examinations and Syllabus of 2nd year M.Tech Machine Design *w.e.f.* 2025-26 **(Annexure 3.9 Pages 90-114, already circulated)**

(E) Multidisciplinary Open Elective-II Courses (Offered by Mechanical Engineering Department for various PG Programs running in the Institute) *w.e.f.* 2025-26 **(Annexure 3.10 Pages 115-118, already circulated)**

(F) Scheme of Examinations and Syllabus of 2nd year B.Tech Mechanical Engineering *w.e.f.* 2025-26 **(Annexure 3.11 Pages 119-171, already circulated)**

and recommended the above to the Academic Council for Approval.

The Academic Council may consider the recommendations of the Board of Studies of Mechanical Engineering Department for approval.

**AC 3.5** **To consider the recommendations made by the Board of Studies of Electronics and Communication Engineering Department in its meeting held on 24.05.2025.**

The Board of Studies of Electronics and Communication Engineering Department vide Reso. 2.3, 2.4, 2.5 and 2.6 of its meeting held on 24.05.2025 **(Annexure 3.12 Pages 172-175, already circulated)** approved

(A) Amendment in the Course Titles and Course Contents of 1st Year M.Tech Electronics and Communication Engineering *w.e.f.* 2025-26 **(Annexure 3.13 Pages 176-183, already circulated)**

(B) Scheme of Examinations and Syllabus of 2nd Year M.Tech Electronics and Communication Engineering *w.e.f.* 2025-26 **(Annexure 3.14 Pages 184-210, already circulated)**

(C) Multidisciplinary Open Elective-II Courses (Offered by Electronics and Communication Engineering Department for various PG Programs running in the Institute) *w.e.f.* 2025-26 **(Annexure 3.15 Pages 211-212, already circulated)**

(D) Scheme of Examinations and Syllabus of 2nd year B.Tech Electronics and Communication Engineering *w.e.f.* 2025-26 **(Annexure 3.16 Pages 213-267, already circulated)**

and recommended the above to the Academic Council for Approval.

The Academic Council may consider the recommendations of the Board of Studies of Electronics and Communication Engineering Department for approval.

**AC 3.6** **To consider the recommendations made by the Board of Studies of Computer Science and Engineering Department in its meeting held on 28.05.2025.**

The Board of studies of Computer Science and Engineering Department vide Reso. 2.3, 2.4, 2.5 and 2.6 of its meeting held on 28.05.2025 **(Annexure 3.17 Pages 268-272, already circulated)** approved

(A) Scheme of Examinations and Syllabus of 2nd year M.Tech Computer Science and Engineering *w.e.f.* 2025-26 **(Annexure 3.18 Pages 273-298, already circulated).**

(B) Scheme of Examinations and Syllabus of 2nd year M.Tech Cyber Forensics and Information Security *w.e.f.* 2025-26 **(Annexure 3.19 Pages 299-324, already circulated).**

(C) Multidisciplinary Open Elective-II Courses (Offered by Computer Science and Engineering Department for various PG Programs running in the Institute) *w.e.f.* 2025-26 **(Annexure 3.20 Pages 325-327, already circulated).**

(D) Scheme of Examinations and Syllabus of 2nd year B.Tech Computer Science and Engineering common with B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) and B.Tech Computer Science and Engineering (Data Science) *w.e.f.* 2025-26 **(Annexure 3.21 Pages 328-381, already circulated).**

and recommended the above to the Academic Council for approval.

The Academic Council may consider the recommendations of the Board of Studies of Computer Science and Engineering Department for approval.

**AC 3.7** **To consider the recommendations made by the Board of Studies of Electrical Engineering Department in its meeting held on 27.05. 2025.**

The Board of Studies of Electrical Engineering Department vide Reso. No. 2.3, 2.4 and 2.6.2 of its meeting held on 27.05.2025 **(Annexure 3.22 Pages 382-384, already circulated)** approved

(A) Scheme of Examinations and Syllabus of 2nd year B.Tech Electrical Engineering *w.e.f.* 2025-26 **(Annexure 3.23 Pages 385-436, already circulated)**.

(B) Scheme of Examinations and Syllabus of 2nd year M.Tech Electrical Power Systems for *w.e.f.* 2025-26 **(Annexure 3.24 Pages 437-455, already circulated)**.

(C) Multidisciplinary Open Elective-II Courses (Offered by Electrical Engineering Department for various PG Programs running in the Institute) *w.e.f.* 2025-26 **(Annexure 3.25 Pages 456-459, already circulated)**.

and recommended the above to the Academic Council for Approval.

The Academic Council may consider the recommendations of the Board of Studies of Electrical Engineering Department for approval.

**AC 3.8** **To consider the recommendations made by the Board of Studies of Civil Engineering Department in its meeting held on 25.05. 2025.**

The Board of Studies of Civil Engineering Department vide Reso. No. 3, 4, 5 and 6 of its meeting held on 25.05.2025 **(Annexure 3.26 Pages 460-463, already circulated)** approved

(A) Addition of One Course in 1st Year M.Tech Structural Design *w.e.f.* 2025-26 **(Annexure 3.27 Pages 464-465, already circulated).**

(B) Scheme of Examinations and Syllabus of 2nd year M.Tech Structural Design *w.e.f.* 2025-26 **(Annexure 3.28 Pages 466-488, already circulated).**

(C) Multidisciplinary Open Elective-II Courses (Offered by Civil Engineering Department) for various PG Programs running in the Institute *w.e.f.* 2025-26 **(Annexure 3.29 Pages 489-492, already circulated).**

(D) Scheme of Examinations and Syllabus of 2nd year B.Tech Civil Engineering *w.e.f.* 2025-26 **(Annexure 3.30 Pages 493-534, already circulated)**

and recommended the above to the Academic Council for Approval.

The Academic Council may consider the recommendations of the Board of Studies of Civil Engineering Department for approval.

**AC 3.9** **To consider the recommendations made by the Board of Studies of Applied Sciences and Humanities in its meeting held on 27.05.2025.**

The Board of Studies of Applied Sciences and Humanities Department vide Reso. No. 2.3 and 2.4 of its meeting held on 27.05.2025 **(Annexure 3.31 Pages 535-538, already circulated)** approved

Ordinance, Scheme of Examinations and Syllabus of B.Tech 1st year (Scheme-B) as per NEP 2020 *w.e.f.* 2025-26 common for

- B.Tech in Civil Engineering,
- B.Tech Computer Science and Engineering,
- B.Tech Computer Science and Engineering (Artificial Intelligence & Machine Learning),
- B.Tech Computer Science and Engineering (Data Science),
- B.Tech Electrical Engineering,
- B.Tech Electronics and Communication Engineering,
- B.Tech Fire Technology and Safety Engineering,
- B.Tech Mechanical Engineering **(Annexure 3.32 Pages 539-636, already circulated).**

and recommended the above to the Academic Council for Approval

The Academic Council may consider the recommendations of the Board of Studies of Applied Science and Humanities Department for approval.

**AC 3.10** **To consider the recommendations made by the Board of Studies of Management Department in its meeting held on 27.05.2025.**

The Board of Studies of Management Department vide Reso. No. 2.3, 2.4, 2.5 and 2.7 of its meeting held on 27.05.2025 **(Annexure 3.33 Pages 637-640, already circulated)** approved

(A) Changes in Credit Structure of Master of Business Administration (MBA) *w.e.f.* 2025-26

(B) Scheme of Examinations and Syllabus of Bachelor of Business Administration (BBA) 3rd Semester (A-Scheme) and BBA 1st Semester (B-Scheme) *w.e.f.* 2025-26 **(Annexure 3.34, Pages 641-705, already circulated).**

(C) Scheme of Examinations and Syllabus of Master of Business Administration (MBA) 3rd Semester *w.e.f.* 2025-26 **(Annexure 3.35, Pages 706-818, already circulated).**

and recommended the above mentioned at (A)-(C) to the Academic Council for Approval.

The Academic Council may consider the recommendations of the Board of Studies of Management Department for approval.

**AC 3.11** **To consider the recommendations made by Board of Studies of Computer Science and Applications Department in its meeting held on 23.05.2025.**

The Board of Studies of Computer Science and Applications Department vide Reso. No. 2.3 (a), 2.3 (b) and 2.4 of its meeting held on 23.05.2025 **(Annexure 3.36 Pages 819-822, already circulated)** approved

(A) Scheme of Examinations and Syllabus of Master of Computer Applications (MCA) 2nd Year *w.e.f.* 2025-26 **(Annexure 3.37 Pages 823-880, already circulated).**

(B) Amendment in the Course Name of MCA 1st Year (2nd Semester) *w.e.f.* 2025-26

| Existing Course Name | Course Code | Amended Course Name | Semester | Course Category |
|---|---|---|---|---|
| Digital Design & Computer Architecture | DSEC-MCA-111A | Computer Organization and Architecture | I | Elective-I |
| Computer Networks and Distributed System | DSEC-MCA-116A | Computer Network | II | Elective-IV |
| Advance Computer Architecture and Quantum Computing | DSEC-MCA-118A | Advance Computer Architecture | II | Elective-IV |

(C) Scheme of Examinations and Syllabus of Bachelor of Computer Applications (BCA) 2nd Year (A-Scheme) *w.e.f.* 2025-26 **(Annexure 3.38 Pages 881-919, already circulated).**

(D) Scheme of Examinations and Syllabus of Bachelor of Computer Applications (BCA) 1st Semester (B-Scheme) *w.e.f.* 2025-26 **(Annexure 3.39 Pages 920-960, already circulated).**

and recommend the above mentioned at (A)-(D) to the Academic Council for approval.

The Academic Council may consider the recommendations of the Board of Studies of Computer Science and Applications Department for approval.

**AC 3.12** **To consider the recommendations of the Academic Committee of the Institute in its meeting held on 17.05.2025 that**

(A) **Proposal to offer B.Tech in Computer Science and Engineering, B.Tech in Fire Technology and Safety Engineering, M.Tech in Computer Science and Engineering and MBA Programs for Working Professionals from the Academic Year 2025-26, as per AICTE guidelines recommended by Academic Committee in its meeting held on 17.05.2025 (Annexure 3.40 Pages 961-977, already circulated).**

The Institute got approval for running of under graduate and post graduate programs for working professionals from AICTE vide **F. No. North-West/1-44641001793/ 2025/EOA** on dated 03.04.2025.

| Level | Program | Course | Working Professional Approved Intake 2025-26 |
|---|---|---|---|
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING | 60 |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | FIRE TECHNOLOGY AND SAFETY | 60 |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING | 60 |
| POST GRADUATE | MANAGEMENT | MBA | 60 |

And as per **Clause 10.2 (Page No. 15)** of UGC regulations for Autonomous college (Gazetted notification) "*An autonomous college is free to start a new degree programme(s) at undergraduate and postgraduate levels with the approval of the Academic Council of the Autonomous College and concerned Statutory Council(s), wherever required, provided the nomenclature of the degree is in consonance with UGC Notification on Specification of Degrees, 2014 as amended from time to time. Such courses shall fulfill the minimum standards prescribed by the parent university/UGC/Statutory Council(s) in terms of number of hours, curricular content and standards, and the parent University shall be duly informed of such courses*".

The Academic Committee of the Institute vide Reso. No. 1, 2 and 3 of its meeting held on 17.05.2025, approved the offering of B.Tech in Computer Science & Engineering, B.Tech in Fire Technology and Safety Engineering, M.Tech in Computer Science & Engineering, and MBA Programs for With an intake of 60 seats in each course (as supernumerary seats) working professionals from the Academic Year 2025-26, modalities and guidelines, Infrastructure and Faculty requirements and recommended the same to the Academic Council for approval.

The Academic Committee recommended the same to the Academic Council for approval (**Annexure 3.40 Pages 961-976, already circulated).**

(B) **Proposal to offer B.Tech Honours/Minor as per AICTE Guidelines**

The Academic Committee of the Institute vide Reso. No. 4 of its meeting held on 17.05.2025 recommended the proposal to offer B.Tech Honours/Minor as per AICTE Guidelines to Academic Council for discussion and approval.

(C) **Academic Calendar for the Academic Year 2025-26**

The Academic Committee of the Institute vide Reso. No. 5 of its meeting held on 17.05.2025 approved the Academic Calendar for the Academic Year 2025-26 and recommended the same to Academic Council for approval **(Annexure 3.40 Page 977).**

The Academic Council may consider the recommendations of the Academic Committee for approval.

**AC 3.13** **To consider the recommendations of the Examination Cell regarding conduct of Special Examinations in the month of August- September every year for the students who got reappear in the previous examinations.**

The Examination cell of the Institute in its meeting held on 06.06.2025 proposed the conduct of Special Examinations in the month of August-September every year for the students who got reappear in the previous examinations **(Annexure 3.41 Pages 978-979)** and recommended to the Academic Council for approval.

The Academic Council may consider the recommendations of the Examination Cell for approval.

**AC 3.14** **Any other item with the permission of Chair**

**Member Secretary**
**Academic Council**

**Chairperson**
**Academic Council**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

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# MINUTES OF 2ND MEETING OF THE ACADEMIC COUNCIL HELD ON 25th JANUARY, 2025 AT 2:00 PM IN THE BOARD ROOM OF THE INSTITUTE

**Members Present:**

1. Professor Aman Aggarwal, Chairperson, Director, GITAM
2. Prof. Yudhvir Singh, University Nominee, Professor UIET, MDU Rohtak
3. Prof. Rajeev Kumar, University Nominee, Professor, Deptt of Mathematics, MDU Rohtak
4. Prof. Seema Singh, University Nominee, Professor IMSAR, MDU Rohtak
5. Prof. Gian Bhushan, Member (Academician), Professor, NIT Kurukshetra
6. Mr. Rajesh Sharma, Member (Industry), Soft Chip Instrumentation
7. Ar. Deval Rajvanshi, Member (Academician), GIATP, Kablana
8. Dr. Geeta Prabha, Member (Academician), GIE, Kablana
9. Dr. Anurag Jain, Member, GITAM, Kablana
10. Dr. Punam Devi, Member, GITAM, Kablana
11. Dr. Rakesh Joon, Member, GITAM, Kablana
12. Dr. Nitin Kumar, Member, GITAM, Kablana
13. Dr. Jitender Kumar, Member, GITAM, Kablana
14. Mr. Joginder Singh, Member, GITAM, Kablana
15. Mr. Vivek, Member, GITAM, Kablana
16. Mr. Jitender Singh, Member, GITAM, Kablana
17. Mr. Virender Singh Rana, Member, GITAM, Kablana
18. Ms. Suman Singh, Member, GITAM, Kablana
19. Dr. Dipika, Member, GITAM, Kablana
20. Dr. Hari Parshad, Member, GITAM, Kablana
21. Ms. Upasna, Member, GITAM, Kablana
22. Mr. Parvesh, Member, GITAM, Kablana
23. Dr. Hitanshu Saluja, Member, GITAM, Kablana
24. Dr. Vivek Arora, Member Secretary, Registrar, GITAM, Kablana

**At the outset, the Director, GITAM, welcomed the members to the 2nd Meeting of the Academic Council. After that, with due permission of the chair, the agenda was taken up by the Registrar.**

**AC 2.1 Confirmation of the Minutes of 1st Meeting of the Academic Council held on 27th December, 2024.**

**RESOLVED THAT THE MINUTES OF 1ST MEETING OF THE ACADEMIC COUNCIL HELD ON 27TH DECEMBER, 2024 (ANNEXURE AC 2.1, PAGES 1-2 ALREADY CIRCULATED) BE CONFIRMED.**

AC 2.2 **Follow-up action report on the decisions taken by the Academic Council in its 1st Meeting held on 27th December, 2024.**

**RESOLVED THAT THE FOLLOW-UP ACTION ON THE DECISIONS TAKEN BY THE ACADEMIC COUNCIL IN ITS 1ST MEETING HELD ON 27TH DECEMBER, 2024 (ANNEXURE AC 2.2, PAGE 3 ALREADY CIRCULATED) BE NOTED.**

AC 2.3 **Consideration of the recommendations of the Board of Studies of Applied Science and Humanities Department vide Resolution No. 2 regarding approval of the Ordinance, Scheme of Studies & Examinations and Syllabi of B.Tech 1st Year (Common to all Branches) of its meeting held on 10.01.2025 (Annexure AC 2.3 pages 4-6, already circulated).**

The Board of Studies of Applied Science and Humanities Department recommended the Ordinance, Scheme of Studies & Examinations and Syllabi of B.Tech 1st Year (Common to all Branches) vide Resolution No. 2 of its meeting held on 10.01.2025 **(Annexure AC 2.4 pages 7-85, already circulated).**

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE APPLIED SCIENCE AND HUMANITIES DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.4 **Consideration of the recommendations of the Board of Studies of Mechanical Engineering Department vide Resolution No. 2 of its meeting held on 30.12.2024 (Annexure AC 2.5 pages 86-87, already circulated).**

The Board of Studies of Mechanical Engineering vide Resolution No. 2 of its meeting held on 30.12.2024 recommended the Scheme of Studies & Examinations and Syllabi of M.Tech 1st Year (Machine Design) and M.Tech.1st Year (Manufacturing and Automation) **(Annexure AC 2.6 pages 88-164, already circulated).** The matter was considered by the Director and further ordered to place the same before the Academic Council.
The Academic Council considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE MECHANICAL ENGINEERING DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.5 **Consideration of the recommendations of the Board of Studies of Computer Science and Engineering Department vide Resolution No. 2 and 3 of its meeting held on 04.01.2025 (Annexure AC 2.7 pages 165-166, already circulated).**

The Board of Studies of Computer Science and Engineering recommended the Scheme of Studies & Examinations and Syllabi of M.Tech 1st Year (Computer Science and Engineering) and M.Tech.1st Year (Cyber Forensics and Information Security) vide Resolution No. 2 of its meeting held on 04.01.2025 **(Annexure AC 2.8 pages 167-252, already circulated).**

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE COMPUTER SCIENCE AND ENGINEERING DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.6 **Consideration of the recommendations of the Board of Studies of Electronics and Communication Engineering Department vide Resolution No. 2 of its meeting held on 04.01.2025 (Annexure AC 2.9 pages 253-255, already circulated).**

The Board of Studies of Electronics and Communication Engineering Department recommended the Scheme of Studies & Examinations and Syllabi of M.Tech 1st Year (Electronics and Communication Engineering) vide Resolution No. 2 of its meeting held on 04.01.2025 **(Annexure AC 2.10 pages 256-295, already circulated).**

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.7 **Consideration of the recommendations of the Board of Studies of Electrical Engineering Department vide Resolution No. 2 of its meeting held on 02.01.2025 (Annexure AC 2.11 pages 296-297, already circulated)..**

The Board of Studies of Electrical Engineering Department recommended the Scheme of Studies & Examinations and Syllabi of M.Tech 1st Year (Electrical Power Systems) vide Resolution No. 2 of its meeting held on 02.01.2025 **(Annexure AC 2.12 pages 298-341, already circulated).**

The matter was considered by the Director and further ordered to place the same before the Academic Council.
The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE ELECTRICAL ENGINEERING DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.8 **Consideration of the recommendations of the Board of Studies of Civil Engineering Department vide Resolution No. 2 of its meeting held on 03.01.2025 (Annexure AC 2.13 pages 342-343, already circulated).**

The Board of Studies of Civil Engineering Department recommended the Scheme of Studies & Examinations and Syllabi of M.Tech 1st Year (Structural Design) vide Resolution No. 2 of its meeting held on 03.01.2025 **(Annexure AC 2.14 pages 344-387, already circulated).**

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE CIVIL ENGINEERING DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.9 **Consideration of the recommendations of the Board of Studies of Computer Science and Applications Department vide Resolution No. 2 and 3 of its meeting held on 10.01.2025 (Annexure AC 2.15 pages 388-390, already circulated).**

The Board of Studies of Computer Science and Applications Department recommended the following:

(A) Scheme of Studies & Examinations and Syllabi of MCA 1st Year vide Resolution No. 2 of its meeting held on **10.01.2025 (Annexure AC 2.16 pages 391-463, already circulated).**

(B) Scheme of Studies & Examinations and Syllabi of BCA 1st Year vide Resolution No. 2 of its meeting held on **10.01.2025 (Annexure AC 2.17 pages 464-540**, already circulated).

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE COMPUTER SCIENCE AND APPLICATIONS DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.10 **Consideration of the recommendations of the Board of Studies of Management Department vide Resolution No. 2 and 3 of its meeting held on 30.12.2024 (Annexure 2.18 pages 541-543, already circulated).**

The Board of Studies of Management Department recommended the following

(A) Scheme of Studies & Examinations and Syllabi of BBA 1st Year vide Resolution No. 2 of its meeting held on 30.12.2024 **(Annexure 2.19 pages 544-605, already circulated)**.

(B) Scheme of Studies & Examinations and Syllabi of MBA 1st Year vide Resolution No. 3 of its meeting held on 30.12.2024 **(Annexure 2.20 pages 606-650, already circulated)**.

The matter was considered by the Director and further ordered to place the same before the Academic Council.

The Academic Council Considered the above; and

**RESOLVED THAT THE RECOMMENDATIONS OF THE BOARD OF STUDIES OF THE MANAGEMENT DEPARTMENT AS MENTIONED ABOVE BE APPROVED.**

**[ACTION TAKEN BY REGISTRAR]**

AC 2.11 **Consideration of the approval of Multidisciplinary Open Elective Courses and Foundation Elective Courses recommended by various Board of Studies in their meeting held on as mentioned at item AC 2.3 to AC 2.10.**

The Multidisciplinary Open Elective Courses and Foundation Elective Courses recommended by various Board of Studies in their meeting held on as mentioned at item AC 2.3 to AC 2.10 **(Annexure 2.21 Pages 651-693).**

The matter was considered by the Director and further ordered to place before the Academic Council for approval.
The Academic Council considered the above; and

**RESOLVED THAT MULTIDISCIPLINARY OPEN ELECTIVE COURSES AND FOUNDATION ELECTIVE COURSES RECOMMENDED BY VARIOUS BOARD OF STUDIES BE APPROVED.**

AC 2.12 **Any other item with the permission of the Chair.**
No other item was discussed and the meeting ended with thanks to the Chair.

**Member Secretary**

**Approved**
**Director**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**
**An Autonomous Institute| NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak**

Report of the follow-up action on the decisions taken by the Academic Council in its 2nd meetings held on 25.01.2025.

| Reso. No. | Particulars | Follow-up action taken |
|---|---|---|
| AC 2.1 | Confirmation of the minutes of meeting of the Academic Council held on 25.01.2025. | The minutes of 2nd meeting of the Academic Council were confirmed. |
| AC 2.2 | Follow-up action report on the decisions taken in the meeting of the Academic Council held on 25.01.2025. | The Council noted the follow-up action. |
| AC 2.3 | Consideration of the recommendations of the Board of Studies of Applied Science and Humanities Department vide Resolution No. 2 regarding approval of the Ordinance, Scheme of Studies & Examinations and Syllabi of B.Tech 1st Year (Common to all Branches). | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.4 | Consideration of the recommendations of the Board of Studies of Mechanical Engineering Department vide Resolution No. 2 of its meeting held on 30.12.2024. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.5 | Consideration of the recommendations of the Board of Studies of Computer Science and Engineering Department vide Resolution No. 2 and 3 of its meeting held on 04.01.2025. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |

| | | |
|---|---|---|
| AC 2.6 | Consideration of the recommendations of the Board of Studies of Electronics and Communication Engineering Department vide Resolution No. 2 of its meeting held on 04.01.2025. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.7 | Consideration of the recommendations of the Board of Studies of Electrical Engineering Department vide Resolution No. 2 of its meeting held on 02.01.2025. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.8 | Consideration of the recommendations of the Board of Studies of Civil Engineering Department vide Resolution No. 2 of its meeting held on 03.01.2025. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.9 | Consideration of the recommendations of the Board of Studies of Computer Science and Applications Department vide Resolution No. 2 and 3 of its meeting held on 10.01.2025. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |
| AC 2.10 | Consideration of the recommendations of the Board of Studies of Management Department vide Resolution No. 2 and 3 of its meeting held on 30.12.2024. | Decision conveyed to all concerned.<br>The Scheme of Studies & Examinations and Syllabus of the said programmes have been uploaded on the Institute website. |

| | | |
|---|---|---|
| AC 2.11 | Consideration of the approval of Multidisciplinary Open Elective Courses and Foundation Elective Courses recommended by various Board of Studies in their meeting held on as mentioned at item AC 2.3 to AC 2.10. | Decision conveyed to all concerned.<br>The Syllabus Open Elective Courses and Foundation Elective Courses have been uploaded on the Institute website. |

# DEPARTMENT OF FIRE TECHNOLOGY AND SAFETY
# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR
An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

## MINUTES OF THE 2ND MEETING OF THE BOARD OF STUDIES OF FIRE TECHNOLOGY AND SAFETY DEPARTMENT

**The 2nd Meeting of the Board of Studies of Fire Technology and Safety Department was held on 26.05.2025 at 2:00 PM in the Meeting Room of the Institute.**

### Members Present:

- Dr. Jitender Kumar – Chairperson, BoS, Department of Fire Technology and Safety, GITAM
- Dr. Deepak Chhabra – Associate Professor, UIET, MDU Rohtak (University Nominee)
- Sh. R.C. Sharma – Professor of Practice, IP University, Delhi (Retd. Director, Delhi Fire Service) Subject Expert outside the parent university
- Md. Amir Ali Khan- Associate Professor, National Institute of Disaster Management, Delhi (Online)
- Mr. Sujit – Industry Expert , General Manager, DLF Power and Services
- Mr. Nikhil Sikka – Assistant Professor, GITAM
- Mr. Rajkumar Ruhil- Assistant Professor, GITAM
- Mr. Mohit Taneja – Assistant Professor, GITAM
- Mr. Manoj Kumar- Assistant Professor, GITAM
- Mr. Bhoop Singh – Assistant Professor, GITAM
- Mr. Vikas Goel – Assistant Professor, GITAM
- Mr. Vishnu – Assistant Professor, GITAM
- Dr. Paramjeet – Professor (Mathematics), GITAM
- Dr. Dipika – Professor (Management), GITAM
- Dr. Sunil Kadiyan – Associate Professor, GITAM
- Dr. Aarti- Assistant Professor (Chemistry), GITAM

### Proceedings of the Meeting:

At the outset, the Chairperson, Dr. Jitender Kumar, extended a warm welcome to all the esteemed members of the Board of Studies and appreciated their presence and contribution towards academic development. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Item No. 2.1** **Confirmation of the minutes of the 1st meeting of the Board of Studies of the Department of Fire Technology and Safety held on 30.12.2024.**

**RESOLVED THAT THE MINUTES OF THE 1ST MEETING OF THE BOARD OF STUDIES OF THE DEPARTMENT OF FIRE TECHNOLOGY AND SAFETY HELD ON 30.12.2024, AS PER ANNEXURE 2.1 (PAGES 1-3), BE APPROVED.**

**Item No. 2.2** **Follow-up action report on the decisions taken by Board of Studies in its 1st meeting held on 30.12.2024.**

**RESOLVED THAT THE FOLLOW-UP ACTION ON THE DECISIONS TAKEN BY BOARD OF STUDIES IN ITS 1ST MEETING HELD ON 30.12.2024, AS PER ANNEXURE 2.2 (PAGE 4), BE NOTED.**

**Item No. 2.3** **Scheme of Studies & Examinations and Syllabi of B.Tech Fire Technology and Safety (2nd year) *w.e.f.* Academic Session 2025- 2026.**

The Scheme of Studies & Examinations and Syllabi for B.Tech Fire Technology and Safety (2nd Year) *w.e.f.* Academic Session 2025-26 may be prescribed, as per the **Annexure 2.3 (Pages 5-51).**

The Board of Studies considered the above; and

**RESOLVED THAT THE SCHEME OF STUDIES & EXAMINATIONS AND SYLLABI FOR B.TECH FIRE TECHNOLOGY AND SAFETY (2ND YEAR) W.E.F. ACADEMIC SESSION 2025-26 BE APPROVED. FURTHER RESOLVED THAT THE SAME IS RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.**

**Item No. 2.4** **Review of the Panel of Examiners for Paper Setting and Practical Examinations**

The Panel of Examiners for Paper Setting and Practical Examinations is proposed, as per **Annexure 2.4 (Page 52).**

The Board of Studies considered the above; and

**RESOLVED THAT THE PANEL OF EXAMINERS FOR PAPER SETTING AND PRACTICAL EXAMINATIONS BE APPROVED AND FURTHER RESOLVED THAT THE SAME BE SENT TO CONTROLLER OF EXAMINATIONS FOR FURTHER ACTION.**

**Item No. 2.5** **Proposal to start Certificate Course on Environmental, Social and Governance (ESG)**

The Certificate Course on Environmental, Social and Governance (ESG) is proposed to start along with scheme of examinations, syllabus, eligibility criteria, targeted audience and other modalities, as per **Annexure 2.5 (Pages 53-55).**

The Board of Studies considered the above; and

**RESOLVED THAT SCHEME OF EXAMINATIONS, SYLLABUS, ELIGIBILITY CRITERIA, TARGETED AUDIENCE AND OTHER MODALITIES OF THE CERTIFICATE COURSE, AS PER ANNEXURE-2.5 (PAGES 53-55), BE APPROVED.**

**FURTHER RESOLVED THAT THE PROPOSAL TO START THE CERTIFICATE COURSE ON ESG AND ITS MODALITIES IS RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.**

**Item No. 2.6** **Scheme of Examinations and Syllabus of Fire Ground Operation-I (MAU-102B) and Fire Ground Operation-II (MAU-104B) as Mandatory Audit Course and Fundamentals of Fire and Safety Engineering as Engineering Science Course for B.Tech 1st Year Students.**

The Mandatory Audit Courses, Fire Ground Operation-I and Fire Ground Operation-II for B.Tech (1st Year) Fire Technology and Safety students and Fundamentals of Fire and Safety Engineering as Engineering Science Course (Common to all Branches) may be prescribed, as per **Annexure-2.6 (Pages 56-61).**

The Board of Studies considered the above; and

**RESOLVED THAT THE SCHEME OF EXAMINATIONS AND SYLLABI AS MENTIONED ABOVE BE APPROVED.**

**FURTHER RESOLVED THAT THE SAME IS RECOMMENDED TO THE BOARD OF STUDIES OF APPLIED SCIENCE AND HUMANITIES FOR FURTHER ACTION.**

**Item No. 2.7** **Any other item with the permission of the Chair**

No other item was discussed.

The meeting concluded at 4:30 PM. The Chairperson expressed gratitude to all the members for their active participation and valuable suggestions. He reiterated the Department's commitment to academic excellence and industry relevance. The meeting ended with a vote of thanks to the Chair.

**Chairperson, Board of Studies**
**Department of Fire Technology and Safety**
**GITAM, Jhajjar**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**

**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Evaluation Scheme & Syllabus For

# Bachelor of Technology Fire Technology and Safety

# (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 1 Tutorial (T) per week | 1 Credit |
| 3 | 1 Practical (P) per week | 0.5 Credit |
| 4 | 2 Practical (Lab) per week | 1 Credit |

## 2. RANGE OF CREDIT

A range of credits from 160 to 170 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 18-20 credits. These could be acquired through MOOCs.

## 3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B.TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Basic Science Courses | 21 |
| 2 | Engineering Science Courses | 22 |
| 3 | Professional Core Courses | 71 |
| 4 | Professional Elective Courses (Relevant to chosen specialization/branch) | 18 |
| 5 | Indian Knowledge System | |
| 6 | Multidisciplinary Open Electives Courses | 9 |
| 7 | Humanities and Social Sciences including Management courses | 15 |
| 8 | Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad | 14 |
| 9 | Mandatory Non Credit Courses – Audit Course | (Non-Credit) |
| | **Total Credits** | **170** |

**Minor variation is allowed as per need of the respective disciplines.*

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Basic Science Courses | BSC |
| 2 | Engineering Science Courses | ESC |
| 3 | Professional Core Courses | PCC |
| 4 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 5 | Indian Knowledge System | IKS |
| 6 | Multidisciplinary Open Electives Courses | MOEC |
| 7 | Humanities and Social Sciences including Management courses | HSMC |
| 8 | Laboratory Courses | LC |
| 9 | Mandatory Non-Credit Courses – Audit Course | MAU |
| 10 | Project | PR |
| 11 | Internship | INT |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## B.Tech (Fire Technology and Safety) – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Basic Science Courses | BSC-MFT-201A | Engineering Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-FT-203A | Fundamentals of Fire Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-FT-205A | First Aid and Paramedics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-FT-207A | Fluid Mechanics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Engineering Science Courses | ESC-ME-209A | Thermal Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Humanities and Social Science including Management Courses | HSMC-01A | Fundamentals of Management and Organizational Behaviour | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Courses | LC-FT-211A | Fire Engineering Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Courses | LC-FT-213A | First Aid and Paramedics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Engineering Science Courses | LC-FT-215A | Thermal Engineering Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Professional Core Courses | LC-FT-217A | Fire Ground Operation-III | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| **Total Credits** | | | | | | | | **23** | | | | **800** | |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## B.Tech (Fire Technology and Safety) – 4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-FT-202A | Structural Fire Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-FT-204A | Heat Transfer, Combustion and Explosives | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-FT-206A | Fire Service Hydraulics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-FT-208A | Fundamentals of Safety Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-FT-210A | Safety in Construction | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Professional Elective Courses | Refer Table-1 | Professional Elective-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Courses | LC-FT-212A | Structural Fire Engineering Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Courses | LC-FT-214A | Fire Service Hydraulics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Courses | LC-FT-216A | Heat Transfer, Combustion and Explosives Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Professional Core Courses | LC-FT-218A | Fire Ground Operation-IV | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 11 | Mandatory Non Credit Courses – Audit Course | MC-201A | Environmental Science | 2 | 0 | 1 | 3 | - | 40 | 60 | | - | 3 |
| **Total Credits** | | | | | | | | **23** | | | | **800** | |

**Notes:**

I. MC-201A is a mandatory non –credit course in which the students will be required passing marks in theory.

II. At the end of 4th semester each student has to undergo Practical Training based on Fire and Safety/ Fire and Safety Equipments Installation, Care and Maintenance/Fire and Safety Audits/Any Certificate Course related to Fire and Safety (Min Contact Hours must be 30 Hrs) of 4/6 weeks in Fire Service Department/Industry/ Multi-Speciality Hospital/Professional Organization/ Research Laboratory/ Training Centre/ Educational Institute/other building Occupancy having Fire Fighting Installations etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

III. Choose any one from Professional Elective-I

**Table 1 Professional Elective – I**

| Sr. No. | Code | Subject |
|---|---|---|
| 1 | PEC-FT-220A | Electric Fire Safety Practice and Standards |
| 2 | PEC-FT-222A | Industrial Psychology |
| 3 | PEC-FT-224A | Chemical Process Safety |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **BSC-MFT-201A** | | | | |
| Category | Basics Science Courses | | | | |
| Course title | **Engineering Mathematics-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To introduce the solution methodologies for second order partial differential equations with applications in engineering.<br>● To provide an overview of Numerical methods, Laplace transform and Linear programming to Fire engineers. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Recall the basic concepts of engineering mathematics. | Level 1: Remember |
| CO2 | Understand various methods of partial differential equations, numerical methods, Laplace transforms and Linear programming problems. | Level 2: Understand |
| CO3 | Apply methods and techniques to solve engineering problems. | Level 3: Apply |
| CO4 | Analyze different engineering problems and select the suitable methods to solve these problems. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Partial Differential Equations:** First order linear partial differential equations, First order non-linear partial differential equations, Charpit's method, Second order linear partial differential equations and their classifications, Method of separation of variables and its applications to wave equation, One dimensional heat equations and two dimensional heat flow (steady state solutions only)

**Unit-II**

**Numerical Methods:** Solution of polynomial and transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

**Unit-III**

**Transform Calculus:** Laplace Transforms and its Applications, Laplace transforms of elementary functions, properties of laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, Multiplication by $t^n$, Division by t, Evaluation of integrals by Laplace transforms, Laplace transform of unit step function, unit

impulse function and periodic function, inverse transforms, convolution theorem, application to linear differential equations.

**Unit-IV**

**Linear Programming:** Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method. Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

**Suggested Readings:**

- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers
- Numerical Methods by P. Kandasamy, K. Thilagavathy, K. Gunavathi, S. Chand and Company
- Introductory Methods of Numerical Analysis by S. S. Sastry, PHI Learning.
- A Textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.

**Useful Video Links:**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| **Unit -I** | One Dimensional Heat Equation | https://youtu.be/GmIcbqdvIgc?si=4XnsNAbmcXVgE5ur | **IIT Roorkee** |
| **Unit-II** | Solution by Separation of Variables | https://youtu.be/W3HXK1Xe4nc?si=aqwoXZcWjcdiWifm | **IIT Kharagpur** |
| | Bisection Method | https://youtu.be/3FhE9De2__o?si=LM8q56foPk4yBvDb | **IIT Madras** |
| | Newton-Raphson Method | https://www.youtube.com/watch?v=ZcbFQz_Kwog | **IIT Madras** |
| | Introduction to numerical differentiation interpolation formula | https://www.youtube.com/watch?v=bnUsBhPLekE | **IIT Roorkee** |
| | Divided Difference interpolation | https://www.youtube.com/watch?v=DnfC0IUmUe4 | **IIT Roorkee** |
| **Unit-III** | Laplace Transform | https://www.youtube.com/watch?v=c9NibpoQjDk | **IIT Madras** |
| | Laplace Transform & its existence | https://www.youtube.com/watch?v=2LyY4t0Gfvs | **IIT Kharagpur** |
| | Properties of Laplace Transform-Part-1 | https://www.youtube.com/watch?v=SN0dcSyoJIE | **IIT Madras** |
| | Properties of Laplace Transform-Part-2 | https://www.youtube.com/watch?v=MV3a-sQqDRc | **IIT Madras** |
| | Convolution Theorem for Laplace Transfroms | https://www.youtube.com/watch?v=niOMKg9FMO8 | **IIT Madras** |
| **Unit-IV** | Simplex Method | https://www.youtube.com/watch?v=RcPhmPhjMbc | **IIT Kharagpur** |
| | Testing of Hypothesis-Basic Concepts | https://www.youtube.com/watch?v=IEP3swFeauE | **IIT Kharagpur** |
| | Testing of Hypothesis-I | https://www.youtube.com/watch?v=14PQawp_rjk | **IIT Kharagpur** |
| | Chi-Square Distribution | https://www.youtube.com/watch?v=lQ1ec1nQvKM | **IIT Madras** |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-FT-203A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fundamentals of Fire Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To provide foundational knowledge of fire science, combustion, and physical principles critical to understanding fire behavior.<br>• To develop understanding of emergency preparedness, fire prevention measures, and building codes related to fire safety.<br>• To familiarize learners with various fire protection systems and technologies essential for minimizing fire-related risks.<br>• To train students in the application of firefighting techniques and command systems across various industries and environments. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key terminology, classifications, processes, systems, and equipment related to fire science, fire prevention, fire protection, and firefighting across various applications. | Level 1: Remember |
| **CO2** | Explain the fundamental concepts and applications of Fire Engineering. | Level 2: Understand |
| **CO3** | Apply fire engineering knowledge and safety procedures to select and use appropriate firefighting and protection systems in different industrial and built environments. | Level 3: Apply |
| **CO4** | Analyze the effectiveness of fire safety strategies, emergency response plans, and firefighting operations in diverse scenarios and industries. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Fire Engineering Science:** Fire, Elements of fire, Classification of fire, Flash point, Fire point, Causes of fire, Phases of fire, Physical properties of matter, Temperature, Heat, Heat transmission, Thermal expansion, Hydraulics, Specific heat, Latent heat, Combustion, Types of combustion, Smoke, Electricity.

**Buildings:** Classification of buildings based on occupancy (as per latest National Building Code of India).

**Unit-II**

**Emergency-** Introduction, Emergency Evacuation, Process of Emergency Evacuation, Evacuation Plan, Means of Escape.

**Fire Prevention:** Elements of Construction, Elements of Structure, Fixed Installations–Fire doors, Smoke Ceiling, Compartmentation, Pressurization, Fire Safety Practice, Fire Safety Management.

## Unit-III

**Fire Protection**: Fire Alarm and Detection Systems, Fire Extinguishers, Fire Hose Reels, Fire Hose Cabinets, Fire Hydrants, Fire Pumps, etc., Fire Sprinkler Systems, Fire Suppression Systems, Kitchen Fire Safety, General Requirements and Guidelines for the Installation of Fire Detection and Alarm System in the Buildings.

## Unit-IV

**Fire Fighting**: Incident Command, Use of Compressed Air Breathing Apparatus at Incidents, Rescue, Fire-Fighting, Ventilation, Salvage Operation, Application and Equipment, Rope and Lines, Ladders.

**Applications of Fire Engineering**: Oil and Gas Industries, Pharmaceuticals Industries, Buildings, Fertilizer Industries, Steel Industries, Coal Industries, Airports, etc.

**Suggested Readings:**


- Manual of Firemanship by HMSO
- Fire Safety in Buildings by V K Jain, New Age publishers, New Delhi
- Principles of Fire Safety Engineering by A. K. Das, PHI Publishers.
- Fundamentals of Fire Safety in Building Design by Dr. Than Singh Sharma, Aayush Publications, New Delhi
- Handbook of Fire Technology by R.S.Gupta, Orient Longman Pvt. Ltd., Kolkata
- Manual of Fire Safety by N. Sesha Prakash, CBS Publishers & Distributors Pvt. Ltd.
- National Building Code (NBC) Part-4 Life and Safety (Latest Edition)- Bureau of Indian Standards


**Useful Video Links**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| **Unit-I** | Basics of Fire-Part 1 | https://youtu.be/eLeZ2zc2hgI?si=VeWVsuhIkwRf-XYd | NPTEL (IIT Madras) |
| | Basics of Fire-Part 2 | https://youtu.be/NzIbiOAJONc?si=7H_mIiQm18vvULrd | NPTEL (IIT Madras) |
| | Combustion | https://youtu.be/n6HAyxdup_U?si=IMSS2Ye7w01SQQNz | NPTEL (IIT Delhi) |
| **Unit-II** | Emergency Scene Management (ESM) | https://youtu.be/uibCRbELVbA?si=z9JrmlCfMjKvDR4g | NPTEL ( IIT Kanpur ) |
| | Safety practices for Fire protection | https://youtu.be/-XRu7BSouvY?si=ogFdjHXtUbAbHWly | NPTEL (IIT Madras) |
| **Unit-III** | Fire safety: Internal planning, Detection and Suppression | https://youtu.be/e3Orj5XDj2M?si=YghWp5QRE9ECcIKA | NPTEL (IIT Delhi) |
| | Sprinklers I | https://youtu.be/ZKsqIPM810M?si=5uIMn1w6so-tb7oU | NPTEL (IIT Roorkee) |
| | Sprinklers II | https://youtu.be/Z82ypLX2gn8?si=bdPqswwPWQ-DB613 | NPTEL (IIT Roorkee) |
| **Unit-IV** | Fire Safety: Escape and Refuge | https://youtu.be/O6CYQt9vi_Y?si=D-3_DCTnQ3fF6Bxm | NPTEL (IIT Delhi) |
| | Ventilation | https://youtu.be/K58rDFPGJO0?si=b4r8Lxa3UgPiMnNZ | NPTEL (IIT Delhi) |

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|---|---|---|---|---|---|
| Course Code | **PCC-FT-205 A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **First Aid and Paramedics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To understand the basics of the first Aid.<br>● To study the human body and its various systems like respiratory, circulatory, digestive, central nervous and musculoskeletal systems.<br>● To familiarize with different medical conditions.<br>● To understand different types of casualties handling and lifting techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define the different technical terms associated with first aid. | Level 1: Remember |
| CO2 | Describe the fundamental concepts of the human systems, different medical conditions, accident and first aid. | Level 2: Understand |
| CO3 | Demonstrate different medical conditions, injuries and process of accident investigation and providing the first aid. | Level 3: Apply |
| CO4 | Select the suitable technique for handling casualty and investigate the accidents. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**First Aid:** Introduction, principles of first aid, first aid and resuscitation, training in first aid, general rules of first aid, role of first aider, sequence of action on arrival at scene, first aid kit, vital signs- A, B, C (Airway, Breathing, Circulation), action in emergency, CPR, artificial respiration.

**Unit-II**

**Human Body:** Study of the human body and its various systems such as musculoskeletal system, respiratory system, circulatory system, digestive system, central nervous system etc.
**Wounds:** Wounds and cases of wounds, bleeding and its types, control of bleeding.
**Injuries**: Injuries, first aid for various injuries, head injuries, chest injuries, eye injuries and blindness.

**Unit-III**

**Medical Conditions:** Angina, heart attack, stroke, diabetes mellitus, hyperglycemia, hypoglycemia, seizures in adults and children, fever meningitis, fainting, allergy, headache, migraine, sore throat, earache and toothache, abdominal pain, vomiting and diarrhea, childbirth, electric shock, burn and its types, rule of nine, poisoning and its types, bites frostbite, snake bite, dog bite, insect bite, drowning and choking, unconsciousness, protection of body from winter dryness.

## Unit-IV

**Fractures:** First aid for fractures or broken bones, joints and its types, bandages and slings, handling of casualties, lifting technique and equipment, stretcher and its types, ambulance, installation and use in casualties transportation, dealing with minor illness.
**Accidents:** Accidents and its types, accident reporting, investigation and record keeping, study of human casualty including medical history checking, making of diagnosis report based on symptoms as narrated by the casualties and signs as observed by the paramedic, checking.

### Suggested Readings:

- Manual of first aid to the injured by St. John Ambulance Association.
- First aid text book by American National Red Cross
- Manual of First aid instruction by US Bureau of Mines
- Accident First Aid by V.V. Yudenich, Mir Publishers, Moscow

### Useful Video Links

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| Unit-I | Basic Life Support (BSL)- Part 1 by NPTEL | https://www.youtube.com/watch?v=LAJJDH5ol4M | NPTEL (IIT Madras) |
| | Basic Life Support (BLS) - Part 2 by NPTEL | https://www.youtube.com/watch?v=kYZvMk88zx4 | NPTEL (IIT Madras) |
| | CPR | https://www.youtube.com/watch?app=desktop&v=BQNNOh8c8ks | St. John Ambulance |
| Unit-II | Circulatory System | https://www.youtube.com/watch?v=b0bOclBpyME | NPTEL (IIT Guwahati) |
| | Muscular System | https://www.youtube.com/watch?v=ijiEeazaotE | NPTEL (IIT Guwahati) |
| | Respiratory System | https://www.youtube.com/watch?v=974jAldy8JY&t=5s | SWAYAM (IIT Madras) |
| | Head Injury | https://www.youtube.com/watch?v=a4cIFZx1f2E | St. John Ambulance |
| Unit-III | Stroke- Signs & Symptoms | https://www.youtube.com/watch?v=PhH9a0kIwmk | St. John Ambulance |
| | Diabetic Emergency | https://www.youtube.com/watch?v=L06DNMRcy98&t=144s | St. John Ambulance |
| Unit-IV | How to Treat a Fracture & Fracture Types | https://www.youtube.com/watch?v=2v8vlXgGXwE | St. John Ambulance |
| | Accident Investigation, Reporting | https://www.youtube.com/watch?v=VhuZ6M7a8N8 | NPTEL (IIT Kharagpur) |

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|---|---|---|---|---|---|
| Course Code | **PCC-FT-207A** | | | | |
| Category | Professional Core Course | | | | |
| Course Title | **Fluid Mechanics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To be familiar with different types of tanks and to measure the capacity of tanks.<br>● To know about fluid pressure and its effects.<br>● To understand the Kinematics and Dynamics of fluids. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define fundamental concepts of Fluid Mechanics. | Level 1: Remember |
| CO2 | Explain the fluids, flow and fluid properties. | Level 2: Understand |
| CO3 | Apply the principles and theorems related to fluid mechanics to solve the complex engineering problems. | Level 3: Apply |
| CO4 | Analyze the different fluid properties, losses, discharge etc. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Measurements:** Units of measurements, System of measurements, Capacity of tanks, Rectangular tank and Square tank with flat base and sloping base, Circular, Spherical tank, Elliptical tank, Time of filling and emptying a tank.

**Basics of Hydraulics:** Concept of fluid and flow, Properties of fluids, Newton's Law of viscosity, Types of fluids, Ideal and Real fluids, Surface tension and Capillarity, Newtonian and Non-Newtonian fluids, Use of water in fire service.

## Unit-II

**Hydrostatics:** Concept of pressure, Pressure head, Pascal's law, Effect of shape and size of container on pressure, Effect of specific weight on pressure, Effect of external force on pressure in a vessel, Direction of pressure in a vessel, **Fluid statics:** Pressure variation in compressible and incompressible fluids, Forces on submerged plane surfaces and curved surfaces, Fluid pressure and its measurement (Manometer and Bourdon pressure gauge) , kinetic and Momentum correction factors,

**Buoyancy:** Stability of floating and submerged bodies, Oscillation of floating bodies.

## Unit-III

**Kinematics of fluid flow:** Types of flow, Steady and Unsteady, Uniform and Non-uniform, Laminar and Turbulent, Eulerian and Lagrangian description of fluid flow, Streamline, Path line, Streak line, Flow rate and Continuity equation, One and Two dimensional flow, Velocity and Acceleration at a point, Differential equation of continuity in cylindrical and polar coordinates, Rotation, Vorticity and Circulation, Stream and Potential functions, Flow net, Problems.

## Unit-IV

**Dynamics of fluid flow:** Concept of system and control volume, One dimensional method for flow analysis, Euler's equation of motion, Derivation of Bernoulli's equation for incompressible flow and its application (Venturimeter, Orifice meter, Pitot tube), Measurement of Fluid Flow through pipes, Impulse momentum relationship and its applications, Problems.

**Suggested Readings:**

- Hydraulics and Fluid Mechanics by P.N. Modi, Dr. S.M. Seth, Rajsons Publications
- Hydraulic Mechanics and Hydraulics Machines by Dr. J. Lal, Metropolitan Book Pvt. Ltd.
- Manual of Firemanship
- Fire Service Hydraulics by Dr. G.C. Mishra, Masood Books
- Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications

**Useful Video Links:**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| **Unit-I** | Basics of Measurements | www.youtube.com/watch?v=z5KyhyWr6ps | IIT Guwahati |
| | Basic concepts & Types of Fluids | www.youtube.com/watch?v=F_7OhKUYV5c | IIT Bombay |
| **Unit-II** | Hydrostatic concepts, Buoyancy, Stability | www.youtube.com/watch?v=VTO5n4_PWMw&t=1s | SWAYAM |
| **Unit-III** | Fluid kinematics -I | www.youtube.com/watch?v=whCu4Xl3m98&list=PLbMVogVj5nJQEgL1sHuY24d6omOqXInnt&index=11 | IIT Kharagpur |
| | Fluid kinematics – II | www.youtube.com/watch?v=6q_JPg0ST4s&list=PLbMVogVj5nJQEgL1sHuY24d6omOqXInnt&index=12 | IIT Kharagpur |
| | Fluid kinematics – III | www.youtube.com/watch?v=tLqo55ILM3o&list=PLbMVogVj5nJQEgL1sHuY24d6omOqXInnt&index=14 | IIT Kharagpur |
| **Unit-IV** | Bernoulli's Equation | www.youtube.com/watch?v=NcD9JNPMfUs | IIT Madras |
| | Flow obstruction devices like Venturimeter & Orificemeter | www.youtube.com/watch?v=bsR3o-cFyMU | IIT Guwahati |

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|---|---|---|---|---|---|
| Course Code | **ESC-ME-209A** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Thermal Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To familiarize with the basic concepts of thermal engineering.<br>● To study the basic concepts of steam power generation, IC engines and calculation of different powers.<br>● To learn about the Refrigeration and air conditioning and associated problems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Recall fundamental concepts, laws, and definitions of thermodynamics, boilers, IC engines, and fuels involved in energy systems and thermal processes. | Level 1: Remember |
| CO2 | Explain the principles of thermodynamic cycles, refrigeration, steam generation, and combustion processes, and interpret related system operations. | Level 2: Understand |
| CO3 | Apply the knowledge of thermal engineering to deal with the engineering problems under various conditions. | Level 3: Apply |
| CO4 | Analyze performance parameters, efficiency, and losses in boilers and IC engines, fuel characteristics and combustion processes for optimized energy use. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Introduction, System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Thermodynamic Equilibrium, State, Property, Process, Cycle, Reversibility, Quasi – Static Process, Irreversible Process, Causes of Irreversibility, Energy in State and in Transition, Work and Heat, Point and Path Function, Entropy.

**Unit-II**

**Ideal Gas laws** - Boyle's Law, Charle's Law, Avagadro's Law, Equation of State, Specific Heat, Universal Gas Constant.

**Laws of Thermodynamics:** Zeroth Law of Thermodynamics, First law of Thermodynamics, Steady Flow Energy Equation, Second Law of Thermodynamics, Clausius Statement, Kelvin Plank's Statement, Perpetual Motion Machine, Third Law of Thermodynamics. Air Standard Cycles: Otto, Diesel, Carnot cycle, and Heat engine,

## Unit-III

**Air Conditioning:** Introduction, Types of air conditioning systems, Hazards and structural precautions, special problems associated with each system, HVAC calculations.

**Refrigeration:** Introduction, definition & unit and principle of refrigeration, single stage vapour compression refrigeration cycle. COP of refrigeration, Common refrigerants and their properties, basic precautions, Hazards and method of control in Refrigerating and air conditioning plant.

**Steam Generation and Powers:** Introduction, Classification of Boilers, Selection of a Boiler, Essentials of a Good Boiler, Boiler Mountings and Accessories, Boiler Efficiency, Heat Losses in a Boiler Plant.

## Unit-IV

**IC Engines: Introduction,** Classification of IC engine, Principles of Internal combustion engine, Basic terminology, Indicator Diagram, Ignition System, Brake Power, Horse Power, Indicated Power, Brake Mean Effective Pressure, Engine Efficiency, Testing of IC Engines, Heat Balance Sheet.

**Fuels and Combustion:** Introduction, Classification of Fuels- Solid, Liquid, Gas, Basic Chemistry, Air-Fuel Ratio, Volumetric and Weight Analysis, Calorific Values.

**Suggested Readings:**

- Thermodynamics: An Engineering Approach by Y. A.Cengel and M. A. Boles, McGraw Hill Education
- Engineering Thermodynamics by Dr. P.K.Nag, TMH Publication
- Engineering Thermodynamics by Dr. C.P.Arora, TMH Publication
- Internal Combustion Engines by V. Ganesan, TMH Publication
- Heat Transfer by J.P. Holman, John Wiley & Sons, New York publications
- Refrigeration and Air Conditioning by P. L. Ballaney, Khanna Publishers
- Refrigeration and Air Conditioning by Dr. C. P. Arora, TMH Publication
- Manual of Firemanship: Part -6C

**Useful Video Links:**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| Unit-I | Systems and control volume | https://youtu.be/sGL6nMBNlcA?si=ahjNA1VGJU3ugFe9 | NPTEL (IIT Gandhinagar) |
| | Reversible and Irreversible Processes | https://youtu.be/oOtu9dVVamU?si=qwAZAMVjkqZlRewD | NPTEL (IIT Khargpur) |
| | Basic Thermodynamics: Gibbs free energy | https://youtu.be/VVyNKTDfNjo?si=qOq1kAiCgzNTdrIy | NPTEL (IIT Kanpur) |
| | First law for closed systems | https://youtu.be/6fap22clD14?si=UvaUijHffZFeaKWQ | NPTEL (IIT Guwahti) |
| Unit-II | The Ideal GAS | https://youtu.be/1yymkQQOPAo?si=KCUruAzo7f_YqIn1 | NPTEL (IIT Madras) |
| | Temperature and Zeroth Law of Thermodynamics | https://youtu.be/0murstvco0I?si=ES-Pisx188XwKQ_v | NPTEL (IIT Guwahti) |
| | Laws of thermodynamics | https://youtu.be/pXfuKdTtEWE?si=Q33b0OAviolAxF7j | NPTEL (IIT Guwahti) |
| Unit-III | Steam Generation and Powers | https://youtu.be/ZwT_KR2hKGY?si=onHGbiTheY0UMCQv | NPTEL (IIT Guwahti) |
| | Boiler Draught | https://youtu.be/-cr5vfV4YAI?si=JYxZzgfEzdQ_1blf | NPTEL (IIT Guwahti) |
| Unit-IV | Classification of Internal Combustion Engines | https://youtu.be/H_RgFXjg-5s?si=gQzZoJE_WVzA_qFl<br>https://youtu.be/SU5VTGR2giY?si=gAaXSO5TnKXfuCTO | NPTEL (IIT Madras) |
| | Four-stroke and Two-stroke engines | https://youtu.be/q-CfzNh99sQ?si=Mq6x_sWWNR1rGqcI | NPTEL (IIT Guwahti) |
| | Fuels &Combustion, part A | https://youtu.be/LR7npspe-RI?si=mB7-kETuv2Nbq93Z | NPTEL (IIT Guwahti) |
| | Fuels &Combustion, Part B | https://youtu.be/7vqDaAtTw8M?si=vCB3JDwFkfYRJfPR | NPTEL (IIT Guwahti) |

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|---|---|---|---|---|---|
| Course Code | **HSMC-01A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Fundamentals of Management and Organizational Behaviour** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III/IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework.<br>• Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings.<br>• Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively.<br>• Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define fundamental management concepts, functions, organizational processes, and organizational behavior elements. | Level 1: Remember |
| CO2 | Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations. | Level 2: Understand |
| CO3 | Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges. | Level 3: Apply |
| CO4 | Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction of Management:** Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.
**Functions of Management:** Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration.

## Unit-II

**Introduction of Organization:** Meaning and Process of Organization, Management v/s Organization.
**Fundamentals of Organizational Behavior:** Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB**.**
**Individual Processes and Behavior:** Personality, Concept, Determinants and Applications.
**Perception:** Concept, Process and Applications

**Learning:** Brief Introduction
**Motivation:** Concept, Techniques and Importance

## Unit-III

**Interpersonal Processes**: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict- Concept, Sources, Types, Management of Conflict.

**Leadership:** Concept, Function, Styles, Qualities of Leadership.

**Communication**: Meaning, Process, Channels of Communication, Importance and Barriers of Communication.

## Unit-IV

**Organizational Processes:** Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.
**Organizational Culture**: Elements, Types and Factors affecting Organizational Culture.
**Organizational Change:** Concept, Types and Factors affecting Organizational Change, Resistance to Change.

**Suggested Readings:**


- Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
- Organizational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
- Management concept practice and cases by Ghuman Karminder, Aswathappa K., Tata McGraw Hill, New Delhi
- Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
- Organizational Behaviour by Stephen P Robin, Pearson Education.
- Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
- Organizational Behaviour by FC Sharma, Shree Mahavir Publications.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Nature and Scope of Management | https://nptel.ac.in/courses/110105146 |
| **Unit-II** | Perception and Personality | https://nptel.ac.in/courses/110103433 |
| **Unit-III** | Group Dynamics | https://archive.nptel.ac.in/courses/110/106/110106145/ |
| **Unit-IV** | Organizational Change, Resistance to Change. | https://nptel.ac.in/courses/110105146 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-211A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fire Engineering Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are:<br>• To bridge theory and practice by giving students hands-on experience with real-world firefighting equipment, systems, and safety procedures.<br>• To develop practical skills in identifying fire types, selecting appropriate extinguishing agents, and operating fire detection and suppression systems.<br>• To foster critical awareness of fire hazards, structural fire safety, and compliance with national (NBC) and international (NFPA) fire safety standards.<br>• To prepare students for emergency scenarios by training them to respond effectively using appropriate firefighting tools and decision-making strategies. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Explain the different types of fires, fire elements, extinguishing agents and their appropriate applications in real-life scenarios. | Level 2: Understand |
| **CO2** | Demonstrate the operation and usage of various fire detection, suppression, and firefighting systems including fire extinguishers, hose fittings, sprinkler systems and mobile equipments. | Level 3: Apply |
| **CO3** | Analyze the flashpoint and fire point of the different fuels. | Level 4: Analyze |
| **CO4** | Evaluate structural integrity under fire conditions and interpreting building occupancies and combustion products as per national and international standards. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | To determine the flashpoint and fire point of different fuels using Pensky-Marten apparatus. |
| **2** | To study different types of fire and its elements. |
| **3** | To study different types of extinguishing media- water, foam, dry powder, ABC Powder, CO2, Halon. |
| **4** | To study of Modular Automatic Fire Extinguishers, Trolley Mounted fire extinguishers. |
| **5** | To study the different causes and phases of fire. |
| **6** | To study the fire detection systems. |
| **7** | To study the basic fire protection equipments. |
| **8** | To study the Mobile firefighting equipments |
| **9** | To study different types of sprinkler systems |

| | |
|---|---|
| **10** | To study the products of combustion. |
| **11** | To study different types of occupancies as per National Building Code of India (Latest Edition). |
| **12** | To study structural integrity under fire using standard methods of NFPA. |
| **13** | To study different types of hose fittings and their application. |

**At least 8 experiments to be studied/performed from the above list and other experiments can be studied/performed depending upon the scope of course as decided by the department.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-213A** | | | | |
| Category | Professional Core Course | | | | |
| Course Title | **First Aid and Paramedics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are:<br>● To study various human systems and different medical conditions.<br>● To understand the different casualties and casualties handling techniques. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the different items in the First Aid box and and elements of human systems. | Level 2: Understand |
| **CO2** | Apply the knowledge to provide the first aid to the casualty. | Level 3: Apply |
| **CO3** | Classify bandages, slings, stretchers and other medical conditions. | Level 4: Analyze |
| **CO4** | Measure the bleeding time, dressing time, blood pressure, scale of burn etc. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | To study the first aid kit. |
| **2** | To study different human systems Respiratory, Circulation and Nervous, Digestive and Excretory systems. |
| **3** | To study and perform different techniques of Respiration (CPR). |
| **4** | To study various types of Bandages and Slings. |
| **5** | To measure the victim's dressing time using various types of bandages by first aid responder. |
| **6** | To study maintenance of various charts related to casualties. |
| **7** | To study of stretchers and its types. |
| **8** | To perform and practice the different methods of handling and transportation of victims. |
| **9** | To study different types of medical conditions. |
| **10** | To study accidents, investigations and reporting and record keeping. |

**At least 8 experiments to be studied/performed from the above list and other experiments can be studied/performed depending upon the scope of course as decided by the department.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-215A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Thermal Engineering Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To provide students with practical exposure to the working principles of internal combustion engines, heat transfer mechanisms, and boiler systems<br>• To understand real-world thermal engineering applications and evaluate performance characteristics of fuels, engines, and cooling systems. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Describe the basic concepts of thermal engineering. | Level 2: Understand |
| CO2 | Understand the working of different equipments used in the thermal plants. | Level 2: Understand |
| CO3 | Apply the knowledge of thermal engineering to deal with the engineering problems. | Level 3: Apply |
| CO4 | Determine the values of different parameters applicable in thermal engineering. | Level 4: Analyze |

**List of Experiments**

| **Sr. No.** | **Contents** |
|---|---|
| **1** | To study the working of 2 stroke Petrol engine. |
| **2** | To study the working of 2 stroke Diesel engine. |
| **3** | To study the working of 4 stroke Petrol engine. |
| **4** | To study the working of 4 stroke Diesel engine. |
| **5** | To study different types of fuels along with their flash point, fire point and calorific values. |
| **6** | To study low pressure boilers and their accessories and mountings. |
| **7** | To study high pressure boilers and their accessories and mountings. |
| **8** | To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test. |
| **9** | To prepare the heat balance sheet. |
| **10** | To study different types of cooling towers. |
| **11** | To find out the COP of Refrigerator |

**At least 8 experiments to be studied/performed from the above list and other experiments can be studied/performed depending upon the scope of course as decided by the department.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-217A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fire Ground Operations - III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objective of this course are<br>● To provide foundational knowledge of various fire-fighting tools and equipment including hoses, extinguishers, ropes, and ladders.<br>● To train students in standard operational techniques such as hose drills, rope handling, extinguisher usage, and ladder operations under simulated conditions.<br>● To develop students' ability to inspect, test, and maintain the performance and safety of fire-fighting equipment as per standard protocols.<br>● To instill discipline, coordination, and response skills essential for effective participation in real-life fire emergency operations. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Explain the procedures for hose rolling techniques, rope types, and ladder configurations along with their operational relevance in fire safety. | Level 2: Understand |
| CO2 | Work as an individual and in a group with the capacity to be a leader as well as an effective team member. | Level 3: Apply |
| CO3 | Perform standard hose and extinguisher drills, ladder and rope tests, and demonstrate practical handling and maintenance of fire service equipment. | Level 3: Apply |
| CO4 | Analyze the condition and performance of fire-fighting tools and equipment through standard testing methods and drills to ensure operational readiness. | Level 4: Analyze |

**List of Experiments**

| | |
|---|---|
| 1 | To study and perform extinguisher drills. |
| 2 | To study Fire Hose (Delivery Hose, Suction Hose), Hose binding, washing, storage. |
| 3 | To study and perform rolling of Hoses (Coil roll, Figure of 8 roll, flaking roll, Dutch roll). |
| 4 | To perform different Hose tests (Suction hose test, Delivery hose test, Hose reel hose test ) |
| 5 | To perform the Hose drill (Lifting, Lowering, Carrying, Laying, Connect, Disconnect, Remove the kink, under running) |
| 6 | To study the rope construction and types of ropes (Natural rope (a. Italian hemp, b. Manila, c. Sisal, d. Coir, e. Cotton, f. Jute), Manmade rope ( a. Synthetic, b. Nylon, c. Steel, d. Cara mandala)) |
| 7 | To study and perform rolling of Ropes. |
| 8 | To study and perform testing of Ropes. |
| 9 | To study different types of Ladders and their parts. |
| 10 | To perform different Ladder tests (Round test, String test, Extension line test) |

**Other drills and tests can be performed as decided by department (time to time) depending upon the scope of course.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-FT-202A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Structural Fire Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objective of this course are<br>• To equip students with essential knowledge of building classifications, fire-resistant construction types, and exit planning requirements based on national codes and standards such as NBC and ISI.<br>• To develop a thorough understanding of fire behavior, human response in fire emergencies, and the function of fire detection, control, and compartmentation systems in building design.<br>• To enable students to apply structural fire safety principles for evaluating and designing buildings and components exposed to fire, using fire resistance testing, material behavior, and structural analysis under fire conditions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Describe the classifications of buildings, types of construction, exit requirements, structural components, and fire safety terminology as per NBC and ISI standards. | Level 1: Remember |
| CO2 | Explain the principles of fire development, building fire behavior, human response, fire detection systems, and compartmentation strategies in fire-safe design. | Level 2: Understand |
| CO3 | Apply national codes and structural safety principles to assess exit planning, stair design, fire-resistant construction techniques, and fire safety systems in buildings | Level 3 : Apply |
| CO4 | Analyze fire severity and evaluate structural performance under fire conditions using fire resistance tests, design equations, and material behavior in elevated temperatures. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Classification of building based on occupancy as per National Building Code of India (NBC), Classification of types of construction according to fire resistance as per NBC, General fire safety requirements applicable to all individual occupancies, fire zones as per NBC, general exit requirements as per NBC, Means of escape, Internal staircases, horizontal exits, fire tower, ramps, fire lifts, external fire escape ladders, planning of location and calculation of capacity, number and width of exit as per NBC for different types of occupancy, sizes layout and various kinds of

stairs in different kind of building, egress and containment. Fire hazards in stilt parking, basement parking and podium parking.

**Unit-II**

Introduction to the elements of structure, Study of different kinds of components of super-structures, Various Common Types of Buildings with Reference to Relevant I.S. Specifications, different types of walls, roofs and floors and their construction methods. Behaviour of elements of structure in a fire, causes of wall collapse, criteria for assessing the fire properties of building materials and elements of structure, Standards and guides for passive fire protection.

**Unit-III**

Fire safety in buildings, process of fire development, fire behaviour, human behaviour, fire detection and control system, fire resistance, fire design time, fire load, and grading of occupancies by Fire load, controlling fire spread, compartmentation, defend in place theory, Fire severity, equivalent fire severity, fire resistance test, fire resistance of assemblies – walls, floors, beams, columns, penetrations, joints, fire doors, ducts and glasses, testing and inspection of fire doors, firestop system, material and fire dampers, building construction for fire safety. Fire safety design of façade, building integrated and building attached photovoltaic system.

**Unit-IV**

Fire design time, design of structures exposed to fire - structural design at normal temperatures, loads, structural design in fire conditions, design equation, loads for fire design, structural analysis for fire design, material properties in fire, design of individual members exposed to fire, design of structural assemblies exposed to fire, Structural Steel Fire Protection.

**Concrete Structures** - Behaviour of concrete structures in fire, concrete materials in fire, spalling of cover concrete, concrete and steel reinforcing temperatures, mechanical properties of concrete at elevated temperatures, design of concrete members exposed to fire - continuous slabs and beams, axial restraint. International standards for structural fire protection

**Suggested Readings**


- Fire Safety in Buildings by V K Jain, New Age publishers, New Delhi.
- National Building Code (NBC)- Part-IV (Latest Edition)
- Fundamentals of Fire Safety in Building Design by Dr. Than Singh Sharma, Aayush Publications, New Delhi
- Principles of Fire Safety Standards for Building Construction by M. Ya. Roytman, Amerind Publishing Co. Pvt. Ltd., New Delhi
- Structural Design For Fire Safety by Andrew H. Buchanan & Anthony K. Abu, John Wiley and Sons Ltd., New York, U.S.A.
- Relevant IS & NFPA codes
- Building materials and construction by B. C. Punmia, Laxmi Publications.


**Useful Video Links**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| **Unit-I** | General Exit Requirements as per NBC | https://www.youtube.com/watch?v=O6CYQt9vi_Y | NPTEL (IIT Delhi) |
| | Stairs, Sizes layout | https://www.youtube.com/watch?v=hxakW1miEcM | NPTEL (IIT Kharagpur) |
| **Unit-II** | Roofs and floors construction methods | https://www.youtube.com/watch?v=ptsDs8bcxTI | NPTEL (IIT Delhi) |
| | Building Construction, Components of Super Structure | https://www.youtube.com/watch?v=X9tNq4kRm9s | Unacademy |
| **Unit-III** | Fire detection and control system | https://www.youtube.com/watch?v=vNKXzw6GCHw | NPTEL (Madras) |
| | Building construction for fire safety | https://www.youtube.com/watch?v=Z15UfahUsG0&t=251s | NPTEL (IIT Delhi) |
| **Unit-IV** | Fire resistance | https://www.youtube.com/watch?v=SuepcXmNREU | NPTEL (IIT Delhi) |
| | Structural Steel Fire Protection | https://www.youtube.com/watch?v=uOegFI_jNEc&t=775s | NPTEL (IIT Delhi) |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-FT-204A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Heat Transfer, Combustion and Explosives** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To learn about the heat and modes of heat transfer.<br>● To make the students familiar with the combustion, products of combustion and their effects.<br>● To understand the different explosives and rules. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define the different terms related to heat transfer, combustion and explosives. | Level 1: Remember |
| CO2 | Describe the fundamentals concepts of heat transfer, combustion and explosives rules and acts. | Level 2: Understand |
| CO3 | Apply the knowledge of heat transfer, combustion, explosive rules and acts to deal with the real life problems. | Level 3: Apply |
| CO4 | Analyze the problems due to fire, combustion and explosives | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Heat Transfer:** Heat Transfer, Modes of Heat Transfer.
**Conduction:** Introduction, 1-D heat conduction through a plane wall, long hollow cylinder, Conduction equation in Cartesian, polar and spherical co-ordinate systems.
**Convection:** Forced Convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations.
**Radiation:** Terms used in radiation heat transfer, Stefan Boltzman Law, Kirchoff's law, Planck's law and Wein's displacement law, black body radiation, Heat exchange between non-black bodies, heat exchange between two parallel infinite black surfaces, grey bodies, effect of radiation shield.

## Unit-II

**Combustion:** Combustion, types of combustion, complete and incomplete, smoldering, rapid, spontaneous, micro-combustion, chemical equations, stoichiometric combustion of a hydrocarbon in oxygen, stoichiometric combustion of a hydrocarbon in air, incomplete combustion of a hydrocarbon in oxygen, liquid fuels, gaseous fuels, solid fuels, combustion management

**Product of Combustion**- Products of combustion, fire effluents, assessment of fire effluents.

## Unit-III

**Explosion:** Introduction, list of Explosives, types of chemical exlosives, causes of Explosion, Vapour Cloud Explosions (VCE), Unconfined Vapour Cloud Explosion (UVCE), confined explosions, dust collector, silos, Physical explosions, BLEVE, Major Accident Hazard (MAH) control, On-site and Off-site emergency plan.
**Petroleum & Explosives Safety Organization (PESO):** Objectives, roles and responsibilities, guidelines for safe inspection of explosives magazines/vans.

## Unit-IV

**Fires Involving Explosives:** Introduction, Nature and properties of explosives, Industrial processes and hazards of explosives, Explosives and fireworks manufacture and filling, Explosive storage, Explosive transport, Causes of fire and methods of protection, Fire extinguishing ball, jet fire, pool fire, boil over, Fire Fighting procedure, Fire Fighting classification, Fighting fires in above ground sites, Fighting fires in underground sites, Fire Fighting involving explosives in transit, Match manufacture and storage, Material used, Process, Causes of fire and protective Measures, Fire Fighting.

**Suggested Readings:**


- Heat and Mass Transfer -3rd edition by PK Nag 2007 Tata McGraw Hill
- Heat and Mass Transfer – revised edition by RK Rajput . S. Chand Publication.
- Heat & Mass transfer 4rd edition by 2014 Yunus A- Cengel Tata McGraw Hill
- Principles of heat transfer by Kreith Thomas Learning 2001
- Fundamental of Heat and Mass Transfer by M. Thirumaleshwar. Pearson.
- Fundamental of Heat and Mass Transfer- 4th edition by C.P.Kothandaraman


**Useful Video Links:**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| Unit-I | Heat Transfer | https://youtu.be/6Zpf3YpkNCM?si=WhLLog7VWHqqB9q8 | NPTEL ( IIT Kharagpur ) |
| | Conduction | https://youtu.be/hZBpV_QVJ3Y?si=gkdZn4iSXVXpIvyk | NPTEL ( IIT Kharagpur ) |
| | Convection | https://youtu.be/zw884u2pWw0?si=UXn4GVnim-mBMULQ | NPTEL ( IIT Kharagpur ) |
| | Radiation | https://youtu.be/TIFGm-QusM4?si=gxeW7TYVqtnnCbHt | NPTEL ( IIT Kharagpur ) |
| Unit-II | Combustion | https://youtu.be/Fyq4Q5yWDDU?si=UiglMcNy2y8j5Pvz | NPTEL (IIT Madras) |
| | Stoichiometric combustion | https://youtu.be/yh1h23fbWtw?si=vxkNdc1J-4UlK5Kt | NPTEL (IIT Madras) |
| Unit-III | Explosion | https://youtu.be/19IGLmowQuw?si=EaRFaaiJAikgqlCN | NPTEL ( IIT Kharagpur ) |
| | Classification of explosion | https://youtu.be/uwr9a98YJ64?si=xD9qtgX97NJzDtZf | NPTEL (IIT Madras) |
| | Explosives | https://youtu.be/1_3OOsnjWjo?si=IOwl5pmE7brHZYdr | NPTEL ( IIT Kharagpur ) |
| Unit-IV | Nature and properties of explosives | https://youtu.be/i7nE6Pl5uWU?si=cTmdJs1p8Wfc0DvV | NPTEL ( IIT Kharagpur ) |
| | Cause of fire and methods of protection | https://youtu.be/PJhjs3gtfEU?si=uBlsCxFZY9eeAlqz | NPTEL ( IIT Madras ) |
| | Fire Protection | https://youtu.be/n6HAyxdup_U?si=oxC3ENbX0qMw-Cex<br>https://youtu.be/krnmHKZ87Wg?si=TUKEin4bND_zczdl | NPTEL ( IIT Delhi ) |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-FT-206A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fire Service Hydraulics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>• To familiarize with water supply and hydrant system.<br>• To determine the impact of jet on different types of vanes.<br>• To determine the discharge through pipes and different Fire Fighting Hoses.<br>• To understand the construction and working of different types of Pumps.<br>• To know about sprinkler and its applications | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Describe key concepts and terminologies related to water properties, hydrant systems, pump types, nozzle design, and sprinkler components used in fire protection. | Level 1: Remember |
| CO2 | Explain the principles of fluid dynamics, pump operations, sprinkler hydraulics, and jet impacts relevant to firefighting and fire suppression systems. | Level 2: Understand |
| CO3 | Apply fluid mechanics equations and nozzle design principles to calculate discharge, pressure loss, power transmission, and sprinkler system demand in practical scenarios. | Level 3: Apply |
| CO4 | Analyze the efficiency of fire suppression systems by examining pipe flows, pump performances, primer mechanisms, and pressure balance in sprinkler operations. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit - I

**Water Supply :** Properties of water, Density, Specific volume, Specific gravity, Latent heat of vaporization, Viscosity, kinematics viscosity, Water sources, Treatment process, Principles and Practical consideration of various methods of Water Relay and operational hints, water requirements with reference to ISI, Water distribution system, Storage tanks, Use of water in fire protection service, Distribution of water supply, Determination of fire flow in accordance with fire load,.

**Hydrants:** Types of hydrants, hydrant gear and characteristics, code of practice in respect of requirements and standardization of Hydrants, Hydrant Gears, Use of flow meter, Inspection and Testing of hydrants, care and maintenance, Fire hydrant system.

**Impact of Free Jets:** Impulse-momentum principle, Jet impingement on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes, Jet striking tangentially at the tip of a stationary vane and moving vanes.

## Unit - II

**Flow through Pipes and Fire Fighting Hoses:** Basic introduction Continuity Equation, Pressure loss in pipes and governing equation, Flow measurement through pipes (series and parallel), Discharge through notches (rectangular and trapezoidal notch), Power transmission through pipeline.

**Nozzle:** Definition, Design of nozzle, Flow through nozzles, Power transmitted through nozzle, Condition for maximum transmission, Relation between nozzle and pipe diameter, Hoses of different diameters, Discharge coefficient, Hagen Poiseuille formula.

## Unit - III

**Pumps and Primers:** Introduction, Types of pumps, Ejector pumps, Vehicle mounted fire pumps, Portable pump, Jockey pump- construction and its working.

**Reciprocating pump-** Introduction, Main parts of a reciprocating pump, Working, Slip of reciprocating pump.

**Centrifugal pump-** Introduction, Main parts of a centrifugal pump, Working, Minimum speed for starting a centrifugal pump, Multistage Centrifugal pump, Maintenance and servicing of pumps.

**Primers:** Definition and purpose of primers, Classification of primers, Role of primers in fire suppression systems, Chemical safety of primers in fire equipment.

## Unit - IV

**Sprinkler System Demand:** Fundamentals of Sprinkler system hydraulics, Hydraulic analysis of side-fed tree sprinkler systems, Impact of flow and pressure in operating sprinkler systems, Pressure balancing in sprinkler head performance.

**Automatic Sprinkler System:** Water supply requirements for Automatic sprinkler system, Basic knowledge tools for hydraulic calculation, Role of pressure reducing valves, Safety margins and redundancy in sprinkler system design.

**Suggested Readings:**


- Hydraulics and Fluid Mechanics by P.N. Modi, Dr. S.M. Seth, Rajsons Publications
- Hydraulic Mechanics and Hydraulics Machines by Dr. J. Lal, Metropolitan Book Pvt. Ltd.
- Manual of Firemanship
- Fire Service Hydraulics by Dr. G.C. Mishra, Masood Books
- Fluid Mechanics and Hydraulic Machines by Dr. R. K. Bansal, Laxmi Publications
- Fire Service Hydraulics and Pump Operations by Paul Spurgeon
- Sprinkler Hydraulics by Wass Jr.
- Fire Pumps and Hydraulics by I.E. Ditts and T.M. Harris.
- Fire-Fighting Hydraulics by Purington

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-FT-208A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fundamentals of Safety Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To familiarize the students with safety, safety management and safety performance.<br>• To understand accidents and the need for safety.<br>• To evaluate the safety performance and cost of accidents.<br>• To identify the roles and responsibilities of all the stakeholders towards safety. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define key concepts related to accidents, safety measures, safety roles, and performance metrics used in industrial and organizational safety management. | Level 1: Remember |
| CO2 | Explain the fundamental concepts, principles of accident prevention, responsibilities in safety management, and the importance of integrating safety, health, and environmental concerns. | Level 2: Understand |
| CO3 | Apply structured safety training methods, emergency planning, job safety analysis, and communication strategies to promote workplace safety. | Level 3: Apply |
| CO4 | Analyze the cost of accidents, safety management performance, the effectiveness of safety systems and engineered safety designs. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Accident:** Introduction, types of accidents, causes of accidents, principle of accident prevention, accident investigation, and process of investigation, onsite and offsite emergency response plan, and cost of accident.

**Safety:** Introduction to safety, need for integration of health and environment safety, safety and productivity, points for consideration of safety, general instructions for safety, personal safety, personal protective equipment.

**Unit-II**

**Safety Management:** Objectives of safety management, principles of safety management, responsibilities of management, plant manager, engineers, individuals, line supervisors, safety managers, workers and trade unions in the field of safety, contractor, government, social organization, safety committee, role of safety committee, advantages.

**Unit-III**

**Safety Education and Training**: Elements of training cycle, objectives of training, training methods, types of training, behaviour oriented training, communication, purpose, barrier to communication, causes of preventable injuries, death off the job.

## Unit-IV

**Safety Audit:** Safety audits, types of audit, audit goals, responsibilities of audit team, audit procedure, safety in design, engineered safety.

**Safety Performance:** Frequency rate, severity rate, incidence rate, activity rate, safe "T" score, safety surveys, Job Safety Analysis (JSA).

### Suggested Readings

- Fundamentals of Industrial Safety & Health by K.U.Mistry, Siddharth Prakashan.
- Industrial Safety Health and Environment management Systems by Jain and Rao, Khanna Publishers
- Safety Management by R.K. Mishra- AITBS Publishers.
- Safety Management in Industry by N.V. Krishnan, Jaico Publishing House, 1997
- Industrial Safety by Ronald P. Blake, Prentice Hall, New Delhi, 1973
- Occupational Safety and Health by David L. Goetsch, Prentice Hall
- Modern Accident Investigation and Analysis by Ted S. Ferry, John Wiley & Sons

### Useful Video Links

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| **Unit-I** | Accident, Accident Investigation | https://youtu.be/VhuZ6M7a8N8?si=AJ0gXnTGKOd9KPFK | NPTEL (IIT Kharagpur) |
| | Safety Engineering & Accident causing mechanisms | https://youtu.be/91YpCY-1Fy0?si=4L5f1y_NiOLGSm-4 | NPTEL (IIT Kharagpur) |
| | Personal Protective Equipment | https://youtu.be/eLnv6Eb2Pq0?si=cbAkgLUqZ9QEJoWQ | NEPTEL (IIT Delhi) |
| **Unit-II** | Safety Committee Meeting | https://youtu.be/N12BEnI1hCY?si=TdR-4HO58IZsM5mp | NPTEL- IITC |
| **Unit-III** | Safety Education | https://youtu.be/v-eltsixu4I?si=2T9UetPJdllhk7YN | NPTEL (IIT Kharagpur) |
| **Unit-IV** | Safety Audit | https://youtu.be/HuYIDi0QQm8?si=y_vJEkJHAVaP81WS | NPTEL (IIT Kharagpur) |
| | Safety Performance Indicators | https://youtu.be/NI89F0ISMog?si=sxTayTaCNV23t7a1 | NPTEL (IIT Kharagpur) |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PCC-FT-210 A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Safety in Construction** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objective of this course are<br>• To develop an understanding of safety challenges, responsibilities, and ergonomics in the construction industry.<br>• To familiarize students with safety practices during various construction operations in compliance with national codes and standards.<br>• To equip students with knowledge related to safe use of construction machinery, tools, and temporary utilities.<br>• To create awareness of legal frameworks governing construction labor, health, welfare, and statutory safety obligations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define key safety concepts, ergonomic considerations, construction hazards, and relevant terminologies, codes, and legal provisions related to construction safety. | Level 1: Remember |
| **CO2** | Explain the causes of accidents, safety measures in construction activities, material handling, and legal roles of stakeholders in promoting safe construction practices. | Level 2: Understand |
| **CO3** | Demonstrate the application of construction safety procedures, including equipment handling, site layout, evacuation plans, and compliance with safety codes and labor laws. | Level 3: Apply |
| **CO4** | Analyze construction project scenarios to identify safety gaps, assess risk levels, and recommend improvements aligned with legal standards and operational safety practices. | Level 4: Analyse |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Construction Industry:** Safety issues in construction, Human factors in construction safety management, Roles of various groups in ensuring safety in construction industry, Framing, contract conditions on safety, related matters, Relevance of ergonomics in construction safety.

## Unit-II

**Safety in Various Construction Operations:** Excavation, under water works, underpinning & shoring Ladders and Scaffolds, Tunneling, Blasting, Demolition, Pneumatic caissons, confined Space Temporary Structures, Indian Standards on construction safety, National Building Code Provisions on construction safety.

## Unit-III

**Safety in Material Handling and Equipments**: Safety in storage & stacking of construction materials, Safety in the use of construction equipments, Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Mixers, Conveyors, Pneumatic and hydraulic tools in construction, Temporary power supply.

## Unit-IV

**Contract Labour (R&A) Act and Central Rules:** Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Workers (RE & CS) Act, 1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions, Penalties.

**Suggested Readings:**


- Construction Safety Management by K.N. Vaid.
- Construction Safety Handbook by V.J. Davies and K. Tomasin.
- Construction Safety, Security & Loss Prevention, James B. Fullman.
- Modern Methods of Material Handling by L Linger.
- Handbook of Temporary Structures in Construction by R.T. Ratay.
- National Building Code of India, 2016 by BIS.
- Relevant Indian Standards published by BIS.
- Contract Labour Act and Central Rules.
- Building and Other Construction Workers (RE & CS) Act, 1996 and Central Rules.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-212A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Structural Fire Engineering Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>● To give students hands-on experience in testing the physical and mechanical properties of materials like timber, bricks, steel, and concrete.<br>● To gain practical experience in evaluating the fire-related and structural performance of building materials.<br>● To build practical skills in using non-destructive testing methods and measuring strain. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the principles and procedures of non-destructive testing methods used to assess the strength of concrete. | Level 2: Understand |
| **CO2** | Apply standard testing procedures to determine the physical and mechanical properties of materials such as steel and concrete. | Level 3: Apply |
| **CO3** | Analyze strain measurements in materials to determine mechanical properties such as Young's Modulus. | Level 4: Analyze |
| **CO4** | Evaluate experimental results to assess properties such as moisture content, compressive strength, workability and fire resistance of building materials. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | To determine the tensile strength of steel at ambient temperature. |
| **2** | To measure the strain in steel using strain gauge. |
| **3** | To determine the compressive strength of concrete at ambient temperature. |
| **4** | To determine the compressive strength of concrete by Non-Destructive Testing. |
| **5** | To determine the moisture content of timber using oven drying methods. |
| **6** | To study the fire resistance testing of structural components including fire doors, beams, columns, slabs, and facade systems according to relevant standards. |
| **7** | To determine the Young's Modulus of a bar material under non-uniform bending by measuring its deflection. |
| **8** | To evaluate the fire performance of firestop and sealing materials according to relevant standards. |
| **9** | To determine the water absorption of burnt clay brick. |
| **10** | To determine the compressive strength of burnt clay brick. |

**At least 8 experiments to be performed from the above list and other experiment can be performed depending upon the scope of course as decided by department.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-214A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fire Service Hydraulics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>● To introduce students to fundamental principles and tools used in hydraulic and fire safety systems.<br>● To develop students' ability to conduct experiments and analyze hydraulic performance in fire protection applications.<br>● To familiarize students with essential fire protection components such as hydrants, pumps, and sprinkler systems.<br>● To instill practical skills for evaluating and maintaining fluid dynamics equipment used in fire engineering. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Explain the principles of water supply systems, hydrant types, and the physical properties of water used in fire protection. | Level 2: Understand |
| **CO2** | Apply the continuity equation and flow measurement techniques to measure discharge through pipes, nozzles, and firefighting hoses. | Level 3: Apply |
| **CO3** | Analyze the impact of free water jets on different surfaces and evaluate flow characteristics through different firefighting equipment. | Level 4: Analyze |
| **CO4** | Evaluate the performance, efficiency, and operational reliability of pumps and automatic sprinkler systems used in fire suppression. | Level 5: Evaluate |

**List of Experiments**

| **Sr. No.** | **Contents** |
|---|---|
| 1 | To study pressure measurement devices. |
| 2 | To study different types of fire hydrants and their components. |
| 3 | To measure force exerted by Jet on Stationary and Moving Plates (Impact of Jet Apparatus) |
| 4 | To determine discharge through Rectangular and Trapezoidal Notches. |
| 5 | To verify Bernoulli’s Theorem for flow through pipes |
| 6 | To determine pressure loss in pipes due to friction (Darcy-Weisbach Equation) |
| 7 | To determine Coefficient of Discharge for Venturimeter. |
| 8 | To determine efficiency of Centrifugal Pump and plot operational characteristics curve. |
| 9 | To determine efficiency of Reciprocating pump |
| 10 | To test the activation and spray pattern of a sprinkler head. |
| 11 | To visit the pump room of any occupancy and prepare a report on pump room. |

At least 8 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-216A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Heat Transfer, Combustion and Explosives Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To provide practical exposure to fundamental heat transfer modes: conduction, convection, and radiation.<br>• To equip students with skills to experimentally determine thermal properties and heat transfer coefficients.<br>• To develop analytical understanding of heat exchanger performance and efficiency of extended surfaces (fins).<br>• To introduce students to the basic concepts of combustion and the safe handling of explosives. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Explain various heat transfer modes, thermal devices, and combustion materials used in experiments. | Level 2: Understand |
| **CO2** | Perform experiments to determine thermal conductivity, heat transfer coefficients, heat exchanger effectiveness, and emissivity. | Level 3: Apply |
| **CO3** | Analyze and interpret experimental data to assess heat transfer performance and combustion behavior under varying conditions. | Level 4: Analyze |
| **CO4** | Estimate the size and type of heat exchanger. | Level 5: Evaluate |

**List of Experiments**

| **Sr. No.** | **Contents** |
|---|---|
| 1 | To determine the thermal conductivity of metal rod. |
| 2 | To determine the thermal conductivity of composite wall. |
| 3 | To determine the surface heat transfer coefficient for a heated vertical tube under natural convection. |
| 4 | To determine average heat transfer coefficient of an externally heated horizontal pipe under forced convection. |
| 5 | To determine efficiency and effectiveness of Metallic Fin. |
| 6 | To verify the Stefan-Boltzmann constant for thermal radiation. |
| 7 | To measure the emissivity of the gray body (plate) at different temperature. |
| 8 | To find overall heat transfer coefficient and effectiveness of a heat exchanger under parallel and counter flow conditions. |
| 9 | Study of boiling (Critical Heat Flux apparatus) and Condensation of Heat Transfer. |
| 10 | To determine the heat transfer in lagged pipe apparatus. |
| 11 | To study the process of combustion and different stages of combustion. |
| 12. | To study different types of explosives, care and handling of explosives. |

**At least 8 experiments to be performed from the above list and other experiment can be performed depending upon the scope of course as decided by department.**

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-FT-218A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Fire Ground Operations - IV** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>● To familiarize students with essential fire-fighting equipment including hoses, extinguishers, ropes, and ladders used in field operations.<br>● To train students in correct handling techniques and drills for fire hoses, extinguishers, and ladders following safety protocols.<br>● To develop practical competence in inspecting, testing, and maintaining the functional readiness of fire-fighting equipment.<br>● To promote teamwork, coordination, and responsiveness essential for real-time fire emergency handling through structured drills and exercises. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Explain the operational principles, testing standards, and storage techniques for fire-fighting hoses, hydrant, extinguishers, ladders and ropes. | Level 2: Understand |
| CO2 | Demonstrate the execution of extinguisher drills, hose and rope rolling methods, and ladder tests in simulated field conditions. | Level 3: Apply |
| CO3 | Analyze the performance of an individual and team. | Level 4: Analyze |
| CO4 | Assess the readiness, safety, and effectiveness of fire-fighting equipment through inspection and standard testing methods. | Level 5: Evalaute |

**List of Experiments**

| **Sr. No.** | **Contents** |
|---|---|
| 1 | To study different types of hydrants: ball type, Sluice valve, Screw down, Pillar and post types of valves. |
| 2 | To study different types of hydrant fittings, types of hydrant gear, hydrant testing equipment. |
| 3 | To perform three men hydrant drill (add, remove and replace of hose, dividing breeching, collecting breeching). |
| 4 | To perform four men hydrant drill (add, remove and replace of hose, dividing breeching, collecting breeching) |
| 5 | To perform hydrant test |

| | |
|---|---|
| 6 | To study different types of fire extinguishers, rating of portable extinguishes for class A, B and C fires. Limitations of portable extinguishers, operation, refilling, testing and maintenance of fire extinguishers, inspection requirement of portable extinguishers. |
| 7 | To perform a foam drill. |
| 8 | To perform four men pump drill. |
| 9 | To perform a six men pump drill. |
| 10 | To perform Emergency Evacuation drills. |

**Other drills and tests can be performed as decided by department (time to time) depending upon the scope of course**.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MC-201A** | | | | |
| Category | Mandatory Courses | | | | |
| Course Title | **Environmental Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | Semester- |
| | 2 | 0 | 1 | - | |
| Course Objectives | The objectives of this course are<br>• Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources.<br>• Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health.<br>• Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society.<br>• Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship. | | | | |
| Practical/Field Visits | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |
| **Remarks** | The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.<br>The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| CO | Skill Demonstrated | Level |
|---|---|---|
| CO1 | Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws, and human-environment interactions. | Level 1: Remember |
| CO2 | Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics, and related legislation for sustainable development. | Level 2 : Understand |
| CO3 | Apply principles of environmental management, pollution control, disaster preparedness, and sustainable practices in real-world and field-based environmental contexts. | Level 3: Apply |
| CO4 | Analyze environmental problems, population growth impacts, climate change, welfare programs, and the role of information technology in promoting public health and environmental sustainability. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

The Multidisciplinary nature of environmental studies. Definition scope and importance.
**Natural Resources:** Renewable and non-renewable resources, Natural resources and associated problems.

**a) Forest resources:** Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their

effects on forests and tribal people.

**b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

**c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**d) Food resources:** World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies. e) Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.

f) **Land resources:** Land as are source, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles

**Unit-II**

**Ecosystems**: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids**,** Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Bio diversity and its conservation:** Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

**Unit-III**

**Environmental Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards.

**Solids Waste Management:** Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies.

**Disaster Management:** Floods, Earthquake, Cyclone and Landslides.

**Social issues and the Environment:** From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies.

**Environmental Ethics:** Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

**Unit-IV**

**Human population and the Environment:** Population growth, Variation among Nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies.

**Field Work (Field work equal to10 lecture hours)-** Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc.

**Suggested Readings**:


- Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
- The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
- Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc., 1989
- Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
- Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press, 1995, 1140p.

- Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi, 1995, 284p.
- Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
- Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd., 1987, 345p.
- Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut, 2001.
- Survey of the Environment, The Hindu.
- Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
- Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
- Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA, 1998, 499p.
- A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Environment Science: Introduction | https://www.youtube.com/watch?v=5QxxaVfgQ3k |
| | Natural Resources | https://www.youtube.com/watch?v=CXCT2R1K6Ts |
| | Ecosystem | https://www.youtube.com/watch?v=1dBU6HB8G6s |
| **Unit-II** | Biodiversity and its conservation | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| **Unit-III** | Sustainable Water Management In Urban Areas | http://digimat.in/nptel/courses/video/127106004/L29.ht |
| | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |
| **Unit-IV** | Population and population growth | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| | National Family Welfare Programme | https://www.youtube.com/watch?v=X5F99L8ZEtc |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-FT-220A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Electrical Fire Safety Practice and Standards** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To impart fundamental knowledge of electrical conductors, wiring systems, and protective devices essential for fire safety.<br>• To understand the causes and mechanisms of electrical fires and develop preventive strategies.<br>• To familiarize students with electrical shock phenomena and safety protocols in different electrical environments.<br>• To enable learners to identify hazardous zones and carry out failure investigations according to statutory requirements. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the classification, properties of conductors, wiring systems, and protective devices used in electrical safety systems. | Level 1: Remember |
| CO2 | Explain the causes and mechanisms of electrical failures and fires, along with the functioning of protective devices such as MCBs, RCCBs, and relays. | Level 2: Understand |
| CO3 | Apply safety procedures, wiring standards, and protection methods in electrical fire prevention and shock hazard mitigation. | Level 3: Apply |
| CO4 | Analyze hazardous zones, investigate electrical failures and fires, statutory compliance and management roles in electrical fire safety. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Conductor, classification and property of conductors, semiconductors, cables, wires, wire splicing and termination, joints, general electrical accessories and insulating materials.

**Terminology:** Electrical fire, failure, defect, seed defect, modes and mechanism of failure, failure rate, metal fatigue, elasticity of metals, creep, stress, strain, elastic and endurance limit.

**Wiring System:** System of supply, selection of wiring, rules and system of wiring, separation of power and lighting circuit, necessity of earthing, system of earthing, rules of earthing, methods of improving the earth resistance.

## Unit-II

**Protection Devices:** Introduction, features of good protective device, relays, fuses, circuit breaker, general specification of MCB's, trip mechanism, ELCB, RCCB.

**Electrical Fire:** Introduction, causes of electrical fires, failure of insulation, types and causes, transformer failure, failure modes, investigation overheating/ burning of crimped sockets, failure of plug and socket connectors.

## Unit-III

**Electrical Shock Phenomenon:** Shocks from AC and DC system, medical analysis of electrical shock, prevention of shocks, Safety precaution in electrical plant, safety precaution against contacts shock, flash shocks and burns.

**Electricity and the Fire Service:** Introduction, Electrical hazards and safeguards, Firefighting procedure, Fires in generating stations, Fires in transformers, Fires in substations, Fires in cable boxes, fires in industrial premises, Fires in private dwellings, Fires involving storage batteries, Fires involving electric railways, Fires in motor cars, relevant standards.

## Unit-IV

**Hazardous Zones:** Classification of hazardous zones. Intrinsically safe and explosion proof electrical apparatus, Selection of equipment in hazardous area Electrical Fires: Hazards of static electricity, Safety procedures in electrical maintenance, statutory requirements from Electrical Inspectorate. Introduction to Indian Electricity Act and Rules.

**Investigation of failures and fires:** Process of investigation, failure investigation: step by step approach, investigation of electrical fire, action plan.
**Role of the Management:** Materials and Training, preparation of specification, selection of supplier, inspection of material, training of staff, tools and instruments.

**Suggested Readings:**


- Electrical Wiring Estimating and Costing by S.L. Uppal, Khanna Publishers.
- Electrical Fires and Failures by A.A. Hattangadi, TMH Publishers.
- Electricity Fire Risk by G.S. Hoges.
- NFPA Manual.
- J.P. Handbook.
- Electrical Safety, Fire Safety and Safety Management by S. Rao, Khanna Publishers, Delhi
- Electrical Safety Handbook by John Cadick, TMH publishers, 6th Edition
- Basic Electrical Engineering by C.L.Wadhwa, New Age Publishers

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-FT-222A** | | | | |
| Category | Professional Elective Course | | | | |
| Course Title | **Industrial Psychology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | • To learn the fundamental of industrial psychology and its applications in occupational health and safety management of an organization through appropriate Industrial Labour Legislations.<br>• To explain the historical development, scope, and nature of occupational health psychology, emphasizing workplace safety, well-being, and environmental health.<br>• To familiarize the students about various levels of psychological interventions targeted at improving physical, mental, and emotional well-being of employees in the workplace. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Recall key concepts of Industrial Psychology and Occupational Health Psychology, such as workplace safety, stress, and occupational hazards. | Level 1: Remember |
| CO2 | Explain the relationship between workplace stressors**,** health issues, and organizational policies for improving employee well-being. | Level 2: Understand |
| CO3 | Apply psychological principles to design solutions for improving work-life balance, employee safety, mental health at work and reduce workplace bullying and violence. | Level 3: Apply |
| CO4 | Analyze labour legislations and workplace issues like stress**,** bullying and violence and the effectiveness of interventions in improving employee health and safety. | Level 4 : Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Industrial Psychology:** Definition, Nature and Background of I/O Psychology, Characteristics of I/O Psychologist, Ethics of I/O field.

**Occupational Health Psychology and Workplace Hazards:** Introduction, Accident and Safety, Infectious Disease Exposure, Loud Noise, Musculoskeletal Disorders, Harmful Substance Exposure, Workplace bullying, Workplace Violence, Work Schedule, Risk factors in the physical work environment, Individual antecedents of safety performance and workplace accidents and injuries, Situational antecedents of safety performance and workplace accidents and injuries, workplace mistreatment, workplace incivility.

## Unit-II

**Interventions and Strategies in Occupational Health Psychology:** Primary Interventions to improve work–life balance, secondary interventions to improve work–life balance, tertiary interventions to improve work–life balance, primary interventions to improve physical health and safety, secondary interventions to improve physical health and safety, tertiary interventions to improve physical health and safety, primary interventions to improve psychological health and well-being, secondary and tertiary interventions to improve psychological health and well-being, work family conflict.

## Unit-III

**Emerging Trends in Occupational Health Psychology:** Mental Health, Physical Health, Aggression in the Workplace, Organizational Climate and Leadership.

**Occupational Stress:** Introduction, Process, Job stressors- Role Ambiguity and Role Conflict, Workload, Social stressors, Organizational Politics, Control, Machine Pacing, Demand and Control Model, Burn-out.

## Unit-IV

**Industrial Labour Legislation**: Labour Legislations in India, Principles of Labour Legislation, Social Justice, Social Equity, National Economy, Classification of Labour Laws, Purpose, Legislature, Period of Enactment, The Factories Act -1948, Main Provisions of the Act, Health and Hygiene (sec 11-20), Safety Provisions (sec 21- 41).

**Suggested Readings**


- Industrial and Organizational Psychology- Research and Practice by Paul E. Spector, Wiley India Edition.
- Work Psychology: Understanding Human Behavior in Organizations by John Arnold, Ray Randall, and Paul Patterson, Tata McGraw-Hill Education (India).
- Occupational Health Psychology: Work, Stress, and Health by Irving B. Weiner and Paul L. Perrewé, Wiley India Pvt. Ltd.
- Handbook of Occupational Health Psychology" edited by Irving B. Weiner, Taylor & Francis India
- World Health Organization (WHO) - Occupational Health (www.who.int)
- National Institute for Occupational Safety and Health (NIOSH) (www.cdc.gov/niosh)
- The Factories Act-1948
- Labour Law in India (2012) by C. K. Johri

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-FT-224A** | | | | |
| Category | Professional Elective Course | | | | |
| Course Title | **Chemical Process Safety** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | • To develop foundational understanding of process safety culture, risk perception, and regulatory frameworks in industrial operations.<br>• To equip students with knowledge of toxicology, industrial hygiene, and hazard identification related to chemical exposure.<br>• To train students in preventive strategies for fire, explosion, and chemical reactivity hazards in process industries.<br>• To introduce safety design strategies, relief systems, and real-world case-based learning for effective hazard mitigation. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define key terms and principles related to process safety, toxicology, industrial hygiene, and hazard mitigation frameworks. | Level 1: Remember |
| CO2 | Explain the fundamentals of risk analysis, fire/explosion prevention, toxicant exposure control, and process safety strategies. | Level 2: Understand |
| CO3 | Apply hazard identification and control techniques, safety procedures, and relief system designs to industrial safety scenarios. | Level 3 : Apply |
| CO4 | Analyze real-world case histories to assess failures in process safety systems and recommend improvements in safety design and strategy. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Definition**,** myths about process safety, safety culture, essential features of safety culture, individual risk, societal risk and risk populations, voluntary and involuntary risk, safety metrics, safety and accident loss statistics, risk perception, risk tolerance/acceptance and risk matrix, risk management and hazardous substance rules, The CCPS 20 elements of risk-based process safety, inherently safer design, strategies.

**Unit-II**

**Toxicology:** Introduction, routes & exposure, entry routes for toxicants and methods for control, elimination of toxicants from the body, effects of toxicants on the body, dose response relationship, dose response and threshold dose: predictive models and extrapolation, relative toxicity.

**Industrial Hygiene:** Regulations and identification, anticipating and identifying hazardous workplace exposures, globally harmonized system for safety data sheets, globally harmonized system for labeling, evaluate the magnitude

of exposures and responses, noise, vibration and radiation, develop and evaluate control techniques to prevent exposures, National Fire Protection Association Diamond.

**Unit-III**

**Concepts to Prevent Fires and Explosions:** Inerting and purging, static electricity, general design methods to prevent fire, explosion-proof equipment and instruments, ventilation, fire extinguishers, sprinkler systems, industry's fire and explosion protection strategy.

**Chemical Reactivity:** Key steps in reactivity hazard evaluation, commitment, awareness and identification of reactive chemical hazards, controlling reactive hazards.

**Unit-IV**

**Introduction to Reliefs:** Relief concepts, definitions, type of reliefs and characteristics, code requirements, relief system design, relief installation practices, relief effluent handling.

**Safety Strategies, Procedures and Designs**: Process safety strategies, safe operating procedures, safe work practices, designs for process safety, designs for runaway reactions, designs and practices for the safe handling of dusts, case histories and lessons learned.

**Suggested Readings**

- Chemical Process Safety: Fundamentals with applications by Crowl and Louvar (2002), New Jersey: Prentice Hall.
- Evaluating Process Safety in the Chemical Industry by Arendt and Lorenzo (2000), New York: CCPS.
- Lees Handbook of Loss Prevention in Chemical Process Industries: hazard identification, assessment and control by Lees F. P. (2005), Butterworths.
- King's safety in the process industries by King et al. (1998), London: Wuerz Publishing Ltd.

**Useful Video Links**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| Unit-I | Safety and Accident Loss Statistics | https://www.youtube.com/watch?v=dlhXg7KkD0M | NPTEL (IIT Roorkee) |
| | Risk Management and Hazardous Substance Rules | https://www.youtube.com/watch?v=QYBA9FNoNDw | NPTEL (IIT Roorkee) |
| Unit-II | Introduction, Routes & Exposure | https://www.youtube.com/watch?v=jZvgAUYtS_Y | NPTEL (IIT Roorkee) |
| | Dose Response Relationship | https://www.youtube.com/watch?v=IxRvsiZkZQ0 | NPTEL (IIT Roorkee) |
| | Dose Response and Threshold Dose: Predictive models and Extrapolation | https://www.youtube.com/watch?v=_Ut_1L2JlQA | NPTEL (IIT Roorkee) |
| Unit-III | Designs to prevent Fire and Explosion: Inerting and Purging | https://www.youtube.com/watch?v=PaBDQ-lOGRM | NPTEL (IIT Roorkee) |
| | Sprinkler Systems | https://www.youtube.com/watch?v=ZKsqIPM810M | NPTEL (IIT Roorkee) |
| Unit-IV | Introduction to Reliefs | https://www.youtube.com/watch?v=Cs8DQ_9f5qM | NPTEL (IIT Roorkee) |
| | Type of Reliefs | https://www.youtube.com/watch?v=Q-4601m2zag | NPTEL (IIT Roorkee) |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

**AN AUTONOMOUS INSTITUTE | NAAC 'A' GRADE | AFFILIATED TO MDU ROHTAK**

## CERTIFICATE COURSE ON ENVIRONMENAL, SOCIAL AND GOVERNANCE

**SESSION: 2025-26**

**Eligibility Criteria:** At least Senior Secondary Examination (10+2) with atleast 50% marks (47.5% in case of SC/ST/Blind/Visually/Differently abled etc. candidates of Haryana Only) from board of school education Haryana, Bhiwani or any other examination recognized by Maharshi Dayanand University, Rohtak as equivalent thereto.

**Program Duration:** 6 Months (Twice in an Academic Year)

**Course Credits:** 3

**No. of Seats:** 30

**The reservation of seats is as given below:**

| Sr. No. | Name of Program | Break of seats as per State Govt. Reservation Policy | | | | | | | | | No. of Sanctioned Seats |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | AIC | EWS* | HOGC | SC# | | BC (A) | BC (B) | DA/PwD/PH/ ESM/DFF## | EWS** | |
| | | | | | OSC | DSC | | | | | |
| 1 | Certificate Course in Environmental, Social and Governance (ESG) | 4 | - | 11 | 3 | 3 | 4 | 3 | 1 | 1 | 30 |

**Note:** In the event of vacant seats remaining after the final date of allotment based on reservations, these may be allocated to general category candidates.

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
**AN AUTONOMOUS INSTITUTE | NAAC 'A' GRADE | AFFILIATED TO MDU ROHTAK**

**SCHEME OF EXAMINATIONS AND SYLLABUS CERTIFICATE COURSE**

| | | | | | |
|---|---|---|---|---|---|
| **Course Code** | CC-ESG-01 | | | | |
| **Category** | Certificate Course | | | | |
| **Program Name** | Certificate Course in Environmental, Social and Governance (ESG) | | | | |
| **Course Title** | **ENVIRONMENTAL, SOCIAL AND GOVERNANCE (ESG)** | | | | |
| **Duration** | 6 Months (**Offering Twice in an Academic Year)** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | |
| | 3 | 0 | 0 | **3** | |
| **Course Objectives** | The objectives of this course are<br>• To introduce students to the core philosophy, principles, and global landscape of Environmental, Social, and Governance (ESG) practices.<br>• To develop a comprehensive understanding of ESG risks, opportunities, reporting standards, and governance mechanisms in corporate and societal contexts.<br>• To equip students with the ability to evaluate ESG materiality, apply sustainable finance strategies, and integrate ESG into investment and business decisions.<br>• To promote critical engagement with contemporary issues in CSR (Corporate Social Responsibility), sustainable development (SD), and ESG auditing frameworks. | | | | |
| **Assessment** | 40 Marks | | | | |
| **End Semester Examination** | 60 Marks | | | | |
| **Total** | 100 Marks | | | | |
| **Duration of Exam** | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define fundamental ESG concepts, including environmental, social, and governance components, and related frameworks such as CSR, SD, BRSR and ESG auditing. | Level 1: Remember |
| **CO2** | Explain the interconnections among ESG issues, BRSR, sustainability, finance, reporting, communication, and corporate responsibilities in a global and local context. | Level 2: Understand |
| **CO3** | Apply BRSR and ESG assessment tools, reporting frameworks, and governance practices to address sustainability challenges in business environments. | Level 3: Apply |
| **CO4** | Analyze material ESG risks, stakeholder engagement strategies, and sustainability integration in investment decisions using real-world data and case studies. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### Unit I: Foundations of ESG and BRSR

**Introduction to Key Concepts:** Philosophy of ESG, Pillars (Environmental, Social, Governance), Glocal ESG Landscape

**Environmental Protection & Rejuvenation:** Key environmental issues, risks and mitigation, opportunities, innovation for sustainability

**Environmental Management System (EMS)**: ISO 14001, Case Studies related to Air, Water and Noise Quality Management

**Social Engagement:** Pertinent social issues, identification and solutions, stakeholder inclusion

### Unit II: Governance and Strategic Materiality

**Governance for Value Creation:** Good governance practices, governance risks and opportunities, risk management mechanisms

**Materiality:** Corporate guidance, identification of material ESG issues, conducting materiality assessments

**Green Transitions**: Introduction to Renewable Energy, Carbon Management, Green Hydrogen, Green Buildings, GRIHA Ratings and LEED Certification

**ESG Evaluation and Reporting:** Overview of ESG frameworks (e.g., GRI, SASB, BRSR, TCFD), reporting differences and applications

### Unit III: ESG in Finance, Communication and Technology

**ESG and Sustainable Finance:** ESG-linked financial instruments, sustainable investment

**ESG Engagement and Communication:** Stakeholder engagement strategies, ESG communication methods

**Corporate Roadmap for ESG Integration:** Steps for ESG implementation, challenges and future directions

### Unit IV: Integration with CSR, SD and Auditing

**ESG, CSR, and Sustainable Development:** ESG integration with investment decisions, CSR initiatives for sustainability

**Concepts of Corporate Social Responsibility (CSR):** Definitions, evolution, impact, and legal framework of CSR

**Concepts of Sustainable Development (SD):** SD principles, UN SDGs, and organizational implications

**ESG Auditing Framework:** ESG assurance and verification processes, ESG audit standards and practices

**Suggested Readings:**


- Environmental, Social, and Governance (ESG) Investing: A Balanced Analysis of the Theory and Practice of a Sustainable Portfolio by John Hill
- Environmental Social Governance: Managing Risk and Expectations by Karlheinz Spitz et al., CRC Press
- The Complete Book of Environmental, Social and Governance ESG by Amitesh Agrahari
- Benchmarking ESG & CSR: A Compendium of Best Practices in ESG & CSR in India – Learn from the ESG & CSR practices of companies of different sizes, nature, and sectors [IICA] by Dr. Garima Dadhich and Dr. Ravi Raj Atrey


**Latest books can be referred by the Experts on ESG.**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

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## Minutes of 2nd meeting of Board of Studies of Mechanical Engineering Department

The 2nd meeting of Board of Studies of Mechanical Engineering Department was held on 24.05.2025 at 11:00 A.M in the Conference Hall of the Institute.

The following members were present for the BOS meeting:

| SN | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Mr. Vivek | HOD, GITAM, Kablana | Chairperson |
| 2 | Dr. Vineet Singla | Professor, UIET, MDU Rohtak | Member |
| 3 | Dr. Vasdev Malhotra | Professor, J.C Bose UST, YMCA Faridabad | Member |
| 4 | Dr. Aman Aggarwal | Professor, GITAM Kablana | Member |
| 5 | Dr. Jitender Kumar | Professor, GITAM Kablana | Member |
| 6 | Dr. Hari Parshad | Professor, GITAM Kablana | Member |
| 7 | Dr. Sunil Kadiyan | Professor, GITAM Kablana | Member |
| 8 | Dr. Vishant Kumar | Professor, GITAM Kablana | Member |
| 9 | Dr. Devender Singh Punia | Assistant Professor, GITAM Kablana | Member |
| 10 | Mr. Parvesh | Assistant Professor, GITAM Kablana | Member |
| 11 | Mr. Bhoop Singh | Assistant Professor, GITAM Kablana | Member |
| 12 | Dr. Balraj Hooda | Assistant Professor, GITAM Kablana | Member |
| 13 | Mr. Manmohan | Assistant Professor, GITAM Kablana | Member |
| 14 | Mr. Chirag Verma | Assistant Professor, GITAM Kablana | Member |
| 15 | Mr. Mohit Taneja | Assistant Professor, GITAM Kablana | Member |
| 16 | Mr. Vikas Goel | Assistant Professor, GITAM Kablana | Member |
| 17 | Mr. Nikhil Sikka | Assistant Professor, GITAM Kablana | Member |
| 18 | Mr. Vishnu | Assistant Professor, GITAM Kablana | Member |
| 19 | Mr. Manoj Kumar | Assistant Professor, GITAM Kablana | Member |
| 20 | Mr. Prince Garg | Industry/ Corporate Sector | Member |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.



**Agenda wise Discussion and Resolutions**

**Item No. 2.1**
Confirmation of the minutes of 1st Meeting of the Board of Studies (BOS) of Mechanical Engineering Department held on 30.12.2024.

**The minutes of 1st meeting of the Board of Studies of Mechanical Engineering Department held on 30.12.2024 (Annexure-2.1 Page No. 1 to 2 already circulated) be confirmed.**

**Item No. 2.2**
Follow up action report of the decisions taken in the 1st Meeting of Board of Studies held on 30.12.2024.

**Follow up action of the decisions taken in the 1st Meeting of Board of Studies held on 30.12.2024 be noted (Annexure 2.2 Pages 3 already circulated).**

**Item No. 2.3**
Minor Changes in the course code of M. Tech (Machine Design) 1st Year and M. Tech (Manufacturing and Automation) 1st Year w.e.f. 2025-26.

**Resolved that the Minor Changes in the course code of M. Tech (Machine Design) 1st Year and M. Tech (Manufacturing and Automation) 1st Year are approved and further resolved that the minor changes are recommended to the Academic Council for approval as given below:**

**a) M.Tech Machine Design 1st Year**

| Name of the Course | Existing Course Code | Amended Course Code |
|---|---|---|
| Materials Management | PEC-MTMD-114A | PEC-MTME-116A |
| Finite Element Methods | PEC-MTMD-118A | PEC-MTME-118A |
| Design of Pressure Vessels | PEC-MTMD-116A | PEC-MTMD-114A |
| Seminar-I | SM-MT-115A | SM-MTMD-115A |
| Seminar-II | SM-MT-110A | SM-MTMD-110A |

**b) M.Tech Manufacturing and Automation 1st Year**

| Name of the Course | Existing Course Code | Amended Course Code |
|---|---|---|
| Artificial Intelligence in Manufacturing | PEC-MTMA-116A | PEC-MTMA-114A |
| Finite Element Methods | PEC-MTMA-114A | PEC-MTME-118A |
| Seminar-I | SM-MT-115A | SM-MTMA-115A |
| Seminar-II | SM-MT-110A | SM-MTMA-110A |

**Item No. 2.4**
Proposal to add one Professional Elective Course "Materials Management" in 2nd Semester of M. Tech Manufacturing Automation from session 2025-26.



**Resolved that one course as Professional Elective Course "Materials Management" in M. Tech Manufacturing and Automation 2nd Semester from session 2025-26 (Annexure 2.3 Pages 4-5) is to be added and further resolved that the same is recommended to the Academic Council for approval.**

**Item No. 2.5**

Scheme of Examinations and Syllabus of 2nd year M.Tech Manufacturing and Automation from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year M. Tech Manufacturing and Automation from Academic Session 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure 2.4 Pages 6-26).**

**Item No. 2.6**

Scheme of Examinations and Syllabus of 2nd year M.Tech Machine Design from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year M. Tech Machine Design from Academic Session 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure 2.5 Pages 27-51).**

**Item No. 2.7**

Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Mechanical Engineering Department for various PG Programs offered by the Institute for academic year 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year of Multidisciplinary Open Elective-II courses offered by the Mechanical Engineering Department for various PG Programs offered by the Institute for academic year 2025-26 is approved. Further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure 2.6 Pages 52-56).**

**Item No. 2.8**

Scheme of Examinations and Syllabus of 2nd year B. Tech Mechanical Engineering from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year B. Tech Mechanical Engineering from Academic Session 2025-26 be approved and recommended to the Academic Council for the approval (Annexure 2.7 Pages 58-109).**

**Item No. 2.9**

Review of the Panel of Examiners for Theory and Practical's of B.Tech and M.Tech programs for academic year 2025-26.



**The panel of examiners Theory and Practical's of B.Tech and M.Tech programs for academic year 2025-26 be reviewed and approved. The same can be sent to the Controller of Examinations of the Institute for the Information (Annexure 2.8 Pages 110-111).**

**Item No. 2.10**

Any other item with the permission of the chair.

To approve the Scheme of Examinations and Syllabus of Basics of Mechanical Engineering to be offered to 1st Year B. Tech students from Academic Session 2025-26.

**Resolved that the Scheme of Examinations and Syllabus of Basics of Mechanical Engineering to be offered to First Year B. Tech students from Academic Session 2025-26 and the same the recommended to the Board of Studies of Applied Science and Humanities for further necessary actions (Annexure 2.9 Pages 112-113).**

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Mechanical Engineering Deptt**

**Endst No.** GITAM/BOSME/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs

**Chairperson**
**Board of Studies**
**Mechanical Engineering Deptt**



| Course Code | **PEC-MTME-116A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Courses | | | | |
| Course Title | **Materials Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• Learn the concepts of material management, its functions, and organizational structures.<br>• Study the material planning and control techniques.<br>• Learn about purchasing and supplier management for cost reduction through effective negotiations and purchasing research.<br>• Learn various methods like variety reduction and material flow cost control to optimize material management. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the fundamental concepts and principles of materials management, including inventory control, procurement, and materials handling etc. |
| **CO2** | Explain the principles and processes of material planning, procurement, and inventory management, and their role in efficient operations. |
| **CO3** | Apply techniques of materials management to ensure efficient and cost-effective management of materials in a manufacturing environment. |
| **CO4** | Analyze the impact of material management strategies and inventory management methods on production efficiency and organizational profitability. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction:** Introduction to material management and productivity, functions of material management, organization structures in material management, role of material management techniques in improved material productivity.<br>**Material planning**: Objectives, material requirement planning, manufacturing resource planning, JIT production planning, strategic material planning, material control: acceptance, sampling, inspection, make or buy decision, simple cost analysis, economic analysis, break even analysis, break-even point theory, whether to add or drop a product line store management and warehousing, product explosion. |
| **Unit-II** | **Purchasing:** Importance of good purchasing system, organization of purchasing functions, purchase policy and procedures, responsibility and limitations, purchasing decisions, purchasing role in new product development, role of purchasing role cost reduction, negotiations and purchase, purchasing research: identification of right sources of supply, vendor rating, standardization, vendor certification plans, vendor and supply reliability, developing new source of supply. |

| | |
|---|---|
| **Unit-III** | **Cost Reduction:** Cost control vs cost reduction, price analysis, material cost reduction techniques, variety reduction, cost reduction and value improvement, techniques of cost control, standard costing, cost effectiveness, cost analysis for material management, material flow cost control**.** |
| **Unit-IV** | **Inventory management**: Inventory vs stores, types of inventory, inventory control, inventory build-up, EOQ, various inventory models, inventory models with quantity discount, exchange curve concept, coverage analysis, optimal stocking and issuing policies, inventory management of perishable commodities, ABC - VED analysis, design of inventory distribution systems, surplus management, information system for inventory management, case studies. |

**Suggested Readings**


1. Material management by WR Stelzer Jr; Prentice Hall.
2. Material management by DS Ammer & Richard Erwin.
3. Material management by AK Dutta; Prentice Hall.
4. Material management: An integrated approach by P Gopalakrishnan & M Sundersen; Prentice Hall.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Basic elements of JIT | https://youtu.be/Zjx7zCjLjyw?feature=shared |
| | Break even analysis | https://youtu.be/KGF1YelPYqA?feature=shared |
| **UNIT-II** | Basics of Purchasing Management | https://youtu.be/DdSfqfXOLXk?feature=shared |
| | Purchasing Cycle & Procurement Development Process | https://youtu.be/H9n5KL4G6_I?feature=shared |
| **UNIT-III** | Accounting for Costs | https://youtu.be/yf0WLsrLsXg?feature=shared |
| | Materials Management | https://youtu.be/4Vs3xcEEU84?feature=shared |
| **UNIT-IV** | EOQ model | https://youtu.be/9tJv5COGkD0?feature=shared |
| | Inventory Control and Management | https://youtu.be/k-9mb4KtaGc?feature=shared |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**
**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Scheme of Examinations & Syllabus For

# Master of Technology (Manufacturing and Automation) 2nd Year

# (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 2 Practical (Lab) per week | 1 Credit |
| 3 | 2 Seminar per Week | 2 Credit |
| 4 | 4 Project per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credits of 86 for a student to be eligible to get Post Graduate degree in Manufacturing and Automation.

## 3. STRUCTURE OF MASTER OF TECHNOLOGY (MANUFACTURING AND AUTOMATION)

| **Sr. No.** | **Category** | **Breakup of Credits** |
|---|---|---|
| 1 | Professional Core Courses | 32 |
| 2 | Professional Elective Courses | 8 |
| 3 | Multidisciplinary Open Elective Courses | 6 |
| 4 | Foundation Elective Courses | 3 |
| 5 | Mandatory Learning Course | 3 |
| 6 | Seminar | 6 |
| 7 | Lab Courses | 4 |
| 8 | Project | 2 |
| 9 | Dissertation | 22 |
| | **Total Credits** | 86 |

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses | PEC |
| 3 | Multidisciplinary Open Elective Courses | OEC |
| 4 | Foundation Elective Courses | FEC |
| 5 | Mandatory Learning Course | MLC |
| 6 | Seminar | SM |
| 7 | Lab Courses | LC |
| 8 | Project | PROJ |
| 9 | Dissertation | DISS |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M.Tech (Manufacturing and Automation) -3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTMA-201A | Manufacturing Automation | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Table -IV | ..... | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Mandatory Learning Course | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Multidisciplinary Open Elective Courses | Refer Table -V | ..... | 4 | 0 | 0 | 4 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Project Courses | PROJ-MTMA-213A | Project | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 6 | Seminar | SM-MTMA-215A | Seminar-III | 0 | 0 | 4 | 4 | 2 | 50 | | | 50 | |
| 7 | Dissertation | DISS-MTMA-217A | Dissertation (Phase-I) | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | |
| **Total Credits** | | | | | | | | **20** | | | | **650** | |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M.Tech (Manufacturing and Automation) -4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTMA-202A | Dissertation (Phase-II) | - | - | - | - | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

**Table IV (Program Elective Courses)**

| Course Code | Course Title |
|---|---|
| PEC-MTMA-203A | Production, Planning and Control |
| PEC-MTMA-205A | Advanced Metrology and Calibration |
| PEC-MTMA-207A | Industrial Inspection |
| PEC-MTME-209A | Industrial Robotics |
| PEC-MTME-211A | Supply Chain Management |

**Table V (Multidisciplinary Open Elective-II Courses)**

Students of all PG programmes are required to study one multidisciplinary open elective course in 3rd Semesters for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

| SN | Courses Code | Course Title | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEL-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Source of Energy-II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics & Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTMA-205A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Advanced Metrology and Calibration** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• Learn the working principles of various measuring instruments for geometrical tolerances and surface finish.<br>• Gain knowledge of calibration procedures for mechanical measuring tools and instruments.<br>• Learn fundamental concepts of dimensional tolerances, fits, and surface texture parameters.<br>• Enhance skills to calculate measurement uncertainties for different metrological instruments. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the concepts of fit, tolerance systems, surface texture parameters, and standard measuring tools. |
| **CO2** | Explain the principles of geometrical tolerances, measuring instruments, and calibration procedures for dimensional metrology. |
| **CO3** | Apply appropriate instruments for advanced metrology and calibration of component. |
| **CO4** | Analyze the impact of fundamental deviations, measurement techniques, instrument calibration, and uncertainty calculations on precision and quality in mechanical metrology. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Fundamental deviation and its calculations, effect of tolerance on the fits, effects of electroplating on the fits and its solution, shaft basis and hole basis system and its applications, Go, No- Go gauge design, tolerance position and tolerance for bolt and nut.<br>Geometrical Tolerances. Surface erosion form, macro and micro errors, reasons for these errors. Surface texture parameters, amplitude, spacing and hybrid, bearing ratio/ ABBOTT-Fire Stone curve, Average Slope |
| **Unit-II** | Measuring instrument for flatness & surface finishes, instrument for geometrical tolerances, profile projector, co-ordinate measuring machine, laser micrometre, various grades of slip gauges and pin gauges, auto collimeters, various types of micrometre |
| **Unit-III** | Introduction to calibration, calibration of mechanical measuring instruments, micrometres depth- micrometre, Vernier calliper, tool maker microscope, pin gauge, surface plate, dial gauges, optical flats, slip gauges. |
| **Unit-IV** | Calculation of uncertainty, both A type & B type, for micrometres, Vernier Callipers and co-ordinate measuring Machine |

**Suggested Readings**

1. Engineering Metrology and Instrumentation by R.K. Rajput.
2. ISI–Standard919andISI-Standard4218.
3. Engineering Tolerances by H.G. Conway

**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Fundamental | https://nptel.ac.in/courses/112104250 |
| | Limit, fit, and tolerance | https://nptel.ac.in/courses/112106179 |
| **UNIT-II** | Measuring instrument for flatness | https://nptel.ac.in/courses/112106179 |
| | Various type of micrometre | https://nptel.ac.in/courses/112104250 |
| **UNIT-III** | Introduction to calibration | https://nptel.ac.in/courses/112106139 |
| | Vernier calliper | https://nptel.ac.in/courses/112106140 |
| **UNIT-IV** | Calculation of uncertainty | https://nptel.ac.in/courses/112106138 |
| | Coordinate measuring Machine | https://nptel.ac.in/courses/112104250 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTMA-207A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Industrial Inspection** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To learn methods for inspection and measurement of threads, gears, and dimensional features.<br>• To study surface texture characteristics, measurement techniques, and process gauging methods.<br>• To comprehend geometrical and positional tolerances and the physical limitations of measurement devices. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define fundamental principles of design, material selection, and tolerance standards relevant to gauges, threads, gears, and surface textures. |
| **CO2** | Explain various measurement and inspection methods for dimensional and geometrical accuracy. |
| **CO3** | Apply measurement instruments and process gauging techniques to solve industrial inspection related problems. |
| **CO4** | Analyze geometrical and positional tolerances while considering the limitations and calibration of measuring devices for quality control. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Design consideration for Gauges and measuring instruments: material selection for gauges, hardness and surface finish, tolerance for linear and dimensional chains, limits, fits and tolerance as per Indian and international standards, design of plug gauge, snap gauge, center distance gauge. |
| **Unit-II** | **Inspection of threads and gears**: thread gauge design, thread size measurement by two wire and three wire methods, Vernier gear tooth gauge design. |
| **Unit-III** | **Surface textures**: components of machined surface texture, specification of surface texture, surface roughness measuring device and techniques, design of pneumatic gauges in process gauging methods. |
| **Unit-IV** | Geometrical and positional tolerances, Geometrical and physical limitations in measuring devices. |

**Suggested Readings**


1. Metrology: I.C. Gupta (Dhanpat Rai Pub.).
2. Engg. Metrology: R. K. Rajput (S. K. Kataria and sons).
3. Metrology: R. K. Jain.

**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Design consideration for Gauges and measuring instruments | https://nptel.ac.in/courses/112104250 |
| **UNIT-II** | https://nptel.ac.in/courses/112104250 | https://nptel.ac.in/courses/112106179 |
| **UNIT-III** | Surface textures | https://nptel.ac.in/courses/112106179 |
| **UNIT-IV** | Geometrical and positional tolerances | https://nptel.ac.in/courses/112103261 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTME-209A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Industrial Robotics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce to the concept of robotics.<br>• To gain the knowledge of kinematics, dynamics, and control of robot manipulators.<br>• To familiarize students with robotic actuators, sensors, and end-effectors for various industrial applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Recall the fundamental concepts of mechanical vibration. |
| **CO2** | Explain the vibration behaviour of mechanical systems using theoretical, mathematical, and experimental approaches. |
| **CO3** | Apply analytical and numerical methods to solve vibration problems. |
| **CO4** | Analyze the vibration characteristics of engineering systems. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction to Robotics**: Evolution of Robots and Robotics, Laws of Robotics, Progressive advancement in Robots. Robot anatomy, Human Arm Characteristics, Design and Control issue, Manipulation and Control, Programming Robots.<br>**Coordinate Frames, Mapping and Transforms**: Coordinate Frames, Description of objects in space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation matrices. |
| **Unit-II** | **Direct Kinematic Model**: Mechanical structure and notations, Kinematic modelling of the manipulator, Denavit Hartenberg Notation, Manipulator Transformation Matrix.<br>**The Inverse Kinematics:** Manipulator workspace, solvability of Inverse kinematics model, solution techniques, closed form solution. |
| **Unit-III** | **Manipulator Differential Motion and Statics**: Linear and angular velocity of a rigid body, relationship between transformation matrix and angular velocity, manipulator Jacobian, Jacobian Inverse, Jacobian Singularities, Static Analysis.<br>**Dynamic Modelling**: Largrangian Mechanics, Two Degree of Freedom manipulator dynamic Model, Lagrange-Euler formulation Newton-Euler formulation, Inverse Dynamics. |
| **Unit-IV** | **Control of Manipulators:** Open and Close loop control, linear control schemes, linear second order SISO model of a manipulator joint. Joint Actuators, Computed Torque Control, force control of Robotics, Manipulators, Hybrid position/force control, Impedance Force/Torque Control.<br>**Robotic Sensors:** Sensors in Robotics, classification of Robotic sensors, kinds of sensors used in robotics-Acoustic sensors optic, Pneumatic, force/Torque sensors. |

**Suggested Readings**


1. Fundamental of Robotics by Robert J. Schilling Prentice Hall of India.
2. Introduction to Robotics by Saeed B. Niku Pearson Education Asia.
3. Robot Modelling and kinematics by Rashid Mansour, Laxmi Publications.
4. Robotics Control, Sensing, Vision and Intelligence, K. S. Fu, R. C. Gonzalez and C.S.G. Lee, McGraw-Hill, 1st Edition, 1987.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| UNIT-I | Robot anatomy | https://youtu.be/rYWJdZ5qg6M?si=2SAVtIH2CeXvQJlq |
| | Design and Control issue | https://www.youtube.com/watch?v=aa3KDFCSmJ0 |
| | Manipulation and Control | https://youtu.be/74d4vauVcWQ?si=uXyVULGAe8AlnaT1 |
| | Programming Robots | https://www.youtube.com/watch?v=rYWJdZ5qg6M |
| UNIT-II | Denavit Hartenberg Notation | https://www.youtube.com/watch?v=FMWFDBhL6FQ |
| | Manipulator Transformation Matrix | https://youtu.be/74d4vauVcWQ?si=paGQubB75ATQ092E |
| | Solvability of Inverse kinematics model | https://www.youtube.com/watch?v=unwUt3kkgvE |
| UNIT-III | Linear and angular velocity of a rigid body | https://www.youtube.com/watch?v=oG6-zmspAvc |
| | relationship between transformation matrix and angular velocity | https://www.youtube.com/watch?v=iFOTm4lwPGA |
| | Jacobian Singularities | https://www.youtube.com/watch?v=UrKWTE5YSDI |
| UNIT-IV | linear second order SISO model of a manipulator joint | https://www.youtube.com/watch?v=A5JRXKWQpbs |
| | Acoustic sensors optic | https://www.youtube.com/watch?v=tD3q5a8LPUc |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTME-211A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Supply Chain Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop an in-depth understanding of supply chains.<br>• To explain the concept of strategic fit.<br>• To explore the key drivers of supply chain performance.<br>• To learn the role and design of supply chain networks.<br>• To know the design of distribution networks. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the fundamental concepts of supply chain management. |
| **CO2** | Explain the concepts of strategic fit and the scope of strategic decisions in aligning supply chain performance with business goals. |
| **CO3** | Apply forecasting and aggregate planning techniques to match supply and demand effectively in a supply chain. |
| **CO4** | Analyze the design of distribution networks and their application. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction to Supply Chain Management:** Understanding the Supply Chain. Supply Chain Performance: Competitive and Supply Chain Strategies, achieving Strategic Fit and Scope of Strategic Fit. |
| **Unit-II** | **Supply Chain Drivers and Metrics:** Drivers of Supply Chain Performance, Framework for structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing and Pricing, Case Study: Seven Eleven Japan Company. |
| **Unit-III** | **Planning Demand and Supply in a Supply Chain:** Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain. Designing Distribution Networks and Application to E Business- Role of distribution, factors influencing distribution network design, design options for a distribution network, E-Business and the distribution network. |
| **Unit-IV** | **Network Design in the Supply Chain:** Role of network design in the supply chain, factors influencing network design decisions, Role of Information Technology in supply chain, coordination in a supply chain, Bullwhip Effect, Effect on performance due to lack of coordination, obstacles to coordination in a supply chain. |

**Suggested Readings**


1. Supply Chain Management: Strategy, Planning & Operation, Sunil Chopra & Peter Meindle, Pearson.
2. Logistical Management: The integrated Supply Chain Process, Donald J. Bowersox & David J. Closs, TMH Publication

**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Introduction to Supply Chain Management | https://www.youtube.com/watch?v=raqi4gjMLm8 |
| | Supply Chain Strategies | https://www.youtube.com/watch?v=l9mebE3CGBQ&t=1s |
| **UNIT-II** | Drivers of Supply Chain Performance | https://www.youtube.com/watch?v=ZiUCB6HDc-8 |
| | Inventory | https://www.youtube.com/watch?v=b6ElgF9TymU&t=2s |
| **UNIT-III** | Demand Forecasting in a Supply Chain | https://www.youtube.com/watch?v=tCnFx6VfPUA |
| | Designing Distribution Networks | https://www.youtube.com/watch?v=-5m3vPMlV70 |
| **UNIT-IV** | Role of network design in the supply chain | https://www.youtube.com/watch?v=iSr5SrQ5kZM&t=2s |
| | Role of Information Technology in supply chain, coordination in a supply chain | https://www.youtube.com/watch?v=mW2vJq-KYfw |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | |
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify research problems, objectives, and data sources based on fundamental research methodology principles. |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations |
| **Unit-II** | Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee. |
| **Unit-III** | Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing. |

| | |
|---|---|
| **Unit-IV** | Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology. |

**Suggested Readings:**


- Research Methodology: Methods and Techniques (4th ed.) by Kothari, C. R., & Garg, G, New Age International Publishers.
- Research Methodology: A Step-by-Step Guide for Beginners (4th ed.). by Kumar, R, SAGE Publications India. ISBN: 978-9351501337
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed.) by Bouchoux, D. E, Cengage Learning.
- Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.


**Useful Video links**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Defining/formulating research problem<br>Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=oTc4_zjmev0<br>https://www.youtube.com/watch?v=tjDBPRoyDJA |
| **Unit-II** | Types of Plagiarism<br>Research Ethics | https://www.youtube.com/watch?v=5--ssYqyWoE<br>https://www.youtube.com/watch?v=4tRCov8pVgQ |
| **Unit-III** | Primary data and Secondary Data.<br>Sampling techniques | https://www.youtube.com/watch?v=caUiRsg5M6k<br>https://www.youtube.com/watch?v=sKtoW5cXt14 |
| **Unit-IV** | Patent Trademarks and Copyrights.<br>What is Patent? Patent Filing Procedure in India. | https://www.youtube.com/watch?v=XQ8tRdcr0xQ<br>https://www.youtube.com/watch?v=azMNhrkRzww |

| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **PROJ-MTMA-213A** | | | | | |
| Category | Project Course | | | | | |
| Course Title | **Project** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 0 | 0 | 4 | 2 | | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in relevant field for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | | |
| Assessment | 50 Marks | | | | | |
| End Semester Examination | 50 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify complex engineering problems relevant to project work based on domain knowledge and real-world challenges. |
| **CO2** | Describe the workflow, technical background, and tools required for planning and executing engineering projects. |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. |

Each student is required to carry out a hardware-based project and submit the project report. The project title and objectives should be chosen by the student in consultation with their allocated Project Guide.

**Evaluation Criteria (Total: 50 marks)**

| Sr. No. | Evaluation Parameter | Marks |
|---|---|---|
| 1 | **Problem Definition and Relevancy** - clarity of problem, significance and alignment with discipline | 5 |
| 2 | **Proposed Solution and Implementation** - functionality, originality, technical depth. | 5 |
| 3 | **Project Benefit and Impact** - benefits to society, industry, and environment. | 10 |
| 4 | **Cost-Effectiveness and Practical Viability** - consideration of cost, resources, and practicality. | 10 |
| 5 | **Presentation and Communication Skills (Viva-voce)** - ability to explain, answer questions, confidence, and depth of knowledge. | 10 |
| 6 | **Project Report Quality** - clarity, completeness, format, and technical content. | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MTMA-215A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Develop students' ability to effectively present research topics and findings by effective communication.<br>• Improve problem-solving and critical thinking skills of thestudents.<br>• Expose students to the latest trends and advancements byreviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated.** |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies andmethodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This course helps M. Tech students improve their research presentation skills. It focuses on choosing a topic or research paper related to their field, reviewing it thoroughly and presenting the findings clearly and effectively.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on publishedreview paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selectedpaper or topic must be approved by the faculty members/ committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | **CO1** |
| 2 | Literature Survey | 10 | **CO2** |
| 3 | Content Relevancy | 10 | **CO3** |
| 4 | Presentation Skills | 10 | **CO4** |
| 5 | Q&A Response | 10 | **CO5** |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTMA-217A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying research topics relevant to field.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTMA-202A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-II)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 20 | 20 | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help identify topics in relevant field.<br>• Understand structured research methodology, literature review, and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Dissertation Stage-I will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation

with the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Students have to publish a research paper in a journal / conference of the research work done before the final submission of Dissertation.
- The student must follow the guidelines for the Dissertation report.

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**
**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Scheme of Examinations & Syllabus For

# Master of Technology (Machine Design) 2nd Year

# (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 2 Practical (Lab) per week | 1 Credit |
| 3 | 2 Seminar per Week | 2 Credit |
| 4 | 4 Project per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credits of 86 for a student to be eligible to get Post Graduate degree in Machine Design.

## 3. STRUCTURE OF MASTER OF TECHNOLOGY (MACHINE DESIGN)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 32 |
| 2 | Professional Elective Courses | 8 |
| 3 | Multidisciplinary Open Elective Courses | 6 |
| 4 | Foundation Elective Courses | 3 |
| 5 | Mandatory Learning Course | 3 |
| 6 | Seminar | 6 |
| 7 | Lab Courses | 4 |
| 8 | Project | 2 |
| 9 | Dissertation | 22 |
| | **Total Credits** | 86 |

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses | PEC |
| 3 | Multidisciplinary Open Elective Courses | OEC |
| 4 | Foundation Elective Courses | FEC |
| 5 | Mandatory Learning Course | MLC |
| 6 | Seminar | SM |
| 7 | Lab Courses | LC |
| 8 | Project | PROJ |
| 9 | Dissertation | DISS |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## M.Tech (MACHINE DESIGN) – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTMD-201A | Mechanical Behaviour of Materials | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Table -IV | …… | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Mandatory Learning Course | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Multidisciplinary Open Elective Courses | Refer Table-V | …… | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Project Courses | PROJ-MTMD-213A | Project | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 6 | Seminar | SM-MTMD-215A | Seminar-III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 7 | Dissertation | DISS-MTMD-217A | Dissertation (Phase-I) | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | |
| **Total Credits** | | | | | | | | **20** | | | | **650** | |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## M.Tech (MACHINE DESIGN) – 4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTMD-202A | Dissertation (Phase-II) | - | - | - | - | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

**Table IV (Program Elective Courses)**

| Course Code | Course Title |
|---|---|
| PEC-MTMD-203A | Total Quality Management |
| PEC-MTMD-205A | Tribology |
| PEC-MTMD-207A | Mechanical Vibrations |
| PEC-MTME-209A | Industrial Robotics |
| PEC-MTME-211A | Supply Chain Management |

**Table V (Multidisciplinary Open Elective-II Courses)**

Students of all PG programmes are required to study one open elective course in 3rd Semesters for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

| SN | Courses Code | Course Title | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEL-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Source of Energy-II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics & Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-MTMD-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Mechanical Behaviour of Materials** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To enhance the understanding of material behavior under various mechanical conditions.<br>• To cultivate skills in evaluating material properties and predicting their behavior under stress, strain, and environmental factors.<br>• To study how different factors affect the performance and durability of materials in real-world applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the fundamental concepts of mechanical behaviour of materials |
| **CO2** | Explain the impact of various factors on material properties. |
| **CO3** | Apply theories and principles to examine the behaviour of materials. |
| **CO4** | Analyze the behaviour of materials subject to different loading conditions. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Plastic Deformation and Dislocation Theory**; lattice defects, deformation in a perfect lattice, dislocation in crystal and deformation, strain hardening of single crystal, low angle grain boundaries, yield point and strain ageing. Stress field of a dislocation, forces between dislocations, dislocation climb and jog, interaction with vacancy and impurity. Multiplication of dislocation and pile-up. |
| **Unit-II** | **Behaviour under Tension**; Engineering and true stress-strain curves, strength coefficient and strain hardening exponent, necking or instability in tension, effect of gauge length on strength and elongation. Effect of strain rate and temperature on tensile properties. Yield point phenomenon. Fracture under tension and torsion. |
| **Unit-III** | **Fatigue of Metals**; Stress cycle, fatigue curve, fatigue fracture characteristics. Fatigue testing and testing machines, determination of fatigue strength. Factors affecting fatigue- size, surface, stress concentration, superimposed static stress, corrosion, contact under pressure. Under stressing, coaxing and overstressing. Effect of metallurgical impurities. |

| | |
|---|---|
| **Unit-IV** | **Creep of Metals**; Creep strain and creep-time curves, low temperature and high temperature creep theories. Fracture at elevated temperature. Stress rupture. Creep parameters and practical applications. Effect of metallurgical variables and materials for high temperature applications.<br><br>**Brittle failure and Behavior under Impact**; The history of failure of engineering structures and parts, high strain rate, stress concentration and low temperature effects, impact tests and results, transition temperature and factors affecting transition temperature. Flow and fracture under rapid loading. Temper and hydrogen embrittlement. |

**Suggested Readings**


1. Mechanical Behaviour Materials by Marc Andre Meyers, K.K. Chawla, PHI
2. Mechanical Metallurgy by GE Dieter; McGraw-Hill.
3. Fatigue of Metals by PG Forrest; Pergamon Press.
4. Material Science by Abdul Mubeen; Khanna Publishers


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Plastic Deformation and Dislocation Theory. | https://nptel.ac.in/courses/11310610 |
| | Multiplication of dislocation. | https://nptel.ac.in/courses/113104085 |
| **UNIT-II** | Engineering and true stress-strain curves. | https://nptel.ac.in/courses/113104096 |
| | Effect of strain rate and temperature on tensile properties. | https://nptel.ac.in/courses/113104104 |
| **UNIT-III** | Fatigue curve, fatigue fracture, Fatigue testing. | https://nptel.ac.in/courses/113105106 |
| | Determination of fatigue strength. | https://nptel.ac.in/courses/113105106 |
| **UNIT-IV** | Creep of Metals. | https://nptel.ac.in/courses/113106088 |
| | Brittle failure and Behavior under Impact. | https://nptel.ac.in/courses/113105106 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTMD-203A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Total Quality Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• Study the key concepts, principles, and practices of Total Quality Management (TQM).<br>• Learn the tools and techniques used in TQM, including PDSA, Kaizen, Benchmarking, and the Seven Quality Tools, for continuous improvement and problem-solving.<br>• Learn statistical process control (SPC) methods, including Taguchi's design and FMEA, to improve product and process quality<br>• Familiarize about international quality standards such as ISO 9000 and EMS 14001, and conduct quality audits and vendor rating systems for performance measurement. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the basic terminologies of Total Quality Management. |
| **CO2** | Explain the principles, philosophies, and frameworks of total quality management and their application in organizations. |
| **CO3** | Apply advanced techniques and tools to monitor and improve processes. |
| **CO4** | Analyse the performance measures to enhance the organizational outcomes. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **TQM Perspective and TQM Implementation**: Quality, Chain Reaction, Dimensions of Quality, Evolution Of Quality, Quality Control, Quality Assurance, Quality Planning, Quality Improvement, Quality Management, Total Quality Management, Cost Of Quality, Classification of Failure Cost, Reducing Costs, Juran's Model of Optimum Quality Costs, Analysis of COQ For Improvement, Analysis of External and Internal Failure Costs, TQM, Elements of TQM, Leadership For TQM, Deeming 14 Points For Top Management, TQM Tools And Techniques, PDSA, Barriers For TQM Implementation. |
| **Unit-II** | **TQM principles and Strategies:** Customer Satisfaction & Employee Involvement. Service Quality, Features of Services, The Kano Model, Employee Motivation, Motivation Theory of Individual Employees, Effective Communications, Training and Mentoring, Recognition and Reward. Continuous Process Improvement and Process Approach. Juran's Tribology, Kaizan, |

| | |
|---|---|
| | PDCA, Seven Quality Tools, BPR, Seven Deadly Wastes, ETX Model, Lean Manufacturing, Kanban System, Cellular Manufacturing, Single Piece Flow, Zero Defects. |
| **Unit-III** | **Statistical Process Control & TQM Tools:** The Seven Quality Control Tools, Standard Normal Distribution, AQL, Seven Management Tools, Benchmarking, QFD, Taguchi's Design, TPM, FMEA. |
| **Unit-IV** | **Quality Systems:** ISO9000 standard, EMS14001, Quality Awards Supplier Partnership and Performance Measures-Importance of Suppliers, Selection And Standards, Quality Audit, Product Audit, Vendor Rating System, PDCA For Measurements, Performance Measure Design, BSC. |

**Suggested Readings**


1. Total Quality Management by Oakland (Butterworth- Heinemann Ltd.)
2. Managing for total quality from Deming to Taguchi and SPC by Logo Thetis N.(PHI)
3. Total Quality Control by Feigenbaum A.V. (MGH)
4. Total Quality Management by Bester field Dale H (Pearson Education)


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Quality and its dimensions | https://youtu.be/5pMWmU_8lfI?si=hI0dsNsI2yUMLrz1 |
| | Quality Control | https://youtu.be/xQQ2AWs0hT4?si=EKjvfZUQxU53kai2 |
| | Total quality management | https://www.youtube.com/watch?v=yWlAOFs04go |
| | Deeming 14 Points | https://archive.nptel.ac.in/courses/110/105/110105088/ |
| **UNIT-II** | Seven Quality Tools | https://www.youtube.com/watch?v=HQiiRh5GoIc |
| | Lean manufacturing | https://archive.nptel.ac.in/courses/110/107/110107130/ |
| | Kanban | https://archive.nptel.ac.in/courses/110/107/110107130/ |
| **UNIT-III** | The Seven Quality Control Tools | https://www.youtube.com/watch?v=6-JVHv5djIc |
| | TPM | https://www.youtube.com/watch?v=UOuTBCrW2kY |
| | FMEA | https://www.youtube.com/watch?v=UOuTBCrW2kY |
| **UNIT-IV** | ISO 9000 | https://archive.nptel.ac.in/courses/110/104/110104080/ |
| | PDCA | https://www.youtube.com/watch?v=4XYS7_NSvLA |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTMD-205A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Tribology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental principles of tribology including friction, wear, and lubrication.<br>• To provide knowledge on various lubrication mechanisms and types of lubricants used in different applications.<br>• To familiarize students with tribological testing methods, standards, and diagnostics in real-world systems and extreme environments. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the concepts of friction, wear, lubrication, and tribological components. |
| **CO2** | Explain tribological principles and their influence on machine elements and performance. |
| **CO3** | Apply tribological concepts for specific engineering applications. |
| **CO4** | Analyze tribological behavior and system performance under varying conditions. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction:** Introduction of Tribology – General tribological considerations in the design of bearings, gears, cams, reciprocating components, etc.<br>**Engine tribology basics** - tribology / aspects of engine components such as bearings, piston assembly, valve train and drive train components etc. |
| **Unit-II** | **Friction**: Natural of metal surfaces - Surface properties - Surface parameters and measurements. Friction – Sliding friction - Rolling friction characteristics of common metals and non-metals – friction under environments. Engine friction - Losses and engine design parameters.<br>**Wear**: Economic role of wear – type of wear- wear mechanism, factors affecting wear, selection of materials for different wear situations, measurement of wear, tribometers and tribometry. Engine wear, mechanisms, wear resistance material and coatings and failure mode analysis.<br>**Bearings and Lubrication**: Lubricants, type of lubricants, properties and testing, service classification of lubricants, lubrication of tribological components, lubrication system, lubricant monitoring, SOAP, ferrography and other rapid testing methods for lubricants contamination.. |

| | |
|---|---|
| **Unit-III** | **Hydrodynamic Lubrication**: Theory of hydrodynamic lubrication, generalized Reynolds equation, slider bearings, fixed & pivoted shoe bearings, hydrodynamic journals bearings, short and finite bearings, thrust bearings, sintered bearing, non-circular bearings and multi side surface bearings.<br>**Externally (Externally - pressurized) lubrication**: Hydrostatic bearing, basic concepts, bearing pads, coefficients, restrictors, capillary, orifice and flow control valve, bearing characteristics number and performance coefficients, flat, conical and spherical pad thrust bearing, multi-recess journal and thrust bearings, air and gas lubricated bearings. |
| **Unit-IV** | **Elasto-hydrodynamic lubrication**: Ball and roller element bearings, classification, selection and life estimation, fatigue, monitoring of ball / roller bearings, diagnostics.<br>**Rheodynamics (Static) lubrication**: Non-Newtonian fluids, characteristics, general recommendations of lubricants, SAE & other cloud numbers, thixotropic, materials and Bingham solids, grease lubrication and care stability, tribology components in extreme environments like vacuum, pressure, temperature, tribology matching and selection, tribology-testing and standards. |

**Suggested Readings**


1. Friction and Lubrication, Bowden F.P. & Tabor D., Heinemann Edu. Books Ltd. 1974.
2. Friction & Wear of Material, Ernest Rabinowitz.
3. Tribology – Handbook, Neal M.J., Butterworth, 1973
4. Theory of Hydro-dynamic Lubrication, Pinkus O, & Sternlicht B., McGraw Hill, 1961.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | General tribological considerations in the design of components | https://www.youtube.com/watch?v=hNfgnX2lA18 |
| | Tribology | https://www.youtube.com/watch?v=7XBeRGmpLrE&t=230s |
| **UNIT-II** | Engine friction | https://www.youtube.com/watch?v=VulB-5MvdOs |
| | SOAP | https://www.youtube.com/watch?v=UFA7UqPND4U |
| **UNIT-III** | Hydrodynamic Lubrication | https://www.youtube.com/watch?v=45CcdjPrxoM |
| | Hydrostatic bearing | https://youtu.be/YBxAa2fOWqk?si=53PMHWLnCiKa7Z6F |
| | Bearing characteristics number and performance coefficients | https://www.youtube.com/watch?v=TCyMujHvDBM |
| **UNIT-IV** | Selection and life estimation | https://www.youtube.com/watch?v=vGl7nQUbWGM |
| | Thixotropic materials | https://www.youtube.com/watch?v=XzgbYwquPjk&t=1288s |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTMD-207A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Mechanical Vibrations** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental principles and types of mechanical vibrations in engineering systems.<br>• To create awareness how to model vibrating systems and derive their governing equations.<br>• To provide analytical and numerical techniques for determining system response under various conditions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the fundamental concepts of mechanical vibration. |
| **CO2** | Explain the vibration behavior of mechanical systems using theoretical, mathematical, and experimental approaches. |
| **CO3** | Apply analytical and numerical methods to solve vibration problems. |
| **CO4** | Analyze the vibration characteristics of engineering systems. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Fundamentals**; review of single degree freedom system, response to arbitrary periodic excitation, Duhamel's integral impulse response function, Lagrange's equation, single degree freedom forced vibration with elastically coupled viscous dampers, system identification from frequency response, Laplace formulation. |
| **Unit-II** | **Two Degree of Freedom System**; free vibration of spring-mass coupled system, bending vibration of two degree of freedom system, forced vibration, vibration absorption and isolation. |
| **Unit-III** | **Multi Degree of Freedom System**; normal mode of vibration, flexibility matrix and stiffness matrix, eigen values and vectors, orthogonal properties-modal matrix analysis, matrix inversion method, modal damping in forced vibration, numerical methods. |
| **Unit-IV** | **Vibration of Continuous Systems**; systems governed by wave equations, vibration of strings and rods, Euler equation for beams, effect of rotary inertia and shear deformation, vibration of plates. **Experimental Methods**; vibration exciters and measuring devices, vibration tests and analysis, tests on free and forced vibration with examples, vibration monitoring and diagnosis, case studies. |

**Suggested Readings**


1. Theory and Practice of Mechanical Vibration by JS Rao and K Gupta; New Age Publications.
2. Mechanical Vibrations by Den Hartog; Dover Publications.
3. Theory of Vibration with Applications by W. T. Thomson; CBC Publishers.
4. Theory of Machines by T Bevan; Longmans and Green.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| UNIT-I | Review of single degree freedom system | https://www.youtube.com/watch?v=Wrfjs-ix8M0 |
| | Duhamel's integral impulse response function | https://www.youtube.com/watch?v=N2uJ-OKRip8 |
| | Lagrange's equation | https://www.youtube.com/watch?v=5KLdiwaJFMg |
| | Laplace formulation. | http://digimat.in/nptel/courses/video/111106139/L21.html |
| UNIT-II | Free vibration of spring-mass coupled system | https://www.youtube.com/watch?v=3i2gu74ghKg |
| | Bending vibration of two degree of freedom system | https://www.youtube.com/watch?v=3i2gu74ghKg |
| | Vibration absorption and isolation | https://www.youtube.com/watch?v=HiReWrkvQIA |
| UNIT-III | Normal mode of vibration | https://www.youtube.com/watch?v=YakssZ7obRI |
| | Orthogonal properties-modal matrix analysis | https://www.youtube.com/watch?v=leQmYZsHWao |
| | Eigen values | https://www.youtube.com/watch?v=h5urBuE4Xhg |
| UNIT-IV | Euler equation for beams | https://www.youtube.com/watch?v=5aDa30ym8RI |
| | Tests on free and forced vibration with examples | https://www.youtube.com/watch?v=tJNaPt5aPmg |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTME-209A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Industrial Robotics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce to the concept of robotics.<br>• To gain the knowledge of kinematics, dynamics, and control of robot manipulators.<br>• To familiarize students with robotic actuators, sensors, and end-effectors for various industrial applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Recall the fundamental concepts of mechanical vibration. |
| **CO2** | Explain the vibration behavior of mechanical systems using theoretical, mathematical, and experimental approaches. |
| **CO3** | Apply analytical and numerical methods to solve vibration problems. |
| **CO4** | Analyze the vibration characteristics of engineering systems. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Robotics**: Evolution of Robots and Robotics, Laws of Robotics, Progressive advancement in Robots. Robot anatomy, Human Arm Characteristics, Design and Control issue, Manipulation and Control, Programming Robots.<br>**Coordinate Frames, Mapping and Transforms**: Coordinate Frames, Description of objects in space, Transformation of Vectors, Inverting a Homogeneous Transform, Fundamental Rotation matrices. |
| **Unit-II** | **Direct Kinematic Model**: Mechanical structure and notations, Kinematic modeling of the manipulator, Denavit Hartenberg Notation, Manipulator Transformation Matrix.<br>**The Inverse Kinematics:** Manipulator workspace, solvability of Inverse kinematics model, solution techniques, closed form solution. |
| **Unit-III** | **Manipulator Differential Motion and Statics**: Linear and angular velocity of a rigid body, relationship between transformation matrix and angular velocity, manipulator Jacobian, Jacobian Inverse, Jacobian Singularities, Static Analysis.<br>**Dynamic Modeling**: Largrangian Mechanics, Two Degree of Freedom manipulator dynamic Model, Lagrange-Euler formulation Newton-Euler formulation, Inverse Dynamics. |

| | |
|---|---|
| **Unit-IV** | **Control of Manipulators:** Open and Close loop control, linear control schemes, linear second order SISO model of a manipulator joint. Joint Actuators, Computed Torque Control, force control of Robotics, Manipulators, Hybrid position/force control, Impedance Force/Torque Control.<br>**Robotic Sensors:** Sensors in Robotics, classification of Robotic sensors, kinds of sensors used in robotics-Acoustic sensors optic, Pneumatic, force/Torque sensors. |

**Suggested Readings**


1. Fundamental of Robotics by Robert J. Schilling Prentice Hall of India.
2. Introduction to Robotics by Saeed B. Niku Pearson Education Asia.
3. Robot Modeling and kinematics by Rashid Mansour, Laxmi Publications.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Robot anatomy | https://youtu.be/rYWJdZ5qg6M?si=2SAVtIH2CeXvQJlq |
| | Design and Control issue | https://www.youtube.com/watch?v=aa3KDFCSmJ0 |
| | Manipulation and Control | https://youtu.be/74d4vauVcWQ?si=uXyVULGAe8AlnaT1 |
| | Programming Robots | https://www.youtube.com/watch?v=rYWJdZ5qg6M |
| **UNIT-II** | Denavit Hartenberg Notation | https://www.youtube.com/watch?v=FMWFDBhL6FQ |
| | Manipulator Transformation Matrix | https://youtu.be/74d4vauVcWQ?si=paGQubB75ATQ092E |
| | Solvability of Inverse kinematics model | https://www.youtube.com/watch?v=unwUt3kkgvE |
| **UNIT-III** | Linear and angular velocity of a rigid body | https://www.youtube.com/watch?v=oG6-zmspAvc |
| | relationship between transformation matrix and angular velocity | https://www.youtube.com/watch?v=iFOTm4lwPGA |
| | Jacobian Singularities | https://www.youtube.com/watch?v=UrKWTE5YSDI |
| **UNIT-IV** | linear second order SISO model of a manipulator joint | https://www.youtube.com/watch?v=A5JRXKWQpbs |
| | Acoustic sensors optic | https://www.youtube.com/watch?v=tD3q5a8LPUc |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTME-211A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Supply Chain Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop an in-depth understanding of supply chains.<br>• To explain the concept of strategic fit.<br>• To explore the key drivers of supply chain performance.<br>• To learn the role and design of supply chain networks.<br>• To know the design of distribution networks. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the fundamental concepts of supply chain management. |
| **CO2** | Explain the concepts of strategic fit and the scope of strategic decisions in aligning supply chain performance with business goals. |
| **CO3** | Apply forecasting and aggregate planning techniques to match supply and demand effectively in a supply chain. |
| **CO4** | Analyze the design of distribution networks and their application. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Supply Chain Management:** Understanding the Supply Chain. Supply Chain Performance: Competitive and Supply Chain Strategies, achieving Strategic Fit and Scope of Strategic Fit. |
| **Unit-II** | **Supply Chain Drivers and Metrics:** Drivers of Supply Chain Performance, Framework for structuring Drivers, Facilities, Inventory, Transportation, Information, Sourcing and Pricing, Case Study: Seven Eleven Japan Company. |
| **Unit-III** | **Planning Demand and Supply in a Supply Chain:** Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain. Designing Distribution Networks and Application to E Business- Role of distribution, factors influencing distribution network design, design options for a distribution network, E-Business and the distribution network. |
| **Unit-IV** | **Network Design in the Supply Chain:** Role of network design in the supply chain, factors influencing network design decisions, Role of Information Technology in supply chain, coordination in a supply chain, Bullwhip Effect, Effect on performance due to lack of coordination, obstacles to coordination in a supply chain. |

**Suggested Readings**


1. Supply Chain Management: Strategy, Planning & Operation, Sunil Chopra & Peter Meindle, Pearson.
2. Logistical Management: The integrated Supply Chain Process, Donald J. Bowersox & David J. Closs, TMH Publication


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Introduction to Supply Chain Management | https://www.youtube.com/watch?v=raqi4gjMLm8 |
| | Supply Chain Strategies | https://www.youtube.com/watch?v=l9mebE3CGBQ&t=1s |
| **UNIT-II** | Drivers of Supply Chain Performance | https://www.youtube.com/watch?v=ZiUCB6HDc-8 |
| | Inventory | https://www.youtube.com/watch?v=b6ElgF9TymU&t=2s |
| **UNIT-III** | Demand Forecasting in a Supply Chain | https://www.youtube.com/watch?v=tCnFx6VfPUA |
| | Designing Distribution Networks | https://www.youtube.com/watch?v=-5m3vPMlV70 |
| **UNIT-IV** | Role of network design in the supply chain | https://www.youtube.com/watch?v=iSr5SrQ5kZM&t=2s |
| | Role of Information Technology in supply chain, coordination in a supply chain | https://www.youtube.com/watch?v=mW2vJq-KYfw |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | |
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify research problems, objectives, and data sources based on fundamental research methodology principles. |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations |

| | |
|---|---|
| **Unit-II** | Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee. |
| **Unit-III** | Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing. |
| **Unit-IV** | Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology. |

**Suggested Readings:**


- Research Methodology: Methods and Techniques (4th ed.) by Kothari, C. R., & Garg, G, New Age International Publishers.
- Research Methodology: A Step-by-Step Guide for Beginners (4th ed.). by Kumar, R, SAGE Publications India. ISBN: 978-9351501337
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed.) by Bouchoux, D. E, Cengage Learning.
- Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.


| **Unit No** | **Topics** | **Links** |
|---|---|---|
| **Unit-I** | Defining/formulating research problem<br>Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=oTc4_zjmev0<br>https://www.youtube.com/watch?v=tjDBPRoyDJA |
| **Unit-II** | Types of Plagiarism<br>Research Ethics | https://www.youtube.com/watch?v=5--ssYqyWoE<br>https://www.youtube.com/watch?v=4tRCov8pVgQ |
| **Unit-III** | Primary data and Secondary Data.<br>Sampling techniques | https://www.youtube.com/watch?v=caUiRsg5M6k<br>https://www.youtube.com/watch?v=sKtoW5cXt14 |
| **Unit-IV** | Patent Trademarks and Copyrights.<br>What is Patent? Patent Filing Procedure in India. | https://www.youtube.com/watch?v=XQ8tRdcr0xQ<br>https://www.youtube.com/watch?v=azMNhrkRzww |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MTMD-215A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Develop students' ability to effectively present research topics andfindings by effective communication.<br>• Improve problem-solving and critical thinking skills of thestudents.<br>• Expose students to the latest trends and advancements byreviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated.** |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies andmethodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This course helps M. Tech students improve their research presentation skills. It focuses on choosing a topic or research paper related to their field, reviewing it thoroughly and presenting the findings clearly and effectively.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on publishedreview paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selectedpaper or topic must be approved by the faculty members/ committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head ofDepartment. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | **CO1** |
| 2 | Literature Survey | 10 | **CO2** |
| 3 | Content Relevancy | 10 | **CO3** |
| 4 | Presentation Skills | 10 | **CO4** |
| 5 | Q&A Response | 10 | **CO5** |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PROJ-MTMD-215A** | | | | |
| Category | Project Course | | | | |
| Course Title | **Project** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in relevant field for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify complex engineering problems relevant to project work based on domain knowledge and real-world challenges. |
| **CO2** | Describe the workflow, technical background, and tools required for planning and executing engineering projects. |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. |

Each student is required to carry out a hardware-based project and submit the project report. The project title and objectives should be chosen by the student in consultation with their allocated Project Guide.

**Evaluation Criteria (Total: 50 marks)**

| Sr. No. | Evaluation Parameter | Marks |
|---|---|---|
| 1 | **Problem Definition and Relevancy** - clarity of problem, significance and alignment with discipline | 5 |
| 2 | **Proposed Solution and Implementation** - functionality, originality, technical depth. | 5 |
| 3 | **Project Benefit and Impact** - benefits to society, industry, and environment. | 10 |
| 4 | **Cost-Effectiveness and Practical Viability** - consideration of cost, resources, and practicality. | 10 |
| 5 | **Presentation and Communication Skills (Viva-voce)** - ability to explain, answer questions, confidence, and depth of knowledge. | 10 |
| 6 | **Project Report Quality** - clarity, completeness, format, and technical content. | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTMD-217A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying research topics relevant to field.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTMD-202A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-II)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 20 | 20 | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help identify topics in relevant field.<br>• Understand structured research methodology, literature review, and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Dissertation Stage-I will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided

to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation with the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Students have to publish a research paper in a journal / conference of the research work done before the final submission of Dissertation.
- The student must follow the guidelines for the Dissertation report.

**Multidisciplinary Open Elective-II Courses**

For students of all PG programmes other than M. Tech (Manufacturing and Automation) and M. Tech (Machine Design).

| SN | Courses Code | Course Title | Offered by Department |
|---|---|---|---|
| 1 | OEC-IS1A | Composite Materials | Mechanical Engineering |
| 2 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **OEC-151A** | | | | |
| Category | Multidisciplinary Open Elective Courses | | | | |
| Course Title | **Composite Materials** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts of composite materials.<br>• To learn the mechanical behaviour of composite materials.<br>• To get an overview of the methods of manufacturing composite materials. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the basic concepts and fundamental of composite materials. |
| **CO2** | Describe the roles and characteristics of matrix and reinforcement materials in composite structures. |
| **CO3** | Apply preparation and processing methods for different types of composite materials. |
| **CO4** | Analyze the influence of composite composition & manufacturing techniques on material performance. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Introduction: Definition – Classification and characteristics of Composite materials, Advantages and application of composites, Functional requirements of reinforcement and matrix, Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. |
| **Unit-II** | Reinforcements: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers, Properties and applications of whiskers, particle reinforcements, Mechanical Behavior of composites, Rule of mixtures, Inverse rule of mixtures, Iso-strain and Iso-stress conditions. |
| **Unit-III** | Manufacturing of Metal Matrix Composites: Casting, Solid State diffusion technique, Cladding – Hot isostatic pressing, Properties and applications, Manufacturing of Ceramic Matrix Composites, Liquid Metal Infiltration – Liquid phase sintering, Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving, Properties and applications. |
| **Unit-IV** | Manufacturing of Polymer Matrix Composites: Preparation of moulding compounds and prepregs - hand layup method – Autoclave method – Filament winding method- Compression moulding – Reaction injection moulding, Properties and applications. |

**Suggested Readings**

- Hand Book of Composite Materials by George Lubin.
- Composite Materials by K.K. Chawla.
- Composite Materials Science and Applications by Deborah D.L. Chung.
- Composite Materials Design and Applications by Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

**Useful Video links**

| Unit No | Topic | Link |
|---|---|---|
| UNIT-I | Classification and characteristics of composite materials. | https://www.youtube.com/watch?v=0kB0G6WKhKE&list=PLSGws_74K01-bdEEUElQ9-obrujIKGEhg |
| | Functional requirements of reinforcement and matrix. | https://www.youtube.com/watch?v=cB_5uqwB8Vc |
| | Effect of reinforcement on overall composite performance. | https://www.youtube.com/watch?v=_JAGKikeCSY |
| UNIT-II | Reinforcements: Preparation-layup, curing, properties and applications of glass fibers. | https://www.youtube.com/watch?v=649fIwvIvRc&list=PLwdnzlV3ogoVE2AIC-G4Uew8XsaINwJGo |
| | Mechanical Behavior of composites | https://www.youtube.com/watch?v=IZXHu5IQOrM |
| | Iso-strain and Iso-stress conditions | https://www.youtube.com/watch?v=dj8r0M5LsnQ |
| UNIT-III | Manufacturing of Metal Matrix Composites | https://www.youtube.com/watch?v=aNie6dhPKZk |
| | Manufacturing of Ceramic Matrix Composites | https://www.youtube.com/watch?v=bdC8yySkARs |
| | Manufacturing of Carbon – Carbon composites | https://www.youtube.com/watch?v=zC3M51uosDc |
| UNIT-IV | Manufacturing of Polymer Matrix Composites | https://youtu.be/uO8EMAUh1po?si=Pnc657NWmkuW2XOR |
| | Filament winding method- Compression Moulding | https://www.youtube.com/watch?v=qos45EwMmd0 |
| | Reaction Injection Moulding | https://www.youtube.com/watch?v=T4C4m0Q8a6Q |

| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **OEC-153A** | | | | | |
| Category | Multidisciplinary Open Elective Courses | | | | | |
| Course Title | **Cost Management of Engineering Projects** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 3 | 0 | 0 | **3** | | |
| Course Objectives | The objectives of this course are<br>• To learn the cost concepts and strategic decision-making.<br>• To learn the project planning and stages of project execution.<br>• To familiarize with advanced costing methods and budgeting techniques.<br>• To introduce to quantitative techniques for cost management. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total Marks | 100 | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define the key cost concepts of cost management of engineering projects. |
| **CO2** | Explain the components and processes involved in cost & project management. |
| **CO3** | Apply appropriate methods, tools and models for decision-making in business operations. |
| **CO4** | Analyze the cost strategies, project controls, and quantitative tools for performance improvement. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Introduction and Overview of the Strategic Cost Management Process, Cost concepts in decision-making, relevant cost, Differential cost, Incremental cost and Opportunity cost, Objectives of a Costing System, Inventory valuation, Creation of a Database for operational control, Provision of data for Decision-Making. |
| **Unit-II** | **Project:** Meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning, Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents Project team: Role of each member, Importance Project site, Data required with significance, Project contracts, Types and contents, Project execution, Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process. |
| **Unit-III** | **Cost Behavior and Profit Planning:** Marginal Costing, Distinction between Marginal Costing and Absorption Costing, Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Standard Costing and Variance Analysis, Pricing strategies, Pareto Analysis, Target costing, Life Cycle Costing, Costing of service sector, Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints, Activity-Based Cost Management, Bench Marking, Balanced Score Card and Value-Chain Analysis, Budgetary Control, Flexible Budgets, Performance budgets, Zero based budgets, Measurement of Divisional profitability pricing ,decisions including transfer pricing. |
| **Unit-IV** | Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory. |

**Suggested Readings:**

- Cost Accounting A Managerial Emphasis by Prentice Hall of India, New Delhi.
- Management & Cost Accounting by Robert S Kaplan, Anthony A. Alkinson.
- Principles & Practices of Cost Accounting by Ashish K. Bhattacharya, A. H. Wheeler publisher.
- Quantitative Techniques in Management by N.D. Vohra, Tata McGraw Hill Book Co. Ltd.

**Useful Video links**

| Unit No | Topic | Link |
|---|---|---|
| Unit-I | Strategic Cost Management Process, Cost concepts in decision-making. | https://www.youtube.com/watch?v=Z-x0uzXDHSU |
| | Objectives of a Costing System | https://www.youtube.com/watch?v=RbkTuAdLzJ8&t=1971s |
| | Inventory valuation | https://www.youtube.com/watch?v=ybmDUg8S02g |
| Unit-II | Pre-project execution main clearances and documents, Project team. | https://www.youtube.com/watch?v=Rk6ba1UMQBY |
| | Project site: Data required with significance, Project contracts. | https://www.youtube.com/watch?v=h6i7TClGqOc |
| | Bar charts and Network diagram, Project commissioning: mechanical and process. | https://www.youtube.com/watch?v=lXw_6anGWFY |
| Unit-III | Cost Behavior and Profit Planning, Marginal Costing. | https://www.youtube.com/watch?v=5ONIgx-Nb1w |
| | Break-even Analysis, Cost-Volume-Profit Analysis. | https://www.youtube.com/watch?v=3OvCF_r1BOY&list=PLBsasm-LNOYV1sr8hAvmtfG_HA4cbkwjl |
| | Budgetary Control: Flexible Budgets, Performance budgets. | https://youtu.be/pYSgMGoK_Jo?si=9GJxp5zvgJaaRCJ2 |
| Unit-IV | Transportation problems | https://www.youtube.com/watch?v=Q31jKiEXxdc |
| | Assignment problems | https://www.youtube.com/watch?v=BUGIhEecipE |
| | Simulation, Learning Curve Theory. | https://youtu.be/1xit5UaQ-rE?si=izx2vEwiVYEkM4Tl |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**
**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Scheme of Examinations & Syllabus For

# Bachelor of Technology (Mechanical Engineering) 2nd Year

# (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 1 Tutorial (L) per week | 1 Credit |
| 2 | 2 Practical (Lab) per week | 1 Credit |
| 3 | 2 Seminar/IT per Week | 1 Credit |
| 4 | 4 Project per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credits of 170* for a student to be eligible to get Under Graduate degree in Mechanical Engineering.

## 3. STRUCTURE OF BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 71* |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | 18* |
| 3 | Engineering Science Courses | 22* |
| 4 | Basic Science Courses | 21* |
| 5 | Humanities and Social Courses including Management Courses | 15* |
| 6 | Multidisciplinary Open Elective Courses | 9* |
| 7 | Seminar/Industrial Training | 10* |
| 8 | Project | 4* |
| 9 | Mandatory Courses | 0* |
| | **Total Credits** | 170* |

**Minor variation is allowed as per need of the respective disciplines.*

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses | PEC |
| 3 | Engineering Science Courses | ESC |
| 4 | Basic Science Courses | BSC |
| 5 | Humanities and Social Courses including Management Courses | HSMC |
| 6 | Multidisciplinary Open Elective Courses | OEC |
| 7 | Seminar/Industrial Training | PT |
| 8 | Project | PR |
| 9 | Mandatory Courses | MC |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## B. Tech (MECHANICALENGINEERING) - 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-ME-201A | Thermodynamics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-ME-203A | CAD&M | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-ME-205A | Materials & Metallurgy | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Engineering Science Courses | ESC-ME-207A | Engineering Mechanics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Basic Science Courses | BSC-ME-209A | Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 6 | Humanity Science & Management Courses | HSMC-01A | Fundamental of Management and Organizational Behaviour | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Courses | LC-ME-211A | Materials & Metallurgy Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| 8 | Professional Core Courses | LC-ME-213A | CAD&M Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| 9 | Engineering Science Courses | LC-ME-215A | Engineering Mechanics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| **Total Credits** | | | | | | | | **23** | | | | **750** | |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## B. Tech (MECHANICALENGINEERING) – 4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-ME-202A | Applied Thermodynamics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-ME-204A | Strength of Materials | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-ME-206A | Fluid Mechanics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-ME-208A | Kinematics of Machines | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-ME-210A | Manufacturing Technology-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Professional Elective Courses | Table-I | ---------- | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Mandatory Audit Courses | *MC-201A | Environmental Science | 2 | 0 | 1 | 3 | 0 | 40 | 60 | | | 3 |
| 8 | Professional Core Courses | LC-ME-220A | Applied Thermodynamics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| 9 | Professional Core Courses | LC-ME-222A | Strength of Materials Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| 10 | Professional Core Courses | LC-ME-224A | Fluid Mechanics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| 11 | Professional Core Courses | LC-ME-226A | Kinematics of Machines Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | |
| **Total Credits** | | | | | | | | **23** | | | | **800** | |

*MC-101A is a mandatory non –credit course in which the students will be required passing marks in theory.

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

**Table I (Program Elective Courses)**

| Courses | Remarks |
|---|---|
| PEC-ME-212A | Industrial Engineering |
| PEC-ME-214A | 3D Printing |
| PEC-ME-216A | CNC Machining |
| PEC-ME-218A | Composite Materials |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-ME-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Thermodynamics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts and principles of thermodynamics.<br>• To know thermodynamic processes involving entropy, availability, and irreversibility.<br>• To learn thermodynamic relationships for analyzing the behavior of pure substances and real systems.<br>• To inculcate problem-solving skills related thermal engineering practice. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the thermodynamic concepts, laws, and properties of pure substances. | Level 1: Remember |
| **CO2** | Explain the laws, entropy, thermodynamic relations and energy interactions in various processes. | Level 2: Understand |
| **CO3** | Apply thermodynamic laws and equations to solve thermodynamic systems. | Level 3: Apply |
| **CO4** | Analyze behavior and efficiency of system using thermodynamic properties and relations. | Level 4: Analyze |

**Note**: The Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each, and the remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Basic concept:** Thermodynamic system, surrounding & boundary, thermodynamics properties – intensive & extensive, thermodynamic equilibrium, state, path, process & cycle, reversible & irreversible processes, path and point function, Quasi-static process. Zeroth law of thermodynamics, temperature scales; methods of temperature measurement.<br>**First Law of thermodynamics:** Joules experiments, first law of thermodynamics for cyclic and non-cycle processes, internal energy and enthalpy, first law applied to non- flow process. |
| **Unit-II** | **First Law of thermodynamics for flow processes:** Derivation of general energy equation for a control volume, steady state steady flow energy equation, throttling process and free expansion process. Problems.<br>**Second Law of Thermodynamics:** Limitations of the first law of thermodynamics, thermal reservoir, heat source & heat sink, heat engine and heat pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMMSK, Carnot Cycle, Carnot heat engine and Carnot heat pump, Carnot theorem and its corollaries. |

| | |
|---|---|
| **Unit-III** | **Entropy:** Definition of entropy**,** demonstration that entropy is a property, Clausius inequality, principle of entropy increase, temperature entropy plot, entropy change in different processes, introduction to Third Law of Thermodynamics. Problems.<br>**Availability& Irreversibility:** High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems. |
| **Unit-IV** | **Pure Substances:** Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid –Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature –Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam. Problems.<br>**Thermodynamic Relations:** Maxwell's Equations, TdS Equations, Difference in Heat Capacities, Ratio of Heat Capacities, Energy Equation, Clausius- Clapeyron Equation, Gibbs Phase Rule, Types of Equilibrium, Third Law of Thermodynamics. |

**Suggested Readings**


1. Thermal Science and Engineering - D.S Kumar, Laxmi Publisher, 6th Edition.
2. Thermodynamics: An Engineering Approach - Yunus A. Cengel, Michael A. Boles, McGraw Hill.
3. Fundamentals of Engineering Thermodynamics - Moran, M. J. and Shapiro, H. N, John Wiley and Sons.
4. Engineering Thermodynamics – PK Nag, Tata McGraw-Hill Publishing Co. Ltd
5. Applied Thermodynamics - R. Yadav, Central Publishing House.
6. Fundamentals of Classical Thermodynamics, Gordon J. Van Wylen and Richard E. Sonntag, WILEY.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Fundamentals of thermodynamics | https://nptel.ac.in/courses/101104063 |
| | Zeroth law of thermodynamics | https://nptel.ac.in/courses/112102255 |
| **UNIT-II** | First Law of thermodynamics | https://nptel.ac.in/courses/112105220 |
| | Second Law of Thermodynamics | https://nptel.ac.in/courses/112105266 |
| **UNIT-III** | Availability & Irreversibility | https://nptel.ac.in/courses/112105266 |
| **UNIT-IV** | Thermodynamic Relations, Equilibrium | https://nptel.ac.in/courses/112105123 |
| | Pure Substances | https://nptel.ac.in/courses/101104067 |

| Course Code | **PCC-ME-203A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Computer Aided Design & Manufacturing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To aware about the introduction of CAD/CAM, and CIM.<br>• To learn the Modeling of different types of curves, surface and solid.<br>• To know about the transformation of points and lines in CAD software.<br>• To know the numerical control machines, FMS, GT & CAPP. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define the basic concepts of CAD/CAM | Level 1: Remember |
| **CO2** | Describe CAD/CAM tools, modeling techniques, geometric transformations & process planning. | Level 2: Understand |
| **CO3** | Apply modeling and coding principles to CAD/CAM systems. | Level 3: Apply |
| **CO4** | Analyze integrated systems for productivity and automation. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Introduction: Introduction to CAD/CAM/CAE, Design Process, Importance and Necessity of CAD, Applications of CAD, Hardware and Software requirement of CAD.<br>Fundamentals of Additive Manufacturing (AM), Basic steps to perform AM, Classification of AM, Applications of AM: Aerospace, Biomedical, Automotive, Bio-printing, Tissue & Organ Engineering, Architectural Engineering, Surgical simulation, Art, Health care. |
| **Unit-II** | Wireframe modeling, Representation of curves, Parametric and non-parametric curves, straight lines, Hermite cubic splines, B splines curves, Bezier curves.<br>Plane surface, ruled surface, surface of revolution, bi-cubic surface, Bezier surface, B spline surface, Solid modeling, boundary representation, sweeping, parametric solid modeling. |
| **Unit-III** | Introduction, 2D & 3D Transformation, translation, rotation, Reflection, Scaling, shearing and combined transformation, Homogeneous coordinates, Orthographic and perspective Projections.<br>Group technology, Part families, Part classification and coding, Optiz method, product flow analysis, Machine cell Design, Advantages of GT. |

| | |
|---|---|
| **Unit-IV** | Numerical control, Types of NC systems, MCU & other components, Co-ordinate system, NC manual part programming, G & M codes, part program for simple parts, Computer assisted part programming.<br>Introduction, FMS component, Types of FMS, FMS layout, planning for FMS, advantage and applications<br>Introduction, conventional process planning, Steps in variant process planning, types of CAPP, planning for CAPP |

**Suggested Readings**


1. CAD/CAM theory and Practice by Ibrahim Zeid, Tata McGraw Hill.
2. CAD/CAM Computer Aided Design and Manufacturing by E Zimmer M Groover, Pearson.
3. CAD/CAM/CIM by P. Radhakrishnan, New Age International Publishers.
4. Automation, Production Systems, and Computer-Integrated Manufacturing, Mikell Groover, Pearson


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Introduction to CAD / CAM | http://www.digimat.in/nptel/courses/video/112102101/L43.html |
| | Fundamentals of Additive Manufacturing | https://youtu.be/t7yv4gSnNkE?si=MbYZjlOhoRt-_4tg |
| **UNIT-II** | Parametric and non-parametric equations | https://youtu.be/_PlFbHuWFOI?si=idtfnZFN-INMjj-4 |
| | Parametric Bezier Curve | https://youtu.be/-J2m_ugWNtc?si=qvFki6d_3LjhAFR7 |
| **UNIT-III** | 2D Transformations | https://youtu.be/iWxS2zpaRjk?si=8SROYKLus9Q4PfVP |
| | Introduction to group technology | https://youtu.be/y3-5ENFtqrQ?si=nwZ4kWVP6fVusQmW |
| **UNIT-IV** | Coordinate Systems | https://www.youtube.com/watch?v=3qd1JT7sRG8 |
| | Computer aided manufacturing and process planning | https://www.youtube.com/watch?v=20_K7c65Swg |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-ME-205A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Materials and Metallurgy** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce to crystal structures, defects and their effects on properties.<br>• To know the mechanical properties and materials testing techniques.<br>• To learn the mechanisms of material failure including fracture, fatigue, and creep.<br>• To gain the knowledge of phase diagrams and heat treatment processes.<br>• To explore severe plastic deformation techniques for advanced applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts of materials and metallurgy. | Level 1: Remember |
| **CO2** | Explain the crystallography, defects, mechanical behavior, phase transformations, heat treatments and advanced methods. | Level 2: Understand |
| **CO3** | Apply appropriate principles and method to enhance the material performance. | Level 3: Apply |
| **CO4** | Analyze the effects of internal structure, mechanical behavior, and processing methods on material characteristics. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Crystallography**: Reviews of Crystal structure, Classification of Lattices - Bravais Lattice, Crystal planes, Crystal directions, Coordinate number, Atoms per unit cell, Atomic Packing Factor, Numerical related to crystallography.<br>**Imperfection in Solids**: Point Defects; vacancy, substitutional, interstitial, Frenkel and Schottky defects; Line Defects; edge and screw dislocations, Planar Defects; grain boundaries and twin boundaries; Volume defects & effects of imperfections on metal properties. |
| **Unit-II** | **Mechanical Property Measurement:** Mechanical properties of materials, relation between true and engineering stress strain curves, generalized hook's law, yielding and yielding strength, hardness testing of materials, Tensile properties of the materials, Effect of strain rate, Impact Testing, Non-destructive testing (NDT).<br>**Fracture of Metals** – Ductile Fracture, Brittle Fracture, Ductile to Brittle Transition Temperature (DBTT), Fatigue – Endurance limit, Fatigue test, S-N curves, factors affecting fatigue, structural changes accompanying fatigue; Creep and stress rupture– mechanism of creep – stages of creep and creep test, Mechanisms of Strengthening in Metals and alloys. |

| | |
|---|---|
| **Unit-III** | **Phase Diagrams and Transformations in Alloys**: Solid solutions and phase diagram; Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram. |
| **Unit-IV** | **Heat Treatment:** Principles of heat treatment, Annealing, Concept of Recovery, Recrystallization and Grain Growth, Normalizing, Hardening, Tempering, Quenching, Special heat treatment processes: Austempering, Martempering, Ausforming, Hardenability of steel, Microstructure changes during heat treatment. Surface hardening processes - Carburizing – Nitriding – Cyaniding and carbo-nitriding, Induction and flame hardening, Laser and Electron beam hardening.<br>**Severe Plastic Deformation**: Introduction; its importance in producing ultrafine-grained materials; SPD techniques: Equal Channel Angular Pressing (ECAP), High Pressure Torsion (HPT), and Accumulative Roll Bonding (ARB); applications, and limitations of SPD-processed materials |

**Suggested Readings**


1. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons. Delhi.
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
3. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi.
4. Engineering Materials and Metallurgy - U. C. Jindal, Pearson.
5. Principles of Materials Science, W.F. Smith, McGraw Hill, 3rd Revised Edition, 1990.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Crystal Structure | https://www.youtube.com/watch?v=OTDVov_kw6A |
| | Imperfection In Solids | https://archive.nptel.ac.in/courses/113/104/113104081/ |
| **UNIT-II** | Fracture, Fatigue and Failure of materials | https://archive.nptel.ac.in/courses/113/105/113105106/ |
| **UNIT-III** | Phase diagram in Materials Science | https://archive.nptel.ac.in/courses/113/104/113104068/ |
| **UNIT-IV** | Heat Treatment | https://archive.nptel.ac.in/courses/113/104/113104074/ |
| | Severe Plastic Deformation | http://digimat.in/nptel/courses/video/113106105/L39.html |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **ESC-ME-207A** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Engineering Mechanics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To know the fundamentals of mechanics.<br>• To learn the concept of equilibrium of rigid bodies.<br>• To find the C.G. & find M.I. of different geometrical figures.<br>• To provide knowledge of simple machines and their applications.<br>• To introduce to principles of kinematics &dynamics. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the basic terminologies and fundamentals of engineering mechanics. | Level 1: Remember |
| **CO2** | Describe the kinematics, dynamics, geometrical properties and simple machines. | Level 2: Understand |
| **CO3** | Apply the theorems and principles to solve the problems of engineering mechanics. | Level 3: Apply |
| **CO4** | Analyze the basic mechanical systems subjected to different loading conditions. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Fundamentals:** Definitions of Mechanics, Statics, Dynamics, Rigid Bodies, Force System, Resolution of Force. Analytical and graphical method for resultant of force, Moment of Force. Varignon's Theorem, Numerical Problems.<br>**Equilibrium:** Definition, condition of equilibrium, types of equilibrium - stable equilibrium, unstable equilibrium, neutral equilibrium, free body diagram, method of equilibrium of coplanar forces – analytical method, graphical method, Lami's Theorem, Numerical Problems. |
| **Unit-II** | **Truss and Frames:** Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Numerical Problems.<br>**Centroid:** Centroid – Definition, Moment of an area about an axis, centroid of geometrical figures such as squares, rectangles, triangles, circles, semicircles & quarter circles, centroid of composite figures, Numerical Problems. |
| **Unit-III** | **Moment of Inertia:** Definition, Parallel axis & Perpendicular axis Theorems. M.I. of plane lamina & different engineering sections, Numerical Problems.<br>**Kinematics**: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, Numerical Problems. |

| | |
|---|---|
| **Unit-IV** | **Dynamics:** Newton's Laws of Motion, Motion of Particle acted upon by a constant force, Equations of motion, DE Alembert's Principle, Work, Power, Energy- Kinetic & Potential energy, Momentum & impulse, Laws of conservation of energy & linear momentum, collision of elastic bodies, Numerical Problems.<br>**Simple Machines:** Definition of simple machine, explain simple & compound lifting machine, define M.A, V.R. & Efficiency, State Law of Machine, Reversibility of Machine, Self-Locking Machine. Study of simple machines – simple axle & wheel, single purchase winch crab& double purchase winch crab, Worm & Worm Wheel, Screw Jack, Types of hoisting machine. |

**Suggested Readings**


1. Text Book of Engineering Mechanics – R.S Khurmi (S. Chand).
2. Engineering Mechanics by Timoshenko S, and Young D.H, Tata McGraw Hill.
3. Engineering Mechanics – Static and Dynamics by Shames I.H, and Rao G.K.M, Pearson Education.
4. Vector Mechanics for Engineers by Beer F.P and Johnson Jr. E.R, Tata McGraw Hill.
5. Engineering Mechanics –Statics & Dynamics, R. C. Hibbeler, 11th Ed., Macmillan Publication Co.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Fundamentals of Mechanics | https://nptel.ac.in/courses/112103108 |
| | Equilibrium of forces | https://nptel.ac.in/courses/112106180 |
| **UNIT-II** | Truss and Frames | https://nptel.ac.in/courses/112106286 |
| | Centroid | https://nptel.ac.in/courses/112104526 |
| **UNIT-III** | Moment of Inertia | https://nptel.ac.in/courses/112103108 |
| | Kinematics | https://nptel.ac.in/courses/112106286 |
| **UNIT-IV** | Dynamics | https://nptel.ac.in/courses/112106180 |
| | Simple Machines | https://nptel.ac.in/courses/112104526 |

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|---|---|---|---|---|---|
| Course Code | **BSC-ME-209A** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Mathematics-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are to make the students<br>• To provide an overview of PDE, Probability and Statistics to engineers.<br>• To introduce the solution methodologies for PDE, Probability and Statistics with Applications in engineering. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts and principles of differential equations, probability & statistics. | Level 1: Remember |
| **CO2** | Describe basic concepts of probability, statistics & partial differential equations. | Level 2: Understand |
| **CO3** | Apply the various methods and techniques to solve engineering problems. | Level 3: Apply |
| **CO4** | Analyse the different patterns and behavior of statistics, probability & partial differential equations. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second- order linear equations and their classification, Initial and boundary conditions, D' Alembert's solution of the wave equation. |
| **Unit-II** | Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. |
| **Unit-III** | Measures of central tendency, Moments, Skewness and Kurtosis, Basic concepts of Probability, Conditional probability, Baye's theorem, Random variables, Discrete random variables, Expectation of discrete random variables, Variance of a sum, Binomial distribution, Poisson distribution, Continuous random variables and their properties, Distribution functions, Normal Distribution. |
| **Unit-IV** | Testing of hypothesis, Test of significance, Large sample test for single proportion, Difference of proportions, Tests for single mean, Difference of means and Difference of standard deviations, Test for ratio of variances, Chi-square test for goodness of fit and Independence of attributes. |

**Suggested Readings:**


1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited
3. N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications
4. Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.
5. S. Ross, A First Course in Probability,6th Ed., Pearson Education India.


## Useful Video links:

| Unit No. | Topics | Links |
|---|---|---|
| **Unit I** | Partial Differential Equations. | https://www.youtube.com/watch?v=KlZqe4UC1jk |
| | Solution to PDE of second order. | https://www.youtube.com/watch?v=5eZbgxmpK3Q&t=520s |
| | Initial and boundary conditions of PDE. | https://www.youtube.com/watch?v=PVUfuiuWaZQ |
| **Unit II** | Duhamel's principle. | https://youtu.be/qu2kuCFCqbM?si=kcSK59hh5XoQrRdA |
| | Separation of variables method. | https://www.youtube.com/watch?v=DgvQzfLpaTY&t=92s |
| | Laplacian in coordinate systems. | https://youtu.be/1wxhLYiHFaE?si=GApUpW3_VTOD8q-b |
| **Unit III** | Introduction of Probability. | https://youtu.be/60vHy2lA4o4 |
| | Discrete random variable. | https://youtu.be/Sv9UYnp9tbs?si=eHqwSJETA5SO3NFI |
| | Continuous Probability distribution. | https://youtu.be/o2LB3KQME3U?si=NWaP0TY_K8tPaAfu |
| **Unit IV** | Testing of Hypothesis. | https://youtu.be/14PQawp_rjk |
| | Large Sample Test. | https://auece.digimat.in/nptel/courses/video/111105090/L72.html |
| | Chi-Square Test. | https://youtu.be/SlCsNb-VXds?feature=shared |

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|---|---|---|---|---|---|
| Course Code | **HSMC-01A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Fundamental of Management and Organizational Behaviour** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework.<br>• Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings.<br>• Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively.<br>• Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define fundamental management concepts, functions, organizational processes, and organizational behavior elements. | Level 1: Remember |
| CO2 | Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations. | Level 2: Understand |
| CO3 | Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges. | Level 3: Apply |
| CO4 | Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction of Management:** Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.<br>**Functions of Management:** Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration. |
| **Unit-II** | **Introduction of Organization:** Meaning and Process of Organization, Management v/s Organization.<br>**Fundamentals of Organizational Behavior:** Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB**.** |

| | |
|---|---|
| | **Individual Processes and Behavior:** Personality, Concept, Determinants and Applications.<br>**Perception:** Concept, Process and Applications<br>**Learning:** Brief Introduction<br>**Motivation:** Concept, Techniques and Importance |
| **Unit-III** | **Interpersonal Processes**: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict- Concept, Sources, Types, Management of Conflict.<br>**Leadership:** Concept, Function, Styles, Qualities of Leadership.<br>**Communication**: Meaning, Process, Channels of Communication, Importance and Barriers of Communication. |
| **Unit-IV** | **Organizational Processes:** Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.<br>**Organizational Culture**: Elements, Types and Factors affecting Organizational Culture.<br>**Organizational Change:** Concept, Types and Factors affecting Organizational Change, Resistance to Change. |

**Suggested Readings:**


1. Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
2. Organizational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
3. Management concept practice and cases by Ghuman Karminder, Aswathappa K., Tata McGraw Hill, New Delhi
4. Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
5. Organizational Behaviour by Stephen P Robin, Pearson Education.
6. Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
7. Organizational Behaviour by FC Sharma, Shree Mahavir Publications.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Nature and Scope of Management | https://nptel.ac.in/courses/110105146 |
| **Unit-II** | Perception and Personality | https://nptel.ac.in/courses/110103433 |
| **Unit-III** | Group Dynamics | https://archive.nptel.ac.in/courses/110/106/110106145/ |
| **Unit-IV** | Organizational Change, Resistance to Change. | https://nptel.ac.in/courses/110105146 |

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|---|---|---|---|---|---|
| Course code | **LC-ME-211A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Materials & Metallurgy Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To study crystallography and imperfections in materials through models.<br>• To learn how to prepare specimen for microstructure analysis.<br>• To familiarise with heat treatment processes and their effects om materials properties and microstructure.<br>• To enhance the skills in using microscopy and other testing equipments. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Explain the crystallography, imperfections, and the working principles of metallurgical equipments. | Level 2: Understand |
| CO2 | Apply specimen preparation and etching techniques for metallographic examination of metals. | Level 3 : Apply |
| CO3 | Analyze the effect of heat treatment processes on material properties & microstructure. | Level 4: Analyze |
| CO4 | Analyze the microstructures of different nonferrous materials. | Level 4: Analyze |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To study various crystal structures through ball models. | **CO1** |
| **2** | To study of crystal imperfections through ball models. | **CO1** |
| **3** | To study the components and functions of metallurgical microscope. | **CO1** |
| **4** | To study of Muffle furnace and policing machine. | **CO1** |
| **5** | To study modern characterization (microscopy) techniques. | **CO1** |
| **6** | To prepare chemical etchant for ferrous and non-ferrous alloys. | **CO2** |
| **7** | To prepare a specimen for metallographic examination. | **CO2** |
| **8** | To analyze the changes in hardness of steel / iron after heat treatment processes. | **CO3** |
| **9** | To analyze the changes in microstructure of steel / iron after annealing. | **CO3** |

| | | |
|---|---|---|
| **10** | To analyze the changes in microstructure of steel / iron after normalizing. | **CO3** |
| **11** | To analyze the changes in microstructure of steel / iron after quenching. | **CO3** |
| **12** | To analyze the microstructure of non-ferrous metal (Aluminum). | **CO4** |
| **13** | To analyze the microstructure of non-ferrous metal (Copper). | **CO4** |
| **14** | To analyze the microstructure of non-ferrous metal (Brass). | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Metallurgical Microscope | https://mrmsmtbs-iitk.vlabs.ac.in/exp/nucleus-cellsproliferation/simulation.html |
| Hardness Measurement | https://mrmsmtbs-iitk.vlabs.ac.in/exp/hardness-modulus/simulation.html |
| Crystal Structures | https://www.youtube.com/watch?v=OTDVov_kw6A |
| Techniques of materials characterization | https://archive.nptel.ac.in/courses/113/105/113105101/ |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-ME-213A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Computer Aided Design & Manufacturing Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To introduce students to the fundamentals and key features of CAD software used for part modelling and assembly design.<br>• To provide hands-on experience in generating 3D models, part drawings, and assemblies using modern CAD tools.<br>• To familiarize students with CNC programming for basic machining operations.<br>• To expose students to classification systems and emerging technologies in manufacturing. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Explain the essential features and tools of CAD software and NC programming. | Level 2: Understand |
| CO2 | Use drawing and modification tools to create 2D sketches and part models. | Level 3: Apply |
| CO3 | Use CAD software for 3D models and assembly of mechanical components. | Level 3: Apply |
| CO4 | Use G & M codes to write NC part programs for manufacturing operations. | Level 3: Apply |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To Introduction to the different features of CAD softwares. | **CO1** |
| **2** | To Work with the draw and modify tools like pattern, copy, rotate, move, mirror etc. | **CO2** |
| **3** | To Draw the 2D part drawing of product 1 using software. | **CO2** |
| **4** | To Draw the 2D part drawing of product 2 using software. | **CO2** |
| **5** | To Work with creating 3D features like extrude revolve etc. | **CO3** |
| **6** | To Work with tools like hole, round, chamfer etc. | **CO3** |
| **7** | To Draw 3D models by extruding simple 2D objects. | **CO3** |
| **8** | To make an assembly drawing using different parts. | **CO3** |
| **9** | To study the G codes and M codes. | **CO1** |
| **10** | To Write a NC program for milling operation. | **CO4** |

| | | |
|---|---|---|
| **11** | To Write a NC program for drilling operation. | **CO4** |
| **12** | To Write a NC program for turning operation | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Computer Aided Design Tools | https://youtu.be/UvP3fSGye-Y |
| Program using G & M Codes | https://youtu.be/ImtSsDLgAaI |
| Introduction To CNC Machines | https://youtu.be/B7MM5M7DzpM?si=SxDdSNolcFlwN4A9 |
| CNC Programming | https://youtu.be/_5r2XR1h1aQ |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-ME-215A** | | | | |
| Category | Basic Science Courses | | | | |
| Course title | **Engineering Mechanics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To understand force laws using triangle law, polygon law, and parallel force experiments.<br>● To learn how to calculate mechanical advantage, velocity ratio, and efficiency of simple machines.<br>● To study the moment of inertia using a flywheel.<br>● To measure the deflections in a pin-jointed truss. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Determine the forces in members by applying laws of forces. | Level 3: Apply |
| CO2 | Calculate mechanical advantage, velocity ratio, and efficiency of lifting devices. | Level 3: Apply |
| CO3 | Analyze the internal forces and deflections in various structural elements. | Level 4: Analyze |
| CO4 | Evaluate the moment of inertia and verify beam deflection principles including reciprocal and parallel force theorems. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To determine the resultant force by applying law of polygon of forces. | **CO1** |
| **2** | To determine the resultant force by applying law of triangle of forces. | **CO1** |
| **3** | To calculate the mechanical advantage, velocity ratio and Mechanical efficiency of winch crab. | **CO1** |
| **4** | To calculate the mechanical advantage, velocity ratio and mechanical efficiency of a screw jack. | **CO2** |
| **5** | To calculate the mechanical advantage, velocity ratio and mechanical efficiency of single start worm and worm wheel. | **CO2** |
| **6** | To calculate the mechanical advantage, velocity ratio and mechanical efficiency of double & triple start worm and worm wheel. | **CO2** |
| **7** | To analyse the internal forces acting on various members of a jib crane using experimental methods. | **CO2** |
| **8** | To analyse the horizontal and vertical deflections at various joints of a pin-jointed truss using experimental data.. | **CO3** |
| **9** | To analyse the behaviour of a 3-bar pin-jointed truss by comparing experimental results with analytical calculations. | **CO3** |

| | | |
|---|---|---|
| **10** | To evaluate the moment of inertia of a given fly-wheel. | **CO4** |
| **11** | To verify the reciprocal theorem of deflection using a simply supported beam. | **CO4** |
| **12** | To verify the principle of forces in beam of parallel forces apparatus. | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Moment of inertia of a given fly-wheel. | http://phy-sc22-au.vlabs.ac.in/mechanics/Moment_of_Inertia_of_Flywheel/ |
| Trusses | https://virtual-labs.github.io/exp-trusses-iiith/index.html |
| Parallelogram Law of Vectors | https://amrita.olabs.edu.in/?sub=1&brch=5&sim=20&cnt=4 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-ME-202A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Applied Thermodynamics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To learn about dynamics involved in thermal energy transformation.<br>• To know thermal system components for improving efficiency and effectiveness.<br>• To provide a knowledge of steam generation systems, fuels, and combustion processes used in power generation.<br>• To introduce about gas and vapour power cycles. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define fundamental concepts of steam generation, fuels, power cycles, and related equipment. | Level 1: Remember |
| **CO2** | Describe principles and functions involved in thermodynamic cycles and devices. | Level 2: Understand |
| **CO3** | Apply thermodynamic principles and equations to solve energy and flow problems. | Level 3: Apply |
| **CO4** | Analyze the effects of operating parameters on the performance of thermal systems and machinery. | Level 4: Analyze |

**Note**: The Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each, and the remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Steam Generators**: Introduction, classification of boilers, comparison of fire tube and water tube boilers, description of boilers; Lancashire, Babcock Wilcox, Cochran etc. boiler's mountings and accessories, design of natural draught chimney, artificial draught, mechanical draught, efficiency of boiler and heat balance.<br>**Fuel and Combustion:** Classification of fuels – solid, liquid and gaseous fuels, calorific values of fuels, stoichiometric air fuel ratio, excess air requirement, efficiency of boiler and heat balance. Problems. |
| **Unit-II** | **Vapor power cycles:** Carnot vapour power cycle, Simple and modified Rankine cycle, p-v, h-s and T-s diagram for Rankine and Modified Rankine Cycle, effect of operating parameters on Rankine cycle performance. Effect of maximum pressure, effect of exhaust pressure, reheating and regenerative Rankine cycle.<br>**Gas power cycles:** Air standard Otto, Diesel and Dual Cycles-Air standard Brayton cycle, effect of reheat, regeneration and inter cooling- Combined gas and vapor power cycles. Problems |

| | |
|---|---|
| **Unit-III** | **Steam Nozzles**: Function of steam nozzles, shape of nozzles for subsonic and supersonic flow of steam, steady state energy equation, continuity equation, nozzle efficiency, critical pressure ratio for max. discharge, design of steam nozzle, problems.<br>**Steam Condensers**: Classification of condensers, sources of air leakage in condensers, effect of air leakage in condenser, vacuum efficiency, condenser efficiency, air pumps, calculation of cooling water requirement, and problem. |
| **Unit-IV** | **Reciprocating compressors:** Staging of reciprocating compressors, optimal stage pressure ratio, effect of inter cooling, isothermal efficiency, volumetric efficiency, minimum work for multistage reciprocating compressors. Problems.<br>**Steam Turbine:** Classification of steam turbine, impulse turbine, working principle, compounding of impulse turbine, velocity diagram, power output and efficiency of a single stage impulse turbine, reaction turbine, working principle, degree of reaction, velocity diagram, power output, efficiency, condition for max. Efficiency, governing of steam turbines, problem. |

**Suggested Readings**


1. Engineering Thermodynamics - Nag, P.K, Tata McGraw-Hill Publishing Co. Ltd
2. Thermal Engineering - P.L. Ballaney Khanna Publisher.
3. Engineering Thermodynamics - Jones, J. B. and Duggan, R. E., Prentice Hall of India.
4. Thermodynamics and Heat Engines Vol II - R. Yadav, Central Publishing House.
5. I.C. Engines - M.L. Mathur and Sharma Dhanpat Rai & Sons.
6. Thermodynamics- An Engineering Approach, Y. Cengel and M. Boles, McGraw Hill Education; Eighth Edition, 2017


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Introduction to fuels | https://nptel.ac.in/courses/112103421 |
| | Fuel and their properties | https://youtu.be/fscJadXHhTU?feature=shared |
| **UNIT-II** | Vapor power cycles | https://youtu.be/4-BI22Wx4Pc?feature=shared |
| | Gas power cycles | https://youtu.be/G02aeguJBwc?feature=shared |
| **UNIT-III** | Steam Nozzle | https://youtu.be/t-Kucwi3SDI?feature=shared |
| | Condenser | https://nptel.ac.in/courses/112103307 |
| **UNIT-IV** | Reciprocating compressors | https://youtu.be/xFHWR99U3Q?feature=shared |
| | Analysis of steam turbines | https://nptel.ac.in/courses/112107291 |

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|---|---|---|---|---|---|
| Course Code | **PCC-ME-204A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Strength of Materials** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To familiarize with stress, strain and deformation of solids under different loading conditions.<br>• To equip students with ability to think critically and solve problems related to the strength and stability of structures.<br>• To learn how materials, behave under different types of forces and conditions.<br>• To develop an ability to analyze the real engineering problems and design engineering systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts of strength of materials. | Level 1: Remember |
| **CO2** | Explain the expression and behavior of structural elements under various loading and support conditions. | Level 2: Understand |
| **CO3** | Solve problems related to internal forces, stresses, and deformations in structural members. | Level 3: Apply |
| **CO4** | Analyze the structural components for performance under different loading conditions. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Stress & Strain:** Concept & types of Stresses and Strains, Poisson's ratio, Hooks law, Stress Strain diagrams, stresses and strains in simple and compound bars under axial loading, elastic constants & their relationships, temperature stresses and strains in simple and compound bars under axial loading, Problems.<br>**Principle Stresses& Strains:** Two-dimensional stress system, stress at a point on a plane, principal stresses and principal planes, Mohr's circle of stresses, Problems. |
| **Unit-II** | **Shear Force & Bending Moment:** Definitions, Beams and types transverse loading on beams, types of beam support, SF& BM diagram for cantilevers, simply supported and over-hanging beams, calculation of maximum BM & SF and Point of contra flexure, Problems.<br>**Bending & Shear Stresses in Beams:** Bending stresses in Beam, Theory of bending of beams, bending stress distribution and neutral axis, shear stresses in beam, shear stress distribution Problems. |

| | |
|---|---|
| **Unit-III** | **Torsion of Circular Members:** Torsion, stresses and deformation in circular solid and hollow shafts, stepped shafts, deflection of shafts fixed at both ends, Problems.<br>**Columns & Struts:** Introduction**,** Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Euler's, Rankine, Gordon's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Problems. |
| **Unit-IV** | **Slope & Deflection:** Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated & uniformly distributed loads and Maxwell's reciprocal theorem, Problems. |

**Suggested Readings**


1. Strength of Materials – G.H. Ryder - Macmillan, India.
2. Strength of materials, RK Bansal, Laxmi Publication.
3. Engineering Mechanics of Solids - EGOR. P. POPOV, Prentice Hall of India.
4. Strength of Materials - R. Subramanian, Oxford University Press.
5. Mechanics of Materials, F.P. Beer, E.R. Johnston (Jr.) and J.T. DeWolf, Tata McGraw Hill


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Stress & Strain | https://nptel.ac.in/courses/112106319 |
| | Principle Stresses | https://youtu.be/vC8h1RFKYs?feature=shared |
| **UNIT-II** | Shear Force & Bending Moment | https://nptel.ac.in/courses/112107147 |
| | Bending & Shear Stresses in Beams | https://youtu.be/sP34uzn7diA?feature=shared |
| **UNIT-III** | Columns & Struts | https://youtu.be/ZSQ_5lRj5gI?feature=shared |
| | Torsion of Circular Members | https://youtu.be/IQB0bJRCRxo?feature=shared |
| **UNIT-IV** | Slope & Deflection | https://nptel.ac.in/courses/105105108 |

| Course Code | **PCC-ME-206A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Fluid Mechanics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts and properties of fluids.<br>• To learn the fluid behavior under various flow conditions.<br>• To learn applications involving compressible flow, viscous effects, boundary layers, and turbulence.<br>• To understand flow measurement devices and solve problems pertaining to flow through pipes. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define fundamental concepts and basics of fluid mechanics. | Level 1: Remember |
| **CO2** | Explain the fluid properties &principles governing fluid motion and behavior. | Level 2: Understand |
| **CO3** | Apply fluid mechanics laws and equations to solve flow problems. | Level 3: Apply |
| **CO4** | Analyze performance characteristics and behavior of fluid under various conditions. | Level 4: Analyze |

**Note**: The Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each, and the remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Fluid Properties and Fluid Statics:** Concept of fluid and flow, ideal and real fluids, continuum concept, and properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium, Problems.<br>**Fluid Kinematics:** Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net, Problems. |
| **Unit-II** | **Fluid Dynamics:** Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orifice meter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications, Problems.<br>**Compressible Fluid Flow:** Introduction, continuity momentum and energy equation, sonic velocity, propagation of elastic waves due to compression of fluid, propagation of elastic waves due to disturbance in fluid, stagnation properties, isentropic flow, effect of area variation on flow properties, isentropic flow through nozzles, diffusers, injectors, Problems. |

| | |
|---|---|
| **Unit-III** | **Viscous Flow:** Flow regimes and Reynolds's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems.<br>**Flow Through Pipes:** Major and minor losses in pipes, Hagen- Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, Problems. |
| **Unit-IV** | **Boundary Layer Flow:** Boundary layer concept, displacement, momentum and energy thickness, Von-Karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies lift and drag on a cylinder and an airfoil, Problems**.**<br>**Turbulent Flow:** Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes, Problems. |

**Suggested Readings**


1. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons.
2. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill.
3. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH.
4. Mechanics of Fluids – I H Shames, Mc Graw Hill.
5. Fluid Mechanics – Streeter, Wylie and Bedford, TMH.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Ideal fluids, Velocity potential, Potential flows | https://youtu.be/mKROgeUc_Ow?feature=shared |
| | Eulerian and Lagrangian description of fluid flow | https://youtu.be/H38vI93exns?feature=shared |
| **UNIT-II** | Euler's equation | https://youtu.be/nftfzCxQKfk?feature=shared |
| | Effects of Area Variation on Properties in an Isentropic Flow | https://youtu.be/cVmK3dLeCZ4?feature=shared |
| **UNIT-III** | Flow regimes and Reynolds's number | https://youtu.be/p7-oAAAszHc?feature=shared |
| | Flow in Pipes: Minor Losses | https://youtu.be/CzrQxXK0CKk?feature=shared |
| **UNIT-IV** | Boundary layer concept | https://youtu.be/zw2F4utGoVQ?feature=shared _ |
| | Shear stress in turbulent flow | https://youtu.be/OsCTaeh_rBc?feature=shared |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-ME-208A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Kinematics of Machines** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To learn the fundamentals of mechanisms and motion transmission.<br>• To develop students for generation of cam profile<br>• To equip students with tools for kinematic analysis and synthesis.<br>• To know the friction and belt drive systems used in machines. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the basic terminologies related to kinematics of machines. | Level 1: Remember |
| **CO2** | Explain the principles of kinematics, motion and function of mechanical systems and components. | Level 2: Understand |
| **CO3** | Apply graphical and analytical methods to solve the kinematics related problems. | Level 3: Apply |
| **CO4** | Analyze the performance and motion characteristics of mechanisms and power transmission systems. | Level 4: Analyze |

**Note**: The Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each, and the remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction**: Mechanism and machines, kinematics links, kinematics pairs, kinematics chains, degree of freedom, Grumbler's rule, kinematics inversion, equivalent linkages, four link planar mechanisms, straight line mechanisms, steering mechanisms, pantograph, problems.<br>**Kinematics Analysis of Plane Mechanisms:** displacement analysis, velocity diagram, velocity determination, relative velocity method, instantaneous center of velocity, Kennedy's theorem, graphical and analytical methods of velocity and acceleration analysis, problems. |
| **Unit-II** | **Cams:** Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods, cams with specified contours, problems.<br>**Gears: F**undamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, interference and undercutting, center distance variation, path of contact, arc of contact, non-standard gear teeth, helical, spiral bevel and worm gears, problems. |

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|---|---|
| **Unit-III** | **Gear Trains**: Synthesis of simple, compound and reverted gear trains, analysis of epicyclic gear trains, problems.<br>**Kinematics synthesis of Mechanisms:** Function generation, path generation, Freudenstein's equation, two and three position synthesis of four bar and slider crank mechanisms by graphical and analytical methods, precision positions, structural error; Chebychev spacing, transmission angle, problems. |
| **Unit-IV** | **Friction**: Types of friction, laws of friction, motion along inclined plane, screw threads, efficiency on inclined plane, friction in journal bearing, friction circle and friction axis, pivots and collar friction, uniform pressure and uniform wear.<br>**Belts and pulleys**: Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, chain length, classification of chains. |

**Suggested Readings**


1. Theory and Machines - S.S. Rattan, Tata McGraw Hill.
2. Theory of Machines - Bevan, Pearson Indian Education Service Pvt. Ltd. India.
3. Mechanism and Machine Theory - J.S. Rao and R.V. Dukkipati, New Age International.
4. Theory of Mechanisms and Machines - Amitabha Ghosh and Ashok Kumar Malik, East-West Press.
5. Theory of Machines and Mechanisms, J. J. Uicker, G. R. Pennock, J. E. Shigley, Oxford Education, Fourth Edition, 2011.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Introduction to mechanism and machines<br>Kinematics Analysis of Plane Mechanisms | https://archive.nptel.ac.in/courses/112/104/112104121/<br>https://archive.nptel.ac.in/courses/112/106/112106270/#<br>https://archive.nptel.ac.in/courses/112/105/112105268/ |
| **UNIT-II** | Cams<br>Gears | https://archive.nptel.ac.in/courses/112/104/112104121/<br>https://archive.nptel.ac.in/courses/112/106/112106270/#<br>https://archive.nptel.ac.in/courses/112/105/112105268/ |
| **UNIT-III** | Gear Trains<br>Kinematics synthesis of Mechanisms | https://archive.nptel.ac.in/courses/112/104/112104121/<br>https://archive.nptel.ac.in/courses/112/106/112106270/#<br>https://archive.nptel.ac.in/courses/112/105/112105268/ |
| **UNIT-IV** | Friction<br><br>Belts and pulleys | https://nptel.ac.in/courses/112103108<br>https://nptel.ac.in/courses/112106286<br>https://nptel.ac.in/courses/112105124 |

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|---|---|---|---|---|---|
| Course Code | **PCC-ME-210A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Manufacturing Technology -I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To know how cutting tools work, how chips are formed, and what affects the life of a cutting tool.<br>• To learn how to calculate machining costs and choose the best cutting conditions to save time and money.<br>• To know how jigs and fixtures help in holding work-pieces and how measuring tools are used to check sizes and surface finish.<br>• To understand how gears are made, how machines are specified, and how milling and drilling operations are done. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts of Manufacturing Technology. | Level 1: Remember |
| **CO2** | Explain principles of cutting, forming, metrology, and machine tools. | Level 2: Understand |
| **CO3** | Apply suitable tools, conditions, and setups for machining operations. | Level 3: Apply |
| **CO4** | Analyze the effects of process parameters and tool specifications on performance. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Metal Cutting & Tool Life:** Introduction, basic tool geometry, single point tool nomenclature, chips types and their characteristics, mechanics of chips formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocity, forces, and power consumption, cutting speed, feed and depth of cut, coolant, temperature profile in cutting, tool life relationship, tailor equation of tool life, tool material and mechanism.<br>**Economics of Metal Machining:** Cost considerations in manufacturing, elements of machining cost, minimum cost per piece, maximum production rate, optimum cutting speed and optimum tool life for minimum cost of production and maximum production rate. |
| **Unit-II** | **Jigs and Fixtures:** Introduction to jigs and fixtures, principles of locations, locating and clamping devices, jigs bushes, drilling jigs, milling fixtures, turning fixtures, boring and broaching fixtures, welding fixtures, different materials for jigs and fixtures, economics of jigs and fixtures.<br>**Metrology:** Measurement, linear and angular simple measuring instruments, various clampers, screw gauge, sine bar, auto-collimator, comparator- mechanical, electrical, optical, surface finish |

| | |
|---|---|
| | and its measurements, micro and macro deviation, factors influencing surface finish and evaluation of surface finish. |
| **Unit-III** | **Gear manufacturing and finishing:** Introduction, Classification of gear production method, Gear generation processes: gear hobbing, gear shaping, Gear finishing methods: shaving, roll finishing, burnishing, grinding, lapping, honing.<br>**Specification of Machine Tools:** Introduction, purpose of machine tool specifications, Methods of specification of conventional machine tools: specification of lathes, specification of drilling and boring machines, specification of shaper, planer and slotter machines, specification of milling machine, specification of gear teeth generating machines, specification of grinding machines. |
| **Unit-IV** | **Milling Process:** Milling Machine Operations performed on Milling machine, Parts of Milling Machine, Types of Milling machines, fundamentals of Milling process, Milling Cutters, Elements of Plain Milling cutter, Cutter Holing devices, Indexing, Methods of Indexing.<br>**Drilling Machine:** Types of Drills, Drilling machine Types, Drilling machine operations, Size of Drilling machine, Main parts of drilling machine, Cutting speed, Feed and Depth of cut in drilling, MRR in drilling. |

**Suggested Readings**


1. Manufacturing Engineering Technology, K. Jain, Pearson Education
2. Principles of Manufacturing Materials and Processes, James S. Campbell, TMH.
3. Production Engineering Sciences by P.C. Pandey and C.K. Singh, Standard Publishers Ltd.
4. Manufacturing Science by A. Ghosh and A.K. Mallik, Wiley Eastern


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Tool Life | https://youtu.be/-R-fySRLa9Q?si=rjouuxiO4PYAi8VL |
| | Economics of Machining | https://www.youtube.com/watch?v=YDSdhiMksoQ |
| **UNIT-II** | Jigs and Fixtures For Machine Shops | https://www.youtube.com/watch?v=7yzvno4AvKw |
| | Introduction to Metrology | https://www.youtube.com/watch?v=HpIEeBtJupY |
| **UNIT-III** | Gear Manufacturing | https://www.youtube.com/watch?v=B8w-0Oi0Yf4 |
| | Metal Cutting and Machine Tools | https://archive.nptel.ac.in/courses/112/105/112105233/ |
| **UNIT-IV** | Milling Machine- Indexing | https://youtu.be/Rf90Jbbcr3M?si=3oMLtK3cYdBA1koj |
| | Machining Operations: Milling & Drilling | https://www.youtube.com/watch?v=a07gtJbK9aU |

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|---|---|---|---|---|---|
| Course Code | **MC-201A** | | | | |
| Category | Mandatory Courses | | | | |
| Course Title | **Environmental Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 2 | 0 | 1 | - | |
| Course Objectives | The objectives of this course are<br>• Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources.<br>• Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health.<br>• Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society.<br>• Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship. | | | | |
| Practical/Field Visits | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |
| **Remarks** | The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.<br>The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **CO** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws, and human-environment interactions. | Level 1: Remember |
| CO2 | Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics, and related legislation for sustainable development. | Level 2 : Understand |
| CO3 | Apply principles of environmental management, pollution control, disaster preparedness, and sustainable practices in real-world and field-based environmental contexts. | Level 3: Apply |
| CO4 | Analyze environmental problems, population growth impacts, climate change, welfare programs, and the role of information technology in promoting public health and environmental sustainability. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | The Multidisciplinary nature of environmental studies. Definition scope and importance.<br>**Natural Resources:** Renewable and non-renewable resources, Natural resources and associated problems.<br>**a) Forest resources:** Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.<br>**b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.<br>**c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.<br>**d) Food resources:** World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies. e) Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.<br>f) **Land resources:** Land as are source, land degradation, man induced landslides, soil erosion and desertification.<br>Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles |
| **Unit-II** | **Ecosystems**: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids**,** Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).<br>**Bio diversity and its conservation:** Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity. |
| **Unit-III** | **Environmental Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards.<br>**Solids Waste Management:** Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies.<br>**Disaster Management:** Floods, Earthquake, Cyclone and Landslides.<br>**Social issues and the Environment:** From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies.<br>**Environmental Ethics:** Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness. |
| **Unit-IV** | **Human population and the Environment:** Population growth, Variation among Nations, Population explosion -Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies. **Field Work (Field work equal to10 lecture hours)-** Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc. . |

**Suggested Readings**:


1. Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
2. The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
3. Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc.
4. Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
5. Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press
6. Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi.
7. Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
8. Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd.
9. Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut,
10. Survey of the Environment, The Hindu.
11. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
12. Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
13. Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA.
14. A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Environment Science: Introduction | https://www.youtube.com/watch?v=5QxxaVfgQ3k |
| | Natural Resources | https://www.youtube.com/watch?v=CXCT2R1K6Ts |
| | Ecosystem | https://www.youtube.com/watch?v=1dBU6HB8G6s |
| **Unit-II** | Biodiversity and its conservation | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| **Unit-III** | Sustainable Water Management In Urban Areas | http://digimat.in/nptel/courses/video/127106004/L29.ht |
| | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |
| **Unit-IV** | Population and population growth | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| | National Family Welfare Programme | https://www.youtube.com/watch?v=X5F99L8ZEtc |

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|---|---|---|---|---|---|
| Course code | **LC-ME-220A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Applied Thermodynamics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To introduce students to the fundamental principles and operational features of thermal equipment.<br>● To enable students to gain practical knowledge in analyzing and evaluating the performance of thermal systems.<br>● To provide hands-on experience in conducting experiments related to steam generation, heat transfer, and power generation systems. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Explain the construction details of various types of boilers, mountings and accessories. | Level 2: Understand |
| CO2 | Demonstrate the working principle of various thermal equipments. | Level 3: Apply |
| CO3 | Analyze the thermodynamic properties of steam and system performance. | Level 4: Analyze |
| CO4 | Evaluate the performance of reciprocating air compressor and cooling tower. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To study low pressure boilers and their accessories and mountings. | **CO1** |
| **2** | To study high pressure boilers and their accessories and mountings. | **CO1** |
| **3** | To study the working of impulse and reaction steam turbines. | **CO2** |
| **4** | To study principle, construction and working of Bomb Calorimeter. | **CO2** |
| **4** | To study of heat balance sheet for given boiler. | **CO2** |
| **5** | To find power output & efficiency of a steam turbine. | **CO3** |
| **6** | To find dryness fraction of steam by separating and throttling calorimeter. | **CO3** |
| **7** | To find the condenser efficiencies. | **CO3** |
| **8** | To evaluate the volumetric efficiency of a reciprocating air compressor. | **CO4** |

| | | |
|---|---|---|
| **9** | To study cooling tower and evaluate its efficiency. | **CO4** |
| **10** | To evaluate the isothermal efficiency of a reciprocating air compressor. | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| To find dryness fraction of steam by separating and throttling calorimeter. | https://vmtitg.vlabs.ac.in/Separating_and_Throttling_Calorimeter(theory).html |
| To study cooling tower and evaluate its efficiency. | https://vmt-iitg.vlabs.ac.in/Water_cooling_tower(procedure).html |
| To evaluate the volumetric efficiency of a reciprocating air compressor. | https://www.youtube.com/watch?v=AQEQl8qJgfI |
| To study high pressure boilers and their accessories and mountings. | https://www.youtube.com/watch?v=S1pDhYR7ZQg |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-ME-222A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Strength of Materials Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To learn the working principles of various material testing machines and perform tests.<br>● To enhance the knowledge stress, strain of materials and ability to interpret the data from the experiments.<br>● To evaluate the mechanical properties of materials through impact, tensile, compression, bending, and shear tests. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Apply hardness testing procedures to determine the hardness of various engineering materials. | Level 3: Apply |
| CO2 | Use appropriate methods to determine material behavior under sudden impact & sheet deformation. | Level 3: Apply |
| CO3 | Analyze the behavior of materials under different types of loading. | Level 4: Analyze |
| CO4 | Evaluate torsional, spring, and fatigue behavior of materials using theoretical relationships. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To determine the hardness of the given specimen using Brinell hardness test. | **CO1** |
| **2** | To determine the hardness of the given Specimen using Rockwell hardness test. | **CO1** |
| **3** | To determine the hardness of the given Specimen using Vickers hardness test. | **CO1** |
| **4** | To conduct sheet metal test in Erichsen sheet metal testing machine. | **CO2** |
| **5** | To determine the Impact strength of a given specimen using Izod impact test. | **CO2** |
| **6** | To determine the Impact strength of a given specimen using Charpy impact test | **CO2** |
| **7** | To perform tensile test on UTM. | **CO3** |
| **8** | To perform compression test on UTM. | **CO3** |
| **9** | To perform bending tests on UTM. | **CO3** |
| **10** | To perform the shear test on UTM. | **CO3** |

| | | |
|---|---|---|
| **11** | To evaluate the torsional properties of mild steel using a torsion testing machine. | **CO4** |
| **12** | To evaluate the stiffness of a spring and the modulus of rigidity of its wire. | **CO4** |
| **13** | To evaluate a material's response to cyclic loading with a fatigue test machine. | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Brinell Hardness Test. | https://sm-nitk.vlabs.ac.in/exp/brinell-hardness-test/ |
| Rockwell Hardness Test. | https://sm-nitk.vlabs.ac.in/exp/rockwell-hardness-test/ |
| Vickers Hardness Test. | https://sm-nitk.vlabs.ac.in/exp/vickers-hardness-test/ |
| Izod Test | https://sm-nitk.vlabs.ac.in/exp/izod-impact-test/ |
| Charpy Test | https://sm-nitk.vlabs.ac.in/exp/charpy-impact-test/ |
| Tensile Test | https://sm-nitk.vlabs.ac.in/exp/tensile-test-mild-steel/ |
| Bending Test. | https://sm-nitk.vlabs.ac.in/exp/bending-test-mild-steel/ |
| Compression Test. | https://sm-nitk.vlabs.ac.in/exp/compression-test-mild-steel/ |
| Sheer Test | https://sm-nitk.vlabs.ac.in/exp/direct-shear-test-steel-rod/ |
| Torsion test. | https://sm-nitk.vlabs.ac.in/exp/torsion-test-mild-steel/ |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-ME-224A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Fluid Mechanics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To gain knowledge of fluid flow principles and pipe flow behavior.<br>● To measure key flow parameters such as friction factor, Reynolds number, and viscosity.<br>● To know the causes and impact of energy losses in pipe systems.<br>● To provide hands-on experience to observe fluid flow phenomena through experiments.. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Apply fluid flow measurement techniques to determine discharge coefficients and fluid properties. | Level 3: Apply |
| CO2 | Calculate friction factor, Reynolds number, viscosity and flow losses in pipes. | Level 3: Apply |
| CO3 | Analyze stability of floating bodies and fluid flow characteristics. | Level 4: Analyze |
| CO4 | Evaluate the fundamental fluid properties and mechanics principles through experimentation. | Level 5: evaluate |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To find out the coefficient of discharge of an orifice meter. | **CO1** |
| **2** | To find out the coefficient of discharge of venturimeter | **CO1** |
| **3** | To find out the coefficient of discharge of Notch (V and Rectangular types). | **CO1** |
| **4** | To find out the coefficient of discharge, contraction & velocity of an orifice. | **CO1** |
| **5** | To calculate the friction factor for the pipes. | **CO2** |
| **6** | To calculate the minor losses due to sudden enlargement, sudden contraction and bends. | **CO2** |
| **7** | To analyze the stability of a floating body by determining the metacentric height of a floating body. | **CO3** |
| **8** | To analyze the velocity and pressure variation with radius in a forced vertex flow. | **CO3** |
| **9** | To analyse the critical Reynolds number for a pipe flow. | **CO3** |

| | | |
|---|---|---|
| **10** | To evaluate the viscosity of a fluid by Stokes' law apparatus. | **CO4** |
| **11** | To verify the Bernoulli's Theorem. | **CO4** |
| **12** | To verify the momentum equation.. | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Friction in Pipes | https://fm-nitk.vlabs.ac.in/exp/friction-in-pipes/simulation.html |
| Venturimeter | https://fm-nitk.vlabs.ac.in/exp/venturimeter/ |
| Reynolds Experiment | https://me.iitp.ac.in/Virtual-Fluid-Laboratory/reynolds/simulation.html |
| Bernoulli's Experiment | https://me.iitp.ac.in/Virtual-Fluid-Laboratory/bernoulli/about_setup.html |
| V-Notch Experiment | https://me.iitp.ac.in/Virtual-Fluid-Laboratory/notch/about_setup.html |
| Stability of Floating Bodies | https://me.iitp.ac.in/Virtual-Fluid-Laboratory/metacenter/about_setup.html |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-ME-226A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Kinematics of Machines Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To provide knowledge of the basic elements and working principles of mechanical linkages and mechanisms.<br>● To introduce the motion characteristics of mechanisms used in machinery and equipment.<br>● To equip students with skills to analyze the performance of motion transmission systems such as cams, gears, and gear trains.<br>● To enable hands-on experience in evaluating the behavior and efficiency of mechanical systems through laboratory experiments. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Understand various kinematic links, pairs, chains, and mechanisms, including their inversions. | Level 2: Understand |
| CO2 | Apply graphical methods to draw displacement, velocity, and acceleration diagrams of mechanisms. | Level 3: Apply |
| CO3 | Analyze the characteristics and profiles of cams, followers, and gears. | Level 4: Analyze |
| CO4 | Evaluate the performance and efficiency of power transmission elements. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | To study various types of Kinematic links, pairs, chains and Mechanisms. | **CO1** |
| **2** | To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms. | **CO1** |
| **3** | To plot slider displacement, velocity and acceleration against crank rotation for single slider-crank mechanism. | **CO2** |
| **4** | To draw velocity diagram of four bar mechanism. | **CO2** |
| **5** | To draw velocity diagram of slider crank mechanism. | **CO2** |
| **6** | To draw acceleration diagram of four bar mechanism. | **CO2** |
| **7** | To categories various type of cam and follower arrangements. | **CO3** |
| **8** | To plot follower displacement vs cam rotation for various cam follower systems. | **CO3** |

| | | |
|---|---|---|
| **9** | To classify various types of gears- spur, helical, worm, bevel gear etc. | **CO3** |
| **10** | To classify various types of gear trains - simple, compound, reverted & epicyclic. | **CO3** |
| **11** | To generate spur gear involute tooth profile using simulated gear shaping process. | **CO3** |
| **12** | To evaluate the MA, V.R. and efficiency of screw jack. | **CO4** |
| **13** | To evaluate the coefficient of friction between belt and pulley. | **CO4** |

**Note:** At least ten experiments are to be performed. Eight experiments should be from the above list and remaining two experiments may either be performed from the above list or as per the scope of the syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Velocity analysis of Grashof four bar mechanism | https://mm-nitk.vlabs.ac.in/exp/velocity-analysis-grashof/ |
| CAM Follower Mechanism | https://mr-iitkgp.vlabs.ac.in/exp/cam-follower-mechanism/ |

| Course Code | **PEC-ME-212A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Courses | | | | |
| Course Title | **Industrial Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce to different recording charts and PPC.<br>• To learn techniques for accurate sales forecasting and demand estimation.<br>• To grasp inventory management principles for cost-effective control and stock optimization.<br>• To know value analysis methods to enhance product and process value while reducing costs. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define the fundamental concepts and techniques related to industrial engineering. | Level 1: Remember |
| **CO2** | Explain the principles, procedures, techniques, and tools used to improve industrial systems. | Level 2: Understand |
| **CO3** | Apply standard methods, analytical and practical tools for managing industrial operations. | Level 3: Apply |
| **CO4** | Analyze industrial processes and organizational systems for performance improvement. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Introduction to work study; Method study; Basic procedure, Recording techniques (Charts and diagrams); Elemental breakdown; Micro-motion studies; Therbligs; SIMO- chart principles of motion- economy. Introduction; Objectives; techniques (time) information recording; methods of things, Time study allowances; work sampling technique, Performances rating and its determinant ion technique, Performance rating and its determination PMTS; M.T.M., Work factor. |
| **Unit-II** | Principle of organization; Importance and characteristics of organization; Organization theories; Classical Organization theory; Neo-Classical organization theory, modern organization theory; Types of organization. Military or line organization, Functional organization, line and staff organization, Committee objectives of PPC; Functions of PPC Preplanning and planning; Routing; Estimating; scheduling; master schedule; Daily schedule; Gantt chart; Dispatching. |
| **Unit-III** | Introduction, Objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting, Collective opinion method, Delphi technique, economic indicator method; Regression analysis, introduction, Functions of inventory; Types of inventory; Control importance functions, Inventory costs, factors affecting inventory control, Various inventory controls models; A.B.C. analysis, lead-time calculations. |

| | |
|---|---|
| **Unit-IV** | Introduction, Objective; Concept and life cycle of a product and V.E.; Steps in V.E. Methodology and techniques, Fast diagram, Matrix method. Various concepts in industrial engineering.<br>a) Wages and Incentives; Concept; Types, plans, Desirable characteristics.<br>b) Supply Chain Management; Its Definition, Concept, Objectives, Applications, Benefits, some successful cases in Indian Industries.<br>c) JIT; Its definition, concept, importance, misconception, relevance, Applications, Elements of JIT (brief description)<br>d) Time Management; Introduction, steps of time man agreement, Ways for saving time KEY for time saving. |

**Suggested Readings**


1. Industrial Engineering and Organization Management-S.K. Sharma & Savita Sharma, KATSONs.
2. Industrial Engineering and Production Management by M. Mahajan, Dhanpat Rai & Co.
3. Production planning and control by S. Elion.
4. Industrial Engineering and management -I P Singh, Neelam Publications.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | SIMO Chart | https://youtu.be/BGxW2T8lhFU?feature=shared |
| | Allowances in Time Study | https://youtu.be/iTBirKYQ6zw?feature=shared |
| **UNIT-II** | Gantt chart | https://youtu.be/xZs7WsNPJXY?feature=shared |
| | Organization Theory | https://youtu.be/6_3VHAAJddY?feature=shared |
| **UNIT-III** | Planning, Sales forecasting and Budgeting | https://youtu.be/i7uPlBLBG4I?feature=shared |
| | Various inventory controls models | https://youtu.be/9tJv5COGkD0?feature=shared |
| **UNIT-IV** | Supply Chain Management | https://youtu.be/PmR2SKeY9Ms?feature=shared |
| | JIT | https://youtu.be/HkdoR-NNEoI?feature=shared |

| Course Code | **PEC-ME-214A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Courses | | | | |
| Course Title | **3D Printing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To aware the working principle and process parameters of additive manufacturing processes.<br>• To learn applications of AM processes in various fields.<br>• To know different post processing methods for AM.<br>• To learn the basics of different tooling and its methods for AM | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Recall the basic concepts, classifications, and applications of additive manufacturing technologies. | Level 1: Remember |
| **CO2** | Explain the processes, materials, and software used in additive manufacturing and reverse engineering. | Level 2: Understand |
| **CO3** | Apply additive manufacturing principles to model development, data processing, and part fabrication. | Level 3: Apply |
| **CO4** | Analyze additive manufacturing processes and post-processing methods for suitability and efficiency in various applications. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | **Introduction:** Overview of Additive Manufacturing (AM); AM history; Classification of AM; Merits/de-merits and applications of AM process; Outline on AM software's. Brief information on different materials used for AM.<br>**Reverse Engineering:** Meaning, Use, RE-The generic process, Phase of RE–scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development. |
| **Unit-II** | **CAD Data Processing for AM:** - CAD model development; Overview on Data requirements, Data formats (STL, SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP), Data interfacing, Part orientation and support generation; Design of support structure for AM; Overview on slicing methods; Tool path generation for AM. |
| **Unit-III** | **Liquid, Solid & Powder Based AM Technologies:** Stereo lithography; FDM; LOM; Multi-jet Modeling, SLS, Direct Metal Laser Sintering, 3-Dimensional Printing; Working Principles, products, materials, merits, drawbacks and applications –Case studies.<br>**Direct Energy Deposition AM Process:** Laser Engineered Net Shaping (LENS), Direct Metal Deposition (DMD), Electron Beam based metal deposition: working principles, products, benefits and drawbacks, applications. Overview on new & Hybrid AM technologies. |

| | |
|---|---|
| **Unit-IV** | **Post Processing of AM Parts:** Overview on support material removal, Surface quality and aesthetic improvement. Overview on construction of basic AM machines.<br>**Rapid Tooling:** Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.<br>**AM Applications:** Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP. |

**Suggested Readings**


1. Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing, Ian Gibson, David W Rosen, Brent Stucker, 2nd Edition, Springer, 2015
2. Rapid prototyping: Principles and applications, second edition, Chua C.K., Leong K.F., and Lim C.S., World Scientific Publishers, 2003
3. 3D Printing and Additive Manufacturing: Principles and Applications: Fourth Edition of Rapid Prototyping, Chee Kai Chua, Kah Fai Leong, World Scientific Publishers, 2014
4. Additive Manufacturing Technologies, Ian Gibson, David W. Rosen, Brent Stucker, Springer,2009


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Fundamentals of Additive Manufacturing | https://youtu.be/t7yv4gSnNkE?feature=shared |
| | Reverse Engineering | https://youtu.be/W2QpGdsTIJ8?feature=shared |
| **UNIT-II** | Slicing Methods | https://youtu.be/Neb9IdIctmI?feature=shared |
| **UNIT-III** | Stereo lithography | https://youtu.be/Aq6Ea8TBIbs?feature=shared |
| | Fused Deposition Modeling | https://youtu.be/Ua7pEn7Rsws?feature=shared |
| **UNIT-IV** | Post Processing of AM Parts | https://youtu.be/jq9Lqil6bLw?feature=shared |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-ME-216A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **CNC Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamentals and evolution of CNC technology.<br>• To learn CNC machine structure, hardware components, and coordinate systems.<br>• To learn manual and computer-aided part programming methods.<br>• To enable students to gain programming skills and tooling knowledge. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the key concepts & components of CNC machines and part programming.. | Level 1: Remember |
| **CO2** | Explain the working principles and structure of CNC systems and tooling. | Level 2: Understand |
| **CO3** | Apply CNC programming techniques to generate part programs for various machining operations. | Level 3: Apply |
| **CO4** | Analyze CNC machine operations & programs to improve machining efficiency and accuracy. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Computer Numerical Control (CNC) Technology: Numerical Control (NC), Historical Development of CNC Machines, NC Coordinate Systems, NC Modes, Advantages and Limitations of CNC Machine Tools. CNC Hardware: Structure of CNC Machine tools, Drives used in CNC machines, Actuation Systems of CNC Machines Tools, Feedback Devices used in CNC Machine. |
| **Unit-II** | CNC Programming Fundamentals: Part Programming Steps, Axes Identification in CNC Turning and Machining Centers, Machine Zero and Home Position, ISO Standards for Coding. Manual Part Programming: Preparatory Functions, Miscellaneous Functions, Absolute and Incremental Programming, Tool Length Compensation. |
| **Unit-III** | Turning Centre Programming: Motion Commands, Tool Nose Radius Compensation, Cut Planning, Thread Cutting, Part Program Numericals. Machining Centre Programming: Canned Cycles, Cutter Radius Compensation, Part Program Numericals. |
| **Unit-IV** | Computer Aided Part Programming: APT Language, Geometry Statements, Motion Statements, Post Processor Statements, Auxiliary Statements, Part Program Numericals. CNC Tooling: Cutting Tool Material and Characteristics, Turning Tool Geometry, Tooling System for Turning, and Milling. Tool Presetting, Automatic Tool Changers, Work Holding. |

**Suggested Readings**


1. Computer Numerical Control: Operation and Programming by Jon Stennerson, Prentice Hall.
2. CNC Programming Principles & Applications by Mattson Mike, Cengage learning.
3. Machining and CNC Technology by Fitzpatrick, McGraw-Hill Higher Education.
4. Industrial Engineering and management by I P Singh, Neelam Publications.
5. CNC Tips and Techniques: A Reader for Programmers by Peter Smid, Industrial Press Inc.


**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| **UNIT-I** | Computer Numerical Control (CNC) | https://youtu.be/Gi42gKGiCl0?feature=shared |
| **UNIT-II** | Preparatory functions | https://youtu.be/Mj6VbVL4tn0?feature=shared |
| | Absolute and Incremental Programming | https://youtu.be/PN_tGm5Gip4?feature=shared |
| **UNIT-III** | CNC programming | https://youtu.be/_5r2XR1h1aQ?feature=shared |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-ME-218A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Composite Materials** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts of composite materials.<br>• To learn the mechanical behaviour of composite materials.<br>• To get an overview of the methods of manufacturing composite materials. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the basic concepts and fundamental of composite materials. | Level 1: Remember |
| **CO2** | Describe the roles and characteristics of matrix and reinforcement materials in composite structures. | Level 2: Understand |
| **CO3** | Apply preparation and processing methods for different types of composite materials. | Level 3: Apply |
| **CO4** | Analyze the influence of composite composition & manufacturing techniques on material performance. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Content |
|---|---|
| **Unit-I** | **Introduction**: Definition - Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. |
| **Unit-II** | **Reinforcements**: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Iso-strain and Iso-stress conditions. |
| **Unit-III** | **Manufacturing of Metal Matrix Composites:** Casting – Solid State diffusion technique, Cladding - Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration - Liquid phase sintering. Manufacturing of Carbon - Carbon composites: Knitting, Braiding, Weaving. Properties and applications. |
| **Unit-IV** | **Manufacturing of Polymer Matrix Composites**: Preparation of moulding compounds and prepregs - hand layup method – Autoclave method – Filament winding method- Compression moulding – Reaction injection moulding. Properties and applications. |

**Suggested Readings**


1. Hand Book of Composite Materials-George Lubin
2. Composite Materials– K.K. Chawla.
3. Composite Materials Science and Applications–Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tsai.


## Useful Video links

| Unit No. | Topic | Link |
|---|---|---|
| UNIT-I | Classification of composite materials. | https://youtu.be/0kB0G6WKhKE?feature=shared |
| | Effect of reinforcement on composite. | https://www.youtube.com/watch?v=_JAGKikeCSY |
| UNIT-II | Preparation-layup, curing, properties. | https://youtu.be/649fIwvIvRc?feature=shared |
| | Mechanical Behavior of composites | https://www.youtube.com/watch?v=IZXHu5IQOrM |
| | Iso-strain and Iso-stress conditions | https://www.youtube.com/watch?v=dj8r0M5LsnQ |
| UNIT-III | Manufacturing of Metal Matrix Composites | https://www.youtube.com/watch?v=aNie6dhPKZk |
| | Manufacturing of Ceramic Matrix Composites | https://www.youtube.com/watch?v=bdC8yySkARs |
| | Manufacturing of Carbon – Carbon composites | https://www.youtube.com/watch?v=zC3M51uosDc |
| UNIT-IV | Manufacturing of Polymer Matrix Composites | https://youtu.be/uO8EMAUh1po?feature=shared |
| | Filament winding method- Compression moulding | https://www.youtube.com/watch?v=qos45EwMmd0 |
| | Reaction injection moulding | https://www.youtube.com/watch?v=T4C4m0Q8a6Q |

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

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## Minutes of 2nd meeting of Board of Studies of Electronics and Communication Engineering (ECE) Department

The 2nd meeting of Board of Studies of Electronics and Communication Engineering (ECE) Department was held on 24.05.2025 at 11:00 A.M in the Conference Hall of the Institute.

The following members were present for the BOS meeting:

| S.No. | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Prof. Rakesh Kumar Joon | Head of the Department | Chairperson |
| 2 | Prof. Manoj Taleja | Professor, NIT, New Delhi | Member |
| 3 | Prof. Pradeep Sangwan | Professor, MSIT, New Delhi | Member |
| 4 | Dr. Vivek Kumar | Professor, GITAM, Kablana | Member |
| 5 | Dr. Rishu Bhatia | Professor, GITAM, Kablana | Member |
| 6 | Dr. Hitanshu | Associate Professor, GITAM, Kablana | Member |
| 7 | Dr. Nitin Kumar | Associate Professor, GITAM, Kablana | Member |
| 8 | Mr. Amit Dalal | Asst. Professor, GITAM, Kablana | Member |
| 9 | Mr. Satish | Asst. Professor, GITAM, Kablana | Member |
| 10 | Ms. Lalina | Asst. Professor, GITAM, Kablana | Member |
| 11 | Ms. Gagan Preet | Asst. Professor, GITAM, Kablana | Member |
| 12 | Ms. Ritu Juneja | Asst. Professor, GITAM, Kablana | Member |
| 13 | Mr. Vishal | Asst. Professor, GITAM, Kablana | Member |
| 14 | Mr. Dhruv Malik | Asst. Professor, GITAM, Kablana | Member |
| 15 | Ms. Neetu Sharma | Asst. Professor, GITAM, Kablana | Member |
| 16 | Ms. Deepanshi | Asst. Professor, GITAM, Kablana | Member |
| 17 | Ms. Ritu Rana | Asst. Professor, GITAM, Kablana | Member |
| 18 | Ms. Rashmi Kiran | Asst. Professor, GITAM, Kablana | Member |
| 19 | Mr. Devender Nath Maurya | Mr. Devender Nath Maurya, Manager (R&D), Embedded Deptt. Company Name: Virtual Employee Pvt. Ltd. , J-38, Sector-63, Noida, GB Nagar, UP-201301 | Member |

HOD ECE

| | | | |
|---|---|---|---|
| 20 | Mr. Nishant Dev Rathi | Decimal Technologies, Urban Business Park sector-67 Gurugram | Member |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Agenda wise Discussion and Resolutions**

**Item No. 2.1**

Confirmation of the minutes of 1st Meeting of the Board of Studies of Electronics and Communication Engineering Department held on 04.01.2025

**The minutes of 1st meeting of the Board of Studies of Electronics and Communication Engineering Department held on 04.01.2025 (Annexure I: Pages 1-3 already circulated) be confirmed.**

**Item No. 2.2**

Follow up action report of the decisions taken in the 1st Meeting of Board of Studies held on 04.01.2025 **(Annexure II: Pages 4 already circulated)**

**The Follow up action report of the decisions taken in the 1st Meeting of Board of Studies held on 04.01.2025 be noted.**

**Item No. 2.3**

Amendment in the course title and course contents of M.Tech Electronics and Communication Engineering 1st year w.e.f. Academic Year 2025-26 **(Annexure III: Pages 5 to 12)**

**Resolved that amendment in the course title and course contents of M.Tech Electronics and Communication Engineering 1st year are approved and further resolved that the same is recommended to the Academic Council for approval as given below:**

b) Amendment in course title of M.Tech Electronics and Communication Engineering:

| Name of the Course | Semester | Course Code | Existing Course Title | Amended Course Title |
|---|---|---|---|---|
| Microprocessor and Microcontroller lab | 1st | LC-MTECE-113A | Microprocessor and Microcontroller Lab | Microprocessor and Embedded Systems Lab |
| Advanced VLSI Design and Semiconductor Technologies | 2nd | PCC-MTECE-104A | Advanced VLSI Design and Semiconductor Technologies | VLSI Design and Semiconductor Technologies |

c) Amendment in Course Contents of M.Tech Electronics and Communication Engineering:

| Name of the Course | Semester | Course Code | Added Course Contents |
|---|---|---|---|
| Satellite communication and Space Technology | 1st | PCCC-MTECE-101A | Satellite Orbits, Space debris and collision avoidance, HEO satellites, Orbital perturbations and station keeping, FM improvement factor, Interference effects on complete link design, ITU-R propagation models, Antenna subsystems, frequency reuse antennas, Global positioning Satellite Systems, Cyber Security threats in satellite systems to meet with the latest technology and trends of the industry |
| Information Theory and Coding Techniques | 1st | PCCC-MTECE-103A | Systematic Cyclic Codes, Non-systematical Cyclic Codes, Performance comparison for coded and uncoded system, Interleaving of coded data for channels with burst errors to meet with the upcoming and latest technology |
| Data Networks and Communication Protocols | 1st | PCCC-MTECE-107A | FDMA, TDMA, CDMA, SDMA and their comparison |

**Item No. 2.4**

Scheme of Examinations and Syllabus of 2nd year M.Tech Electronics and Communication Engineering from Academic Year 2025-26

**Resolved that the Scheme of Examinations and Syllabus of 2nd year M.Tech Electronics and Communication Engineering from Academic Year 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure IV: Pages 13 to 39).**

**Item No. 2.5**

Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Electronics and Communication Engineering Department for various PG Programs offered by the Institute for Academic Year 2025-26

**Resolved that Scheme of Examinations and Syllabus of the 2nd year of Multidisciplinary Open Elective-II courses offered by the Electronics and Communication Engineering Department for various PG Programs offered by the Institute for Academic Year 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure V: Pages 40 to 41).**

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**Item No. 2.6**

Scheme of Examinations and Syllabus of 2nd year B.Tech Electronics and Communication Engineering from Academic Year 2025-26

**Resolved that Scheme of Examinations and Syllabus of 2nd year B.Tech Electronics and Communication Engineering from Academic Year 2025-26 be approved and recommended to the Academic Council for the approval (Annexure VI: Pages 42 to 95).**

**Item No. 2.7**

Review of the Panel of Examiners for Theory and Practical's of B.Tech Electronics and Communication Engineering and M.Tech Electronics and Communication Engineering programs for Academic Year 2025-26

**The panel of examiners for Theory and Practical's of B.Tech Electronics and Communication Engineering and M.Tech Electronics and Communication Engineering programs for Academic Year 2025-26 has been reviewed and approved. The same is to be sent to the Controller of Examinations of the Institute for the Information (Annexure VII: Pages 96 to 97).**

**Item No. 2.8**

Any other item with the permission of the chair.

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Department of ECE**

**Endst No.** GITAM/BOSECE/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs

**Chairperson**
**Board of Studies**
**Department of ECE**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**M.Tech (Electronics & Communication Engineering) – 1st Semester**

***W.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTECE-101A | Satellite Communication and Space Technology | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-MTECE-103A | Information Theory and Coding Techniques | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-MTECE-105A | Advanced Digital Signal Processing and Systems | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-MTECE-107A | Data Networks and Communication Protocols | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-MTECE-109A | Microprocessor and Embedded Systems | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 6 | Lab Course | LC-MTECE-111A | Satellite Communication Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 7 | Lab Course | LC-MTECE-113A | Microprocessor and Embedded Systems Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Seminar | SM-MTECE-115A | Seminar-I | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| | | | | | | | **Total Credits** | **24** | **300** | **300** | **50** | **650** | |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**M.Tech (Electronics & Communication Engineering) – 2nd Semester**

***W.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional CoreCourses | PCC-MTECE-102A | Optical Communication | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional CoreCourses | PCC-MTECE-104A | VLSI Design and Semiconductor Technologies | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Professional Elective Courses | Refer Annexure -I | Professional Elective Table -I | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Multidisciplinary Open Elective Courses | Refer Annexure -I | MultidisciplinaryOpen Elective Table -II | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Foundation Elective Courses | Refer Annexure -I | Foundation Elective Table -III | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Lab Course | LC-MTECE-106A | VLSI Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 7 | Lab Course | LC-MTECE-108A | Optical Communication Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Seminar | SM-MTECE-110A | Seminar-II | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| **Total** | | | | | | | | **22** | **300** | **300** | **50** | **650** | |

| Course Code | PCC-MTECE-101A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Satellite Communication and Space Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Learn about the history, advantages and applications of satellite communication systems.<br>• Study the effects of environmental factors on satellite signal propagation.<br>• Explore orbital mechanics and satellite launching processes.<br>• Gain insights into the design of satellite communication links.<br>• Understand modulation, detection techniques of satellite systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define fundamental concepts and operational terminologies of satellite communication systems. |
| CO2 | Explain launch mechanisms, Earth station parameters, subsystems, link design equations and environmental effects influencing signal propagation and satellite performance. |
| CO3 | Apply Kepler's laws, orbital determination techniques, modulation methods, detection techniques, and error rate performance to optimize satellite communication systems. |
| CO4 | Analyze synchronization techniques, multiple access methods, security protocols and their effects on satellite communication performance. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Origin, brief history & elements of communication satellites, Satellite frequency allocation & band spectrum, Satellite orbits, types, advantages and applications of satellite communication, Concept of download and uplink frequency in satellite communication, Space debris and collision avoidance, Current status of satellite communication. |
| Unit-II | **Orbital Mechanism and Satellite Launching :** Kepler's laws, LEO, MEO, GEO and HEO satellites and their characteristics, Look angle, Azimuth angle, Elevation angle, Orbital determination, Orbital perturbations and station keeping, Mechanism of launching a Satellite, Overview of current and reusable launch vehicles.<br>**Satellite Link Design:** General link design equation, Complete link design, FM improvement factor, Interference effects on complete link design, Earth Station parameters, Delay Transponders, Eclipse effects. |

| | |
|---|---|
| **Unit-III** | **Propagation Effects:** Introduction, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Eliminating propagation effects, ITU-R propagation models.<br>**Satellite Subsystems:** Telemetry, tracking and command system, Transponder communication link, Antenna subsystems, frequency reuse antennas. |
| **Unit-IV** | **Multiple Access Techniques:** Introduction and comparison of FDMA, TDMA, CDMA, SDMA, Advantages and disadvantages of TDMA and FDMA, Hybrid systems.<br>**Global positioning Satellite Systems:** GPS Development, Technical Structure Applications, The Trilateration method, GPS codes, GPS receiver Error correction, Applications of GPS technology.<br>**Satellite Security and Encryption:** Overview to Cyber Security threats in satellite systems, Encryption techniques, Authentication, Early warning satellites, Reconnaissance satellites. |

**Suggested Readings:**

- Satellite Communications by Dennis Roddy, TMH
- Satellite Communication by D.C. Aggarwal, Khanna Publishers
- Satellite Communication by T. Pratt and C.W. Boston, John Willey and sons
- Satellite Communication by Monojit Mitra, PHI
- Fundamentals of satellite Communication by K.N.Raja Rao, PHI
- Satellite Communications by Sapna Katiyar , Katson Books
- Satellite Communications Systems Engineering by Louis J. Ippolito, Wiley

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Space Debris and Collision Avoidance | https://www.youtube.com/watch?v=OlZfC_6b-dY |
| | Active & Passive satellite. Applications of satellite communication | https://www.youtube.com/watch?v=Xf7AqkTiZf4 |
| **Unit-II** | Overview of launch vehicle technologies | https://www.youtube.com/watch?v=SMX4-rIIIak |
| | Satellite and Orbits, Types of Orbits | https://www.youtube.com/watch?v=GGncz-DKkeU |
| | Propagation Effects in Satellite Communication | https://www.youtube.com/watch?v=-ltobgKDdWU |
| **Unit-III** | Rain Attenuation | https://youtu.be/ulCRyxC5H3o |
| **Unit-IV** | Satellite Cyber security and Encryption | https://www.youtube.com/watch?v=AltCfizF_4w |
| | Multiple Access Techniques (FDMA, TDMA, CDMA) | https://www.youtube.com/watch?v=HFNbkmub6MQ |



| Course Code | PCC-MTECE-103A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Information Theory and Coding Techniques** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand key concepts in information theory, like informationand redundancy.<br>• Explore methods to detect and correct errors in data.<br>• Study linear block codes and their use for error correction.<br>• Compare the effectiveness of different coding methods for errorcorrection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define the fundamental concept of information, entropy, mutual and joint information for efficient encoding schemes used in communication system. |
| CO2 | Understand and apply the principle of various channel encoding/decoding schemes used in communication system. |
| CO3 | Apply various error detection and correction techniques used in communication system like linear block code, cyclic code & hamming code etc. |
| CO4 | Analyze the various parameters and coding schemes to maximize the efficiency rate of communication system. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Information Theory:** Concept of Information and Entropy, Shannon's theorems, Channel Capacity Self information, Discrete and Continuousentropy, Mutual and joint information, Redundancy. |
| Unit-II | **Coding Theory:** Source encoding & channel encoding, Error detection & Correction, Various codes for channel coding, Rate Distortion functions. Linear block codes, systematic linear codes & optimum coding for Binary symmetric channel. Systematic Cyclic Codes, Non-systematical Cyclic Codes. |
| Unit-III | **Information Theory Codes:** The Generator & parity check matrices, Syndrome decoding & Symmetric channels. Hamming codes, Weight enumerator, Perfect codes, BCH codes, Idempotent & Mattson Solomon polynomials, Reed Solomon codes, Justeen codes, MDS codes & generalized BCH codes, Convolution codes & Viterbi decoding algorithm. |
| Unit-IV | **Performance of codes:** Performance comparison for coded and uncoded system, Performance of linear block codes & convolution code, code incurable error probability Upper & lower bounds. Interleaving of coded data for channels with burst errors. |

**Suggested Readings:**

- Digital Modulation and Coding by Wilson, Pearson
- Communication System by B.P. Lathi, Oxford
- Information Theory, Coding & Cryptography by Ranjan Bose, TMH
- Principles of Digitals Communication by J. Dass. , S.K. Malik & P.K. Chatterjee
- Information Theory and Coding by Nitin Mittal, Bharat
- Information Theory and Coding by Murlidhar Kulkarni, K.S. Shivaprakasha, Wiley

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Huffman Coding | https://www.youtube.com/watch?v=uDS8AkTAclU |
| Unit-II | Introduction to Rate Distortion Theory | https://youtu.be/qmCTnAoMSc8 |
| Unit-III | Convolution Codes | https://youtu.be/9JTXHsZVutM |
| Unit-IV | Block Code & Amp; its Properties | https://youtu.be/5d9O530dUKQ |



| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **PCC-MTECE-107A** | | | | | |
| Category | Professional Core Course | | | | | |
| Course Title | **Data Networks and Communication Protocols** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** | |
| | 4 | 0 | 0 | 4 | | |
| Course Objectives | The objectives of this course are to<br>• Introduce the fundamentals of data communication networks.<br>• Understand the functions of various topologies and switching techniques.<br>• Understand the functions of various protocols of the Data link layer.<br>• Examine various layer Protocols of OSI & TCP/IP models. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define the fundamental concepts of analog and digital transmission of data communication network. |
| CO2 | Describe various switching techniques and topologies of data communication network. |
| CO3 | Apply various detection and correction techniques used in data communication network. |
| CO4 | Analyze various communication architectures and their protocols in data communication network. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Data Transmission:** Overview of Data Communication and networking, Analog And Digital Data Transmission, Transmission Impairments, Various Transmission Media, Data Encoding.<br>**Digital Data Communication Techniques**: Asynchronous And Synchronous Transmission, Error Detection and correction techniques, Physical interfaces. |
| Unit-II | **Data Link Control:** Link Configurations, Protocol principles (Error control, Flow control), Bit Oriented and character oriented protocol, Data link layer services, Link Control.<br>**Multiplexing and access techniques:** F.D.M. Synchronous TDM, Statistical TDM, FDMA, TDMA, CDMA, SDMA and their comparison . |
| Unit-III | **Communication Networking Techniques:** Communication Networks, Circuit Switching, Message Switching, Packet Switching, Local Networking Technology, The bus / tree topology, the ring topology, Medium Access control protocols (CSMA/CD, Token ring, FDDI, DQDB). |

| | |
|---|---|
| **Unit-IV** | **Computer Communication Architecture:** OSI and TCP/IP Model, Protocol And Architecture, Networking Access protocols, Inter Networking, Transport layer Protocols, Session Service And Protocols, and Presentation/ Application protocols **ISDN Networks**: Concepts & Architecture, Protocols. |

**Suggested Readings:**

- Data and Computer Communication by William Stallings, PHI
- Data communications and networking by Forouzan, TMH
- Computer Networking by Andrew Tanenbaum, PHI
- Data communications and network by Godbole, TMH
- Data Communication and networks by Dr. Sanjay Sharma, Katson
- Introduction to data communications and networking by Wayne Tomasi, Pearson

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Communication Networks–An Introduction and Overview | https://www.youtube.com/watch?v=VwN91x5i25g&list=PLBlnK6fEyqRgneraVKkEXrwyLVx2vJUvt |
| **Unit-II** | Multiplexing | https://www.youtube.com/watch?v=L5jJIN8Z4lo |
| **Unit-III** | Switching Techniques Circuit Switching | https://www.youtube.com/watch?v=yZV3y-usK_g |
| **Unit-IV** | ISDN Networks | https://www.youtube.com/watch?v=CGXkmyRLSLk |



## GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR

### Scheme of Studies and Examination

### M.Tech (Electronics & Communication Engineering) – 3rd Semester

*W.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTECE-201A | Neural Networks & Fuzzy Logic | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Annexure -II | Professional Elective Table-IV | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Multidisciplinary Open Elective Courses | Refer Annexure -II | Multidisciplinary Open Elective Table-V | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Mandatory Learning Courses | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Seminar | SM-MTECE-217A | Seminar-III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 6 | Lab Course | LC-MTECE-211A | MATLAB-Based Modelling and Simulation Lab | 0 | 0 | 2 | 2 | 1 | 50 | | 50 | 100 | 3 |
| 7 | Project | PROJ-MTECE-213A | Project Lab | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 8 | Dissertation | DISS-MTECE-215A | Dissertation (Phase-I) | 0 | 0 | 4 | 4 | 2 | 100 | | - | 100 | 3 |
| **Total** | | | | | | | | **21** | **410** | **240** | | **750** | |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**M.Tech (Electronics & Communication Engineering) – 4th Semester**

***W.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTECE-202A | Dissertation | 0 | 0 | 20 | 20 | 20 | 250 | - | 500 | 750 | 3 |
| **Total** | | | | | | | | **20** | **250** | **-** | **500** | **750** | |

**Annexure-II**

**Professional Elective (Table-IV)**

| SN | Course Code | Course Name |
|---|---|---|
| 1 | PEC-MTECE-203A | CDMA System |
| 2 | PEC-MTECE-205A | Next-Generation Wireless Technologies |
| 3 | PEC-MTECE-207A | RF and Microwave Circuit Design |
| 4 | PEC-MTECE-209A | Cognitive Radio |
| 5 | PEC-MTECE-211A | Markov Chain and Queuing System |
| 6 | PEC-MTECE-213A | MIMO System |
| 7 | PEC-MTECE-215A | Analog IC Design |

**Multidisciplinary Open Elective-II Courses (Table-V)**

| Sr. No. | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEC-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Sources of Energy - II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics and Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

| Course Code | PCC-MTECE-201A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | Neural Networks & Fuzzy Logic | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to:<br>• Introduce neural network basics, historical development, neuron models, and common topologies.<br>• Explain learning methods and models like Hopfield, Kohonen, and K-means clustering.<br>• Explore advanced neural networks such as RBF, back propagation and ART architectures.<br>• Apply neural networks and fuzzy logic in real-world applications and intelligent systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define and explain the fundamental concepts of neural networks and fuzzy logic, their structures, and applications. |
| CO2 | Apply neural network models to solve real-world problems related to classification, clustering and pattern recognition. |
| CO3 | Categorize neural network learning methods and their effectiveness for various applications. |
| CO4 | Analyze the performance of neural network architectures and fuzzy logic systems in solving computational problems. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Neural networks characteristics, history of development in neural networks principles, network architecture, biological neural network, artificial neural network terminology, model of a neuron, topology. |
| Unit-II | **Learning Methods & Neural network models**: Types of learning, supervised, unsupervised, reinforcement learning. knowledge, representation and acquisition. basic hop field model, basic learning laws, unsupervised learning, competitive learning, k-means clustering algorithm, Kohonen`s feature maps. |
| Unit-III | **Artificial Neural Networks:** Radial basis function neural networks, basic learning laws in RBF nets, recurrent back propagation. introduction to counter propagation networks, CMAC network, and ART networks.<br>Applications of neural nets: Applications such as pattern recognition, Pattern mapping, Associative memories, speech and decision-making. |
| Unit-IV | **Fuzzy Logic:** Basic concepts of fuzzy logic, Fuzzy vs. Crisp set, Linguistic variables, Membership functions, Fuzzy sets & Operations of fuzzy sets, Fuzzy IF- THEN rules, Variable inference techniques, De-Fuzzification, Basic fuzzy inference algorithm, Fuzzy system design, Antilock Breaking system (ABS), Industrial applications. |

**Suggested Readings:**

- Artificial Neural Networks by B. Yegnanarayana, PHI
- Introduction to artificial neural systems by J.M. Zurada, Jaico Pub.
- Fuzzy logic with engineering application by ROSS J.T, TMH
- Neural Networks by Simon Haykin, PHI

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Model of Neuron | https://youtu.be/vbNDNkvzzuk |
| Unit-II | K-means Clustering | https://youtu.be/ZTP6b3LaVGg |
| Unit-III | Radial basis function | https://youtu.be/yk_dsPu9Hmg |
| Unit-IV | Introduction: Fuzzy set, Logic & System | https://youtu.be/JrRWdPvG7yk |



| Course Code | **PEC-MTECE-203A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **CDMA System** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand fundamental CDMA concepts, spread spectrum techniques, and sequence correlation functions.<br>• Analyze error probabilities, fading effects, and performance metrics in CDMA systems.<br>• Evaluate capacity, power control strategies, and handoff techniques in CDMA networks.<br>• Explore advanced CDMA technologies, coding trade-offs, and multi-user detection methods. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define key concepts of CDMA systems, DSSS, FHSS, spreading sequence and their correlation functions. |
| CO2 | Explain acquisition and tracking of spread spectrum signals and error performance of DS-CDMA over AWGN and frequency-selective fading channels. |
| CO3 | Examine the impact of power control and handoff mechanism in improving CDMA system performance. |
| CO4 | Analyze how coding tradeoffs, multi-carrier CDMA techniques and multi-user detection affect capacity, performance and limitations of cellular CDMA systems under varying conditions. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | Introduction of direct sequence and frequency hopped spread spectrum, spreading sequence and their correlation functions, acquisition and tracking of spread spectrum signals, multipath and RAKE receiver, CDMA in cellular communication |
| Unit-II | Error probability for DS-CDMA on AWGN channels, DS-CDMA on frequency selective fading, channels, Performance analysis of cellular CDMA, Orthogonal Frequency Division Multiplexing (OFDM), OFDM synchronization, Multi Carrier-CDMA, Difference between OFDMA and MC-CDMA |
| Unit-III | CDMA channel structure, Capacity estimation, Power control, effect of imperfect power control on DS CDMA performance, reverse link power control and forward link power control in open loop and closed loop, hard handoffs, soft Handoffs. |
| Unit-IV | Forward pilot channel, forward synchronization channel, reverse pilot channel, reverse access channel, spreading /coding tradeoffs, multi-carrier CDMA, IS-95 CDMA system, UMTS, multi-user detection. |



**Suggested Readings:**

- CDMA Principles of spread spectrum communications by Andrew J. Viterbi, Addison Wesley 1995.
- The cdma 2000 system for mobile communication by Vanghi, Vieri, Pearson Education
- Communication Systems (Analog and Digital) by Sanjay Sharma, S. K. KATARIA & SONS
- Spread spectrum CDMA by Steve Lee, TMH
- CDMA system Engineering handbook by J.S. Lee and L.E. Miller, Artech house 1998.
- CDMA : 2000 : Cellular/ PCS system Implementation by Garg, Pearson

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Introduction to CDMA, Spread Spectrum and LFSR | https://youtu.be/TJNKoRPn-G8 |
| Unit-II | Frequency Selective Fading | https://youtu.be/SB2ECmjwre0 |
| Unit-III | Power control - Need, objectives and classifications | https://youtu.be/JOI1cBQ9eSc |
| Unit-IV | CDMA based IS 95 standard | https://youtu.be/Nu1n4kpGx8c |



| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **PEC-MTECE-205A** | | | | | |
| Category | Professional Elective Course | | | | | |
| Course Title | **Next-Generation Wireless Technologies** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 4 | 0 | 0 | 4 | | |
| Course Objectives | The objectives of this course are to<br>• Understand the evolution of mobile communication from 5G and beyond technologies.<br>• Learn advanced waveforms and multiple access techniques used in Next gen mobile comm.<br>• Study the architecture and protocol layers of 5G networks.<br>• Explore applications like Massive MIMO, IoT, D2D, and V2X in next-generation mobile networks. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Define and understand the fundamental concepts and evolution of mobile generations, their deployment challenges with suitable applications. |
| **CO2** | Describe the architecture, core network components, protocols and control planes of modern mobile communication systems. |
| **CO3** | Apply multiple access techniques to design and implement mobile communication systems |
| **CO4** | Analyze the technological parameters of various mobile generations and their impact on system performance and service capabilities to address future requirement. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| **Unit No.** | **Contents** |
|---|---|
| **Unit-I** | Introduction to 5G and Network Evolution: Overview of 3G and 4G (LTE), Introduction to 5G: Vision and Use Cases , Evolution from LTE to 5G , 5G NR and Core Network (5GCN) , Spectrum for 5G , Deployment Options and Challenges |
| **Unit-II** | 5G Waveforms and Access Technologies: OFDM and OFDMA , MIMO-OFDM , Generalized Frequency Division Multiplexing (GFDM) , Universal Filtered OFDM (UF-OFDM) , Non-Orthogonal Multiple Access (NOMA) , Comparison of Multiple Access Techniques |
| **Unit-III** | 5G Architecture and Protocols: 5G NR Requirements , Core Network and Radio Access Network (RAN) Overview , Radio Protocol Architecture , User Plane and Control Plane Protocols , Medium Access Control (MAC) and Physical Layer Overview , Logical and Transport Channels in 5G NR |
| **Unit-IV** | Applications: Massive MIMO and Beam forming , Device-to-Device (D2D) Communication , 5G for IoT and V2X (Vehicle-to-Everything) Communication, Overview of 6G and beyond technologies and their future applications |

**Suggested Readings:**

- 5G Mobile Communication by Dr. S. K. Gupta, Wiley India
- Mobile Communications by SCHILLER JOCHEN, Pearson Education
- 5G Technology: A Comprehensive Guide by Prof. R. K. Gupta & Prof. A. K. Verma, Wiley India
- Mobile Communication Systems by Wesolowski, Krzysztof, Wiley India

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Introduction to 5G | https://youtu.be/SbYltPawklg |
| Unit-II | 5G Technologies | https://youtu.be/krAfb0morss |
| Unit-III | 5G Network Architecture | https://youtu.be/MdPY0UCQe2o |
| Unit-IV | Massive MIMO | https://youtu.be/RwZn3VEzHBc |



| Course Code | PEC-MTECE-207A | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **RF and Microwave Circuit Design** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Gain insight into microwave transmission lines, impedance matching, and network analysis<br>• Familiarize with working principles of passive microwave components<br>• Understand about the behaviour of microwave devices and affect of noise and nonlinearity.<br>• Explore circuit-level design of RF amplifiers, oscillators, and mixers used in communication systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define and understand the operating principles and functions of key passive microwave components with their roles in RF systems. |
| CO2 | Apply techniques for impedance matching and network parameter evaluation, and analyze the behavior of microwave transmission lines using circuit and field models |
| CO3 | Interpret the characteristics of microwave semiconductor devices and describe the effects of nonlinearity, noise, and distortion on system performance. |
| CO4 | Design and analyze microwave amplifiers, oscillators, and mixers using appropriate performance metrics such as gain, stability, and noise figure. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Transmission Line Theory:** Lumped element circuit model for transmission line, field analysis, Smith chart, quarter wave transformer, generator and load mismatch, impedance matching and tuning.<br>**Microwave Network Analysis:** Impedance and equivalent voltage and current, Impedance and admittance matrix, The scattering matrix, transmission matrix, Signal flow graph. |
| Unit-II | **Microwave Components:** Microwave resonators, Microwave filters, power dividers and directional couplers, Ferromagnetic devices and components.<br>Nonlinearity And Time Variance Inter-symbol interference, random process & noise, definition of sensitivity and dynamic range, conversion gain and distortion. |
| Unit-III | **Microwave Semiconductor Devices And Modelling:** PIN diode, Tunnel diodes, Varactor diode, Schottky diode, IMPATT and TRAPATT devices, transferred electron devices, Microwave BJTs, GaAs FETs, low noise and power GaAs FETs, MESFET, MOSFET, HEMT. |
| Unit-IV | **Amplifiers Design:** Power gain equations, stability, impedance matching, constant gain and noise figure circles, small signal, low noise, high power and broadband amplifier, oscillators, Mixers design. |

**Suggested Readings:**

- Microwave and Radar Engineering by Kulkarni, M, Umesh Publication
- Microwave Devices and Circuit Design Srivastava, G, PHI Learning
- Microwave devices and circuit by Liaom Samuel Y, Pearson Education
- Microwave Engineering : Passove Circuits by Rizzi, Peter A, PHI Learning
- Microwave and Radar Engineering by Arora, Navneet , Ishan Publication

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Lumped element circuit model for transmission line | https://www.youtube.com/watch?v=m2I-4sQNKLw&pp=ygUyTHVtcGVkIGVsZW1lbnQgY2lyY3VpdCBtb2RlbCBmb3lgdHJhbnNtaXNzaW9uIGxpbmU%3D |
| **Unit-II** | Microwave resonators, Microwave filters | https://www.youtube.com/watch?v=2w0hRoKLr_k&list=PLc3zKsWdO93f_OQ8eUzuqbP9ODPIjKDpO |
| **Unit-III** | Microwave Semiconductor Devices And Modelling | https://www.youtube.com/watch?v=lqXoTja8Kuc&list=PLgwJf8NK-2e5sQL18mb1B9E0QlYLGMFFe |
| **Unit-IV** | Amplifiers Design: Power gain equations, stability, impedance matching | https://www.youtube.com/watch?v=RIBR5tIA94M&pp=ygUzUG93ZXIgZ2FpbiBlcXVhdGlvbnMsIHN0YWJpbGl0eSwgaW1wZWRhbmNlIG1hdGNoaW5n |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTECE-209A** | | | | |
| Category | Professional Elective Course | | | | |
| Course Title | **Cognitive Radio** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Introduce basic concepts, architecture, and functions of cognitive radio and dynamic spectrum access.<br>• Know how radios find and use free spectrum with help from TV signals and maps.<br>• Apply optimization methods for dynamic spectrum allocation and efficient spectrum use.<br>• Explore spectrum access strategies, cognitive system architectures, and learning-based decision-making approaches | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define and understand the architecture, key functions, and applications of cognitive radios, dynamic spectrum access, and the key concept of digital dividend. |
| CO2 | Apply spectrum sensing methods and collaborative techniques for detecting available spectrum holes and sharing models. |
| CO3 | Apply optimization techniques like linear, convex, and dynamic programming to solve spectrum allocation problems. |
| CO4 | Analyze dynamic spectrum access strategies and protocols, including centralized, distributed and learning - based cognitive radio architectures. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | Introduction to Cognitive Radios: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio. |
| Unit-II | Spectrum Sensing: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market). |
| Unit-III | Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming. |
| Unit-IV | Dynamic Spectrum Access and Management: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols. |

**Suggested Readings:**

- Dynamic spectrum access and management in cognitive radio networks by Hossain, E., Niyato, D., & Han, Z Cambridge University Press.
- Dynamic spectrum management: From cognitive radio to blockchain and artificial intelligence by Liang, Y.-C. (2020), Springer
- Cooperative spectrum sensing and resource allocation strategies in cognitive radio networks by Fernando, X., Sultana, A., Hussain, S., & Zhao, L, Springer
- Radioactive Materials by Rao, B M, Himalaya Publishing House

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Cognitive Radio | https://youtu.be/SljXFf0vgvw |
| Unit-II | Spectrum Sensing | https://youtu.be/iorvwRwOs-s |
| Unit-III | Optimization Techniques of Dynamic Spectrum Allocation: Linear programming, | https://www.youtube.com/watch?v=knZrhVkZ71Q&list=PLU6SqdYcYsfLewoQPYjgg7SMBLjSV704v |
| Unit-IV | Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access | https://www.youtube.com/watch?v=qSoVP3Zxral |



| Course Code | PEC-MTECE-211A | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Markov Chain and Queuing System** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understanding basic probability and theorems to explain random events and their effect on systems behaviour.<br>• Understand Poisson processes, renewal processes and Markov chains in discrete and continuous time.<br>• Study basic queuing models and evaluate system performance using standard measures.<br>• Explore priority, vacation, and retrial queues and examine their effect on system performance. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define the concepts of basic probability, nonnegative random variables, laws of large numbers, and the Central Limit Theorem to analyze stochastic systems. |
| CO2 | Analyze renewal processes, Poisson processes, and Markov chains (discrete and continuous time), including their long-term behaviour using theoretical results such as Wald's and Blackwell's theorems. |
| CO3 | Examine queuing systems using fundamental results like Little's Theorem, conservation laws, and solve Markovian queues using Jackson and BCMP network models. |
| CO4 | Identify advanced queuing models including M/G/1, G/M/1, G/G/1 systems and queues with priorities, vacations and retrials, and assess their performance using analytical and numerical methods. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | Introduction: Review of basic probability, properties of nonnegative random variables, laws of large numbers and the Central Limit Theorem.<br>Renewal Processes: Basic definitions, recurrence times, rewards and renewal reward theorem, point processes, Poisson process, Walds equation, Blackwell's theorem. |
| Unit-II | Discrete time Markov chains: definitions and properties, matrix representation, Perron-Frobenius theory.<br>Continuous time Markov chains: basic definitions, Q-matrix, birth-death processes, quasibirth death processes. Embedded Markov processes, semi Markov processes, reversible Markov chains, Random walks. |
| Unit-III | Fundamental queuing results: Little's theorem, invariance of the mean delay, Conservation law. |
| Unit-IV | Markovian queues: Jackson and BCMP networks, numerical Algorithms. M/G/1 & G/M/1 queues and G/G/1 queues.<br>Advanced queuing models: priority, vacation and retrials in queues. |

**Suggested Readings:**

- Stochastic Modelling and the Theory Queues by Cliffs, Prentice Hall, 1989.
- Markov Chains by P.Bremaud, Springer-Verlag, 1999.
- Non Negative Matrices and Markov Chains by E.Seneta, Springer Series in Statistics, Springer,1981.
- Discrete Stochastic Processes by R.Gallager, Kluwer Academic Press, 1996
- Queuing Systems by L.Kleinrock, John Wiley and Sons 1976.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | properties of nonnegative random variables, laws of large numbers | https://www.youtube.com/watch?v=CEsyFhFrfBo |
| Unit-II | Perron-Frobenius theory. | https://www.youtube.com/watch?v=jMmagF4IWrY |
| Unit-III | Fundamental queuing results: Little's theorem | https://www.youtube.com/watch?v=VtksT_vacAc |
| Unit-IV | Markovian queues: Jackson and BCMP networks | https://www.youtube.com/watch?v=sH4N7c7rvsA |



| Course Code | PEC-MTECE-213A | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | MIMO System | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand multi-antenna systems and compare the performance of MIMO and other antenna architectures<br>• Apply diversity techniques to improve system reliability.<br>• Apply MIMO signal processing methods for better spectral efficiency.<br>• Explore MIMO applications in LTE and develop skills in channel estimation for various propagation environments. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define the principles, types, and architecture and the basic structure and operation of MIMO systems. |
| CO2 | Compare MIMO with other multi-antenna architectures based on capacity, diversity, and multiplexing performance. |
| CO3 | Apply space-time coding and diversity techniques such as Alamouti scheme, transmit/receive diversity, and cyclic delay diversity to improve system performance. |
| CO4 | Analyze MIMO signal processing techniques and channel estimation methods in LTE and other wireless systems under various channel conditions. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems, MIMO vs. multi-antenna systems, Diversity, Exploiting multipath diversity, Transmit diversity, Space-time codes, The Alamouti scheme, Delay diversity, Cyclic delay diversity, Space-frequency codes, Receive diversity, The rake receiver, Combining techniques, Spatial Multiplexing, Spectral efficiency and capacity, Transmitting independent streams in parallel, Mathematical notation |
| Unit-II | The generic MIMO problem, Singular Value Decomposition, Eigen values and eigenvectors, Equalising MIMO systems, Disadvantages of equalising MIMO systems, Pre-distortion in MIMO systems, Disadvantages of pre-distortion in MIMO systems, Pre-coding and combining in MIMO systems, Advantages of pre-coding and combining, Disadvantages of pre-coding and combining, Channel state information.<br>Codebooks for MIMO, Beam forming, Beam forming principles, Increased spectrum efficiency, Interference cancellation, Switched beamformer, Adaptive beam former, Narrowband beam former, Wideband beam former |
| Unit-III | Case study: MIMO in LTE, Codewords to layers mapping, Pre-coding for spatial multiplexing, Pre-coding for transmit diversity, Beam forming in LTE, Cyclic delay diversity based pre-coding, Pre-coding codebooks, Propagation Channels, Time & frequency channel dispersion, AWGN and multipath propagation channels, Delay spread values and time variations, Fast and slow fading environments, Complex baseband multipath channels, Narrowband and wideband channels, MIMO channel models. |

| | |
|---|---|
| **Unit-IV** | Channel Estimation, Channel estimation techniques, Estimation and tracking, Training based channel estimation, Blind channel estimation, Channel estimation architectures, Iterative channel estimation, MMSE channel estimation, Correlative channel sounding, Channel estimation in single carrier systems, Channel estimation for CDMA, Channel estimation for OFDM. |

**Suggested Readings:**

- MIMO Wireless Communications : From Real-world Propagation to Space-time Code Design by Claude Oestges, Bruno Clerckx , Academic Press, 1st edition, 2010.
- Space - Time Codes and MIMO Systems by Mohinder Janakiraman, Artech House Publishers, 2004.
- Wireless Communications: Principles and Practice by Theodore S. Rappaport, PHI
- Digital Communication over Fading Channels by Marvin K. Simon and Mohamed-Slim Alouini, Wiley

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Multi-antenna Systems, Motivation, Types of multi-antenna systems | https://www.youtube.com/watch?v=OA4viERrlzA&list=PLTv48TzNRhaKz0C-dCAwimXSypV_5UTxg |
| **Unit-II** | The generic MIMO problem, Singular Value Decomposition | https://www.youtube.com/watch?v=NGHBniMyteo&pp=ygU2VGhlIGdlbmVyaWMgTUlNTyBwcm9ibGVtLCBTaW5ndWxhciBWYWx1ZSBEZWNvbXBvc2l0aW9u |
| **Unit-III** | Case study: MIMO in LTE , MIMO channel models | https://www.youtube.com/watch?v=pWs_PXDD_VA&list=PLZjlBaHNchvMhWbPYNBvIytmraDtEJCAl |
| **Unit-IV** | Channel Estimation, Channel estimation techniques, | https://www.youtube.com/watch?v=1POWoBj9NX0&list=PLUM3V2jjDpWnFTJ8wSQsfDxfeHpqqi21W |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-MTECE-215A** | | | | |
| Category | Professional Elective Course | | | | |
| Course Title | **Analog IC Design** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand MOS device physics and modeling for analog circuit design.<br>• Design and analyze analog building blocks like amplifiers and current mirrors.<br>• Evaluate frequency response and key performance metrics of analog circuits.<br>• Design operational amplifiers with feedback ensuring stability and efficiency. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define the fundamental principles of MOS device physics, amplifier stages, current mirrors, operational amplifiers, and feedback topologies used in analog integrated circuits. |
| CO2 | Explain the behavior of analog circuits by analyzing MOS models, amplifier configurations, biasing schemes, and frequency response characteristics. |
| CO3 | Examine analog circuits such as current mirrors, operational amplifiers, and multistage amplifiers using MOS technologies with appropriate biasing and compensation techniques. |
| CO4 | Analyze the impact of device mismatches, feedback mechanisms, gain enhancement methods, and performance parameters on overall circuit performance. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Basic MOS device physics-General considerations, MOS current-voltage characteristics, Transconductance, Second order effects, MOS small signal models.<br>**Single Stage Amplifiers:** Basic concepts, Common source stage, Source follower, Common gate stage, Cascode stage, Folded cascode.<br>**Differential Amplifiers**: Single ended and differential ended operation, Basic differential pair, Common mode Response, Differential pair with MOS loads, Gilbert cell. |
| Unit-II | **Current Mirrors:** Basic current mirrors, Cascode current mirrors, Widlar current mirror, Wilson Current mirror, Active current mirrors, Low current biasing, Supply insensitive biasing, Temperature insensitive biasing, Impact of device mismatch.<br>**Frequency Response of Amplifiers:** Amplifier transfer function, Miller effect, Common source stage, Source followers, Common gate stage, Cascade stage, Differential pair amplifier. |
| Unit-III | **Operational Amplifiers:** Performance characteristics, Design of one-stage and two stage op amps, Gain boosting, MOS telescopic-cascode operational amplifiers, MOS folded cascode amplifier, Common mode feedback, Input range limitations, Slew rate, Power supply rejection, Noise in op amps, Buffered op amps, Stability and frequency compensation. |

| | |
|---|---|
| **Unit-IV** | **Feedback Amplifiers:** General considerations, Feedback topologies, effect of loading. **Nonlinear Circuits:** Multipliers, Comparators, VCO circuit design, Charge pump circuits, Phase locked loop (PLL), Delay locked loop (DLL), Digital to analog (D/A) and Analog to Digital (A/D) converters. |

**Suggested Readings:**

- B.Razavi, "Design of Analog CMOS Integrated Circuits", 2nd Edition, McGraw Hill Edition 2016.
- Paul. R.Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley, 5th Edition, 2009.
- R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation", 3rd Edition, Wiley, 2010.
- T. C. Carusone, D. A. Johns and K. Martin, "Analog Integrated Circuit Design", 2nd Edition, Wiley, 2012
- P.E.Allen and D.R. Holberg, "CMOS Analog Circuit Design", 3rd Edition, Oxford University Press, 2011.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Introduction to MOSFET | https://www.youtube.com/watch?v=sfXsyOA0L5Y&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=2 |
| | Common source amplifier | https://www.youtube.com/watch?v=dJf6vqAKOAQ&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=3 |
| Unit-II | MOSFET Current mirrors | https://www.youtube.com/watch?v=SqnCGvtvDq0&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=4 |
| | Noise, Offset, Slew Rate | https://www.youtube.com/watch?v=L-8F1CHaXqA&list=PLbMVogVj5nJRlMz5diOg9wBizaU6-egJc&index=35 |
| Unit-III | Cascode amplifier | https://www.youtube.com/watch?v=2UlNiFPbG2c&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=5 |
| | One Stage Op amp | https://www.youtube.com/watch?v=NlD9KDBVaM0&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=17 |
| | Telescopic Stage Op amp | https://www.youtube.com/watch?v=Py6xFtWGZu0&list=PLdlPA9pGVVtZ7abJ1MAJc71S2ta-OnGux&index=26 |
| Unit-IV | Effect of Loading in Feedback | https://www.youtube.com/watch?v=NRYMrheAAJI&t=945s |
| | Frequency compensation | https://www.youtube.com/watch?v=B0zpK8srBwA |



| Course Code | **MLC-01A** | | | | |
|---|---|---|---|---|---|
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Identify research problems, objectives, and data sources based on fundamental research methodology principles. |
| CO2 | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. |
| CO3 | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. |
| CO4 | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. |

| Unit No. | Contents |
|---|---|
| Unit-I | Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations |
| Unit-II | Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee. |
| Unit-III | Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing. |
| Unit-IV | Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT.Patent Rights: Scope of Patent Rights, Licensing and transfer of technology. |

**Suggested Readings:**

- Research Methodology: Methods and Techniques (4th ed.) by Kothari, C. R., & Garg, G, New Age International Publishers.
- Research Methodology: A Step-by-Step Guide for Beginners (4th ed.). by Kumar, R, SAGE Publications India. ISBN: 978-9351501337
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed.) by Bouchoux, D. E, Cengage Learning.
- Intellectual Property Rights Under WTO by T. Ramappa, S. Chand.

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Defining/formulating research problem<br><br>Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=oTc4_zjmev0<br><br>https://www.youtube.com/watch?v=tjDBPRoyDJA |
| Unit-II | Types of Plagiarism<br><br>Research Ethics | https://www.youtube.com/watch?v=5--ssYqyWoE<br><br>https://www.youtube.com/watch?v=4tRCov8pVgQ |
| Unit-III | Primary data and Secondary Data.<br><br>Sampling techniques | https://www.youtube.com/watch?v=caUiRsg5M6k<br><br>https://www.youtube.com/watch?v=sKtoW5cXt14 |
| Unit-IV | Patent Trademarks and Copyrights.<br><br>What is Patent? Patent Filing Procedure in India | https://www.youtube.com/watch?v=XQ8tRdcr0xQ<br><br>https://www.youtube.com/watch?v=azMNhrkRzww |



| Course Code | SM-MTECE-217A | | | | |
|---|---|---|---|---|---|
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Develop students' ability to effectively present research topics and findings by effective communication.<br>• Improve problem-solving and critical thinking skills of the students.<br>• Expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated. |
|---|---|
| CO1 | Identify the trends and advancements in the related field. |
| CO2 | Analyze and synthesize research literature with in-depth reviews of key studies and methodologies. |
| CO3 | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| CO4 | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| CO5 | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This course helps M. Tech students improve their research presentation skills. It focuses on choosing a topic or research paper related to their field, reviewing it thoroughly and presenting the findings clearly and effectively.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selected paper or topic must be approved by the faculty members/ committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head ofDepartment. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | CO1 |
| 2 | Literature Survey | 10 | CO2 |
| 3 | Content Relevancy | 10 | CO3 |
| 4 | Presentation Skills | 10 | CO4 |
| 5 | Q&A Response | 10 | CO5 |

| Course Code | LC-MTECE-211A | | | | |
|---|---|---|---|---|---|
| Category | Lab Courses | | | | |
| Course Title | **MATLAB-Based Modelling and Simulation Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Introduce MATLAB environment features, interface components, and basic programming structure.<br>• Develop understanding of MATLAB-based arithmetic, vector, and matrix operations.<br>• Apply MATLAB commands to create plots, visualizations, and graphical user interfaces.<br>• Utilize MATLAB toolboxes and Simulink for solving real-world engineering problems. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define and understand the main features of the MATLAB development environment. |
| CO2 | Describe the arithmetic operations, vector product and different matrix operations using MATLAB. |
| CO3 | Apply various commands to create and edit different plots and graphics user interface (GUI). |
| CO4 | Solve, simulate, and analyze various circuits related to the field of Electronics and Communication using the MATLAB environment. |

## LIST OF EXPERIMENTS

| Sr. No. | Contents |
|---|---|
| 1 | To perform basic matrix operations and visualize data using 2D and 3D plots in MATLAB |
| 2 | Write a Program for generation of unit impulse, unit step, ramp, exponential, sinusoidal and cosine sequence. |
| 3 | Write a Program for computing inverse Z-transform of a rational transfer function. |
| 4 | Write a Program for linear convolution |
| 5 | Determine the execution time of the FFT function. |
| 6 | Demonstrate the effectiveness of high-speed convolution FFT algorithm |
| 7 | Write a program to compute the Signal Energy and Power Using MATLAB |
| 8 | Write a Program for computing Discrete Fourier Transform |
| 9 | Simulate the effect of coefficient quantization on the frequency response of a direct form IIR digital filter. |
| 10 | Simulate the effect of coefficient quantization on the frequency response of a Direct form FIR digital filter. |
| 11 | Design a Butterworth Low pass IIR filter using Bilinear Z-transform method. |
| 12 | Design FIR Low pass filter and High pass filter using Rectangular window. |
| 13 | Transform an analog filter in to a digital filter using Impulse Invariant method. |

| | |
|---|---|
| 14 | Implement a Cascade and Parallel form realization of IIR Filter and write a MATLAB Program to convert Cascade and Parallel form to direct form. |
| 15 | Write a MATLAB program that converts a direct form FIR filter structure to Frequency Sampling form FIR. |

**Note:** At least 10 experiments are to be performed by the students. Faculty member can add 2-3 extra experiment under topic beyond syllabus.

**Useful Video Links:**

| Exp No. | Topics | Links |
|---|---|---|
| 1 | Introduction to matlab toolboxes: | https://www.youtube.com/watch?v=hu5uFbkGJF8&pp=ygUhSU5UUk9EVUNUSU9OIFRPIE1BVExBQiBUT09MQk9YRVM6 |
| 2 | Convolution (Using Matlab) | https://www.youtube.com/watch?v=8_EwCR9hC |
| 3 | MATLAB programming and simulink basics | https://www.youtube.com/watch?v=5A9sEaEt3Z4&list=PLcgIaTuuWp3kWI8d1C1wZDl0SfQDxm-CK |
| 4 | Graphics using matlab | https://www.youtube.com/watch?v=X5fBmNEo46c&list=PLho7ncbqgQbvgt0rlMKi2vnqf_d3jXprc |



| Course Code | **DISS-MTECE-215A** | | | | |
|---|---|---|---|---|---|
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying relevant research topics in Electronics and Communication Engineering.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Electronics and Communication Engineering to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.



| Course Code | PROJ-MTECE-215A | | | | |
|---|---|---|---|---|---|
| Category | Project | | | | |
| Course Title | **Project Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in Electronics and Communication Engineering for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify complex engineering problems relevant to project work based on domain knowledge and real-world challenges. |
| **CO2** | Describe the workflow, technical background, and tools required for planning and executing engineering projects. |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. |

Each student is required to carry out a hardware-based project and submit a project report on a topic related to Electronics Engineering or an interdisciplinary area. The project title and objectives should be chosen by the student in consultation with their allocated Project Guide. The student must present their project in the form of a viva-voce in front of a Project Evaluation Committee. The Head of Department will constitute this committee for evaluation.

**Evaluation Criteria (Total: 50 marks)**

| Sr. No. | Evaluation Parameter | Marks |
|---|---|---|
| 1 | **Problem Definition and Relevancy** — clarity of problem, significance and alignment with discipline | 5 |
| 2 | **Proposed Solution and Implementation** — functionality, originality, technical depth | 5 |
| 3 | **Project Benefit and Impact** — benefits to society, industry, and environment | 10 |
| 4 | **Cost-Effectiveness and Practical Viability** — consideration of cost, resources, and practicality | 10 |
| 5 | **Presentation and Communication Skills (Viva-voce)** — ability to explain, answer questions, confidence, and depth of knowledge | 10 |
| 6 | **Project Report Quality** — clarity, completeness, format, and technical content | 10 |

| Course Code | DISS-MTECE-202A | | | | |
|---|---|---|---|---|---|
| Category | Lab Courses | | | | |
| Course Title | Dissertation | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-IV |
| | 0 | 0 | 20 | 20 | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help identify relevant topics in Electronics and Communication Engineering.<br>• Understand structured research methodology, literature review, and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| CO1 | Identify the research topic/area relevant to the field of Electronics and Communication Engineering to carry out independent research. |
| CO2 | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| CO3 | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| CO4 | Analyze and synthesize research findings to the agreed area of research carried out. |
| CO5 | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| CO6 | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Dissertation Stage-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Stage-2.
- The student must follow the guidelines for the Dissertation report.



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **OEC-155A** | | | | |
| Category | Multidisciplinary Open Elective Courses | | | | |
| Course Title | **Voice and Data Network** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to:<br>• Explore network design principles and their impact on network behavior.<br>• Learn data link layer protocols and queuing models for analyzing network traffic.<br>• Understand Internet architecture, IP addressing, and routing protocols.<br>• Explain congestion control and quality of service methods in networks. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define and apply network design principles, key protocols, and basic concepts in voice and data networks to optimize performance. |
| **CO2** | Explain data link layer protocols, queuing models, and their importance in managing network traffic behavior. |
| **CO3** | Apply Internet architecture, IP addressing, routing protocols, and transport layer mechanisms to solve real-world network problems. |
| **CO4** | Analyze and evaluate congestion control techniques, QoS mechanisms, and their effects on network reliability. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Network Design Issues, Network Performance Issues, Network Terminology, centralized and distributed approaches for networks design, Issues in design of voice and data networks, Layered and Layer less Communication, Cross layer design of Networks, Voice Networks (wired and wireless) and Switching, Circuit Switching and Packet Switching, Statistical Multiplexing. |
| **Unit-II** | Data Networks and their Design, Link layer design- Link adaptation, Link Layer Protocols, Retransmission. Mechanisms (ARQ), Hybrid ARQ (HARQ), Go Back N, Selective Repeat protocols and their analysis. |
| **Unit-III** | Queuing Models of Networks , Traffic Models , Little's Theorem, Markov chains, M/M/1 and other Markov systems, Multiple Access Protocols , Aloha System , Carrier Sensing , Examples of Local area networks, Inter-networking, Bridging, Global Internet , IP protocol and addressing , Sub netting , Classless Inter domain Routing (CIDR) , IP address lookup , Routing in Internet. End to End Protocols, TCP and UDP. Congestion Control , Additive Increase/Multiplicative Decrease , Slow Start, Fast Retransmit/ Fast Recovery |

| | |
|---|---|
| **Unit-IV** | Congestion avoidance, RED TCP Throughput Analysis, Quality of Service in Packet Networks. Network Calculus, Packet Scheduling Algorithms. |

**Suggested Readings:**

- Data Networks by Bertsekas, Pearson Education
- Computer Networks : A Top-Down Approach by Forouzan, Behrouz A; Mosharraf, Firouz, TMH
- Computer Networks: A Systems Approach by Larry, L Peterson; Brace, S Dave, MORGAN KUFTMAN
- COMMUNICATION NETWORK by Alberto, Leon; Gancia ; WidJaje,TMZ
- Vijay Ahuja, "Design and Analysis of Computer Communication Networks", McGraw Hill, 1987

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Data link layer in computer Networks and its Responsibilities.<br>Switching Techniques in Networking (Circuit Switching, Message Switching, Packet Switching). | https://www.youtube.com/watch?v=JRgmPco0KWI<br><br>https://www.youtube.com/watch?v=zMn1IeEMk8E |
| **Unit-II** | Hybrid ARQ (HARQ)<br><br>Stop and Wait ARQ protocol \| Data link layer | https://www.youtube.com/watch?v=TxsAvr8YHqQ<br><br>https://www.youtube.com/watch?v=YIX1NfaUpsU |
| **Unit-III** | Queuing Models of Networks | https://www.youtube.com/watch?v=d9hpfrrZXac&list=PLU6SqdYcYsfJxRfVS-vKgVa-Oz-THlJNk |
| **Unit-IV** | RED TCP Throughput Analysis | https://www.youtube.com/watch?v=1eJHqvvjHqk |



**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**
**(An Autonomous Institute)**

**'A' GRADE ACCREDITED BY NAAC**

**Evaluation Scheme & Syllabus For**

**Bachelor of Technology (Electronics and Communication Engineering)**

**2nd Year**

**(Effective from the Session: 2025-26)**

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Hr. Lecture (L) per week | 1 Credit |
| 2 | 1 Hr. Tutorial (T) per week | 1 Credit |
| 3 | 2 Hr. Practical (Lab) per week | 1 Credit |
| 4 | 2 Hr. Project per Week | 1 Credit |

## 2. RANGE OF CREDIT

Credits of 160-180 for a student to be eligible to get an Undergraduate Degree in Electronics and Communication Engineering.

## 3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B. TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 70 |
| 2 | Program Elective Courses (Relevant to chosen specialization/branch) | 15 |
| 3 | Multidisciplinary Open Elective Courses | 09 |
| 4 | Basic Science Courses | 21 |
| 5 | Engineering Science Courses | 24 |
| 6 | Humanities and Social Sciences including Management courses | 15 |
| 7 | Practical Training | 10 |
| 8 | Project | 6 |
| 9 | Mandatory Courses (Non credit) | |
| | **Total Credits** | 170* |

**Minor variation is allowed as per need of the respective disciplines.*



## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Program Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 3 | Multidisciplinary Open Elective Courses | OEC |
| 4 | Basic Science Courses | BSC |
| 5 | Engineering Science Courses | ESC |
| 6 | Humanities and Social Sciences including Management courses | HSMC |
| 7 | Practical Training | PT |
| 8 | Mandatory Courses (Non credit) | MC |
| 9 | Project | PROJ |
| 10 | Lab Courses | LC |



**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**B.Tech (Electronics & Communication Engineering) – 3rd Semester**

*W.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core courses | PCC-ECE-201A | Electronic Devices | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Engineering Science Courses | PCC-CSE-203A | Data Structures | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-ECE-205A | Analog & Digital Communication | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | BSC Courses | BSC-MECE-209A | Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-ECE-211A | Signal Systems and Network Analysis | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | MAC Courses | *MC-201A | Environmental Science | 2 | 0 | 1 | 3 | | 40 | 60 | | | 3 |
| 7 | HSMC Courses | HSMC-02A | Economics for Engineers | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 8 | Professional Core Courses | LC-ECE-213A | Electronic Devices Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 9 | Professional Core Courses | LC-ECE-215A | Analog & Digital Communication lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 10 | Professional Core Courses | LC-ECE-217A | Signal Systems and Network Analysis Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| 11 | Professional Core Courses | LC-ECE-219A | Electronic Workshop & PCB Design Lab | 0 | 0 | 2 | 2 | 1 | 25 | - | 25 | 50 | 3 |
| Total Credits | | | | | | | | 23 | | | | 800 | |

*MC-201A is a mandatory non –credit course in which the students will be required passing marks.

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**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**B.Tech (Electronics & Communication Engineering) – 4th Semester**

*W.e.f.* **2025-26**

| Sr. No. | Category | Course Code | Course Title | Lectures per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-ECE-202A | Analog Electronic Circuits | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-ECE-204A | Digital Electronics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-ECE-206A | Microprocessor and Microcontroller | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Engineering Science Courses | PCC-CSE-207A | Python Programming | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Program Elective Courses | Refer to Annexure-I | Program Elective (Table –I) | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6. | HSMC Courses | HSMC-01A | Fundamental of Management and Organizational Behavior | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7. | Engineering Science Courses | LC-CSE-213A | Python Programming Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8. | Professional Core Courses | LC-ECE-216A | Analog Electronics Circuit Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9. | Professional Core Courses | LC-ECE-218A | Digital Electronics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10. | Professional Core Courses | LC-ECE-220A | Microprocessor and Microcontroller Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 11. | MAC Courses | *MC-222A | Project Based Learning/Micro Project | 0 | 0 | 2 | 2 | | 50 | | | | 3 |
| **Total Credits** | | | | | | | | **23** | | | | **800** | |

*MC-222A is a mandatory non –credit course in which the students will be required passing marks.

**NOTE:** At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

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**Annexure-I**
**Program Elective Courses (Table-I)**

| S. No | Course Code | Course Name |
|---|---|---|
| 1 | PEC-ECE-208A | Bio-Medical Electronics |
| 2 | PEC-ECE-210A | Scientific Computing |
| 3 | PEC-ECE-212A | Power Electronics |
| 4 | PEC-ECE-214A | Computer Vision |

| Course Code | **PCC-ECE-201A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Electronic Devices** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand the fundamental concepts and operating principles of semiconductor devices.<br>• Study the characteristics and practical applications of various semiconductor devices.<br>• Design and analyze basic electronic circuits using semiconductor components.<br>• Explore biasing techniques and equivalent models for device operation in amplification and switching applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| CO1 | Understand and apply the fundamental concepts, working operations and characteristics of semiconductor devices to design electronic circuits and systems. |
| CO2 | Apply diode principles to design and analyze its applications in rectifiers, Clippers, Clampers, filters, voltage doubler circuits. |
| CO3 | Analyze biasing techniques used in amplifiers to determine their stability conditions for establishing a proper operating point. |
| CO4 | Describe the working principles and applications of special purpose semiconductor devices used in electronics circuits. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Basic Semiconductor And PN-Junction Theory:** Introduction, Atomic Structure, Band Theory of Semiconductors, Effect of Temperature on Conduction, Drift Current, Donor & Accepter Impurities in Semiconductor, Law of Mass Action, Hall's Effect, Hall Coefficient & Mobility, continuity equation.<br>**Characteristics Of Diode:** PN-Junction, Construction Types, Unbiased Junction, Biased Junction, Space Charge Region, Diode Characteristics & Parameters, Diode Capacitance, Diode Resistance, DC And AC Load Lines, Diode Testing, Zener And Avalanche Breakdown Diodes, Temperature Characteristics of Diode, Reverse Recovery Time, Switching Characteristics of Diode. |
| Unit-II | **Diode Applications:** Half Wave, Full Wave Center Tapped, Full Wave Bridge(Rectification), Series Clipping Circuit, Shunt Clipping Circuit, Clamping Circuit, Bridge Voltage Doubler, Filtering Circuit Using Capacitor & Inductor.<br>**Special Semiconductor Devices:** Optoelectronic Devices, Photoconductors, Photo Diode, Photo Voltaic Sensor, Solar Cells, LED, LCD, Laser Diode, Schottky Diode, Tunnel Diode ,SCR, TRIAC, DIAC, UJT, IGBT, Opto Coupler. |

| | |
|---|---|
| **Unit-III** | **Junction Transistor:** Introduction, Construction Of Junction Transistor, Circuit Symbols, Transistor Operation, Unbiased Transistor, Operation Of Biased Transistor, Transistor Current Components, DC & AC Load Line, Operating Point, Transistor Configuration CB, CE, CC, Input/Output Characteristics, Early Effect(Base Width Modulation), Eber's-Moll-Model of Transistor, Maximum Rating of Transistor, Transistor Testing, Transistor as an amplifier, Transistor as oscillator.<br>**BJT Biasing:** Bias Stability, Instability Due To β, Thermal Stability, Stability Factor, Fixed Biased Circuits, Effect of Emitter Resistor, Collector to Base Bias, Voltage Divider Biasing, Advantage & drawbacks of Biasing Techniques, Stability Factor calculation of Biasing Techniques, Bias Compensation by various device, Thermal Runway, Transistor Dissipation, Thermal Resistance, Condition of Thermal Stability. |
| **Unit-IV** | **Small Signal Circuit:** Two Port Network, Hybrid (H-Parameter) Model, Typical Values of H-Parameter Model, Conversion of CE, CB, CC Configuration to Equivalent Hybrid Model, CB Circuit Analysis, CE circuit with & without $R_E$ analysis, CC circuit analysis, Analysis of CE, CB & CC Configuration with approximate Hybrid Model, Miller's Theorem, Dual of Miller Theorem.<br>**FET:** Introduction, The Junction FET, Basic Construction, Operation, P- Channel FET, N-Channel FET, High Frequency Model of FET, Low Frequency FET Amplifiers, Transfer Characteristics of FET. JFET AND MOSFET Structure, Operation and characteristics. |

**Suggested Readings:**

- Electronics Device & Circuit by J.B. Gupta -S.K. Kataria and Sons.
- Electronics Device & Circuit by Sahdev, S.K 2nd Edition—Dhanpat Rai & sons.
- Integrated Electronics by Millman Halkias -- TMH.
- Electronics Device Circuit by David. A. Bell -- Oxford.
- Principal of Electronics Device & Circuit by Theraja , B.L, Sedha, RS, S Chand.
- Electronics Device &Circuit by Maini, A.K; Agarwal, Varsha—Wiley India.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Basic Semiconductor Introduction | https://youtu.be/CXFtbpYaBXw?si=yAkLNOIiRFCCo7te |
| | Characteristics of Diode | https://youtu.be/OkyKCNvKJI4?si=zAN6-T2SNOou2hkI |
| Unit-II | Clipper Circuit | https://www.youtube.com/watch?v=1hfhih839oU |
| | Special Semiconductor Devices | https://www.youtube.com/watch?v=o_d9j67Zm7k |
| Unit-III | Introduction to BJT | https://youtu.be/qFaAk9YPURw?si=74PmQzvApKquQF1R |
| | Transistor Configuration | https://www.youtube.com/watch?v=x8WxZjKrvTc |
| | BJT Biasing | https://www.youtube.com/watch?v=1vRgDzJ2yOU |
| Unit-IV | H-parameter | https://youtu.be/N5YIsvY5uBM?si=AAdMvHVVN_mNKG00 |
| | Small Signal Amplifier | https://www.youtube.com/watch?v=5MLVr9r6Vzk&list=PL-IC1WV1OE4kRdcpTfgtNjFpR8XEpDu7O |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE-203A** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Data Structures** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• To introduce the basics of data structures and algorithms.<br>• To explain the concept of Stacks, Queues, Linked Lists, Trees, related operations and their implementation.<br>• To understand sorting, hashing, and graph algorithms, including their design and complexity analysis<br>• To develop the ability to evaluate algorithm efficiency in terms of time and space complexity. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define the key terminologies of data structures and algorithms including their classifications, operations, and performance characteristics. |
| **CO2** | Describe the design and implementation of various linear and non-linear data structures, and their real-world applications including hashing and binary trees. |
| **CO3** | Apply appropriate data structures such as arrays, stacks, queues, linked lists, trees, and graphs to solve computational problems effectively. |
| **CO4** | Analyze the efficiency of algorithms and operations in searching, sorting, and traversals using time and space complexity metrics. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Searching: Linear Search and Binary Search Techniques and their complexity analysis. Arrays: Array Definition, Types, Operations on array and their complexity analysis. |
| **Unit-II** | **Stacks and Queues:** Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. Tower of Hanoi problem. Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis. |



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| | |
|---|---|
| **Unit-III** | **Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.<br>**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Path length, Huffman's algorithm, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis. |
| **Unit-IV** | **Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.<br>**Graph:** Basic Terminologies, Sequential representation of graphs, Adjacency matrices. Graph search and traversal algorithms and complexity analysis. |

**Suggested Readings:**

- Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press. Programming in ANSI C by E. Balaguruswamy, Tata McGraw-Hill
- Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
- How to Solve it by Computer, 2nd Impression by R.G. Dromey, Pearson Education.
- Data Structures and Algorithms Made Easy by Narasimha Karumanchi.
- Data Structures Using C by Aaron M.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Data Structures and Algorithms | https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F |
| | Linear Search Algorithm | https://www.youtube.com/watch?v=C46QfTjVCNU |
| | Binary Search | https://www.youtube.com/watch?v=V_T5NuccwRA |
| **Unit-II** | Stacks | https://youtu.be/g1USSZVWDsY?list=PLBF3763AF2E1C572F |
| | Stack and its Applications | https://www.youtube.com/watch?v=aG0HjeXBUDU |
| | Queues and Linked Lists | https://youtu.be/PGWZUgzDMYI?list=PLBF3763AF2E1C572F |
| **Unit-III** | Linked Lists-I | https://www.youtube.com/watch?v=K7VIKlUdo20 |
| | Trees | https://youtu.be/tORLeHHtazM?list=PLBF3763AF2E1C572F |
| | Search Trees-II | https://www.youtube.com/watch?v=5jQGqaAUzOI |
| | AVL Trees | https://youtu.be/mRGQyIRWAsI?list=PLBF3763AF2E1C572F |
| **Unit-IV** | Sorting | https://youtu.be/4OxBvBXon5w?list=PLBF3763AF2E1C572F |
| | Hashing | https://www.youtube.com/watch?v=2-h9193Ztqg |
| | Graphs | https://youtu.be/9zpSs845wf8?list=PLBF3763AF2E1C572F |



| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **PCC-ECE-205A** | | | | | |
| Category | Professional Core Course | | | | | |
| Course Title | **Analog and Digital Communication** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 3 | 0 | 0 | 3 | | |
| Course Objectives | The objectives of this course are to<br>• Understand the basic concepts of communication systems and the impact of noise on signals.<br>• Compare various techniques used for signal transmission and reception.<br>• Learn methods for converting signals between analog and digital forms.<br>• Understand the working principles of radio transmitters and receivers. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define basic terminologies, signal types, communication modes and media used in analog and digital systems. |
| CO2 | Understand and apply analog & pulse modulation and demodulation techniques used in communication systems for effective signal transmission. |
| CO3 | Describe the structure and function of various radio transmitters and receivers used in communication systems. |
| CO4 | Classify various modulation techniques and examine the impact of noise on signal quality and system performance |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction :** Modulation, Demodulation, Radio Frequency Spectrum, Signals & their classification, Limitations & Advantages of a Communication System, Comparison of Analog & Digital Communication Systems, Historical Perspective, Modes & Medias of Communication.<br>**Noise:** Sources of Noise, External & Internal Noise, Noise Ratio, Noise Figure, Noise Temperature, Noise in Communication Systems, Pre-Emphasis & De-Emphasis. |
| Unit-II | **Amplitude Modulation:** Basic definition & derivation for Modulation & Modulation Index, Modulation & Demodulation of AM, Suppressed Carrier Modulation, Quadrature Amplitude Modulation, SSB-SC, DSB-SC, VSB Modulation & Demodulation, Comparison of various AM Systems, Generation of AM waves.<br>**Angle Modulation:** Basic definition & derivation for Modulation & Modulation Index, Generation of FM & PM waves, Bandwidth & Frequency Spectrum of FM, Types of FM, Demodulation of FM & PM waves, Comparison between AM, FM & PM. |
| Unit-III | **Pulse Analog Modulation:** Sampling theory, Multiplexing & De multiplexing (TDM, FDM), Sampling Techniques, PAM, PWM, PPM, Modulation & Demodulation techniques.<br>**Pulse Digital Modulation:** Quantization, Elements of Pulse Code Modulation, Noise, Bandwidth & Channel Capacity of PCM System. Delta Modulation (DM), Adaptive Delta Modulation (ADM), Differential Pulse Code Modulation (DPCM). Comparison of PCM/DM/ADM/DPCM. |

| | |
|---|---|
| **Unit-IV** | **Digital Carrier Modulation And Demodulation Techniques**: Digital Modulation Formats, Coherent Binary Modulation & Demodulation: ASK, BFSK, BPSK, Coherent Quadrature Modulation & Demodulation Techniques: QPSK, MSK.<br>Non Coherent BFSK, Differential PSK, M-Ary Modulation & Demodulation Techniques: M-Ary<br>PSK, M-Ary QAM, M-Ary FSK.<br>**Transmitters & Receivers**: Basic Block Diagram of Radio Transmitter, Classification of Radio Transmitters, Basic Block Diagram of Radio Receiver, Classification of Radio Receivers. |

**Suggested Readings:**

- Electronic Communication Systems, By Kennedy – TMH
- Communiation Systems, By Singh & Sapre – TMH
- Communication System (Analog & Digital), Sanjay Sharma, Kataria & sons.
- Digital and Analog Communication Systems by Couch, Leon W, Pearson Education
- Communication System, By Manoj Duhan – I. K. International
- Analog Communication Systems by Chakraborty P, Dhanpat Rai & Company
- Communication System by Haykin, Simon, Wiley India

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Communication System | https://www.youtube.com/watch?v=INn5EQ9l5PE |
| | Noise in communication system | https://www.youtube.com/watch?v=u9nuKs2RAe0 |
| **Unit-II** | Analog Modulation & Demodulation | https://www.youtube.com/watch?v=kAs8OerKRmc&list=PLgwJf8NK-2e7uyUYrpgUUQowmRuKxRdwp |
| **Unit-III** | Pulse Analog & Digital Modulation | https://www.youtube.com/watch?v=TM47sEXeaj8&list=PLDp9Jik5WjRvjqQ6ruRFC6hZcxnOsp3BE |
| **Unit-IV** | Digital Carrier Modulation and Demodulation Techniques | https://www.youtube.com/watch?v=01zv0thaAUw |
| | Radio Transmitters & Receivers | https://www.youtube.com/watch?v=iUBC-S_zLk4 |



| Course Code | BSC-MECE-209A | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Mathematics-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are to make the students<br>• Understand and classify first and second-order linear partial differential equations, and apply appropriate solution techniques including complementary function and particular integral methods.<br>• Solve and analyze physical models such as wave and diffusion equations using methods like separation of variables and D'Alembert's solution. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define partial differential equations and probability distributions, including their properties and physical relevance. |
| CO2 | Solve second-order PDEs using complementary functions and particular integrals. |
| CO3 | Apply probability concepts, including conditional probability and Bayes' Theorem, for real-world problems using discrete and continuous distributions. |
| CO4 | Implement numerical methods (Bisection, Newton-Raphson, Euler, Runge-Kutta) for solving equations and ODEs with a focus on accuracy and efficiency. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Partial Differential Equations**: Partial Differential Equations of higher order, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method, Initial and boundary conditions, D'Alembert's solution of the wave equation, Separation of variables method to simple problems in Cartesian coordinates. |
| Unit-II | **Probability and Statistics:** Measure of central tendency, Basic concept of Probability, Conditional Probability, Baye's Theorem, Random Variables, Discrete and Continuous Distributions, Binomial, Poisson and Normal Distribution, Linear Regression and Correlation. |
| Unit-III | **Numerical Methods 1:** Solution of polynomial and transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical differentiation, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules |
| Unit-IV | **Numerical Methods 2:** Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first and second order ordinary differential equations. Matrix inversion (Gauss Seidel, Gauss Elimination Method, LU Decomposition). |





**Suggested Readings:**

- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers
- Higher Engineering Mathematics by B. V. Ramana, TMH
- A text book of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications
- A text book of Engineering Mathematics by Mathur, A.B., PHI Learning
- Numerical Methods by Balagurusamy, E, TMH
- Introductory Methods of Numerical Analysis by S. S. Sastry, PHI
- Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit I | Definition of Partial Differential Equations | https://www.youtube.com/watch?v=KlZqe4UC1jk |
| | Second-order linear partial differential equations | https://www.youtube.com/watch?v=PVUfuiuWaZQ |
| | Solution to homogenous and non-homogenous linear P.D.E | https://www.youtube.com/watch?v=5eZbgxmpK3Q&t=520s |
| | Separation of variables method | https://www.youtube.com/watch?v=DgvQzfLpaTY&t=92s |
| Unit II | Basic concept of Probability, Conditional probability, Bays' theorem | https://youtu.be/60vHy2lA4o4<br>https://www.youtube.com/watch?v=ZFMcWe_SNyI<br>https://www.youtube.com/watch?v=-ELHOnLwE9U |
| | Discrete and Continuous Distributions | https://www.youtube.com/watch?v=ruWsWnik7YY |
| | Binomial, Poisson and Normal Distribution | https://www.youtube.com/watch?v=eH4bao6elis |
| | Measure of central tendency | https://www.youtube.com/watch?v=X48cZ6DGaSw |
| | Linear Regression and Correlation | https://www.youtube.com/watch?v=_WM8vzYSQhs |
| Unit III | Bisection method, Regula-Falsi method and Newton-Raphson method | https://www.youtube.com/watch?v=3j0c_FhOt5U&list=PLU6SqdYcYsflk1VhXxIYNPFU67ym6gae8<br>https://www.youtube.com/watch?v=FliKUWUVrEI&list=PLU6SqdYcYsflk1VhXxIYNPFU67ym6gae8&index=2<br>https://www.youtube.com/watch?v=7eHuQXMCOvA&list=PLU6SqdYcYsflk1VhXxIYNPFU67ym6gae8&index=5 |
| | Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae | https://www.youtube.com/watch?v=Y-yMQvYpltU<br>https://www.youtube.com/watch?v=zdyUwzOm1zw<br>https://www.youtube.com/watch?v=2h0R0Uka1HI |
| | Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules | https://www.youtube.com/watch?v=EA76ONWBgK4&list=PLhSp9OSVmeyJBkLSO51JFPSEIIoeRiaJy |
| Unit IV | Taylor's series | https://www.youtube.com/watch?v=0JxwRqIM5t8&t=879s |
| | Euler and modified Euler's methods | https://www.youtube.com/watch?v=zD-Mg4ZUGsE&t=776s<br>https://www.youtube.com/watch?v=zD-Mg4ZUGsE |
| | Runge-Kutta method | https://www.youtube.com/watch?v=iSO9DFcMDog |



| Course Code | PCC-ECE-211A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Signal Systems & Network Analysis** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Provide foundational knowledge on classification and representation of signals and systems in time and frequency domains.<br>• Introduce Fourier and Laplace techniques for analyzing continuous and discrete-time signals and system responses.<br>• Explain systematic procedures for analyzing electrical networks using theorems, transformations and two-port parameters.<br>• Study transient responses, network functions, and topology-based analysis using poles, zeros, and graph-theory approaches. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Explain and summarize various types of signals and systems by interpreting their properties and characteristics in time and frequency domains. |
| CO2 | Apply Fourier Series and Fourier Transform techniques to determine signal spectra and evaluate system responses for different excitation signals. |
| CO3 | Apply node, mesh and matrix analysis methods along with network theorems to determine responses of electrical networks. |
| CO4 | Analyze electrical network behavior using network functions, pole–zero plots, two-port parameter relationships, state variable models and graph theory concepts. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Signal:** Signal Definition, Classification with examples, Continuous – Time & Discrete –Time, Continuous –valued & Discrete –valued, Analog & Digital, Deterministic & Random, One Dimensional & Multi Dimensional, Even/Symmetric, Odd/Anti symmetric signals, Causal, Non causal ; Anti causal; Real & Complex, Periodic & Aperiodic, Energy & Power signals Elementary Discrete Time Signals.<br>**Introduction to Systems:** Continuous –Time & Discrete Time System, classifications of Systems: Causal and Non-causal Systems, Time-variant and Time-invariant Systems, Stable and Unstable Systems, Linear and non-linear systems, Static and Dynamic System, Invertible and inverse Systems. |
| Unit-II | **Fourier Series (FS):** Definition, Frequency domain representation of a signal, Existence of Fourier Series, Types of Fourier Series, Fourier Spectrum, Dirichlet's Condition, Concept of Gibbs phenomenon, Properties of Fourier Series.<br>**Fourier Transforms (FT):** Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT.<br>**State Space Analysis:** State Variable Model, Variable Model using Physical variables, Variable Model using Phase variables. |

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| | |
|---|---|
| **Unit-III** | **Fundamentals of Network Analysis:** Node and Mesh Analysis, matrix approach of network containing voltage and current sources. source transformation and duality. Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer theorem.<br>**Network Functions:** Terminal pairs or Ports, Network functions for one-port and two port networks, poles and zeros of Network functions, Time domain behavior from the pole-zero plot. |
| **Unit-IV** | **Two port network and interconnections:** Characteristics and parameters of two port networks, Network Configurations, short-circuit Admittance parameters, open-circuit impedance parameters, Transmission parameters, hybrid parameters, Inter-relationships between parameters of two-port network sets, Inter-connection of two port networks.<br>**Network Topology:** Basic terminology of network topology, Principles of network topology, graph matrices, network analysis using graph Theory. |

**Suggested Readings:**


- Fundamentals of Electric Circuit" by C.K Alexander and Sadiku.
- Network Analysis by M.E. Van, Valkenburg., 3rd Edition, Pearson Education
- Circuits and Network by Sudhakar A. Shyammohan, S. P., TMH
- Network Analysis and Synthesis by Raja, P; Singh, K.K, Raja, Umesh Publications
- Network Theory by Soni K.M., S.K. Kataria and Sons
- Network Theory and Filter Design by Aatre, Vasudev K, New Age International
- Signals & Systems by A. V. Oppenheim, A. S. Willsky, with S. Nawab, 2nd Edition, Pearson Education
- Signals & Systems by Nagrath & R. Ranjan, TMH
- Digital Signal Processing, Principles, Algorithms, & Applications by J. G. Proakis, D. G. Manolakis 4th Edition, Pearson Education
- Signals & Systems by Dr. Sanjay Sharma, Katsons Books
- Digital Signal Processing By S. Salivahanan
- Signals & Systems by A. Anand Kumar, PHI , 3RD Edition


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Basics of S&S | https://www.google.com/search?q=basics+of+signals+and+system+nptel+lectures&oq=basics+of+signals+and+system+nptel+lectures&aqs=chrome..69i57j33i10i160l2j33i671.33428j0j15&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:1ac57207,vid:DVuEYt0J11c,st:0 |
| | LTI System | https://www.youtube.com/watch?v=vk42imdZ6Pc |
| **Unit-II** | Fourier Transform | https://youtu.be/l2I2hys8uGQ?si=noWoflLMPtI4Fl3q |
| | Laplace Transform | https://www.youtube.com/watch?v=c9NibpoQjDk&t=9s |
| | State Variable technique | https://www.youtube.com/watch?v=d34nosv-_uc |
| **Unit-III** | Fundamentals of Network Analysis | https://www.youtube.com/watch?v=YhJWrhW3vjE&list=PL9RcWoqXmzaLG1SpJk_istSmesK4mZBiZ |
| **Unit-IV** | Two port network and interconnections | https://www.youtube.com/watch?v=pn777Ya0OHk&list=PLBlnK6fEyqRjQZj_QXvH8sp1lOWtjQCtT |
| | Transient Response of RC, RL, and RLC Circuits to various excitation signals | https://www.youtube.com/watch?v=Vb_OFPpynpg&list=PLgwJf8NK-2e58RyKZzw9t3mfXUqpJL6nV |

| Course Code | *MC-201A | | | | |
|---|---|---|---|---|---|
| Category | MAC Course | | | | |
| Course Title | **Environmental Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 2 | 0 | 1 | - | |
| Course Objectives | The objectives of this course are<br>• Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources.<br>• Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health.<br>• Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society.<br>• Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |
| Remarks | The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.<br>The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws and human-environment interactions. |
| **CO2** | Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics and related legislation for sustainable development. |
| **CO3** | Apply principles of environmental management, pollution control, disaster preparedness and sustainable practices in real-world and field-based environmental contexts. |
| **CO4** | Analyze environmental problems, population growth impacts, climate change, welfare programs and the role of information technology in promoting public health and environmental sustainability. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.



| Unit No. | Contents |
|---|---|
| Unit-I | The Multidisciplinary nature of environmental studies. Definition scope and importance.<br>**Natural Resources:** Renewable and non-renewable resources, Natural resources and associated problems.<br>**a) Forest resources:** Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.<br>**b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.<br>**c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.<br>**d) Food resources:** World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies.<br>**e)** Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.<br>f) **Land resources:** Land as are source, land degradation, man induced landslides, soil erosion and desertification.<br>Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles |
| Unit-II | **Ecosystems**: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids, Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).<br>**Biodiversity and its conservation:** Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity. |
| Unit-III | **Environmental Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards.<br>**Solids Waste Management:** Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies.<br>**Disaster Management:** Floods, Earthquake, Cyclone and Landslides.<br>**Social issues and the Environment:** From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies.<br>**Environmental Ethics:** Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness. |



| | |
|---|---|
| **Unit-IV** | **Human population and the Environment:** Population growth, Variation among Nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies.<br>**Field Work (Field work equal to10 lecture hours)**-Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc. |

**Suggested Readings:**


- Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
- The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
- Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc., 1989
- Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
- Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press, 1995, 1140p.
- Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi, 1995, 284p.
- Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
- Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd., 1987, 345p.
- Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut, 2001.
- Survey of the Environment, The Hindu.
- Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
- Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
- Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA, 1998, 499p.
- A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Environment Science: Introduction | https://www.youtube.com/watch?v=5QxxaVfgQ3k |
| | Natural Resources | https://www.youtube.com/watch?v=CXCT2R1K6Ts |
| | Ecosystem | https://www.youtube.com/watch?v=1dBU6HB8G6s |
| Unit-II | Biodiversity and its conservation | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| Unit-III | Sustainable Water Management In Urban Areas | http://digimat.in/nptel/courses/video/127106004/L29.ht |
| | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |
| Unit-IV | Population and population growth | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| | National Family Welfare Programme | https://www.youtube.com/watch?v=X5F99L8ZEtc |



| Course Code | **HSMC-02A** | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Economics for Engineers** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce the basic concepts of economics and their relevance to science, engineering, and national development.<br>• Develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures.<br>• Equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions.<br>• Familiarize students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Describe economic concepts, the connection between economics with engineering and technological development, along with economic laws relevant to resource based decision making in society. |
| CO2 | Explain economic growth theories and illustrate the role of engineering and technology in supporting economic development. |
| CO3 | Apply theories of consumption and production to the design and development of engineering products. |
| CO4 | Analyze market conditions, evaluate cost structures and financial aspects to assess the feasibility of engineering projects. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Definition of Economics:** Various Definitions, Types of Economics, Micro and Macro Economics, Nature of Economic Problem, Production Possibility Curve, Economic Laws and their Nature, Relationship between Science, Engineering, Technology and Economic Development.<br>**Demand:** Meaning of Demand, Law of Demand, Elasticity of Demand, Meaning, Factors affecting the Elasticity of Demand, Practical Application and Importance. |
| Unit-II | **Production:** Meaning of Production and Factors of production, Law of Variable Proportions, Returns to Scale, Internal and External Economies and Diseconomies of Scale, Various concepts of Cost of Production- Fixed Cost, Variable Cost, Money Cost, Real Cost, Accounting Cost, Marginal Cost, Opportunity Cost, Shape of Average Cost, Marginal Cost, Total Cost etc. in short run and long run. |
| Unit-III | **Market:** Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).<br>**Supply:** Supply and Law of Supply, Role of Demand and Supply in Price Determination and Effect of Changes in Demand and Supply on Prices. |

| | |
|---|---|
| **Unit-IV** | **Indian Economy:** Nature and Characteristics of Indian Economy as underdeveloped, developing and mixed economy(brief and elementary introduction).<br>**Privatization:** Meaning, Merits and Demerits.<br>**Globalization of the Indian Economy:** Merits and Demerits<br>**Banking:** Concept of a Bank, Commercial Bank, Central Bank, Functions of a Bank, Difference between Commercial and Central Bank. |

**Suggested Readings:**

- Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
- Indian Economy by S.K. Misra & V.K. Puri, Himalaya Publishing House
- Indian Economy : Principles and Policies by Srirangam, SriRam, ; Rohit Deo, Pearson Education
- Managerial Economics by R. Cauvery et al., S. Chand & Company Pvt. Ltd.
- Microeconomic Theory by Andreu; Whinston, Michael D ; Green, Jerry R, Oxford University Press.
- Principles of Economics by Case, Karl E; Fair, Ray C ; Oster, Sharon E, Pearson Education

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Fundamental concepts of microeconomics, including definitions, types, and the nature of economic problems. | https://www.youtube.com/watch?v=IFtOcNbej0o&list=PLFNFJbo2hfBGRTCMuroZGykNzacwmAH2L |
| **Unit-II** | Production and Cost of production | https://www.youtube.com/watch?v=VU1zySe-8NA |
| **Unit-III** | Theory of Markets | https://www.youtube.com/watch?v=HylqSa58lqQ |
| **Unit-IV** | Nature and characteristics of the Indian economy, highlighting aspects of underdevelopment and development. | https://www.youtube.com/watch?v=ME-0GOhhZcs&list=PLFW6lRTa1g83winAolK92HL4xTytJaW7S |



| Course Code | **LC-ECE-213A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Electronic Devices Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Study the characteristics and applications of various electronic devices.<br>• Analyze different transistor configurations and their behavior.<br>• Explore the operation of field-effect transistors and their amplifier circuits.<br>• Understand and test special semiconductor devices used in practical applications. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Examine the behavior of PN junction diodes under different biasing conditions and their applications in electronic circuits and filters. |
| CO2 | Demonstrate the characteristics of special purpose semiconductor devices of thyristor family used in triggering and switching circuits. |
| CO3 | Design and analyze transistor configurations in amplifiers and switches to optimize the performance of electronic circuits. |
| CO4 | Demonstrate and analyze the characteristics of field-effect transistors under different configurations for electronic circuit applications. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To study and Analyze the characteristics of diode. |
| 2 | To study and Analyze zener diode as a voltage regulator. |
| 3 | To study and Analyze half wave and full wave rectifiers. |
| 4 | To study and Analyze power supply filters. |
| 5 | To study and Analyze diodes as a clipper and clamper. |
| 6 | To study and design of a DC voltage doubler. |
| 7 | To study and Analyze transistor as a constant current source in CE configuration |
| 8 | To study and Analyze CB & CC transistor configuration. |
| 9 | To study and Analyze CE amplifier for voltage, current and power gains input, output impedances. |
| 10 | To study characteristics of FET. |
| 11 | To study and Analyze FET common source amplifier. |
| 12 | To study characteristics of SCR. |
| 13 | To study characteristics of DIAC. |
| 14 | To study UJT as a relaxation oscillator. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.



**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | Characteristics of diode. | https://www.youtube.com/shorts/wVVDrphYtLI |
| 2 | Clipper and Clamper Circuits | https://www.youtube.com/watch?v=JAWswYG-iDA |
| 3 | DC voltage doubler | https://www.youtube.com/watch?v=779NQxJZeFc |
| 4 | UJT as a relaxation oscillator | https://www.youtube.com/watch?v=8AK0rxgsN9o |
| 5 | CE amplifier | https://www.youtube.com/watch?v=0iRs1XMNChI |
| 6 | Transistor configuration. | https://www.youtube.com/watch?v=DJHmaOb6Z7s |



| Course Code | LC-ECE-215A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Analog & Digital Communication Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand the basic principles of analog modulation and demodulation techniques like AM, FM, and PM.<br>• Learn and observe the waveform analysis of pulse modulation and demodulation methods.<br>• Study digital modulation techniques such as ASK, FSK, and PSK with waveform analysis. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Apply various analog modulation schemes for representation of AM, FM, PM signals. |
| CO2 | Implement various analog detection methods for optimized & effective signal reception. |
| CO3 | Examine the performance and applications of various pulse modulation & demodulation techniques used in communication systems. |
| CO4 | Categorize different digital modulation & demodulation schemes used in modern communication systems. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To study and waveform analysis of amplitude modulation and determine the modulation index of amplitude modulation. |
| 2 | To study and waveform analysis of amplitude demodulation by any method. |
| 3 | To study and waveform analysis of frequency modulation and determine the modulation index of frequency modulation. |
| 4 | To study and waveform analysis of frequency demodulation by any method. |
| 5 | To study and waveform analysis of phase modulation. |
| 6 | To study Phase demodulation. |
| 7 | To study Pulse amplitude modulation and demodulation. |
| 8 | To study Pulse width modulation and demodulation. |
| 9 | To study Pulse position modulation and demodulation. |
| 10 | To study Pulse code modulation. |
| 11 | To study delta modulation. |
| 12 | To study Amplitude Shift Keying (ASK) modulation. |
| 13 | To study Frequency Shift Keying (FSK) modulation. |
| 14 | To study Phase Shift Keying (PSK) modulation. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

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**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | Analog Modulation & Demodulation | https://www.youtube.com/watch?v=kAs8OerKRmc&list=PLgwJf8NK-2e7uyUYrpgUUQowmRuKxRdwp |
| 2 | Pulse Analog & Digital Modulation | https://www.youtube.com/watch?v=TM47sEXeaj8&list=PLDp9Jik5WjRvjqQ6ruRFC6hZcxnOsp3BE |
| 3 | Digital Carrier Modulation And Demodulation Techniques | https://www.youtube.com/watch?v=01zv0thaAUw |



| Course Code | LC-ECE-217A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Signal Systems and Network Analysis Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Introduce circuit simulation using software tools for analyzing electrical networks.<br>• Understand and analyze circuits with R, L and C components in time and frequency domains.<br>• Design and evaluate low-pass, high-pass and band-pass filters through simulations.<br>• Calculate and interpret two-port network parameters and their system impact. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Demonstrate standard signals and visualize time-domain behaviors using circuit simulation tools. |
| CO2 | Analyze RC, RL, and RLC circuits for transient and steady-state responses. |
| CO3 | Design and examine the filter circuits by determining their frequency response characteristics. |
| CO4 | Determine and verify two-port parameters and assess their effect on connected networks. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | Introduction of circuit creation & simulation by relevant software. |
| 2 | To study various commands for creating two and three dimensional plots using simulation software. |
| 3 | Write a program to plot the continuous time and discrete time Step Function using simulation software. |
| 4 | Write a program to plot the continuous time and discrete time Impulse Function using simulation software. |
| 5 | Write a program to perform amplitude-scaling, time-scaling and time shifting on a given signal using simulation software. |
| 6 | Write a program to plot the continuous time and discrete Ramp Function using simulation software. |
| 7 | To plot the transient response of RC, RL circuit. |
| 8 | To find the resonance frequency, bandwidth of RLC series circuit. |
| 9 | To plot the frequency response of low pass filter and determine half-power frequency. |
| 10 | To plot the frequency response of high pass filters and determines the half-power frequency. |
| 11 | To plot the frequency response of band-pass filters and determines the band-width. |
| 12 | To calculate and verify "Z" & "Y" parameters of a two port network. |
| 13 | To determine equivalent parameter of parallel connections of two port network and study loading effect. |
| 14 | To calculate and verify "ABCD" parameters of a two port network. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members may add 2-3 extra experiment under topic beyond syllabus.

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**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | Introduction of circuit creation & simulation software like TINAPRO | https://www.youtube.com/watch?v=REQ9K3qqp-0&list=PLsMtCcso-QfbYqJOsWwcg97gtN0GxungD |
| 2 | Analyze the transient response of RC, RL, and RLC circuits using simulation tools to evaluate circuit behavior and performance. | https://www.youtube.com/watch?v=86OpfpZchOY |
| 3 | To calculate and verify "Z" & "Y" parameters of a two port network. | https://www.youtube.com/watch?v=Op__l8_kMes |
| 4 | To plot the frequency response of high pass filter and determine the half-power frequency. | https://www.youtube.com/watch?v=lagfhNjMuQM |
| 5 | To calculate and verify "ABCD" parameters of a two port network. | https://www.youtube.com/watch?v=5Q1coA-0-Tg |
| 6 | To plot the frequency response of band-pass filter and determine the band-width. | https://www.youtube.com/watch?v=MG_OvKdhqiQ |
| 7 | Introduction to MATLAB | https://www.youtube.com/watch?v=0x4JhS1YpzI&list=PLjVLYmrlmjGcNZrPa9bRg0JVlcxLX4Mu9 |
| 8 | Amplitude-scaling, Time-scaling and Time shifting on a given signal. | https://www.youtube.com/watch?v=IO3K7UpKcgY |



| Course Code | LC-ECE-219A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Electronic Workshop & PCB Design Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand and simulate electronic circuits using relevant software.<br>• Learn the operation of machines used in PCB fabrication and gain hands-on experience.<br>• Practice PCB fabrication processes such as etching, drilling, and coating.<br>• Develop skills to design, assemble, and test printed circuit boards for practical applications. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Understand and apply simulation and PCB design tools for the design and development of electronic circuits. |
| CO2 | Implement the process of etching, UV exposure, drilling and coating for PCB fabrication using standard tools and techniques. |
| CO3 | Analyze circuit parameters and component behavior to design compact and efficient PCBs for optimized system performance. |
| CO4 | Evaluate the functionality and performance of fabricated electronic circuits through testing and validation procedures. |

**List of**

**Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | Introduction & Hands on experience to use circuit creation & simulation software like TINAPRO , Edwin XP etc. |
| 2 | Identification of various active and passive devices used for circuit designing. such as R, C, L, transformers, relays, switches, bread board, universal printed circuit board, diode, Zener diode, light emitting diode, transistors etc. |
| 3 | To study the process of PCB fabrication and assembly, including etching, post-etching treatments and various component mounting techniques. |
| 4 | Design and verify half wave rectifier with software like TINAPRO/EdwinXP. |
| 5 | Design and verify full wave rectifier with software like TINAPRO/EdwinXP. |
| 6 | Design and verify half adder with software like TINAPRO/EdwinXP. |
| 7 | Design and verify full adder with software like TINAPRO/EdwinXP. |
| 8 | Convert the power supply circuit into PCB & simulates its 2D & 3D view. |
| 9 | To test the functionality and performance of the electronic circuit. |
| 10 | Design and simulate a regulated power supply circuit using LM317/7805 IC and convert it into a PCB layout. |
| 11 | Fabricate a simple electronic project on a PCB and test its functionality. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

**Useful Video Links:**

| Exp No. | Topics | Links |
|---|---|---|
| 1 | TINA- Introduction and DC Simulation | https://youtu.be/51ztp8zgEG8 |
| 2 | Etching of PCB | https://youtu.be/QbAuq00BaII |



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| | | |
|---|---|---|
| 3 | Exposing to UV Light & Developing | https://youtu.be/ILRdnfEM7YI |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-ECE-202A** | | | | |
| Category | Professional Core Course | | | | |
| Course Title | **Analog Electronic Circuits** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Study working operation and behavior of transistors and amplifiers.<br>• Understand different types of feedback which affects the overall performance of the circuit.<br>• Learn working operation of oscillator circuits.<br>• Study power amplifiers, voltage regulators, and the basics of operational amplifiers with practical circuit applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Analyze the frequency response of BJTs and multistage amplifiers to determine gain, bandwidth, and high-frequency performance. |
| CO2 | Design and implement feedback mechanism in amplifiers and oscillators used for improving the performance of analog circuits. |
| CO3 | Classify power amplifiers and voltage regulators to ensure efficient power management in analog and mixed-signal circuits. |
| CO4 | Understand and apply the process, principles and characteristics of operational amplifiers and IC fabrication for designing the electronic circuits. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **High Frequency Analysis of BJT and Multistage Amplifier:** Hybrid Pi Model, CE Short Circuit Gain, Frequency Response, Alpha Cut off Frequency, Gain Bandwidth Product, Emitter Follower at High Frequencies. RC Coupled Transistor Amplifier, Lower & Upper Cut off Frequency, Frequency Response curve & Bandwidth, Transformer Coupled Amplifier, Direct Coupled Amplifier, Cascode Amplifier, Darlington Pair Amplifier, Distortion In Amplifiers.<br>**Feedback Amplifiers:** Feedback concept , Transfer Gain with Feedback, General Characteristics of Negative Feedback, Advantages & disadvantages, Input And Output Resistance, Voltage Series Feedback topology, Voltage Shunt, Current Series & Current Shunt topology ,Equivalent circuit for each topology, Effects of Negative Feedback. |

| | |
|---|---|
| **Unit-II** | **Oscillators:** Introduction, Barkhausen Criterion, Oscillator with RC Feedback circuit (RC Phase Shift, Wien Bridge), Tuned Collector, Tuned Base Oscillator, LC Feedback circuits (Hartley, Colpitts), Condition for Sustained Oscillations & Frequency of Oscillations, Crystal Oscillator.<br>**Power Amplifier:** Definition, Application & Types of Power Amplifiers, Amplifier Classes of Efficiency (Class - A, B, AB, C), Push Pull Amplifiers, Distortion in Simple & Push Pull Amplifier, Complementary Push Pull Amplifier, Integrated Circuit Power Amplifier , Introduction to MOSFET & CLASS D Power Amplifier. |
| **Unit-III** | **Voltage Regulators:** Voltage Regulation, Basic Series Regulators, Basic Shunt Regulators, Power Supply Parameters, Basic Switching Regulators, Step up Configuration, Step down Configuration, IC Voltage Regulator, SMPS.<br>**Integrated Circuit Fabrication Process**: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapour deposition, sputtering, twin-tub CMOS process. |
| **Unit-IV** | **Operational Amplifier Fundamentals:** Block Diagram Representation, Ideal OP-AMP, OP-AMP Equivalent Circuit, Ideal Voltage Transfer Curve, Input Offset Voltage, Input Bias Current, Input Offset Current, Output Offset Voltage, Thermal Drift, Effect of Variation in Power Supply Voltages on Offset Voltage, Common Mode Configuration and CMRR, Frequency Response of OP-AMP: Open Loop Response, Close Loop Response, Input and Output Impedances, Effect of Finite Gain Bandwidth Product, Slew Rate, OP-AMP as Integrator, Differentiator<br>**Operational Amplifier Applications**: Linear and non-linear applications-ADC and DAC, Multivibrators, Astable Multivibrator, Monostable Multivibrator, Bistable Multivibrator, 555 Timer, Monostable & Astable Operation with 555 Timer. |

**Suggested Readings:**


- Integrated Electronics By Millman Halkias -- TMH.
- Electronics Device & Circuit By Robert Boylestad ,Louis Nashelsky, 11th Edition, Pearson Education.
- Electronics Device & Circuit Theory By Nagrath, I.J., PHI Learning
- Electronics Device & Integrated Circuit By Singh, A K, PHI Learning
- A Textbook of Electronic Devices and Circuits by Gupta, J.B., S.K. Kataria and Sons
- Integrated Electronics : Analog and Digital Circuits and Systems by Millman, Jacob, TMH
- Applications and Design with analog Integrated Circuits by Jacob, Michael, Pearson Education


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | RC Coupled Amplifiers | https://youtu.be/BSR26SU3R2U |
| **Unit-II** | Power Amplifiers | https://youtu.be/huDZjQcEBMg |
| **Unit-III** | Voltage regulators | https://youtu.be/R_QnIAEk7Go |
| **Unit-IV** | Operational Amplifier | https://youtu.be/clTA0pONnMs |



| Course Code | PCC-ECE-204A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Digital Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Learn basic concepts of Boolean algebra, number systems, logic simplification, and error detection techniques.<br>• Design and study logic circuits used for arithmetic, control, and memory functions.<br>• Understand the working of analog-to-digital and digital-to-analog converters.<br>• Introduced various programmable devices like FPGAs and CPLDs for building digital systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Understand the knowledge of Boolean algebra, K-MAP and other digital design methods for simplification and optimization of digital circuits. |
| CO2 | Design and implement combinational logic circuits using logic gates for arithmetic operations, code conversion, and control applications. |
| CO3 | Understand and apply the concepts of latches, flip-flops, and counters in designing synchronous and asynchronous circuits for memory and storage applications. |
| CO4 | Analyze memory types and programmable logic device architectures to interpret the functional organization. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Logic Simplification**: Review of Boolean Algebra and De Morgan's Theorem, Digital codes, Logic gates and their operations, Realization of logic gates using universal gates, Number system, Representation of Boolean functions in sum of products (SOP) form and product of sums (POS),Addition and subtractions of a complements numbers, Minimization of Boolean functions using Karnaugh map and Quine McCuskey methods, Error detection and correction code. |
| Unit-II | **Combinational Logic Design**: Half and Full Adders, Half and Full Subtractors, Multiplexers, Demultiplexers, Encoder, Decoder, Magnitude Comparators, Priority encoder, Parallel Adders, Adder with Look Ahead Carry, BCD Adder. |



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|---|---|
| **Unit-III** | **Sequential Logic Design**: Latches, Concept of edge triggered and level triggered clock, Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF,Conversions of FF, Ripple and Synchronous counters, Ring and Johnson counter, UP & DOWN counter, Sequence Generator, Shift registers. |
| **Unit-IV** | **A/D and D/A Converter**: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.<br>**Programmable Logic Devices**: ROM, PLA, PAL, SRAM, DRAM. FPGA and CPLDs |

**Suggested Readings:**

- Modern digital Electronics by R.P. Jain,Tata McGraw Hill, 4th edition.
- Switching Theory & Logic Design by A.Anand Kumar, PHI.
- Digital Electronics Circuit and System by V K Puri, TMH.
- Digital Circuits and Systems by D.V. Hall, Tata McGraw Hill.
- Principle of Digital Electronics by K Meena, PHI
- Logic & Computer Fundamentals by Morris Mano,4th Edition, Pearson Education.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Boolean Algebra | https://www.youtube.com/shorts/xtAYbY_Pz7I |
| **Unit-II** | Multiplexer | https://www.youtube.com/watch?v=p6yPvw88BJk |
| | Combinational Circuits | https://www.youtube.com/watch?v=fXrbYMDevDU |
| **Unit-III** | Sequential Circuits | https://www.youtube.com/watch?v=S0mKCNLmCh4&list=PLgwJf8NK-2e4mEQv0ttgW-am4wiqrpdcX |
| | Counter | https://www.youtube.com/watch?v=NTCrCYPoA5A&list=PLgwJf8NK-2e6lcDg0NxW-_yO6Bl5dPBp8 |
| **Unit-IV** | Finite state machines | https://www.youtube.com/watch?v=LOZxYBOKRLg |
| | PLD's | https://www.youtube.com/watch?v=m6975d-U6j8 |



| Course Code | **PCC-ECE-206A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Course | | | | |
| Course Title | **Microprocessor and Microcontroller** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Understand the architecture and instruction set of microprocessors (8086, x86) and microcontrollers (8051, ARM).<br>• Develop low-level programming skills using assembly language.<br>• Learn peripheral interfacing concepts such as timers, I/O ports, ADC/DAC, and communication protocols.<br>• Explore advanced processors and embedded system using ARM Architecture | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Describe the features and architecture of Intel processors and microcontrollers for signal descriptions and system design. |
| CO2 | Use addressing modes and instructions of microprocessors and microcontrollers to write simple and efficient assembly programs." |
| CO3 | Classify the interrupts and modes of operation in microprocessors and microcontrollers and analyze their impact on system performance and functionality |
| CO4 | Apply appropriate data transfer schemes and hardware for transfer data between the of peripheral devices for interfacing I/O devices |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Fundamentals of Microprocessors and Interfacing:** Introduction to Microprocessors: Evolution, 8-bit/16-bit (8086), Architecture, Pin configuration, Addressing modes and register organization of 8085.<br>**8086 Architecture:** Register organization, Addressing Modes, Memory Segmentation, Instruction Set of 8086, Minimum/Maximum Mode, Memory Interfacing, Peripheral Interfacing (8255 PPI, 8254 Timer), Concepts of Interrupts and DMA. |
| Unit-II | **Advanced Microprocessors and Memory Systems :**<br>**X86 Microprocessor Family**: 80186, 80286, 80386, and 80486 – Architectural Features, Pentium to Pentium IV: Enhancements and features, Multi-core Processors and Mobile Processor Architectures.<br>**Memory Concepts**: Cache Memory, Virtual Memory – Mapping and Access Mechanisms. |

| | |
|---|---|
| **Unit-III** | **8051 Microcontroller and Interfacing :**<br>**8051 Architecture**: RAM/ROM layout, machine cycle, I/O structure, Instruction Set: Addressing Modes, Data Transfer, Arithmetic, Logical, Branching, Assembly Language Programming. Peripherals and Interfacing: Timers/Counters, Serial Communication, Interrupts, ADC, DAC, LCD, LED, Keypad. |
| **Unit-IV** | **ARM Processor Architecture and Embedded Design :**<br>RISC vs. CISC, ARM Design Philosophy, ARM Architecture: States (ARM, Thumb, Jazelle), Register, Sets, Modes, Pipelining, ARM Instruction Set: Data Processing, Load/Store, Branch, Conditional Execution, SWI, Vector Tables, Exception Handling, Embedded System Applications. |

**Suggested Readings:**

- Microprocessors and interfacing by D. V. Hall,, TMH, 2nd Edition.
- Microprocessor 8086: Architecture, Programming and Interfacing by Sunil Mathur, PHI Publisher
- Microprocessors and Microcontrollers by Sunil Mathur, Jeebananda Panda, PHI Publisher
- Advanced Microprocessors and Peripherals Architectures, Programming and Interfacing by Ray A. K. and Burchandi, TMH.
- The Intel Microprocessors 8086- Pentium Processor by Brey, 8th Edition, Pearson Education.
- The X86 PC: Assembly Language, Design and interfacing by M. A. Mazidi, J. P. Maizidi and Danny Causey, 5th Edition, Pearson Education.
- Microcontrollers : Architectures, Programming, Interfacing and System Design by Raj Kamal, Pearson Education

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Microprocessors and Interfacing – NPTEL Focuses on the interfacing aspects of microprocessors, covering essential concepts and practical applications | https://www.youtube.com/playlist?list=PLdlPA9pGVVtaUwRP-2Eaux10vo_USuDy1 |
| | Microprocessors & Microcontrollers by Prof. Sunil Mathur | https://www.youtube.com/@profsunilmathur8809 |
| **Unit-II** | Advanced Microprocessors and Memory Systems | https://www.youtube.com/playlist?list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3 |
| **Unit-III** | 8051 Microcontroller and Interfacing ,The 8051 Microcontroller and Embedded Systems by Prof. Santanu Chattopadhyay (IIT Kharagpur) | https://www.youtube.com/playlist?list=PLEPI1RnS5drMCNu1VPDwdrRO_U0awwTxJ |
| **Unit-IV** | ARM Processor Architecture and Embedded Design Embedded System Design with ARM by Prof. Dhananjay V. Gadre (IIT Delhi). Focuses on ARM architecture and its application in embedded system design, offering practical insights and examples. | https://www.youtube.com/playlist?list=PLbRMhDVUMngcJu5oUhgpgYqtOn7DmSfuU |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE- 207A** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Python Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To introduce Python programming fundamentals, including syntax, data types, control structures and basic python libraries.<br>• To develop skills in Python data structures, functions, recursion and python libraries like NumPy, Pandas, Tkinter etc..<br>• To explore Python's graphical programming, image processing, and GUI development. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define key terminology of Python syntax, data types, control structures, data structures, libraries, and GUI tools. |
| CO2 | Explain the functionality of Python programming constructs, data handling techniques, and graphical modules. |
| CO3 | Use Python programs for data processing, file handling, numerical computing, graphics, and GUI applications. |
| CO4 | Analyze Python programming constructs, data structures, libraries, graphics, image processing, and GUI techniques to solve real-world problems effectively. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; numerical types; arithmetic operators and expressions; Loops and selection statements, Control statements String manipulations: subscript operator, indexing, slicing a string; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file. |
| Unit-II | **Lists, Tuple, dictionary and Design with functions:** Basic list operators, replacing, inserting, removing an element; searching and sorting lists; Tuple: creating tuples, accessing elements, tuple immutability, operations, tuple methods, tuples vs. lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity; arguments and return values; Program structure and design. Recursive functions. |

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|---|---|
| **Unit-III** | **Introduction to NumPy:** NumPy arrays, Array Indexing and Slicing, Array Operations, Array Manipulation, Linear Algebra with NumPy, Random Number Generation and Statistics.<br>**Introduction to Pandas:** Pandas Series, Pandas Data Frames, Data Frame Indexing and Selection, Data Cleaning and Pre-processing, Data Manipulation, Group by Operations, Merging, Joining, and Concatenating Data Frames, Input/output Operations. |
| **Unit-IV** | **Simple graphics and image processing:** Simple graphics, Turtle operations, Manipulating turtle screen, Drawing two dimensional shapes, examining an object attributes, Taking a random walk, Colour and RGB scheme, Image processing: Image manipulation operations, properties of images, image module, copying, blurring and reducing image.<br>**Graphical User Interfaces using Tkinter:** Terminal based and GUI based programs, Introduction to Tkinter, Simple GUI-Based Programs, Windows and Window Components, Input and Output with Entry Fields, Defining and Using Instance Variables, Other Useful GUI Resources. |

**Suggested Readings:**


- Fundamentals of Python: First Programs by Kenneth Lambert, Course Technology, Cengage Learning, 2012.
- Introduction to Computer Science Using Python: A Computational Problem-Solving by Dierbach, C. Focus, John Wiley & Sons, 2012.
- Let Us Python by, Kanetkar, A., & Kanetkar, Y., BPB Publications.
- Python – The Complete Reference by Brown, M. C., McGraw Hill Education.
- Core Python Programming by Rao, R. N., Dream Tech Press.
- Python Programming: Using Problem Solving Approach by Thareja, R., Oxford University Press.
- Python Programming by Sridhar, S., Indumathi, J., & Hariharan, V. M., Pearson Education.
- Python for Data Analysis by Wes McKinney, 3rd Edition, O'Reilly Media, 2022.
- Python Data Science Handbook by Jake VanderPlas, O'Reilly Media.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Variables and Input Statement | https://youtu.be/ruQb8jzkGyQ |
| | Data Types, Operators and Expressions | https://youtu.be/8n4MbjuDBu4 |
| | Introduction to for loop | https://youtu.be/lvXuQ_x7EsI |
| | Introduction to while loop | https://youtu.be/KTvVNN7ia8o |
| | String Methods | https://youtu.be/p-4HU1rcG5s |
| | Reading and Writing to a File | https://www.youtube.com/watch?v=rYLJaAdgLhI |
| | Creating and reading a formatted file | https://www.youtube.com/watch?v=NBTSDtBy5bs |
| **Unit-II** | List operators | https://youtu.be/jMShssechMI |
| | Searching and sorting lists | https://youtu.be/4OxBvBXon5w |
| | Tuples | https://youtu.be/mzx74TdGYbg |
| | Dictionary literals, adding, and removing elements | https://youtu.be/Aj7PwBI99A4 |
| | Recursive functions | https://youtu.be/Uo7RyqJaaRQ |
| **Unit-III** | NumPy | https://youtu.be/rjY59WLMK2o |
| | Pandas | https://youtu.be/6DTFIKF8QIg?feature=shared |
| **Unit-IV** | Simple graphics | https://www.youtube.com/watch?v=pxKu2pQ7Ilo |
| | Graphical User Interfaces using Tkinter | https://youtu.be/-GhzpvvIXIM?si=itHn2839Kkhy89B3 |

| Course Code | **PEC-ECE-208A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Bio-Medical Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand human physiology and basic biomedical transducer principles.<br>• Learn bio-electrode configurations and bio-potential amplifier techniques.<br>• Measure non-electrical physiological body parameters.<br>• Explore medical imaging, therapeutic equipment, and safety standards. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Describe the structure, function, and electrical activity of human physiological systems and the role of biomedical transducers used to measure physiological parameters |
| CO2 | Explain the configurations and implement the applications of bio-electrodes and bio-potential amplifiers in physiological measurements. |
| CO3 | Measure and interpret non-electrical physiological parameters using appropriate biomedical instruments and techniques. |
| CO4 | Analyze the principles, applications, and safety considerations of medical imaging and therapeutic biomedical equipment. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Physiology and Transducers:** Brief introduction to human physiology: Cell and its structure; Resting and Action Potential; Cardiovascular system; respiratory system; Basic components of a biomedical system. Biomedical transducers: Transducers selection criteria; Piezoelectric; ultrasonic; displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases; Temperature measurements; Fiber optic temperature sensors. |
| Unit-II | **Electro – Physiological Measurements:** Bio-electrodes and Biopotential amplifiers for ECG, EMG, EEG, etc.: Limb electrodes; floating electrodes; pre-gelled disposable electrodes; Micro, needle and surface electrodes. ECG; EEG;EMG; ERG; Lead systems and recording methods. |

| | |
|---|---|
| **Unit-III** | **Non-Electrical Parameter Measurements:** Measurement of blood temperature, pressure and flow; Cardiac output ; Heart rate ;Heart sound Pulmonary function measurements ;spirometer ; Impedance plethysmography; Photo Plethysmography, Body Plethysmography. |
| **Unit-IV** | **Medical Imaging:** Ultrasonic, X-ray and nuclear imaging: Radiographic and fluoroscopic techniques; Computer tomography; MRI; Ultrasonography<br>**Assisting And Therapeutic Equipments:** Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped; Safety aspects: safety parameters of biomedical equipments. |

**Suggested Readings:**

- Handbook of Biomedical Instrumentation by RS Khandpur;TMH, New Delhi, latest edition.
- A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall,latest edition
- Introduction to Biomedical Electronics by Edward J. Perkstein; Howard Bj, USA
- Medical Electronics by Vikas Soni, Ishan publication
- Leslie Cromwell,—Biomedical Instrumentation and Measurementl, Prentice Hall of India, New Delhi, latest edition

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Brief introduction to human physiology: Cell and its structure; Resting and Action Potential. Biomedical transducers: Transducers selection criteria; Piezoelectric; ultrasonic. | https://www.youtube.com/watch?v=Z1vp0bNFovU https://www.youtube.com/watch?v=nb_GXOaS94w |
| **Unit-II** | Bio-electrodes and Biopotential amplifiersfor ECG, EMG, EEG. | https://www.youtube.com/watch?v=3RcS4cDgK08 http://swayam.gov.in |
| **Unit-III** | Measurement of blood temperature, pressure and flow; Cardiac output ; Heart rate ; Heart sound. Body Plethysmography. | https://www.youtube.com/watch?v=n_6A2BL0YlA http://swayam.gov.in https://www.youtube.com/watch?v=8pmVZwGUEgU&t=50s |
| **Unit-IV** | Ultrasonic, X-ray and nuclear imaging: Radiographic and fluoroscopic techniques; Computer tomography; MRI;Ultrasonography. Pacemakers,defibrillators,heart-lung machine, artificial kidney. | https://www.youtube.com/watch?v=ZN9lPpkHiH8 https://www.youtube.com/watch?v=h2JgleSpocE http://swayam.gov.in |



| Course Code | **PEC-ECE-210A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Scientific Computing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand different types of errors in numerical computation.<br>• Solve differential equations using numerical methods and understand advanced computational techniques.<br>• Apply numerical methods to solve linear and nonlinear systems, and perform data fitting. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define errors, stability, conditioning and other key terminologies related to computer arithmetic and numerical methods. |
| CO2 | Describe the purpose, strengths, and application areas of numerical methods used in solving engineering and scientific problems. |
| CO3 | Apply methods to solve linear and nonlinear systems, data fitting, interpolation, differentiation, integration, and differential equations. |
| CO4 | Analyze the performance, accuracy, and limitations of numerical algorithms and their applications in simulation, optimization, and signal processing. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation. |

| | |
|---|---|
| **Unit-II** | **System of linear equations:** Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting<br>**Eigen values and singular values:** Eigen values and Eigenvectors, Methods for Computing All Eigen values, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD |
| **Unit-III** | **Nonlinear equations:** Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation Numerical Integration And Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation |
| **Unit-IV** | Initial Value Problems for ODES, Euler's Method, Taylor Series Method, RungaKutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigen value Problems Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers And Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences |

**Suggested Readings:**


- Scientific Computing: An Introductory Survey by Heath Michael T., McGrawHill, latest edition.
- Numerical Recipes: The Art of Scientific Computing by Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery, Cambridge University Press, latest edition
- Introduction To Computational Mathematics by Xin-she Yang (Ed.).,World Scientific Publishing Co.
- Computational Science by Kiryanov D. and Kiryanova E., Infinity Science Press, latest edition
- Scientific Computing With MATLAB And Octave by Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, Springer, latest edition.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Data Error and Computational, Truncation Error and Rounding Error | https://www.youtube.com/watch?v=nPZmfpFrgPo |
| **Unit-II** | Positive Definite Systems and Indefinite System | https://www.youtube.com/watch?v=ttMZB5Gm_fM |
| **Unit-III** | One-Dimensional Optimization, Multidimensional Unconstrained Optimization | https://www.youtube.com/?bp=wgUCEAE%3D |
| **Unit-IV** | Solution for Sparse Linear Systems | https://www.youtube.com/watch?v=gwqbNtFuvWU |



| Course Code | **PEC-ECE-212A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Course | | | | |
| Course Title | **Power Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand the construction and working of power electronic devices.<br>• Design and analyze rectifiers, inverters, choppers, and converters.<br>• Study different control techniques for AC and DC electric drives.<br>• Explore real-world applications of power electronics in systems like UPS and electric vehicles. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Explain the construction, working principles, and characteristics of power electronic devices. |
| CO2 | Analyze single-phase and three-phase controlled rectifier circuits and inverter configurations for various load conditions. |
| CO3 | Apply the concepts of choppers, dual converters, and cyclo- for efficient power control and conversion in electrical systems. |
| CO4 | Implement thyristor-based control strategies for DC and AC electric drives and identify real-world applications of power. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | Role of power electronics, SCR- Construction, working principles of SCR, V-I characteristics of SCR, Two transistor analogy of SCR, Protection of SCR, Different methods of SCR triggering, Different commutation circuits for SCR, Construction & working principle of DIAC, TRIAC, IGBT, GTO, MOSFET, UJT and their V-I characteristics. Basic idea about the selection of Heat sink for thyristors. |
| Unit-II | **Controlled Rectifiers:** Single phase half wave-controlled rectifier with R, R-L Load & concept of freewheeling diode, Single phase half controlled full wave rectifier (Half Bridge and Full Bridge with R, R-L Load), Single phase full wave centre tapped rectifier, Three phase full wave half-controlled and fully controlled bridge rectifier (R Load) Inverters: Principle of operation of basic inverter circuits, concepts of duty cycle, series & parallel, inverters & their applications. |

| | |
|---|---|
| **Unit-III** | **Choppers:** Introduction, types of choppers (Class A, Class B, Class C and Class D). Step up and step-down choppers. Cyclo-converters: Dual Converters and cyclo- converters: Introduction, types & basic working principle of dual converters and cyclo- converters & their applications. |
| **Unit-IV** | **Thyristorised Control of Electric drives DC drive control:** Half wave drives, Full wave drives, Chopper drives (Speed control of DC motor using choppers) AC drive control: Phase control, Constant V/F operation, Cyclo-converter /Inverter drives, Slip control AC drives Applications of power devices: light intensity control, speed control of universal motors, fan regulator, battery charger. Uninterrupted power supplies (UPS online, off line), SMPS Application of Power Electronics in Electrical vehicles controls. UJT as relaxation oscillator. |

**Suggested Readings:**

- Power electronics by Muhammad H. Rashid, Prentice Hall of India.
- Power electronics by PC Sen,2nd edition, TMH.
- Power Electronics: Devices, Circuits, and Matlab Simulation by Alok Jain, Pernam international Publication.
- Power Electronics by M H Rashid, 3rd Edition,Pearson Education.
- Power Electronics and drive by Sachin Sharma, Vayu Education.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Two transistor analogy of SCR | https://www.youtube.com/watch?v=uN42NhZCU_M |
| **Unit-II** | Single phase half controlled full wave rectifier | https://www.youtube.com/watch?v=IFrbdl9AsQE |
| **Unit-III** | Step up and step-down choppers | https://www.youtube.com/watch?v=8UbLt2U1Ydw |
| **Unit-IV** | Thyristorised Control of Electric drives DC drive control | https://www.youtube.com/watch?v=q4YEChr8R5I |

| Course Code | **PEC-CSE-214A** | | | | |
|---|---|---|---|---|---|
| Category | Program Elective Courses | | | | |
| Course Title | **Computer Vision** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand about images formation, representation, and processed using cameras, geometry, and transformations.<br>• Learn how to estimate and track motion in image sequences using techniques like optical flow and Kalman filters.<br>• Explore methods to detect shapes such as lines, circles, and ellipses using the **Hough Transform** and its variations.<br>• Understand how to reconstruct 3D scenes and objects from 2D images using depth cues and 3D projection methods. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define computer vision fundamentals, image acquisition, imaging geometry, geometric transformations, and camera projection models. |
| CO2 | Explain image enhancement techniques and feature detection methods for visual data processing. |
| CO3 | Apply 3D vision techniques, surface representations, motion analysis techniques, and motion tracking techniques. |
| CO4 | Analyze object recognition methods and shape representation using feature detection and appearance-based approaches. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Overview of computer vision and its applications:** Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation<br>**Image Processing:** Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal. |
| Unit-II | **Hough Transform**: Line detection – Hough Transform (HT) for line detection , foot-of normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection – accurate center location – speed problem – ellipse detection.<br>**Case study:** Human Iris location, hole detection, Generalized Hough Transform (GHT), Spatial matched filtering, GHT for ellipse detection , object location, GHT for feature collation. |

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| Course Code | PEC-CSE-214A | | | | |
|---|---|---|---|---|---|
| Category | Program Elective Courses | | | | |
| Course Title | **Computer Vision** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Understand about images formation, representation, and processed using cameras, geometry, and transformations.<br>• Learn how to estimate and track motion in image sequences using techniques like optical flow and Kalman filters.<br>• Explore methods to detect shapes such as lines, circles, and ellipses using the **Hough Transform** and its variations.<br>• Understand how to reconstruct 3D scenes and objects from 2D images using depth cues and 3D projection methods. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Define computer vision fundamentals, image acquisition, imaging geometry, geometric transformations, and camera projection models. |
| CO2 | Explain image enhancement techniques and feature detection methods for visual data processing. |
| CO3 | Apply 3D vision techniques, surface representations, motion analysis techniques, and motion tracking techniques. |
| CO4 | Analyze object recognition methods and shape representation using feature detection and appearance-based approaches. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Overview of computer vision and its applications:** Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation<br>**Image Processing:** Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal. |
| Unit-II | **Hough Transform**: Line detection – Hough Transform (HT) for line detection , foot-of normal method, line localization, line fitting, RANSAC for straight line detection, HT based circular object detection – accurate center location – speed problem – ellipse detection.<br>**Case study:** Human Iris location, hole detection, Generalized Hough Transform (GHT), Spatial matched filtering, GHT for ellipse detection , object location, GHT for feature collation. |

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| | |
|---|---|
| **Unit-III** | **3D Vision:** Methods for 3D vision – projection schemes, shape from shading – photometric stereo, shape from texture, shape from focus – active range finding,<br>**Surface Representations:** point-based representation , volumetric representations- 3D object recognition, 3D reconstruction. |
| **Unit-IV** | **Introduction to Motion:** Triangulation, bundle adjustment, translational alignment, parametric motion, spline-based motion, Optical flow, layered motion.<br>**Motion tracking:** statistical filtering; iterated estimation; observability and linear systems; the Kalman filter.<br>**Object recognition and shape representation:** alignment, appearance-based methods, invariants, image eigen spaces. |

**Suggested Readings:**

- Mastering OpenCV with Practical Computer Vision Projects by D. L. Baggio etal., Packt Publishing.
- Computer & Machine Visionl by E. R. Davies, Fourth Edition, Academic Press.
- Programming Computer Vision with Python Tools and algorithms for analyzing images by Jan Erik Solem, O'Reilly Media.
- Feature Extraction & Image Processing for Computer Vision by Mark Nixon and Alberto S. Aquado, Third Edition, Academic Press.
- Computer Vision: Algorithms and Applications by R. Szeliski, Springer.
- Computer Vision: Models, Learning, and Inferencel by Simon J. D. Prince, Cambridge University Press.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Computer Vision | https://www.youtube.com/watch?v=yetsJWgYh0o&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=2 |
| | Introduction to Image Processing | https://www.youtube.com/watch?v=1I6kfkY4GyQ&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=3 |
| **Unit-II** | Image Features and Edge Detection | https://www.youtube.com/watch?v=U-5x0L48LzE&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=22 |
| | Hough Transform | https://www.youtube.com/watch?v=4fTxG-Eb37k&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=24 |
| **Unit-III** | 3D object recognition, 3D reconstruction | https://www.youtube.com/watch?v=yG74TklRPoo |
| | Image Formation in a Stereo Vision Setup | https://www.youtube.com/watch?v=IvYu0O8ZQNI |
| **Unit-IV** | Structure from Motion | https://www.youtube.com/watch?v=ffYs3i2BAig |
| | Object Boundary and Shape Representations | https://www.youtube.com/watch?v=sVTlQQ2jXIM&list=PLwdnzlV3ogoVsma5GmBSsgJM6gHv1QoAo&index=27 |



| Course Code | **HSMC-01A** | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Fundamental of Management and Organizational Behavior** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework.<br>• Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings.<br>• Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively.<br>• Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Define fundamental management concepts, functions, organizational processes, and organizational behavior elements. |
| **CO2** | Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations. |
| **CO3** | Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges. |
| **CO4** | Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction of Management:** Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.<br>**Functions of Management:** Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration. |
| **Unit-II** | **Introduction of Organization:** Meaning and Process of Organization, Management v/s Organization.<br>**Fundamentals of Organizational Behavior:** Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB.<br>**Individual Processes and Behavior:** Personality, Concept, Determinants and Applications.<br>**Perception:** Concept, Process and Applications.<br>**Learning:** Brief Introduction.<br>**Motivation:** Concept, Techniques and Importance. |

| | |
|---|---|
| **Unit-III** | **Interpersonal Processes:** Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict- Concept, Sources, Types, Management of Conflict.<br>**Leadership:** Concept, Function, Styles, Qualities of Leadership.<br>**Communication:** Meaning, Process, Channels of Communication, Importance and Barriers of Communication. |
| **Unit-IV** | **Organizational Processes:** Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.<br>**Organizational Culture:** Elements, Types and Factors affecting Organizational Culture.<br>**Organizational Change:** Concept, Types and Factors affecting Organizational Change, Resistance to Change. |

**Suggested Readings:**

- Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
- Organisational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
- Management concept practice and cases by Ghuman Karminder, Aswathappa K.,TM, New Delhi.
- Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
- Organizational Behaviour by Stephen P Robin, Pearson Education.
- Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
- Organizational Behaviour by FC Sharma, Shree mahavir publications.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Nature and Scope of Management | https://nptel.ac.in/courses/110105146 |
| **Unit-II** | Perception and Personality | https://nptel.ac.in/courses/110103433 |
| **Unit-III** | Group Dynamics | https://archive.nptel.ac.in/courses/110/106/110106145/ |
| **Unit-IV** | Organizational Change, Resistance to Change. | https://nptel.ac.in/courses/110105146 |

| Course Code | LC-CSE-213A | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Python Programming Lab** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To introduce students to the basics of Python programming including syntax, data types, control structures, and file operations.<br>• To enable students to use Python data structures and modular programming techniques effectively.<br>• To provide hands-on experience with data analysis using NumPy and Pandas libraries.<br>• To develop skills in GUI programming, simple graphics, and image processing using Python. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Understand the installation process, basic features and programming constructs in Python. |
| CO2 | Apply Python programming techniques to implement algorithms for mathematical operations, searching, sorting and other real life problems. |
| CO3 | Apply NumPy and Pandas for data manipulation, statistical operations. |
| CO4 | Analyze Python's graphics, image processing, and GUI programming concepts to develop interactive applications. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | Study the basic features and installation of Python. |
| 2 | Write a Python program to compute the G.C.D. of two numbers. |
| 3 | Write a Python program to find the square root of a number. |
| 4 | Write a Python program to find the power of a number. |
| 5 | Write a Python program to find the maximum in a list of numbers. |
| 6 | Write a Python program to implement linear search and binary search in a list. |
| 7 | Write a Python program to sort the element using selection sort, insertion sort and merge sort. |
| 8 | Write a Python program to compute first "n" prime numbers. |
| 9 | Write a Python program to find the most frequent word in a text file. |
| 10 | Write a Python program to create and perform operations on arrays using NumPy. |
| 11 | Write a Python program to apply Pandas for manipulating a dataset and performing grouped statistical operations. |
| 12 | Write a Program in Python for a random walk using turtle. |
| 13 | Create simple graphics using Turtle: draw shapes and take random walks. |
| 14 | Perform image processing: copy, blur, and reduce images using PIL or OpenCV |
| 15 | Design a GUI application using Tkinter with input, output, and buttons. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.



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**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | Arithmetic Operations | https://python-iitk.vlabs.ac.in/exp/arithmetic-operations/ |
| 2 | Built-in Functions | https://python-iitk.vlabs.ac.in/exp/built-in-functions/ |
| 3 | Loops | https://python-iitk.vlabs.ac.in/exp/loops/ |
| 4 | Strings | https://python-iitk.vlabs.ac.in/exp/strings/ |
| 5 | File Handling | https://python-iitk.vlabs.ac.in/exp/file-operators/simulation.html |



| Course Code | **LC-ECE-216A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Analog Electronics Circuit Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand the characteristics and AC analysis of RC coupled amplifiers.<br>• Understand the operation and characteristics of different oscillators, regulators and timers.<br>• Understand the operation of the power supply. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Analyze the characteristics and frequency response of different transistor amplifier configurations. |
| **CO2** | Examine the effects of negative feedback topologies on the performance of amplifiers. |
| **CO3** | Apply oscillator and op-amp principles to design and analyze circuits for signal generation and processing. |
| **CO4** | Demonstrate and apply the principles and working operations of IC regulators, SMPS, and 555 timers in analog circuits. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To analyze and study frequency response of RC coupled amplifier. |
| 2 | To analyze and study different types of feedback topologies. |
| 3 | To analyze and study RC phase shift oscillator. |
| 4 | To analyze and study the wein bridge oscillator. |
| 5 | To analyze and study three terminal IC voltage regulator. |
| 6 | To draw characteristics of a transistor. |
| 7 | To analyze and study inverting and non-inverting op-amp amplifiers. |
| 8 | To analyze and study the 555 timer as a square wave generator. |
| 9 | To analyze and study SMPS power supply. |
| 10 | To analyze and study working of Push-Pull amplifiers. |
| 11 | To analyze and study op-amp amplifiers as a differentiator. |
| 12 | To analyze and study op-amp amplifiers as an integrator. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.



**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | Frequency response of RC coupled amplifier. | https://www.youtube.com/watch?v=ru72wlF6epU |
| 2 | Characteristics of a transistor. | https://www.youtube.com/shorts/8dN_4qNJALE |
| 3 | 555 timer as a square wave generator | https://www.youtube.com/shorts/wjN-7eiuIgY |
| 4 | Wein bridge oscillator | https://www.youtube.com/watch?v=_TD0xG5FbCs |
| 5 | SMPS | https://www.youtube.com/shorts/5DQP-41mlQk |
| 6 | Working of Push-Pull amplifier | https://www.youtube.com/watch?v=NuW2ztF27R8 |
| 7 | Inverting and non-inverting op-amp amplifiers | https://www.youtube.com/watch?v=EOZyofNXWXc |



| Course Code | **LC-ECE-218A** | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Digital Electronics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Learn the basics of digital electronics and use logic gates and ICs.<br>• Design and check different combinational and sequential logic circuits.<br>• Understand the working operation of adders, subtractors, multiplexers, flip-flops, and counters in digital systems.<br>• Learn to build and test ADC, DAC, and practical counters for various applications. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Identify and apply operational principles of logic gates used in digital systems. |
| CO2 | Apply K-map techniques to simplify Boolean expressions and design efficient combinational and sequential circuits. |
| CO3 | Verify the truth tables and behavior of various combinational circuits with different states and inputs. |
| CO4 | Design and develop counters and shift registers using flip flops for various practical applications used in digital systems. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To study & design basic gates. |
| 2 | To study and realize logic functions with the help of universal gates. |
| 3 | To realize and minimize five & six variables using K-Map method. |
| 4 | To verify the operation of Multiplexer & De-multiplexer. |
| 5 | To perform half adder and full adder |
| 6 | To perform half subtractor and full subtractor. |
| 7 | To verify the truth table of S-R, J-K, T & D Type flip flop. |
| 8 | To design & verify the operation of 3 bit synchronous counter. |
| 9 | To design & verify the operation of synchronous UP/DOWN decade counter using JK flip |
| 10 | To design & verify operation of Asynchronous counter. |
| 11 | To design and implement a circuit to detect a count sequence. |
| 12 | To design & verify operation of ADC & DAC. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.



**Useful Video Links:**

| Sr. No. | Topics | Links |
|---|---|---|
| 1 | To study & design basic gates. | https://de-iitr.vlabs.ac.in/exp/truth-table-gates/ |
| 2 | To study and realize logic functions with the help of universal gates. | https://de-iitr.vlabs.ac.in/exp/half-full-adder/ |
| 3 | To verify the operation of Multiplexer & De-multiplexer. | https://de-iitr.vlabs.ac.in/exp/multiplexer-demultiplexer/ |
| 4 | To perform half adder and full adder | https://de-iitr.vlabs.ac.in/exp/half-full-adder/ |
| 5 | To perform half subtractor and full subtractor. | https://de-iitr.vlabs.ac.in/exp/half-full-subtractor/index.html |
| 6 | To verify the truth table of S-R, J-K, T & D Type flip flop. | https://de-iitr.vlabs.ac.in/exp/truth-tables-flip-flops/ |
| 7 | To design & verify the operation of 3 bit synchronous counter. | https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/ |
| 8 | To design & verify operation of Asynchronous counter. | https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/ |



| Course Code | LC-ECE-220A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Microprocessor and Microcontroller Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand architecture and working of Microprocessor and Microcontroller.<br>• Learn assembly programming for arithmetic and data operations.<br>• Provide hands-on experience in interfacing various peripherals with processor based systems. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Explain the architecture and functioning of microprocessors and microcontroller using model kits and instruction sets. |
| CO2 | Develop and debug assembly language programs for arithmetic, logical and data manipulation tasks using instruction sets. |
| CO3 | Apply interfacing techniques to connect peripherals with computing devices for practical applications. |
| CO4 | Analyze embedded control algorithms for hardware interfacing and timing operations using microcontroller kit. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To study the architecture and functional blocks of the 8085 and 8086 microprocessors using trainer kit. |
| 2 | Write and execute program to perform arithmetic operations such as addition, subtraction, multiplication and division using 8085 instruction set. |
| 3 | Write a program to add the content of the memory location to the content of other memory location and store the result in 3rd memory location using 8086 instruction set. |
| 4 | Write a program to add 16 bit number using 8086 instruction set. |
| 5 | Write a program for multiplication of two 16 bit numbers using 8086 instruction set. |
| 6 | Write a program for division of two 16 bit numbers using 8086 instruction set. |
| 7 | Write a program to calculate the factorial of a given number using the 8086 instruction set. |
| 8 | Write a program to find the average of two given numbers using the 8086 instruction set. |
| 9 | Write a program to find the largest number in a data array using 8086 Instruction set. |
| 10 | Write and execute an 8086 assembly language program to interface and control a stepper motor using the 8255 (PPI). |
| 11 | To study the architecture and functioning of the 8051 microcontroller using trainer kit. |
| 12 | Write and execute a program to generate a square wave using the 8051 microcontroller. |
| 13 | Write and execute a program to interface an LED with the 8051 microcontroller and generate a blinking effect using software delay. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.



GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD ECE

| Course Code | MC-222A | | | | |
|---|---|---|---|---|---|
| Category | Professional Core Courses | | | | |
| Course Title | **Project Based Learning/Micro Project** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 0 | 0 | 2 | | |
| Course Objectives | The objectives of this course are to<br>• To expose students to domains related real-world engineering problem.<br>• To introduce structured approaches for project planning, execution, documentation and technical presentation.<br>• To enable the use of engineering concepts, tools and technologies for developing practical project solutions.<br>• To create awareness of ethical, economic, environmental, and sustainability considerations in engineering projects. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | ..... | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| CO1 | Identify domain specific real world or engineering problems and applications suitable for project development. |
| CO2 | Explain the principles, methodology and systematic process for project execution, reporting and technical presentation. |
| CO3 | Apply appropriate engineering knowledge, tools and techniques to develop solutions for identified problem. |
| CO4 | Analyze ethical practices, economics associated with different technologies suitable for project development. |
| CO5 | Justify design choices, performance parameters, and technical constraints of the developed solution. |
| CO6 | Design and develop a cost effective, environmental friendly, functional prototype addressing a defined engineering problem. |

**Note:**

- This mandatory non-credit course prepares students for innovation, real-world problem solving, major projects, and industry-oriented learning through project-based learning.
- The minimum passing marks are mandatory in this course.
- Students shall undertake a project in a group of 2 to 4 students, under the supervision of a faculty mentor.
- The project shall focus on identification, design, development, and evaluation of a solution to a real-world or engineering problem relevant to Electronics and Communication Engineering or allied domains.
- To promote project based learning, faculty mentors may use digital learning platforms.
- The scope of the project may include hardware implementation, software development, simulation, or a hybrid approach.
- The course shall be evaluated for 50 internal marks only, and no external examination shall be conducted for this course.
- Assessment shall be based on clearly defined rubrics ensuring transparency and objectivity in evaluation.
- Students shall demonstrate teamwork, professional ethics, effective communication, and responsibility during the execution and presentation of the project.
- Successful completion of this course is mandatory for the award of the degree and serves as a foundation for higher-level projects, internships, and industry-oriented learning in
- Continuous assessment shall be carried out through periodic reviews, seminar presentation, project demonstration and submission of a structured technical report.



# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

## Minutes of 2nd meeting of the Board of Studies

The 2nd meeting of Board of Studies of Computer Science and Engineering Department was held on 28.05.2025 at 12:30 P.M in the Board Room of the Institute.

The following members were present for the BOS meeting:

| Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|
| Dr. Nitin Kumar | HOD, CSE, Ganga Institute of Technology and Management, Kablana | Chairperson |
| Prof. Yudhvir Singh | Director, UIET, MDU, Rohtak, University Nominee | Member |
| Prof. Yogesh Chaba | Subject Expert (Professor, CSE, GJU Science & Technology, Hisar), Outside Parent University | Member |
| Prof. Namita Gupta | Subject Expert (Professor, CSE, MAIT, New Delhi), Outside Parent University | Member |
| Mr. Sumit Nijhawan | Industry/ Corporate Sector | Member |
| Dr. Pramod Kumar | Associate Professor, CSE, GITAM Kablana | Member |
| Dr. Poonam | Assistant Professor, CSE, GITAM Kablana | Member |
| Dr. Priyanka Rani | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Upasna | Assistant Professor, CSE, GITAM Kablana | Member |
| Mr. Rahul | Assistant Professor, CSE, GITAM Kablana | Member |
| Mr. Jitender Kumar | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Nisha Rani | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Ritu Kadyan | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Manjali | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Aakansha | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Smriti | Assistant Professor, CSE, GITAM Kablana | Member |
| Mr. Tarun Kumar | Assistant Professor, CSE, GITAM Kablana | Member |
| MS. Sonika | Assistant Professor, CSE, GITAM Kablana | Member |
| Ms. Ritu Lohchab | Assistant Professor, CSE, GITAM Kablana | Member |
| Mr. Vikas | Assistant Professor, CSE, GITAM Kablana | Member |
| Mr. Arihant Jain | Alumni | Member |

**Agenda of the Meeting:**

**Item No. 2.1:** Confirmation of the minutes of 1st meeting of Board of Studies of Computer Science and Engineering Department held on 04.01.2025.

**Item No. 2.2:** Follow up action report on the decisions taken by Board of Studies of Computer Science and Engineering Department in the 1st Meeting held on 04.01.2025.

**Item No. 2.3:** Scheme of Examinations and Syllabus of 2nd year M.Tech Computer Science and Engineering (CSE) from Academic Session 2025-26.

**Item No. 2.4:** Scheme of Examinations and Syllabus of 2nd year M.Tech Cyber Forensics and Information Security (CFIS) from Academic Session 2025-26.

**Item No. 2.5:** Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Computer Science and Engineering for various PG Programs offered by the Institute for Academic Session 2025-26.

**Item No. 2.6:** Scheme of Examinations and Syllabus of 2nd year B.Tech Computer Science and Engineering (CSE) common with B.Tech CSE-Data Science, B.Tech CSE-Artificial Intelligence and Machine Learning from Academic Session 2025-26.

**Item No. 2.7:** Scheme of Examinations and Syllabus of Basics of Computer Science and Engineering, Basics of Data Science, and Basics of Artificial Intelligence forB. Tech CSE/CSE-AI&ML/CSE-DS 1st year courses offered by the Computer Science and Engineering Department for Academic Session 2025-26.

**Item No. 2.8:** Review of the Panel of Examiners for Theory and Practical's of B.Tech and M.Tech programs for Academic Session 2025-26

**Item No. 2.9:** Any other item with the permission of the chair.

**Agenda Items Discussed:**

At the outset, the Chairperson, Dr. Nitin Kumar, extended a warm welcome to all the esteemed members of the Board of Studies and appreciated their presence and contribution towards academic development. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Item No. 2.1:** Confirmation of the minutes of 1st meeting of Board of Studies of Computer Science and Engineering Department held on 04.01.2025.

**The minutes of 1st meeting of Board of Studies of Computer Science and Engineering Department held on 04.01.2025 be confirmed and attached as Annexure-2.1 from Page No. 1 to 2**.

**Item No. 2.2:** Follow up action report on the decisions taken by Board of Studies of Computer Science and Engineering Department in the 1st Meeting held on 04.01.2025.

**Follow-up action report on the decisions taken by Board of Studies of Computer Science and Engineering Department in the 1st Meeting held on 04.01.2025 be noted.**

| Item No. | Particulars | Follow-up Action |
|---|---|---|
| **Board of Studies meeting dated 04.01.2025** | | |
| **1.2** | Approval of the Scheme of Examinations and Syllabus prescribed for M.Tech CSE 1st year and M.Tech CFIS 1st year for academic session 2024-25. | Approved the Scheme of Examinations and Syllabus prescribed for M.Tech CSE 1st year and M.Tech CFIS 1st year for academic session 2024-25. |
| **1.3** | Approval of Scheme of Examinations and Syllabus of Programming for Problem Solving (PPS) for B.Tech 1st year (Common for all branches) offered by the Computer Science and Engineering Department for academic session 2024-25. | Approved the Scheme of Examinations and Syllabus of Programming for Problem Solving (PPS) for B.Tech 1st year (Common for all branches) offered by the Computer Science and Engineering Department for academic session 2024-25. |
| **1.4** | Panel of examiners for theory and practical's of B.Tech and M.Tech Programs for academic session 2024-25. | Approved the Panel of examiners for theory and practical's of B.Tech and M.Tech Programs for academic session 2024-25. |

**Item No. 2.3:** Scheme of Examinations and Syllabus of 2nd year M.Tech Computer Science and Engineering (CSE) from Academic Session 2025-26.

**The Scheme of Examinations and Syllabus of M.Tech Computer Science and Engineering (CSE) 2nd year for the Academic Session 2025-26 was presented and discussed. Members provided constructive feedback and suggestions for improvement. Resolved that the Scheme of Examinations and Syllabus is approved. The approved Scheme and Syllabus of M.Tech-CSE 2nd year for the academic session 2025-26 are attached as Annexure-2.2 from pages 3 to 28. Further resolved that the Scheme of Examinations and Syllabus of above is recommended to the Academic Council for Approval.**

**Item No. 2.4:** Scheme of Examinations and Syllabus of 2nd year M.Tech Cyber Forensics and Information Security (CFIS) from Academic Session 2025-26.

**The Scheme of Examinations and Syllabus of M.Tech Cyber Forensics and Information Security (CFIS) 2nd year for the Academic Session 2025-26 was presented and discussed. Members provided constructive feedback and suggestions for improvement. Resolved that the Scheme of Examinations and Syllabus is approved. The approved Scheme and Syllabus of M.Tech-CFIS 2nd year for the academic session 2025-26 are attached as Annexure-2.3 from pages 29 to 54. Further resolved that the Scheme of Examinations and Syllabus of above is recommended to the Academic Council for Approval.**

**Item No. 2.5:** Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Computer Science and Engineering for various PG Programs offered by the Institute for Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year of Multidisciplinary Open Elective-II courses offered by the Computer Science and Engineering Department for various PG Programs offered by the Institute for academic session 2025-26 are attached as Annexure-2.4 from pages 55 to 57 is approved. Further resolved that the Scheme of Examinations and Syllabus of above is recommended to the Academic Council for Approval.**

**Item No. 2.6:** Scheme of Examinations and Syllabus of 2nd year B.Tech Computer Science and Engineering (CSE) common with B.Tech CSE-Artificial Intelligence and Machine Learning, B.Tech CSE-Data Science from Academic Session 2025-26.

**The Scheme of Examinations and Syllabus of 2nd year B.Tech Computer Science and Engineering (CSE) common with B.Tech CSE-Artificial Intelligence and Machine Learning (AI&ML), B.Tech CSE-Data Science was presented and thoroughly discussed. Members provided constructive feedback and suggestions for improvement. After consideration, the syllabus was unanimously approved with modifications as suggested. The approved scheme and syllabus of B.Tech Computer Science and Engineering (CSE) common with B.Tech CSE-Artificial Intelligence and Machine Learning (AI&ML), B.Tech CSE-Data Science 2nd year for the academic session 2025-26 are attached as Annexure-2.5 from pages 58 to 111. Further resolved that the Scheme of Examinations and Syllabus of above is recommended to the Academic Council for Approval.**

**Item No. 2.7:** Scheme of Examinations and Syllabus of Basics of Computer Science and Engineering, Basics of Data Science, and Basics of Artificial Intelligence forB. Tech CSE/CSE-AI&ML/CSE-DS 1st year courses offered by the Computer Science and Engineering Department for Academic Session 2025-26.

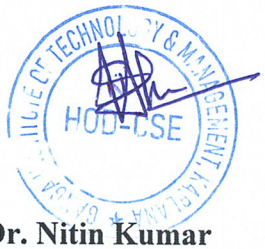
**Resolved that Scheme of Examinations and Syllabus of Basics of Computer Science and Engineering, Basics of Data Science, and Basics of Artificial Intelligence in B. Tech CSE/CSE-AI&ML/CSE-DS 1st year courses offered by the Computer Science and Engineering Department for academic session 2025-26 are attached as Annexure-2.6 from pages 112 to 117 is approved. Further resolved that the Scheme of Examinations and Syllabus of above is recommended to the Academic Council for Approval.**

**Item No. 2.8:** Review of the Panel of Examiners for Theory and Practical's of B.Tech and M.Tech programs for Academic Session 2025-26

**The panel of examiners for Theory and Practical's of B.Tech and M.Tech programs for academic session 2025-26 be reviewed and approved are attached as Annexure-2.7 from pages 118 to 120. Further resolved that the panel of examiners is to be sent to the Controller of Examinations of the Institute for the Information.**

**Item No. 2.9:** Any Other Item with the Permission of the Chair.

The meeting concluded with the thanks to the Chair.




**Dr. Nitin Kumar**
**Chairperson**
**Board of Studies**
**Computer Science and Engineering Deptt**

**Endst No.**GITAM/BOSCSE/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs




**Dr. Nitin Kumar**
**Chairperson**
**Board of Studies**
**Computer Science and Engineering Deptt**

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

## Evaluation Scheme and Syllabus for

## Master of Technology (Computer Science and Engineering)

## Effective from the Session: 2025-26

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 2 Practical (P) per week | 1 Credit |
| 3 | 2 Seminar per Week | 2 Credit |
| 4 | 4 Project Per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credit of 86 is required for a student to be eligible for a postgraduate degree in Computer Science and Engineering.

## 3. STRUCTURE OF POSTGRADUATE ENGINEERING PROGRAM (M. TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 32 |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | 8 |
| 3 | Mandatory Learning Course | 3 |
| 4 | Multidisciplinary Open Elective Courses | 6 |
| 5 | Foundation Elective Courses | 3 |
| 6 | Seminar | 6 |
| 7 | Lab Courses | 4 |
| 8 | Project | 2 |
| 9 | Dissertation | 22 |
| | **Total Credits** | **86** |

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 3 | Mandatory Learning Course | MLC |
| 4 | Multidisciplinary Open Elective Courses | OEC |
| 5 | Foundation Elective Courses | FEC |
| 6 | Seminar | SM |
| 7 | Lab Courses | LC |
| 8 | Project | PROJ |
| 9 | Dissertation | DISS |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Computer Science & Engineering) –3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTCSE-201A | Knowledge Based System | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Table -IV | ..... | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Multidisciplinary Open Elective Courses | Refer Table -V | ..... | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Mandatory Learning Courses | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Project Courses | PROJ-MTCSE-213A | Project | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 6 | Seminar | SM-MT-215A | Seminar-III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 7 | Dissertation | DISS-MTCSE-217A | Dissertation (Phase-1) | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | 3 |
| **Total Credits** | | | | | | | | **20** | | | | **650** | |

**Table IV: Professional Elective Courses**

| Sr. No. | Course Code | Course Name |
|---|---|---|
| 1 | PEC- MTCSE-203A | Quantum Computing |
| 2 | PEC- MTCSE-205A | Cloud Computing |
| 3 | PEC- MTCSE-207A | Blockchain and Applications |
| 4 | PEC- MTCSE-209A | Network Security |
| 5 | PEC- MTCSE-211A | Advanced Signal Processing |

**Table V: Multidisciplinary Open Elective-II Courses**

Students of all M. Tech programmes are required to study one Multidisciplinary open elective course in each of the 2nd and 3rd Semesters and one foundation elective course in 2nd Semester for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

| Sr. No | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEL-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Source of Energy-II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics & Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Computer Science & Engineering) – 4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTCSE-202A | Dissertation and viva (Phase-2) | - | - | 20 | 20 | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-MTCSE-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Knowledge Based System** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the basics of logic, reasoning, and logic programming.<br>• To explain knowledge representation methods and inference techniques.<br>• To expose students to search strategies for AI problem-solving.<br>• To enable students to understand techniques for managing uncertainty and agent-based systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of logic, knowledge representation, search strategies, and uncertainty management in artificial intelligence systems. | Level 1: Remember |
| **CO2** | Explain the working of logic programming, inference mechanisms, and knowledge-based systems including semantic nets, frames, and agents. | Level 2: Understand |
| **CO3** | Implement logic-based reasoning techniques, search algorithms, and knowledge representation models to solve AI-related problems. | Level 3: Apply |
| **CO4** | Analyze and differentiate between various logic reasoning methods, search techniques, and uncertainty handling approaches to determine their applicability in intelligent systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Logic:** Propositional Logic concepts, Semantic Tableaux and Resolution in Propositional Logic, First-Order Predicate Logic (FOPL), Semantic Tableaux in Predicate Logic, Resolution in Predicate Logic, Logic Programming in Prolog.

## Unit-II

**Knowledge Representation:** Semantic Nets, Partitioned Nets, Parallel Implementation of Semantic Nets, Frames, Common Sense Reasoning and Thematic Role Frames, Architecture of Knowledge Based System, Rule Based Systems, Frame based systems, Forward and Backward Chaining.

## Unit-III

**Search Techniques:** Uninformed Search-Depth-First Search (DFS), Breadth-First Search (BFS), Depth-Limited Search (DLS), Iterative Deepening DFS, Uniform Cost Search (UCS).
Heuristic Search: Greedy Best-First Search, A*, Hill Climbing.

## Unit-IV

**Uncertainty Management in Expert Systems:** Fuzzy Logic, Probabilistic Methods, Bayesian Theory, Dempster-Shafer Theory, Bayes Network, Introduction to Agents and their Application in Intelligent Systems.

**Suggested Readings:**


1 Artificial Intelligence: A New Synthesis, Nils J. Nilsson, Morgan Kaufmann.
2 Artificial Intelligence, Elain Rich, Kevin Knight, Tata McGraw-Hill.
3 Artificial Intelligence: A modern approach, Staurt Russel and Peter Norvig, Pearson Education India.
4 Artificial Intelligence, Patrick Henry Winston, Pearson India.
5 The Essence of Logic, John Kelly, Prentice Hall.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Propositional Logic concepts | https://youtu.be/xlUFkMKSB3Y |
| | Semantic Tableaux Method for Predicate Logic | https://youtu.be/We9w5fJmcsI |
| | Resolution in Predicate Logic | https://youtu.be/CgQ6U_ub5Uo |
| **Unit-II** | Semantic Net | https://youtu.be/RTmafl2rzEw |
| | Frames | https://youtu.be/nXJ_2uGWM-M |
| **Unit-III** | DFS and BFS | https://youtu.be/TMLyKcBtHuo |
| | Heuristic Search | https://youtu.be/Rahq1F-n650 |
| **Unit-IV** | Expert Systems | https://youtu.be/nE5c5w4aizU |
| | Bayesian Networks | https://youtu.be/rFQsbArQE6Y |
| | Intelligent Agents | https://youtu.be/d39tTuUbDVw |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCSE-203A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Quantum Computing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To introduce the foundational principles of classical and quantum computing, including the mathematical framework of Hilbert spaces and quantum mechanics.<br>● To explain the quantum computational model, qubit representation, quantum gates, and circuit design.<br>● To develop the ability to implement and analyze key quantum algorithms such as Deutsch-Jozsa, Simon's, and Quantum Fourier Transform.<br>● To familiarize students with quantum computational complexity, error correction techniques, and fault-tolerant quantum computing principles. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define key concepts of quantum and classical computing models, quantum states, and gates. | Level 1: Remember |
| **CO2** | Explain the principles of quantum mechanics as applied to computation, including qubit behavior, quantum entanglement, quantum measurement, and the functioning of quantum circuits. | Level 2: Understand |
| **CO3** | Apply the concepts and principles of quantum algorithms to solve basic computational problems. | Level 3: Apply |
| **CO4** | Analyze various quantum computing concepts, algorithms, quantum error correction codes and computational complexity to evaluate the feasibility and reliability of quantum computation under noisy environments. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Foundation:** Overview of traditional computing, Church-Turing thesis, circuit model of computation, reversible computation, quantum physics, quantum physics and computation, Dirac notation and Hilbert Spaces, dual vectors, operators, the spectral theorem, functions of operators, tensor products, Schmidt decomposition theorem.

## Unit-II

**Qubits and Quantum Model of Computation:** State of a quantum system, time evolution of a closed system, composite systems, measurement, mixed states and general quantum operations, quantum circuit model, quantum gates, universal sets of quantum gates, unitary transformations, quantum circuits.

## Unit-III

**Quantum Algorithms:** Superdense coding, quantum teleportation, applications of teleportation, probabilistic versus quantum algorithms, phase kick-back the Deutsch algorithm, the Deutsch, Jozsa algorithm, Simon's algorithm, quantum phase estimation, quantum Fourier Transform, eigen value estimation.

## Unit-IV

**Quantum Computational Complexity and error correction:** Computational complexity, black-box model, lower bounds for searching, general black-box lower bounds, polynomial method, block sensitivity, adversary methods, classical error correction, classical three-bit code, fault tolerance, quantum error correction, three- and nine-qubit quantum codes, fault-tolerant quantum computation.

**Suggested Readings:**


1. An introduction to Quantum Computing by P. Kaye, R. Laflamme, and M. Mosca, Oxford University Press, 1999.
2. Quantum Computing by V. Sahni, Tata McGraw-Hill Publishing Company, 2007.
3. Quantum Computation and Quantum Information by Michael A. Nielsen and Isaac L. Chuang, Cambridge University Press, 2013.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Quantum Computing | https://youtu.be/7WSe4QA8Gts |
| | Spectral Theorem | https://youtu.be/ym9TBGngBDY |
| **Unit-II** | Qubits | https://youtu.be/6oHnkzjrGUc |
| | Quantum gates | https://youtu.be/m4llFGkoXeE |
| **Unit-III** | Deutsch Jozsa algorithm | https://youtu.be/3775XAgRw8M |
| | Simon's algorithm | https://youtu.be/bNyg9rFPWhg |
| **Unit-IV** | Quantum error correction | https://youtu.be/O9LrBncWUtI |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCSE-205A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Cloud Computing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To provide a comprehensive understanding of cloud computing concepts, characteristics, components, and service models such as SaaS, PaaS, and IaaS.<br>● To familiarize students with various cloud computing platforms (e.g., Amazon EC2, Google App Engine, Microsoft Azure), architecture, and migration challenges.<br>● To introduce cloud programming frameworks and storage technologies such as Map Reduce, GFS, HDFS, and Hadoop, along with fundamentals of cloud security and privacy.<br>● To explain the role of networking and virtualization technologies in cloud computing, including hypervisors and virtual resource management across data centers. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts, characteristics, service models, architecture, platforms, and virtualization technologies of cloud computing. | Level 1: Remember |
| **CO2** | Explain the working principles of cloud services, cloud architecture, programming models, storage frameworks, and security mechanisms. | Level 2: Understand |
| **CO3** | Apply cloud computing models, platforms, programming frameworks (like Hadoop), and virtualization tools in solving practical computing problems. | Level 3: Apply |
| **CO4** | Analyze various cloud computing architectures, programming paradigms, and security approaches to evaluate their effectiveness in real-world scenarios. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Cloud Computing:** Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others; Comparison among SAAS, PAAS, IAAS; Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Challenges, Risks and Approaches of Migration into Cloud, Future of the cloud.

## Unit-II

**Networking Support for Cloud Computing:** Ubiquitous Cloud and the Internet of Things. Cloud Computing Architecture: Cloud Reference Model, Layer and Types of Clouds, Services models, Web services, Data center design and interconnection Network, Architectural design of Computer and Storage Clouds.

## Unit-III

**Cloud Programming and Software:** Fractures of cloud programming, Parallel and distributed programming paradigms, High level Language for Cloud. Introduction to Map Reduce, GFS, HDFS, Hadoop Framework.
**Cloud security fundamentals**: Vulnerability assessment tool for cloud, Privacy and Security in cloud.

## Unit-IV

**Virtualization Technology:** Definition, Understanding and Benefits of Virtualization, Implementation Level of Virtualization, Virtualization Structure/Tools and Mechanisms, Hypervisor, VMware, KVM, Xen. Virtualization of CPU, Memory, I/O Devices, Virtual Cluster and Resources Management, Virtualization of Server, Desktop, Network, and Virtualization of data-center.

**Suggested Readings:**


1. Cloud Computing Bible by Sosinsky Barrie, Wiley India, 2011.
2. Cloud computing: Principles and paradigms by Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds., Vol. 87, John Wiley & Sons, 2010.
3. Cloud Computing Black Book by Jayaswal, Kailash, John Wiley & Sons, 2014.
4. Cloud Computing: A Practical Approach by Velte, Anthony T., Toby J. Velte, and Robert Elsenpeter, McGraw-Hill, Inc. 2019.
5. Cloud Computing: A Complete Guide by Gerardus Blokdyk, Starcooks, 2019.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Cloud Computing | https://youtu.be/SqG-b5E9vHs?si=iWZbkNVLbLBoqKiN |
| | SAAS, PAAS, IAAS | https://youtu.be/SqG-b5E9vHs?si=iWZbkNVLbLBoqKiN |
| **Unit-II** | Cloud Computing Web Services | https://youtu.be/SqG-b5E9vHs?si=iWZbkNVLbLBoqKiN |
| **Unit-III** | Cloud file system, GFS | https://youtu.be/SqG-b5E9vHs?si=iWZbkNVLbLBoqKiN |
| | Map reduce | https://youtu.be/SqG-b5E9vHs?si=iWZbkNVLbLBoqKiN |
| | Cloud Security | https://youtu.be/LcAPj95KeSA?si=Evk97L0RSHO3brlr |
| **Unit-IV** | Virtualization | https://youtu.be/AkST9AO01x0?si=7nqZThCcFLfIwX5B |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCSE-207A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Blockchain and Applications** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To introduce the fundamental concepts of distributed record keeping, consensus algorithms, and the motivation behind blockchain technology.<br>● To explain the cryptographic foundations and key technologies that enable blockchain systems, including hash functions, digital signatures, and fault-tolerant computing.<br>● To develop an understanding of major blockchain platforms such as Bitcoin and Ethereum, their consensus mechanisms, scripting languages, and smart contract capabilities.<br>● To analyze advanced blockchain concepts including security challenges, privacy-preserving techniques, and emerging consensus algorithms for scalable and secure blockchain solutions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts of blockchain technology, including consensus algorithms, cryptographic foundations, and key blockchain platforms like Bitcoin and Ethereum. | Level 1: Remember |
| **CO2** | Explain the principles of distributed record keeping, cryptographic techniques, consensus mechanisms, and the functionality of smart contracts in blockchain systems. | Level 2: Understand |
| **CO3** | Apply blockchain protocols and consensus algorithms to design and implement secure and scalable distributed ledgers and smart contract solutions. | Level 3: Apply |
| **CO4** | Analyze the challenges related to blockchain scalability, security vulnerabilities, and privacy concerns, and evaluate advanced blockchain technologies and consensus mechanisms to address these issues. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Need for Distributed Record Keeping and Consensus algorithms:** Modelling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Why Nakamoto came up with Blockchain based cryptocurrency.

## Unit-II

**Blockchain Technologies:** Technologies borrowed in Blockchain — hash pointers, consensus, Byzantine fault-tolerant distributed computing, digital cash, Atomic Broadcast, Consensus, Byzantine Models of fault tolerance. Cryptographic Foundations of Blockchain: Hash functions, Puzzle friendly Hash, Collision-resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.

## Unit-III

**Bitcoin Blockchain and Alternatives:** Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

## Unit-IV

**Ethereum, Smart Contracts, and Advanced Blockchain Concepts**: Ethereum and Smart Contracts, Turing Completeness of Smart Contract Languages, Verification challenges, Using smart contracts to enforce legal contracts, Comparing Bitcoin scripting vs. Ethereum Smart Contracts, Hyper-ledger Fabric, Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, Attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks, Advent of Algorand, Sharding-based consensus algorithms.

**Suggested Readings:**


1. Blockchain: Blueprint for a New Economy by Melanie Swan, O'Reilly Media, 2015.
2. Blockchain: The Blockchain For Beginners Guide To Blockchain Technology And Leveraging Blockchain Programming by Josh Thompsons, 2017.
3. Cloud Computing Black Book by Jayaswal, Kailash, John Wiley & Sons, 2014.
4. Cloud Computing: A Practical Approach by Velte, Anthony T., Toby J. Velte, and Robert Elsenpeter, McGraw-Hill, Inc. 2019.
5. Cloud Computing: A Complete Guide by Gerardus Blokdyk, Starcooks, 2019.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Byzantine Faults | https://youtu.be/sm2jMy-uZkI |
| | Consensus algorithms | https://youtu.be/fN8F54C39RY |
| **Unit-II** | Blockchain Technologies | https://nptel.ac.in/courses/106105235 |
| | Cryptography | https://youtu.be/uTsAiyZ_cZ4 |
| **Unit-III** | Bitcoin blockchain | https://youtu.be/fN8F54C39RY |
| | Proof of Work | https://youtu.be/fN8F54C39RY |
| **Unit-IV** | Ethereum | https://youtu.be/KVqA1ZgLZ88?si=bxp6CY9AZFgARyld |
| | Smart Contracts | https://youtu.be/0hVR_utJ2W8 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC- MTCSE-209A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Network Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● Understand basic concepts of network security, attacks, and classical encryption techniques.<br>● Explore modern cryptographic algorithms and key management techniques.<br>● Learn and evaluate secure communication protocols used over the internet.<br>● Examine authentication methods, firewalls, and system-level security mechanisms. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define fundamental concepts, terminologies, and mechanisms related to network security, including classical encryption techniques, cryptographic algorithms, security protocols, and system-level security practices. | Level 1: Remember |
| **CO2** | Explain the principles, working mechanisms, and roles of symmetric and asymmetric encryption, block cipher operations, authentication protocols, and security standards used in networked systems. | Level 2: Understand |
| **CO3** | Apply suitable cryptographic methods, security protocols, and firewall configurations to secure data communication and protect against common threats in real-world networking environments. | Level 3: Apply |
| **CO4** | Analyze security threats and vulnerabilities in network systems by evaluating encryption methods, authentication protocols, and firewall architectures to propose appropriate countermeasures. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Services, Mechanisms and attacks, OSI security architecture, Network security model; Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography). Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

## Unit-II

**Block Ciphers & Public Key Cryptography:** Data Encryption Standard, Block cipher principles, block cipher modes of operation, Advanced Encryption Standard (AES), Triple DES, Blowfish, RC5 algorithm.
Public key cryptography: Principles of public key cryptosystems, The RSA algorithm, Key management, Diffie Hellman Key exchange, Elliptic curve arithmetic, Elliptic curve cryptography.

## Unit-III

**Internet Security Protocols:** basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), Secure HyperText Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, Electronic Money, Email Security.

## Unit-IV

**Security Practice & System Security**: Authentication applications, Kerberos, X.509, Authentication services, Internet Firewalls for Trusted System: Roles of Firewalls, Firewall related terminology, Types of Firewalls, Firewall designs, SET for E-Commerce Transactions. Intruder, Intrusion detection system, Virus and related threats, Countermeasures, Firewalls design principles, Trusted systems, Practical implementation of cryptography and security.

**Suggested Readings:**


1. Cryptography and Network Security by Atul Kahate, TMH.
2. Network Management Principles & Practices by Subramanian, Pearson Education India.
3. Network Management by U. Black, MGH.
4. Cryptography & Network Security by Behrouz A. Forouzan, Tata Mc Graw Hill, 2007.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Classical Cryptosystems | https://youtu.be/Vazi_07u_ck?list=PL71FE85723FD414D7 |
| | Symmetric Key Ciphers | https://youtu.be/QbczPuEphUY?list=PL71FE85723FD4147 |
| **Unit-II** | Block Cipher Standards (DES) | https://youtu.be/eCAHcfA2c8?list=PL71FE85723FD414D7 |
| | RSA algorithm | https://youtu.be/cOpYHlqis3o?list=PL71FE85723FD414D7 |
| **Unit-III** | SSL | https://youtu.be/3xCRJ79YYVQ |
| | TLS | https://youtu.be/tcQQ9A8M2L0 |
| **Unit-IV** | Firewalls and Intrusion detection system | https://youtu.be/2YGUvopGkQc?list=PL71FE85723FD417 |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCSE-211A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Advanced Signal Processing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To introduce the fundamental concepts of discrete-time signals and systems.<br>● To develop understanding of digital filter design techniques, their structures, characteristics, and limitations due to finite word length effects.<br>● To equip students with the skills to implement efficient digital signal processing algorithms for real-time and high-performance applications.<br>● To enable learners to explore various spectral estimation techniques, and to introduce the architectural features and principles of modern DSP processors for effective signal processing implementation. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts of discrete-time signals and systems. | Level 1: Remember |
| **CO2** | Explain digital filter design techniques, signal processing operations and the role of transform methods in frequency domain representation. | Level 2:Understand |
| **CO3** | Apply appropriate mathematical and algorithmic techniques to analyze discrete-time signals, design IIR and FIR filters, implement FFT algorithms, and perform power spectrum estimation using classical and parametric approaches. | Level 3: Apply |
| **CO4** | Analyze the performance and limitations of digital signal processing systems, compare various filter structures, and examine different spectral estimation methods and architectural designs. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Discrete Time Signals and Systems:** Frequency Domain Representation, Z-Transforms, Discrete Fourier Transforms, Impulse Response and Transfer functions, Convolution and Correlation.

**Unit-II**

**IIR Filter Design:** Filter Approximation, Impulse Invariant Method, Bi-linear Transformation method filter structures, Finite word length effects, limitations of IIR filters. FIR Filter Design: Linear phase response, Windowing technique, Gibb's Phenomenon, Frequency Sampling Method, FIR Filter structures.

## Unit-III

Frequency Domain Realization of Digital Filters, Radix-2 FFT Algorithm, Introduction to Multirate digital signal processing.

## Unit-IV

Power Spectrum Estimation, Classical Spectral Estimation, Parametric Modeling- AR, MA, ARMA methods, Minimum variance spectral estimation, Principles of DSP Architecture.

**Suggested Readings:**


1. Digital Signal Processing, Principles, Algorithms and Applications by G. J. Proakis and D. G. Manolakis, 4th ed. Pearson Education.
2. Digital Signal Processing by S. K. Mitra, 3rd ed. TMH.
3. Discrete Time Signal Processing by A.V. Oppenheim and R.W. Schafer, PHI, 1992.
4. Modern Spectral Estimation by Steven M. Kay, PHI, 1988.
5. Lab view DSP and Digital communication by Clark Cory L, TMH, 2005.
6. Introduction to Digital Signal Processing by Roman Kuc, McGraw Hill, 1988.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Discrete Time Signals and Systems | https://youtu.be/a5xq-XeD5V8 |
| | Discrete Fourier Transforms | https://youtu.be/UBv_E_7eS9w |
| **Unit-II** | IIR Filter | https://youtu.be/CmIidApT5EA |
| | FIR Filter | https://youtu.be/HP5pCUyEEcg |
| **Unit-III** | Radix-2 FFT Algorithm | https://youtu.be/xMKgWNHELiw |
| | Multirate digital signal processing | https://youtu.be/_MdjuI47k8E?si=J67HRPkw9AF_RfnP |
| **Unit-IV** | Spectral Estimation | https://youtu.be/5lHJYbkrH6o |

| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | | |
| Category | Mandatory Learning Course | | | | | |
| Course Title | **Research Methodology and IPR** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 3 | 0 | 0 | **3** | | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Identify research problems, objectives, and data sources based on fundamental research methodology principles. | Level 1: Remember |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. | Level 2: Understand |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. | Level 3: Apply |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

**Unit-II**

Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

## Unit-III

Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing.

## Unit-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology.

**Suggested Readings:**


1. Research Methodology: Methods and Techniques by Kothari, C. R., & Garg, G, 4th ed., New Age International Publishers.
2. Research Methodology: A Step-by-Step Guide for Beginners by Kumar, R, 4th ed., SAGE Publications India, ISBN: 978-9351501337.
3. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets by Bouchoux, D. E, Cengage Learning 6th ed.
4. Intellectual Property Rights under WTO by T. Ramappa, S. Chand.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Defining/formulating research problem | https://www.youtube.com/watch?v=oTc4_zjmev0 |
| | Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=tjDBPRoyDJA |
| Unit-II | Types of Plagiarism | https://www.youtube.com/watch?v=5--ssYqyWoE |
| | Research Ethics | https://www.youtube.com/watch?v=4tRCov8pVgQ |
| Unit-III | Primary data and Secondary Data | https://www.youtube.com/watch?v=caUiRsg5M6k |
| | Sampling techniques | https://www.youtube.com/watch?v=sKtoW5cXt14 |
| Unit-IV | Patent Trademarks and Copyrights. | https://www.youtube.com/watch?v=XQ8tRdcr0xQ |
| | What is Patent? Patent Filing Procedure in India | https://www.youtube.com/watch?v=azMNhrkRzww |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PROJ-MTCSE-213A** | | | | |
| Category | Project | | | | |
| Course Title | **Project** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in Computer Science and Engineering for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Identify complex engineering problems relevant to project work based on domain knowledge and real-world challenges. |
| **CO2** | Describe the workflow, technical background, and tools required for planning and executing engineering projects. |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MT-215A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **2** | |
| Course Objectives | The objectives of this course are<br>● To develop students' ability to effectively present research topics and findings by effective communication.<br>● To improve problem-solving and critical thinking skills of the students.<br>● To expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies and methodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This is a course designed to help M.Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar:**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | CO1 |
| 2 | Literature Survey | 10 | CO2 |
| 3 | Content Relevancy | 10 | CO3 |
| 4 | Presentation Skills | 10 | CO4 |
| 5 | Q&A Response | 10 | CO5 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTCSE-217A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying relevant research topics in Computer Science and Engineering.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Computer Science and Engineering to carry out the research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Computer Science & Engineering) –4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTCSE-202A | Dissertation and viva (Phase-2) | - | - | 20 | 20 | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTCSE-202A** | | | | |
| Category | Lab Courses | | | | |
| Course Title | **Dissertation and viva (Phase-2)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 20 | 20 | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help identify relevant topics in Computer Science and Engineering.<br>• Understand literature review, structured research methodology and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Computer Science and Engineering to carry out the research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Dissertation Phase-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Phase-2.
- The student must follow the guidelines for the Dissertation report format as per Annexure-I.

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**
**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Evaluation Scheme and Syllabus For

# Master of Technology (Cyber Forensics and Information Security)

# Effective from the Session: 2025-26

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 2 Practical (P) per week | 1 Credit |
| 3 | 2 Seminar per Week | 2 Credit |
| 4 | 4 Project Per Week | 2 Credit |

## 2. RANGE OF CREDIT

A credit of 86 is required for a student to be eligible for a postgraduate degree in Cyber Forensics and Information Security.

## 3. STRUCTURE OF POSTGRADUATE ENGINEERING PROGRAM (M.TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 32 |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | 8 |
| 3 | Mandatory Learning Course | 3 |
| 4 | Multidisciplinary Open Elective Courses | 6 |
| 5 | Foundation Elective Courses | 3 |
| 6 | Seminar | 6 |
| 7 | Lab Courses | 4 |
| 8 | Project | 2 |
| 9 | Dissertation | 22 |
| | **Total Credits** | **86** |

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 3 | Mandatory Learning Course | MLC |
| 4 | Multidisciplinary Open Elective Courses | OEC |
| 5 | Foundation Elective Courses | FEC |
| 6 | Seminar | SM |
| 7 | Lab Courses | LC |
| 8 | Project | PROJ |
| 9 | Dissertation | DISS |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Cyber Forensics and Information Security) – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTCFIS-201A | Preserving & Recovering Digital Evidence | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Table -IV | ..... | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Multidisciplinary Open Elective Courses | Refer Table -V | ..... | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Mandatory Learning Courses | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Project Courses | PROJ-MTCFIS-213A | Project | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 6 | Seminar | SM-MT-215A | Seminar-III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 7 | Dissertation | DISS-MTCFIS-217A | Dissertation (Phase-1) | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | 3 |
| **Total Credits** | | | | | | | | **20** | | | | **650** | |

**Table IV: Professional Elective Courses**

| Sr. No. | Course Code | Course Name |
|---|---|---|
| 1 | PEC- MTCFIS-203A | Security in 5G Technologies |
| 2 | PEC- MTCFIS-205A | Social Media Security |
| 3 | PEC- MTCFIS-207A | Wireless Security |
| 4 | PEC- MTCFIS-209A | Internet of Things and Security |
| 5 | PEC- MTCFIS-211A | Professional ethics and cyber security |

**Table V: Multidisciplinary Open Elective-II Courses**

Students of all M. Tech programmes are required to study one Multidisciplinary open elective course in each of the 2nd and 3rd Semesters and one foundation elective course in 2nd Semester for 2-Years Programmes. They may choose any one of the following courses (excluding the courses offered by the departments of their own subjects, if not stated otherwise).

| Sr. No | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEL-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Source of Energy-II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics & Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Cyber Forensics and Information Security) –4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTCFIS-202A | Dissertation and viva (Phase-2) | - | - | 20 | 20 | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-MTCFIS-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Preserving and Recovering Digital Evidence** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To understand digital evidence, computer crime, and investigation procedures.<br>• To learn forensic methods for computers and handheld devices.<br>• To explore network forensics and evidence collection across network layers.<br>• To investigate cybercrimes and follow digital evidence handling guidelines | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define key concepts related to digital evidence, computer crime history, and the digital investigation process. | Level 1: Remember |
| **CO2** | Describe the role of forensic science in examining various computer systems and explain the structure of digital evidence across different operating environments. | Level 2: Understand |
| **CO3** | Apply appropriate forensic techniques and tools to investigate digital crimes involving computers, mobile devices, and networks. | Level 3: Apply |
| **CO4** | Analyze digital crime scenarios by reconstructing incidents, evaluating modus operandi and motives, and interpreting digital evidence for legal proceedings. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Digital Investigation**: Digital evidence and computer crime – history and terminals of computer crime investigation – technology and law - the investigate process – investigate reconstruction-modus operandi, motive and technology –digital evidence in the court room.

**Unit-II**

**Computer basics for digital investigators:** Applying forensic science to computers-forensic examination of Windows systems – forensic examination of UNIX systems - forensic examination of Macintosh systems - forensic examination of handheld devices.

**Unit-III**

**Networks:** Networks basics for digital investigators – applying forensic science to networks-digital evidence on physical and data link layers - digital evidence on network and transport layers-digital evidence on the internet.

## Unit-IV

**Investigating Computer Crime:** Investigating computer intrusions – investigating cyber stalking- digital evidence as alibi. Guidelines: Handling the digital crime scene – digital evidence examination guidelines.

**Suggested Readings:**


1. Digital Evidence and Computer Crime Forensic science, Computers and Internet by Eoghan Casey, Elsevier Academic Press, Second Edition, 2011.
2. The Best Damn Cybercrime and Digital Forensics Book by Jack Wiles, Anthony Reyes, Jesse Varsalone, Perio, Syngress Publishing, 2007.
3. Computer Evidence and Computer Crime: Forensic Science, Computers, and the Internet by Casey, Eoghan, Cambridge: Cambridge University Press, 2000.
4. Computer Forensics Computer Crime Scene Investigation by Vacca, John R., Massachusetts: Charles River Media, 2002.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Handling, Collection and preservation of Digital evidence | https://www.youtube.com/watch?v=YglyYgmAeCw |
| | Digital Evidence-identification, etc. in Court | https://www.youtube.com/watch?v=SzxVK1zR_II |
| | Digital Investigation Procedure | https://www.youtube.com/watch?v=ZTZ_GnFR-GE |
| | Modus Operandi | https://www.youtube.com/watch?v=ZxmlTJ7WWLk |
| **Unit-II** | How to secure a Windows computer(forensic examination of windows systems) | https://www.youtube.com/watch?v=cENIGQdCvUk&list=PLJu2iQtpGvv-2LtysuTTka7dHt9GKUbxD&index=6 |
| | Investigating Unix Systems in Digital Forensics | https://www.youtube.com/watch?v=eR4ROLnk5Sc |
| | Digital Investigations. Computer Forensics for Windows and Mac | https://www.youtube.com/watch?v=BW8pCe0wXtY |
| | Forensics of Hand-Held Devices | https://www.youtube.com/watch?v=j62svCbNf9I |
| **Unit-III** | Network Forensics | https://www.youtube.com/watch?v=OufDs4sI5P4 |
| | Forensics - Basics of Networking | https://www.youtube.com/watch?v=DDHrTcMOGsE |
| | Cyber Forensics and Digital Evidence | https://www.youtube.com/watch?v=Qod9yrq0Ho0 |
| **Unit-IV** | Computer Crime Investigations | https://www.youtube.com/watch?v=8uBU9n206b0 |
| | Digital evidence | https://www.youtube.com/watch?v=taladDGFgKM |
| | Digital crime scene investigation | https://www.youtube.com/watch?v=NPgPE7WbJd4&t=179s |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC- MTCFIS-203A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Security in 5G Technologies** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To explain the evolution of cellular systems and 5G requirements.<br>• To enable students to apply security principles to 5G networks and assess privacy risks.<br>• To make student proficient in cryptographic techniques and security measures for 5G networks.<br>• To enable students to investigate security challenges in cloud and MEC environments for 5G. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the evolution of cellular systems from 1G to 5G, understanding the features and requirements of each generation. | Level 1: Remember |
| **CO2** | Explain the enabling technologies of 5G and their role in meeting the requirements of next-generation mobile networks. | Level 2: Understand |
| **CO3** | Apply design principles for securing 5G networks, including strategies for physical layer security and IoT device protection. | Level 3: Apply |
| **CO4** | Analyze cyber security business models in 5G and assess the impact of security measures on user privacy, identity, and trust. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Evolution of Cellular Systems:** Introduction, First Generation Cellular Systems, Second- Generation Cellular Systems, Third Generation Cellular Systems, Cellular Systems beyond 3G, Fourth Generation Cellular Systems, 5G Mobile Networks: Requirements, Enabling Technologies and Research Activities.

## Unit-II

**Design Principles for 5G Security:** Cyber Security Business Models in 5G, Physical Layer Security, 5G WLAN Security, Safety of 5G Network Physical Infrastructures.
**Software Defined Security Monitoring in 5G Networks**: 5G Device and User Security, IoT Security, User

Privacy, Identity and Trust in 5G.
**5G Positioning:** Security and Privacy Aspects, Outdoor Versus Indoor Positioning Technologies, Passive versus Active Positioning, Brief Overview of 5G Positioning Mechanisms.

**Unit-III**

**Cryptographic Techniques for Security and Privacy of Positioning**: Legislation on User Location Privacy in 5G. 5G Cloud and Virtual Network Security, Mobile Virtual Network Operators (MVNO) Security, NFV and NFV based Security Services.

**Unit-IV**

**Cloud and MEC Security:** Cloud Computing in 5G Networks, MEC in 5G Networks, Security Challenges in 5G Cloud, Security Challenges in 5G MEC. Security Architectures for 5G Cloud and MEC Regulatory Impact on 5G Security and Privacy: Regulatory Objectives for Security and Privacy. Legal Framework for Security and Privacy, Security and Privacy Issues in 5G Technologies

**Suggested Readings:**


1. A Comprehensive Guide to 5G Security by Madhusanka Livanage, ljaz Ahmad, Ahmed Bux Abro ,Andrei Gurtov, Mika Ylianttila.
2. 5G NR: The Next Generation Wireless Access Technology by Dahlman, Erik, Parkvall, Stefan, and Sköld, Johan, Academic Press, 2020.
3. 5G Wireless Network Security and Privacy by Fang, DongFeng, Qian, Yi, and Hu, Rose Qingyang, Hoboken, John Wiley & Sons, 2023.
4. 5G Mobile and Wireless Communications Technology by Osseiran, Afif, Monserrat, Jose F., and Marsch, Patrick, Cambridge: Cambridge University Press, 2016.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Cellular Systems | https://www.youtube.com/watch?v=f2wlHL1Sok8 |
| | 5G Mobile Networks | https://youtu.be/SbYltPawklg?si=k-inUmTQpyz8EUCY |
| **Unit-II** | Security Monitoring in 5G Networks, Security and Privacy Aspects | https://www.youtube.com/watch?v=6TGU9yy96Vk |
| | IoT Security | https://www.youtube.com/watch?v=o5ZsXCVZiiw |
| **Unit-III** | Mobile Virtual Network Operators Security | https://www.youtube.com/watch?v=a57B-9cSXZ4 |
| | Cryptographic Techniques for Security | https://youtu.be/Q-HugPvA7GQ?si=DlMXLqMu0YQv7n0h |
| **Unit-IV** | Security Challenges in 5G Cloud | https://www.youtube.com/watch?v=qCnPoZuo6oQ |
| | MEC in 5G Networks | https://www.youtube.com/watch?v=yoRUC0sFbJo |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCFIS-205A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Social Media Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts, types, and significance of social media in modern communication.<br>• To create awareness about the ethical, privacy, and security challenges associated with social media use.<br>• To explore real-world social media practices to understand effective and ineffective campaign strategies.<br>• To highlight the long-term risks of digital presence, data sharing, and the importance of responsible online behavior. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Identify key concepts, types, and issues related to social media, including its classifications, value, and potential problems. | Level 1: Remember |
| **CO2** | Explain the risks and ethical concerns of social media, including cybercrime, privacy issues, and the implications of content sharing and user behavior. | Level 2: Understand |
| **CO3** | Apply knowledge of social media strategies to evaluate good and bad campaigns and suggest improvements in content management and promotion. | Level 3: Apply |
| **CO4** | Analyze the security, privacy, and data-related risks associated with social media use, identifying potential vulnerabilities and their consequences. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction to Social Media**: Understanding Social Media, Different Types and Classifications, The Value of Social Media, Cutting Edge Versus Bleeding Edge, The Problems That Come With Social Media, Is Security Really an Issue? Taking the Good with the Bad.

**Unit-II**

**Dark side:** Cybercrime, Social Engineering, Hacked accounts, cyber stalking, cyber bullying, predators, phishing, hackers Policies and Privacy Blocking users controlling gap privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing.

**Unit-III**

**Being bold versus being overlooked:** Good social media campaigns, Bad social media campaigns, Sometimes it's better to be overlooked, Social media hoaxes, human factor, Content management, Promotion of social media.

**Unit-IV**

**Risks of Social media:** Introduction Public embarrassment, Once it's out there, it's out there False information, Information leakage, Retention and archiving, Loss of data and equipment Policies and Privacy Blocking users controlling app privacy, Location awareness, Security Fake accounts passwords, privacy and information sharing.

**Suggested Readings:**


1. Social Media Security: Leveraging Social Networking While Mitigating Risk by Michael Cross, Elsevier.
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India.
3. Cybercrime and Society by Majid Yar and Kevin F. Steinmetz, SAGE Publications.
4. Inter disciplinary Impact Analysis of Privacy in Social Networks, Recognizing Your Digital Friends, Encryption for Peer-to-Peer Social Networks Crowd sourcing and Ethics by Altshuler Y, Elovici Y, Cremers A. B, Aharony N, Pentland A.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Social Media | https://youtu.be/5Puxly9TnLk |
| | Privacy and Security in Online Social Media | https://youtu.be/wQYqsgNThKM |
| **Unit-II** | Dark sides of social media, Cyber security and Privacy | https://youtu.be/kZtw4L6LZS8?list=PLyqSpQzTE6M-jkJEzbS5oHJUp2GWPsq6e |
| | Privacy and Security in Online Social Media | https://youtu.be/AQClJAif5w8 |
| **Unit-III** | Best Social Media Marketing Campaigns Ever | http3s://youtu.be/QKtf2IeR5rE |
| | Social media hoaxes | https://youtu.be/Ll5V4mFIXBE |
| **Unit-IV** | Risk Management | https://youtu.be/v7KtPLhSMkU?si=FtJBD3JA_E41puzJ |
| | Privacy: Strategy and safety | https://youtu.be/All1JR-Avjw?si=ArZajLEI3hJ6VTzm |

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|---|---|---|---|---|---|
| Course Code | **PEC- MTCFIS-207A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Wireless Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamentals of wireless communication and information warfare.<br>• To understand security protocols and threats in WLAN and mobile networks.<br>• To explore security challenges and solutions in ad hoc wireless networks.<br>• To study RFID system vulnerabilities and lightweight cryptographic techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Recall fundamental concepts of wireless communication, information warfare, and wireless network taxonomies | Level 1: Remember |
| **CO2** | Explain security threats and standards in WLAN, cellular, and VoIP systems, including the roles of WAP, WTLS, and Bluetooth. | Level 2: Understand |
| **CO3** | Apply routing protocols and security mechanisms to detect and mitigate attacks in ad hoc networks. | Level 3: Apply |
| **CO4** | Analyze vulnerabilities in RFID systems and evaluate lightweight cryptographic solutions for low-cost tags | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Communication Networks**: Information Theory-Decision Theory-A Model for cost effective risk management-Performance measures. Uniqueness of Wireless-Wireless Information Warfare – Taxonomies of wireless.

## Unit-II

**Security in WLAN:** Wireless Transmission Media, WLAN Products and standards- securing WLAN-counter measures-WAP-WTLS-Bluetooth-VoIP. Security in cellular Networks Threats, Hacking and Viruses in mobile communications- Access control and Authentication in mobile communications.

## Unit-III

**Security in Ad hoc Networks:** Ad hoc Networking- Major Routing Protocol in Ad hoc Networks- Attacks against Ad Hoc Networks, Securing Ad hoc Networks- Authentication in Ad hoc Networks–key Management – Intrusion Detection in Ad hoc Networks.

## Unit-IV

**Security in RFID:** Multi tag RFID systems-Attacking RFID systems- RFID Relay attacks- Physical privacy and security in RFID systems- Authentication Protocol in RFID systems- Lightweight Cryptography for Low-Cost RFID tags.

**Suggested Readings:**


1. Wireless Security: Models, Threats, and Solutions by Nichols, Randall K.and Lekkas, Panos, Tata McGraw Hill Education, 2006.
2. Security in RFID and Sensor Networks by Yan Zhang and Paris Kitsos, CRC PRESS, 2009.
3. Security of Mobile Communications by Noureddine Boudriga, ISBN 9780849379413, 2010.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Wireless Communication Network | https://youtu.be/Eu_mTZxPofI?si=THL8YIPksjshgiem |
| | Risk management | https://www.youtube.com/watch?v=zo_dLUoyqjc |
| **Unit-II** | Security in WLAN | https://www.youtube.com/watch?v=0mOrIOtw2_c |
| | VoIP | https://www.youtube.com/watch?v=zZoE7MQ8qO0 |
| | Authentication in mobile communications | https://www.youtube.com/watch?v=VfFAYtmCaCY |
| **Unit-III** | Adhoc Networking | https://youtu.be/ycaz99NogS4?si=5yB_KLLzDUqeKyxJ |
| | Routing Protocol in Adhoc Networks | https://youtu.be/OaUE4otTsuc?si=PNX-n0vPJ1-kkxGp |
| | Intrusion Detection in Ad hoc Networks | https://www.youtube.com/watch?v=2YGUvopGkQc |
| **Unit-IV** | Security in RFID | https://www.youtube.com/watch?v=ssY2CpC0JAQ |
| | Light weight Cryptography | https://www.youtube.com/watch?v=8rtkOk-MUVc |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC- MTCFIS-209A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Internet of Things and Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts, technologies, and communication protocols of IoT.<br>• To explore embedded device prototyping using platforms like Arduino and Raspberry Pi.<br>• To develop skills in building physical and online IoT components using digital fabrication and APIs. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Describe the fundamental concepts, technologies, protocols, and design principles involved in the Internet of Things (IoT). | Level 1: Remember |
| **CO2** | Explain the components, platforms, and prototyping tools used in the development of embedded and connected devices. | Level 2: Understand |
| **CO3** | Develop basic IoT prototypes using physical components and APIs, including digital fabrication techniques such as 3D printing and laser cutting. | Level 3: Apply |
| **CO4** | Analyze the transformation of IoT prototypes into scalable business models, considering ethical, environmental, and privacy challenges. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Fundamentals of IoT:** The flavour of the Internet, Technology of IoT, Enchanted objects, Design principles for connected device, Privacy, Web thinking, Affordance.

**Internet Principles:** Internet Communications, IP, TCP, Protocol suite, UDP, IP Addresses, TCP and UDP ports, MAC Address – Application Layer Protocols.

**Unit-II**

Prototyping Embedded Devices: Prototypes and production, Open source versus closed source, Tapping into the community, Electronics Embedded computing basics, Arduino, Raspberry pi, electric imp, plug computing.

## Unit-III

Prototyping Physical and Online Components: Preparation, sketch, iterate and explore, Non digital methods, Laser cutting, 3D printing Getting started with API, Writing a new API, Real time reactions, Memory Management.

## Unit-IV

Prototype to Business Models: Business model canvas–Models, Funding an internet of things start-up, Scaling up Software, Ethics: Privacy, Control, Environment, Solutions.

**Suggested Readings:**


1. Designing the Internet of Things by Adrian McEwen, Akim Cassimally, 1st Ed., Wiley publication, 2013.
2. Building Internet of Things with the Arduino by Charalampos Doukas, Create space, 2002.
3. Architecting the Internet of Things by Dieter Uckelmann, Springer, 2011.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Fundamentals of IoT | https://youtu.be/WUYAjxnwjU4?si=cOoUNH9n9nBJ6uzr |
| | Internet Communications – IP, TCP | https://youtu.be/5ex1s4lURto?si=x6k1oWwKtGRjpJPV |
| **Unit-II** | Open source versus closed source | https://www.youtube.com/watch?v=QQXcUODEKw |
| | Embedded computing basics | https://youtu.be/y9RAhEfLfJs?si=3GVdXAoxktZjxxwv |
| **Unit-III** | Laser cutting - 3D printing | https://www.youtube.com/watch?v=sFFcPPj4Ti8 |
| | Getting started with API | https://www.youtube.com/watch?v=cRV4HQ39S2s |
| **Unit-IV** | Business model canvas–Models | https://www.youtube.com/watch?v=z6-Ly8Bl4Hc |
| | Ethics: Privacy – Control | https://www.youtube.com/watch?v=amGreeiv77M |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC- MTCFIS-211A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Professional Ethics and Cyber Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce fundamental concepts of computer ethics, professional conduct, and privacy issues in computing.<br>• To provide understanding of intellectual property rights and ethical decision-making in cyberspace.<br>• To equip students with knowledge of cybercrime handling procedures and relevant legal frameworks<br>• To develop skills in cyber forensics, security policies, and understanding industry-standard information security certifications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Recall basic concepts of computer ethics, privacy, and professional codes of conduct relevant to computing and information technology. | Level 1: Remember |
| **CO2** | Explain intellectual property rights, privacy laws, and ethical theories in the context of cyber technologies and professional responsibilities | Level 2: Understand |
| **CO3** | Apply ethical frameworks and legal principles to resolve dilemmas related to cybercrime, intellectual property, and professional conduct. | Level 3: Apply |
| **CO4** | Analyze real-world case studies and cyber forensic scenarios to assess ethical decisions, incident responses, and information security policies. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Computer ethics and philosophical ethics:** Vacuum of policies, conceptual muddles, social context, moral and legal issues, uniqueness of ethical issues, role of analogy, descriptive and normative claims, ethical relativism, utilitarianism, other theories. Professional Ethics: Characteristics, the system of professions, computing as a profession, professional relationships, responsibilities, code of ethics and professional conduct. Privacy: Computers and privacy issue, reframing this issue, legislative background, better privacy protection.

## Unit-II

**Intellectual property issues in cyberspace:** Introduction to intellectual property Protections via Copyright, Trade

Secrets, Trademarks, Patents, Contracting to protect intellectual property, Protection options –Encryption, copyright on web-content, copyright on software. Ethical Decision Making: Types of ethical choices, Making defensible decisions, Ethical dilemmas, law and ethics, Guidelines for dilemma (Informal and Formal), Four-step analysis process of solving dilemma Case studies: i) A stolen password ii) Recovery of data leads to Discovery of confidential files iii) Do copyright ethics change overseas?

**Unit-III**

**Crime incident Handling Basics:** Hacking, cyber activism, Tracking hackers, clues to cybercrime, privacy act, search warrants, common terms, organizational roles, procedure for responding to incidents, reporting procedures, legal considerations, Information Technology Act 2000: Scope, jurisdiction, offense and contraventions, powers of police, adjudication.

**Unit-IV**

**Cyber Forensics:** Cyber forensics, cybercrime examples, forensics casework, investigative incident response actions, computer forensics tools, Threats in cyberspaces, Blended attacks Sample Policy Documents: Antivirus Guidelines Policy, Internal Lab Security Policy, Server Security Policy, Wireless Communications Policy. Information Security Certifications, CISS P and SSCP, CISA and CISM, SCP, GIAC, certification weaknesses, Role of these certified professionals, Windows Server 2003 Security Fundamentals.

**Suggested Readings:**


1. Computer Ethics by Deborah G. Johnson, 4th Edition, Pearson Education Publication, 2008.
2. Ethical Decision making and IT: An Introduction with Cases by Earnest A. Kallman, J. P. Grillo, McGraw Hill Publication, 2008.
3. Cyber security Operations Handbook by John W. Rittinghouse, William M. Hancock, Elsevier Pub., 2003.
4. Principles of Information Security by Michael E. Whitman, Herbert J. Mattord, 2nd Edition, Cengage Learning Pub., 2012.
5. Network Infrastructure Security by Randy Weaver, Dawn Weaver, Cengage Learning Hub, 2006.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Utilitarianism | https://www.youtube.com/watch?v=IngDKG5Nw |
| | Professional Ethics | https://youtu.be/9LSEBK03CiY?si=juRyyIjCHSJTVETL |
| | Privacy: Computers and privacy issue | https://www.youtube.com/watch?v=_aGgZ9u6g3I |
| **Unit-II** | Intellectual property issues in cyberspace | https://www.youtube.com/watch?v=SbqtGOPgqIY |
| | Ethical Decision Making | https://www.youtube.com/watch?v=iiByedXbbso |
| **Unit-III** | Crime incident Handling Basics | https://youtu.be/dm9xZIzDhwM?si=xVVsnK1lZzuviOpV |
| | Information Technology Act 2000 | https://www.youtube.com/watch?v=DQmQYeb8M |
| **Unit-IV** | Types of cybercrime. | https://www.youtube.com/watch?v=gwDghhXamo |
| | Cyber security and privacy | https://youtu.be/OYsY5B9pqYU?si=_V97Elb0g8tlqbQS |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | |
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Identify research problems, objectives, and data sources based on fundamental research methodology principles. | Level 1: Remember |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. | Level 2: Understand |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. | Level 3: Apply |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

**Unit-II**

Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

## Unit-III

Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing.

## Unit-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology.

**Suggested Readings:**


1. Research Methodology: Methods and Techniques by Kothari, C. R., & Garg, G, 4th ed., New Age International Publishers.
2. Research Methodology: A Step-by-Step Guide for Beginners by Kumar, R, 4th ed., SAGE Publications India. ISBN: 978-9351501337
3. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed.) by Bouchoux, D. E, Cengage Learning.
4. Intellectual Property Rights under WTO by T. Ramappa, S. Chand.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Defining/formulating research problem | https://www.youtube.com/watch?v=oTc4_zjmev0 |
| | Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=tjDBPRoyDJA |
| Unit-II | Types of Plagiarism | https://www.youtube.com/watch?v=5--ssYqyWoE |
| | Research Ethics | https://www.youtube.com/watch?v=4tRCov8pVgQ |
| Unit-III | Primary data and Secondary Data | https://www.youtube.com/watch?v=caUiRsg5M6k |
| | Sampling techniques | https://www.youtube.com/watch?v=sKtoW5cXt14 |
| Unit-IV | Patent Trademarks and Copyrights. | https://www.youtube.com/watch?v=XQ8tRdcr0xQ |
| | What is Patent? Patent Filing Procedure in India | https://www.youtube.com/watch?v=azMNhrkRzww |

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|---|---|---|---|---|---|
| Course Code | **PRO-MTCFIS-213A** | | | | |
| Category | Project | | | | |
| Course Title | **Project** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in Computer Science and Engineering for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Identify complex engineering problems relevant to project work based on domain knowledge and real-world challenges. |
| **CO2** | Describe the workflow, technical background, and tools required for planning and executing engineering projects. |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MT-215A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **2** | |
| Course Objectives | The objectives of this course are<br>● To develop students' ability to effectively present research topics and findings by effective communication.<br>● To improve problem-solving and critical thinking skills of the students.<br>● To expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** |
|---|---|
| **CO1** | Identify the trends and advancements in the related field. |
| **CO2** | Analyze and synthesize research literature with in-depth reviews of key studies and methodologies. |
| **CO3** | Undertake problem identification, formulation, proposing solution and analyze the impact on society, economy and environment. |
| **CO4** | Prepare a well-organized report employing elements of effective communication and critical thinking. |
| **CO5** | Demonstrate a sound technical knowledge of their research field. |

**Overview:**

This is a course designed to help M.Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar:**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | CO1 |
| 2 | Literature Survey | 10 | CO2 |
| 3 | Content Relevancy | 10 | CO3 |
| 4 | Presentation Skills | 10 | CO4 |
| 5 | Q&A Response | 10 | CO5 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTCFIS-217A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying relevant research topics in Cyber Forensics and Information Security.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | - | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Cyber Forensics and Information Security Computer Science and Engineering to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M. Tech (Cyber Forensics and Information Security) –4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTCFIS-202A | Dissertation and Viva (Phase-2) | - | - | 20 | 20 | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTCFIS-202A** | | | | |
| Category | Lab Courses | | | | |
| Course Title | **Dissertation and Viva (Phase-2)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 20 | 20 | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help identify relevant topics in Cyber Forensics and Information Security.<br>• Understand literature review, structured research methodology and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Cyber Forensics and Information Security to carry out independent research. |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. |

Dissertation Phase-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Phase-2.
- The student must follow the guidelines for the Dissertation report format as per Annexure-I.

## Multidisciplinary Open Elective –II Courses

Multidisciplinary Open Elective-II course for students of all postgraduate programs, except Computer Science and Engineering (CSE) and Cyber Forensics and Information Security (CFIS).

| Sr. No. | Course Code | Course Title | Offered by Department |
|---|---|---|---|
| 1 | OEC-149A | Optimization Techniques | Computer Sc. and Engineering |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **OEC-149A** | | | | |
| Category | Multidisciplinary Open Elective Courses | | | | |
| Course Title | **Optimization Techniques** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● Understand classical and constrained optimization techniques for non-linear programming.<br>● Solve the linear and integer programming problems using simplex methods, duality, and techniques.<br>● Apply mathematical models and algorithms to transportation and assignment problems.<br>● Analyze system reliability and queuing models using mathematical tools for performance and failure assessment. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of linear/non-linear programming, transportation, assignment, reliability, and queuing models. | Level 1: Remember |
| **CO2** | Explain problem-solving methodologies for optimization, reliability, and queuing systems. | Level 2: Understand |
| **CO3** | Apply optimization techniques, to solve real-world decision-making and resource allocation problems. | Level 3: Apply |
| **CO4** | Analyze and evaluate optimization, reliability, and queuing models for efficient decision-making. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Linear Programming: Simplex Method, Big M-Method, Duality in Linear Programming, Sensitivity Analysis, Revised Simplex Method, Two-Phase Simplex Method, Dual Simplex Method. Integer Linear Programming: Branch and Bound Algorithms, Gomory Cutting Plane Method..

**Unit-II**

Transportation Problems: Types of Transportation Problems, Mathematical Models, Transportation Algorithms. Assignments: Definition, Differences between Transportation and Assignment Models, Representation Assignment Problem as Transportation Problem and as Linear Programming, Assignment Algorithm -Hungarian Method.

**Unit-III**

**Non-Linear Programming:** Classical optimization Techniques, NLP with constraints: Graphical Solution,

Multivariable Optimization with Equality constraints (Lagrange Multipliers Method), with inequality constraints-Kuhn-Tucker conditions, Quadratic Programming and Separable Programming: Standard form, Wolf's Method, Beale's Method .Search Method for Unconstrained Non-Linear Programming Problems.

**Unit-IV**

**Reliability:** Basic concepts, conditional failure rate function, Failure time distributions, certain life Models, Reliability of a system in terms of the reliability of its components, series system, parallel system. Queuing Theory: Introduction, elements or Parameters of Queuing system, Steady state Balance Equation, Kendall's Notation for Representing Queuing /N/FCFS) Finite Models, Model!:Single server Model(M/M/1/∞/∞/FCFS), Model 2:M/M/1/ Capacity Queue System,Model3:Multi-server Model, Model4: Machine Servicing Model.

**Suggested Readings:**


1. Optimization Techniques by C. Mohan and Kusum Deep, New Age International.
2. Operations Research by K. Rajagopal, PHI, India.
3. Reliability Engineering by K K Aggarwal, Springer.
4. Operations Research: An Introduction by Taha H.A.
5. Linear Programming and Network Flows by Mokhtar S. Bazaraa, John J. Jarvis, and Hanif D. Sherali.
6. Reliability Engineering by Elsayed A. Elsayed.
7. Fundamentals of Queuing Theory by Donald Gross, John F. Shortle, James M. Thompson, and Carl M. Harris.


**Useful Video links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Operation Research | https://onlinecourses.nptel.ac.in/noc24_ma55/preview |
| | Linear Programming | https://www.nptelvideos.com/lecture.php?id=14985 |
| **Unit-II** | Dual of the transportation problem and the optimality of the MODI method | https://www.youtube.com/watch?v=-tIfLz3Vsuk |
| | Hungarian Algorithm | https://www.youtube.com/watch?v=BUGIhEecipE |
| **Unit-III** | Nonlinear Programming | https://archive.nptel.ac.in/courses/111/107/111107104/ |
| | Dynamic Programming | https://www.youtube.com/watch?v=qa9fnsdY0A8&t=1s |
| **Unit-IV** | Introduction to Queueing Theory | https://www.youtube.com/watch?v=4H9dMn919cs |
| | Birth-Death Queues: General Theory, M/M/1 Queues and their Steady State Solution | https://www.youtube.com/watch?v=AOcCMi7SPqM |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**

**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Evaluation Scheme and Syllabus For

# Bachelor of Technology Computer Science and Engineering (CSE)

# Common With

# Bachelor of Technology Computer Science and Engineering-Working Professional (CSE-WP)

# Bachelor of Technology Computer Science and Engineering-Artificial Intelligence and Machine Learning (B.Tech CSE-AIML)

# Bachelor of Technology Computer Science and Engineering-Data Science (B.Tech CSE-DS)

## (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 1 Tutorial (T) per week | 1 Credit |
| 3 | 2 Practical (P) per week | 1 Credit |
| 4 | 2 Practical Training per week | 1 Credit |
| 5 | 4 Project per week | 2 Credit |

## 2. RANGE OF CREDIT

A credit range of 160-180 is required for a student to be eligible to obtain an undergraduate degree in Computer Science and Engineering.

## 3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B.TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Professional Core Courses | 71* |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | 18* |
| 3 | Engineering Science Courses | 22* |
| 4 | Basic Science Courses | 21* |
| 5 | Humanities and Social Sciences including Management courses | 15* |
| 6 | Multidisciplinary Open Electives Courses | 9* |
| 7 | Practical Training | 10* |
| 8 | Project | 4* |
| 9 | Mandatory Courses (Non Credit) | - |
| | **Total Credits** | 170* |

**Minor variation is allowed as per need of the respective disciplines.*

## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Professional Core Courses | PCC |
| 2 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 3 | Engineering Science Courses | ESC |
| 4 | Basic Science Courses | BSC |
| 5 | Humanities and Social Sciences including Management courses | HSMC |
| 6 | Multidisciplinary Open Electives Courses | OEC |
| 7 | Practical Training | PT |
| 8 | Project | PR |
| 9 | Mandatory Courses | MC |
| 10 | Lab Courses | LC |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## B.Tech (Computer Science and Engineering) – 3rd Semester

## Common with

## B.Tech Computer Science and Engineering-Working Professional – 3rd Semester

## B.Tech (CSE- Artificial Intelligence and Machine Learning) – 3rd Semester

## B.Tech (CSE – Data Science) – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Basic Science Courses | BSC-MCSE-201A | Engineering Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Course | PCC-CSE-203A | Data Structures | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Course | PCC-CSE-205A | Operating System | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Course | PCC-CSE-207A | Python Programming | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Humanities and Social Science including Management Courses | HSMC-01A | Fundamentals of Management and Organizational Behaviour | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Engineering Science Courses | ESC-ECE-206A | Digital Electronics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Course | LC-CSE-209A | Data Structures Lab Using C | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Course | LC-CSE-211A | Operating System Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Course | LC-CSE-213A | Python Programming Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Engineering Science Courses | LC-ECE-224A | Digital Electronics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 11 | Mandatory Courses (Non-Credit) | MC-201A | Environmental Science | 2 | 0 | 1 | 3 | - | 40 | 60 | | - | 3 |
| **Total Credits** | | | | | | | | **23** | | | | **800** | |

**Note:** MC-201A is a mandatory non–credit course in which the students will be required passing marks in theory.

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## B.Tech (Computer Science and Engineering) – 4th Semester

## Common with

## B.Tech Computer Science and Engineering-Working Professional – 4th Semester

## B.Tech (CSE- Artificial Intelligence and Machine Learning) 4th Semester

## B.Tech (CSE – Data Science) – 4th Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Course | PCC-CSE-202A | Discrete Mathematics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Course | PCC- CSE-204A | Computer Organization and Architecture | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Course | PCC-CSE-206A | Object Oriented Programming | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Course | PCC- CSE-208A | Database Management Systems | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Course | PCC-CSE-210A | Artificial Intelligence | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Professional Elective Courses | Refer Table-1 | Professional Elective-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Course | LC-CSE-212A | Object Oriented Programming Lab using C++ | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Course | LC-CSE-214A | Database Management Systems Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Course | LC-CSE-216A | Artificial Intelligence Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| **Total Credits** | | | | | | | | **23** | | | | **750** | |

**Notes:**

I. Choose any one from Professional Elective – I.

II. At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/ Institute/ Professional Organization/ Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization & its evaluation shall be carried out in the 5th Semester.

**Table 1: Professional Elective - I**

| Sr. No. | Course Code | Course Title |
|---|---|---|
| 1 | PEC-CSE-218A | Cloud Computing |
| 2 | PEC-CSE-220A | Nature Inspired Computing Techniques |
| 3 | PEC-CSE-222A | Human Computer Interaction |
| 4 | PEC-CSE-224A | Cyber Security |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **BSC-MCSE-201A** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Mathematics-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>● To equip students with advanced mathematical tools—multivariable calculus, vector calculus, partial differential equations, and complex analysis—for modelling, analyzing, and solving problems in computational and engineering domains.<br>● To emphasise on applications in areas such as image processing, machine learning, signal processing, and system dynamics. | | | | |
| Course Prerequisite | Mathematics up to 12th Standard and Engineering Mathematics-I | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe key terminology of multivariable integrals, vector calculus, partial derivatives and complex analysis. | Level 1: Remember |
| **CO2** | Explain the principles and applications of multivariable integrals, vector calculus, partial derivatives and functions of complex variables. | Level 2: Understand |
| **CO3** | Solve the problems using techniques of integrals, vector calculus, partial derivatives and complex analysis. | Level 3: Apply |
| **CO4** | Analyze complex mathematical problems associated with multi-variable integrals, vector calculus, partial derivatives and complex function. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Multivariable Integral Calculus:** Evaluation of definite and improper integrals, double integrals, Evaluation of double integrals (Cartesian and polar coordinates), Change of order of integration, Change of variables between Cartesian, cylindrical and spherical polar coordinates, Applications of double integral to find area enclosed by plane curves, Triple integrals, Applications of triple integrals, Beta and Gamma functions.

## Unit-II

**Vector Calculus:** Differentiation of vectors, scalar and vector point functions, Gradient of a scalar point function, Directional derivative, Curl and divergence, Statement of Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using these theorems.

## Unit-III

**Partial Derivatives**: Definition of Partial Differential Equations, First order linear partial differential equations, Partial Differential Equations of higher order: Second-order linear partial differential equations and their classification, Solution to homogeneous and non-homogeneous linear partial differential equations of second order by complementary function and particular integral method, Initial and boundary conditions, D'Alembert's solution of the wave equation, Separation of variables method to simple problems in Cartesian coordinates, One dimensional diffusion equation and its solution by separation of variables.

## Unit-IV

**Functions of Complex Variable**: Differentiability and Analyticity, Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations, Harmonic functions, Integration of complex functions, Cauchy-integral theorem and formula (without proof), Taylor's series, Laurent's series, Zeros of analytic functions, Singularities, Residues, Cauchy Residue theorem (without proof).

**Suggested Readings:**


1. Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
3. Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley& Sons.
4. Advanced Engineering Mathematics by H. K. Dass, S. Chand.
5. A text book of Engineering Mathematics by N. P.Bali and Manish Goyal, Laxmi Publications.
6. Engineering Mathematics for first year by T. Veerarajan, Tata McGraw-Hill Publishing Company Limited.
7. Engineering Mathematics-Calculus, Differential Equations and Linear Algebra by P. Sivarama Krishna Das, C. Vijaya Kumari, Pearson Education.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Multiple Integrals | https://youtu.be/mIeeVrv447s?si=ZxrHvWcK3RQTaOyp |
| | Change Order Of Integration | https://youtu.be/4rc3w1sGoNU?si=GmMACWg459ppFGyn |
| | Change Of Variables | https://youtu.be/wtY5fx6VMGQ?si=bSR0rySP3bql6Ngh |
| Unit-II | Vector Differentiation | https://youtu.be/Qj0KM9Uh7xw?si=9gLE1lLBgoYnyi8v |
| | Gradient of a scalar field and Directional derivative | https://youtu.be/JTJXHcLrxgM?si=kuqQlxeT4Y0N9Xeo |
| | Gradient, Divergence and Curl | https://youtu.be/v_sTlDeCUdU?si=yf6yzC0hazmWzYEh |
| | Line Integral | https://youtu.be/yCqLvRiVtng?si=iqbOrl9Bq28F9HIL |
| | Applications of Line integrals | https://youtu.be/mMBSb_dtkYU?si=rtFe1esglErwBr3b |
| | Green's Theorem | https://youtu.be/34aX-fNMS-c?si=v1hj0iSsVQ2ypsJp |
| | Divergence Theorem of Gauss | https://youtu.be/DtqTXJ5X3xo?si=J5KIjrjWImISylNH |
| | Stoke's Theorem | https://youtu.be/q-fgRrPayJY?si=MI5sFHwamcF8gApa |
| Unit-III | Definition of Partial Differential Equations. | https://youtu.be/Kk5SEzASkZU?feature=shared |
| | Homogeneous and non-homogenous linear partial differential equations of second order | https://youtu.be/Kk5SEzASkZU?feature=shared |
| | Initial and boundary conditions of partial differential equations of second order | https://youtu.be/Kk5SEzASkZU?feature=shared |
| | Separation of variables method to simple problems in Cartesian coordinates | https://youtu.be/Kk5SEzASkZU?feature=shared |
| Unit-IV | Introduction to Complex Numbers | https://www.youtube.com/watch?v=gFjlBKW8aZU |
| | Analytic Functions Of A Complex variable | https://youtu.be/b5VUnapu-qs?si=odZ34Xpop2x-xcob |
| | Calculus Of Residues (Part I) | https://youtu.be/o77UV7YrWvw?si=9T5nTIJ3krNNYKx4 |
| | Calculus Of Residues(Part II) | https://youtu.be/Aq6K0lmv3Qw?si=rWyCcSJMlEVpimr6 |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PCC-CSE-203A** | | | | |
| Category | Professional Core Course | | | | |
| Course title | **Data Structures** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the basics of data structures and algorithms.<br>• To explain the concept of Stacks, Queues, Linked Lists, Trees, related operations and their implementation.<br>• To understand sorting, hashing, and graph algorithms, including their design and complexity analysis<br>• To develop the ability to evaluate algorithm efficiency in terms of time and space complexity. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated |
|---|---|
| CO1 | Define the key terminologies of data structures and algorithms including their classifications, operations, and performance characteristics. |
| CO2 | Describe the design and implementation of various linear and non-linear data structures, and their real-world applications including hashing and binary trees. |
| CO3 | Apply appropriate data structures such as arrays, stacks, queues, linked lists, trees, and graphs to solve computational problems effectively. |
| CO4 | Analyze the efficiency of algorithms and operations in searching, sorting, and traversals using time and space complexity metrics. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Basic Terminologies: Concept of Data Structure, Choice of right Data Structure, Algorithms, how to design and develop algorithm, Complexity of algorithm. Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Searching: Linear Search and Binary Search Techniques and their complexity analysis. Arrays: Array Definition, Types, Operations on array and their complexity analysis.

**Unit-II**

**Stacks and Queues:** Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation -corresponding algorithms and complexity analysis. Tower of Hanoi problem. Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.

## Unit-III

**Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.
**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Path length, Huffman's algorithm, Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

## Unit-IV

**Sorting and Hashing:** Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.
**Graph:** Basic Terminologies, Sequential representation of graphs, Adjacency matrices. Graph search and traversal algorithms and complexity analysis.

**Suggested Readings:**


1. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press. Programming in ANSI C by E. Balaguruswamy, Tata McGraw-Hill
2. Algorithms, Data Structures, and Problem Solving with C++, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company.
3. How to Solve it by Computer, 2nd Impression by R.G. Dromey, Pearson Education.
4. Data Structures and Algorithms Made Easy by Narasimha Karumanchi.
5. Data Structures Using C by Aaron M.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Data Structures and Algorithms | https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F |
| | Linear Search Algorithm | https://www.youtube.com/watch?v=C46QfTjVCNU |
| | Binary Search | https://www.youtube.com/watch?v=V_T5NuccwRA |
| **Unit-II** | Stacks | https://youtu.be/g1USSZVWDsY?list=PLBF3763AF2E1C572F |
| | Stack and its Applications | https://www.youtube.com/watch?v=aG0HjeXBUDU |
| | Queues and Linked Lists | https://youtu.be/PGWZUgzDMYI?list=PLBF3763AF2E1C572F |
| **Unit-III** | Linked Lists-I | https://www.youtube.com/watch?v=K7VIKlUdo20 |
| | Trees | https://youtu.be/tORLeHHtazM?list=PLBF3763AF2E1C572F |
| | Search Trees-II | https://www.youtube.com/watch?v=5jQGqaAUzOI |
| | AVL Trees | https://youtu.be/mRGQylRWAsI?list=PLBF3763AF2E1C572F |
| **Unit-IV** | Sorting | https://youtu.be/4OxBvBXon5w?list=PLBF3763AF2E1C572F |
| | Hashing | https://www.youtube.com/watch?v=2-h9193Ztqg |
| | Graphs | https://youtu.be/9zpSs845wf8?list=PLBF3763AF2E1C572F |

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|---|---|---|---|---|---|---|
| Course Code | **PCC-CSE-205A** | | | | | |
| Category | Professional Core Courses | | | | | |
| Course Title | **Operating System** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 3 | 0 | 0 | **3** | | |
| Course Objectives | The objectives of this course are<br>● To introduce the students to the fundamental concepts, types, and services of operating systems and their evolution.<br>● To develop understanding of process management, thread management, CPU scheduling, and inter-process communication mechanisms.<br>● To explain memory management, virtual memory, file systems, and disk scheduling techniques for effective resource utilization.<br>● To provide practical insight through case studies of UNIX and Windows, enhancing problem-solving and analytical skills for system performance optimization. | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall basic OS concepts, types, services, and case studies. | Level 1: Remember |
| **CO2** | Explain process management, memory, file, and disk management techniques. | Level 2: Understand |
| **CO3** | Apply scheduling, synchronization, and memory management to solve OS problems. | Level 3: Apply |
| **CO4** | Analyze techniques and algorithms in operating systems for efficiency and performance. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Operating Systems:** Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Architecture (window, android, mac), OS Services. Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching.

**Thread:** Definition, Various states, Benefits of threads, Types of threads, Multithreading.

**Process Scheduling:** Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non-pre-emptive, FCFS, SJF, SRTF, RR Scheduling.

## Unit-II

**Inter-process Communication:** Critical Section, Race Conditions, Mutual Exclusion, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc.
**Deadlocks:** Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, and Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

## Unit-III

**Memory Management:** Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging, Memory Protection (ASLR, DEP).
**Virtual Memory:** Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Optimal Page Replacement and Least Recently used (LRU).

## Unit-IV

**File Management:** Concept of File, Access methods, File types, Modern file system (ZFS, Btrfs, APFS), File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), efficiency and performance.
**Disk Management:** Disk structure, Disk scheduling – FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks, Case study on UNIX and WINDOWS Operating System.

**Suggested Readings:**


1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, G. Gagne, Eighth edition, Wiley Publication.
2. Modern Operating Systems by Andrew S. Tanenbaum, Second Edition, Pearson India.
3. Operating System: A Design-oriented Approach by Charles Crowley, McGraw Hill Education.
4. Design of the Unix Operating Systems by Maurice Bach, Pearson Education India.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems | https://www.youtube.com/playlist?list=PLrpK1inhO61UQRHHuB8xSYulwJrAuVGPw |
| | Multithreading | https://www.youtube.com/watch?v=6rYOyIGfy3w&t=1440s |
| Unit-II | Critical Section, other Synchronization Problems | https://youtu.be/qKPCfuZAAEc |
| | Deadlocks, Resources, System State, Necessary and Sufficient conditions for a Deadlock. | https://www.youtube.com/watch?v=8ZS7xzWPo5A&list=PLEAYkSg4uSQ2Pach478muxnoeTNz_QeUJ&index=33 |
| | Banker's algorithm | https://youtu.be/8ZS7xzWPo5A?list=PLyqSpQzTE6M9SYI5RqwFYtFYab94gJpWk |
| Unit-III | Memory Management | https://youtu.be/_pKbqFyG03s |
| | Virtual Memory | https://www.youtube.com/watch?v=Ev4BET3i5R0 |
| | Page Replacement algorithms | https://www.youtube.com/watch?v=Oho3QU-7pB8 |
| Unit-IV | File Management | https://youtu.be/EiFHM-HhsEQ |
| | File Access Methods | https://archive.nptel.ac.in/courses/106/105/106105214/# |
| | Unix and Windows | https://www.youtube.com/watch?v=6El3RW9ZOKE |

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|---|---|---|---|---|---|
| Course Code | **PCC-CSE-207A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Python Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce Python programming fundamentals, including syntax, data types, control structures and basic python libraries.<br>• To develop skills in Python data structures, functions, recursion and python libraries like NumPy, Pandas, Tkinter etc.<br>• To explore Python's graphical programming, image processing, and GUI development. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define key terminology of Python syntax, data types, control structures, data structures, libraries, and GUI tools. | Level 1: Remember |
| **CO2** | Explain the functionality of Python programming constructs, data handling techniques, and graphical modules. | Level 2: Understand |
| **CO3** | Use Python programs for data processing, file handling, numerical computing, graphics, and GUI applications. | Level 3: Apply |
| **CO4** | Analyze Python programming constructs, data structures, libraries, graphics, image processing, and GUI techniques to solve real-world problems effectively. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; numerical types; arithmetic operators and expressions; Loops and selection statements, Control statements String manipulations: subscript operator, indexing, slicing a string; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file.

**Unit-II**

**Lists, Tuple, dictionary and Design with functions:** Basic list operators, replacing, inserting, removing an element; searching and sorting lists; Tuple: creating tuples, accessing elements, tuple immutability, operations, tuple methods, tuples vs. lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity; arguments and return values; Program structure and design. Recursive functions.

## Unit-III

**Introduction to NumPy:** NumPy arrays, Array Indexing and Slicing, Array Operations, Array Manipulation, Linear Algebra with NumPy, Random Number Generation and Statistics.
**Introduction to Pandas:** Pandas Series, Pandas Data Frames, Data Frame Indexing and Selection, Data Cleaning and Pre-processing, Data Manipulation, Group by Operations, Merging, Joining, and Concatenating Data Frames, Input/output Operations.

## Unit-IV

**Simple graphics and image processing:** Simple graphics, Turtle operations, Manipulating turtle screen, Drawing two dimensional shapes, examining an object attributes, Taking a random walk, Colour and RGB scheme, Image processing: Image manipulation operations, properties of images, image module, copying, blurring and reducing image.
**Graphical User Interfaces using Tkinter:** Terminal based and GUI based programs, Introduction to Tkinter, Simple GUI-Based Programs, Windows and Window Components, Input and Output with Entry Fields, Defining and Using Instance Variables, Other Useful GUI Resources.

**Suggested Readings:**


1. Fundamentals of Python: First Programs by Kenneth Lambert, Course Technology, Cengage Learning, 2012.
2. Introduction to Computer Science Using Python: A Computational Problem-Solving by Dierbach, C. Focus, John Wiley & Sons, 2012.
3. Let Us Python by, Kanetkar, A., & Kanetkar, Y., BPB Publications.
4. Python – The Complete Reference by Brown, M. C., McGraw Hill Education.
5. Core Python Programming by Rao, R. N., Dream Tech Press.
6. Python Programming: Using Problem Solving Approach by Thareja, R., Oxford University Press.
7. Python Programming by Sridhar, S., Indumathi, J., & Hariharan, V. M., Pearson Education.
8. Python for Data Analysis by Wes McKinney, 3rd Edition, O'Reilly Media, 2022.
9. Python Data Science Handbook by Jake VanderPlas, O'Reilly Media.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Variables and Input Statement | https://youtu.be/ruQb8jzkGyQ |
| | Data Types, Operators and Expressions | https://youtu.be/8n4MbjuDBu4 |
| | Introduction to for loop | https://youtu.be/lvXuQ_x7EsI |
| | Introduction to while loop | https://youtu.be/KTvVNN7ia8o |
| | String Methods | https://youtu.be/p-4HU1rcG5s |
| | Reading and Writing to a File | https://www.youtube.com/watch?v=rYLJaAdgLhI |
| | Creating and reading a formatted file | https://www.youtube.com/watch?v=NBTSDtBy5bs |
| Unit-II | List operators | https://youtu.be/jMShssechMI |
| | Searching and sorting lists | https://youtu.be/4OxBvBXon5w |
| | Tuples | https://youtu.be/mzx74TdGYbg |
| | Dictionary literals, adding, and removing elements | https://youtu.be/Aj7PwBI99A4 |
| | Recursive functions | https://youtu.be/Uo7RyqJaaRQ |
| Unit-III | NumPy | https://youtu.be/rjY59WLMK2o |
| | Pandas | https://youtu.be/6DTFIKF8QIg?feature=shared |
| Unit-IV | Simple graphics | https://www.youtube.com/watch?v=pxKu2pQ7Ilo |
| | Graphical User Interfaces using Tkinter | https://youtu.be/-GhzpvvIXlM?si=itHn2839Kkhy89B3 |

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|---|---|---|---|---|---|
| Course Code | **HSMC-01A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Fundamentals of Management and Organizational Behaviour** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III/IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework.<br>• Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings.<br>• Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively.<br>• Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define fundamental management concepts, functions, organizational processes, and organizational behavior elements. | Level 1: Remember |
| **CO2** | Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations. | Level 2: Understand |
| **CO3** | Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges. | Level 3: Apply |
| **CO4** | Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction of Management:** Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.
**Functions of Management:** Planning, Organizing, Staffing, Directing& Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration.

**Unit-II**

**Introduction of Organization:** Meaning and Process of Organization, Management v/s Organization.
**Fundamentals of Organizational Behavior:** Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB**.**
**Individual Processes and Behavior:** Personality, Concept, Determinants and Applications.

**Perception:** Concept, Process and Applications
**Learning:** Brief Introduction
**Motivation:** Concept, Techniques and Importance**.**

**Unit-III**

**Interpersonal Processes**: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict-Concept, Sources, Types, Management of Conflict.
**Leadership:** Concept, Function, Styles, Qualities of Leadership.
**Communication**: Meaning, Process, Channels of Communication, Importance and Barriers of Communication.

**Unit-IV**

**Organizational Processes:** Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.
**Organizational Culture**: Elements, Types and Factors affecting Organizational Culture.
**Organizational Change:**Concept, Types and Factors affecting Organizational Change, Resistance to Change.

**Suggested Readings:**


1. Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
2. Organizational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
3. Management concept practice and cases by Ghuman Karminder, Aswathappa K., Tata McGraw Hill, New Delhi.
4. Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
5. Organizational Behaviour by Stephen P Robin, Pearson Education.
6. Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
7. Organizational Behaviour by FC Sharma, Shree Mahavir Publications.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Nature and Scope of Management | https://nptel.ac.in/courses/110105146 |
| **Unit-II** | Perception and Personality | https://nptel.ac.in/courses/110103433 |
| **Unit-III** | Group Dynamics | https://archive.nptel.ac.in/courses/110/106/110106145/ |
| **Unit-IV** | Organizational Change, Resistance to Change. | https://nptel.ac.in/courses/110105146 |

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|---|---|---|---|---|---|
| Course Code | **ESC-ECE-206A** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Digital Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To introduce the basic concepts of Boolean algebra.<br>● To introduce the various combinational circuits and designing.<br>● To introduce the various sequential circuits and designing.<br>● To understand the working of analog-to-digital, digital-to-analog converters, programmable devices for building digital systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** |
|---|---|
| **CO1** | Apply the knowledge of Boolean algebra, K-MAP, and other digital design methods for simplification and optimization of digital circuits. |
| **CO2** | Design and implement combinational logic circuits using logic gates for arithmetic operations, code conversion, and control applications. |
| **CO3** | Understand and apply the concepts of latches, flip-flops, and counters in designing synchronous and asynchronous circuits for memory and storage applications. |
| **CO4** | Analyze memory types and programmable logic device architectures to interpret the functional organization of FPGA and CPLD systems. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Logic Simplification:** Review of Boolean Algebra and De Morgan's Theorem, Digital codes, Logic gates and their operations, Realization of logic gates using universal gates, Number system, Representation of Boolean functions in sum of products (SOP) form and product of sums (POS), Addition and subtractions of a complements numbers, Minimization of Boolean functions using Karnaugh map and Quine McCuskey methods, Error detection and correction code.

## Unit-II

**Combinational Logic Design:** Half and Full Adders, Half and Full Subtractors, Multiplexers, Demultiplexers, Encoder, Decoder, Magnitude Comparators, Priority encoder, Parallel Adders, Adder with Look Ahead Carry, BCD Adder.

## Unit-III

**Sequential Logic Design:** Latches, Concept of edge triggered and level triggered clock, Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF, Conversions of FF, Ripple and Synchronous counters, Ring and Johnson counter, UP & DOWN counter, Sequence Generator, Shift registers.

## Unit-IV

**A/D and D/A Converter:** Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.
**Programmable Logic Devices:** ROM, PLA, PAL, SRAM, DRAM, FPGA and CPLDs.

**Suggested Readings:**


1. Modern digital Electronics by R.P. Jain, Tata McGraw Hill, 4th edition.
2. Switching Theory & Logic Design by A. Anand Kumar, PHI.
3. Digital Electronics Circuit and System by V K Puri, TMH.
4. Digital Circuits and Systems by D.V. Hall, Tata McGraw Hill.
5. Principle of Digital Electronics by K Meena, PHI
6. Logic & Computer Fundamentals by Morris Mano, 4th Edition, Pearson Education.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Boolean Algebra | https://www.youtube.com/shorts/xtAYbY_Pz7I |
| **Unit-II** | Multiplexer | https://www.youtube.com/watch?v=p6yPvw88BJk |
| | Combinational Circuits | https://www.youtube.com/watch?v=fXrbYMDevDU |
| **Unit-III** | Sequential Circuits | https://www.youtube.com/watch?v=S0mKCNLmCh4&list=PLgwJf8NK-2e4mEQv0ttgW-am4wiqrpdcX |
| | Counter | https://www.youtube.com/watch?v=NTCrCYPoA5A&list=PLgwJf8NK-2e6lcDg0NxW-_yO6Bl5dPBp8 |
| **Unit-IV** | Finite state machines | https://www.youtube.com/watch?v=LOZxYBOKRLg |
| | PLDs | https://www.youtube.com/watch?v=m6975d-U6j8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **LC-CSE-209A** | | | | | |
| Category | Professional Core Courses | | | | | |
| Course Title | **Data Structures Lab Using C** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** | |
| | 0 | 0 | 2 | **1** | | |
| Course Objectives | The objectives of this course are<br>● To learn how to create and perform basic operations on arrays linked lists, stacks, and trees using C.<br>● To understand and implement searching techniques like linear search and binary search.<br>● To gain practical knowledge of different sorting algorithms such as insertion sort, bubble sort, merge sort, quick sort, and heap sort.<br>● To improve problem-solving skills by writing and executing C programs for various data structure operations. | | | | | |
| Assessment | 25 Marks | | | | | |
| End Semester Practical Examination | 25 Marks | | | | | |
| Total | 50 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Understand the basics of C language and Turbo C Integrated Development Environment (IDE). | Level 2: Understand |
| CO2 | Apply C programming to implement data arrays, pointers, data structures, searching, sorting, and basic data structure operations like stacks and linked lists. | Level 3: Apply |
| CO3 | Apply C programming techniques to implement and manipulate non-linear data structures such as trees and hash tables. | Level 3: Apply |
| CO4 | Analyze the applicability of appropriate data structures, control statements, iteration statements to implement searching and sorting. | Level 4: Analyze |

**List of Experiments:**

| **Sr. No.** | **Content** | **COs** |
|---|---|---|
| 1 | Study the basics of Turbo C IDE. | CO1 |
| 2 | Write a Program in C programming language to insert and delete an Element in Linear Array. | CO2 |
| 3 | Write a Program in C programming language to Implement Array Traversing. | CO2 |
| 4 | Write a Program in C programming language to Implement Linear Search. | CO2 |
| 5 | Write a Program in C programming language to Demonstrate Binary Search. | CO2 |

| | | |
|---|---|---|
| 6 | Write a Program in C programming language to Insert and Delete Nodes into Linked List. | CO2 |
| 7 | Write a Program in C programming language to Implement PUSH and POP in Stack. | CO2 |
| 8 | Write a Program in C programming language to Implement Insertion Sort. | CO4 |
| 9 | Write a Program in C programming language to Implement Bubble Sort. | CO4 |
| 10 | Write a Program in C programming language to Implement Merge Sort. | CO4 |
| 11 | Write a Program in C programming language to Implement Quick Sort. | CO4 |
| 12 | Write a Program in C programming language to Implement Heap Sort. | CO4 |
| 13 | Write a program in C programming language to implement a binary tree and perform its inorder, preorder, and postorder traversals. | CO3 |
| 14 | Write a Program in C programming language to Find the Height of a Binary Tree in C. | CO3 |
| 15 | Write a Program in C programming language to implement a hash table with separate chaining for collision resolution. | CO3 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

### Virtual Lab Links:

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Write a Program in C to implement Linear Search and binary Search. | https://ds1-iiith.vlabs.ac.in/exp/unsorted-arrays/code-assessment.html |
| Write a Program in C programming language to Implement Bubble Sort. | https://ds1-iiith.vlabs.ac.in/exp/bubble-sort/code-assessment.html |
| Write a Program in C to implement Merge Sort. | https://ds1-iiith.vlabs.ac.in/exp/merge-sort/code-assessment.html |
| Write a Program in C programming language to Implement Quick Sort. | https://ds1-iiith.vlabs.ac.in/exp/quick-sort/code-assessment.html |
| Write a program in C programming language to implement a binary tree and perform its inorder, preorder, and postorder traversals. | https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/code-assessment.html |
| Write a Program in C to implement Linear Search and binary Search. | https://ds1-iiith.vlabs.ac.in/exp/unsorted-arrays/code-assessment.html |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CSE-211A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Operating System Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To gain hands-on experience with UNIX/Linux commands, system calls, and shell programming.<br>● To implement basic operating system concepts such as process creation, scheduling, and synchronization.<br>● To develop practical skills in memory management, file systems, and disk scheduling algorithms. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Describe the basic concepts and features of Linux, Windows, UNIX Operating System, basic UNIX commands and vi editor usage. | Level 2: Understand |
| **CO2** | Write shell scripts for system tasks like displaying user info, performing calculations, and managing files. | Level 3: Apply |
| **CO3** | Implement control structures in shell scripting to solve problems such as checking conditions and generating series. | Level 3: Apply |
| **CO4** | Analyze file allocation methods and CPU scheduling algorithms for efficient file and process management. | Level 4: Analyze |

**List of Experiments:**

| **Sr. No.** | **Content** | **COs** |
|---|---|---|
| **1** | Explore the architecture, features, and file system of the Windows Operating System. | CO1 |
| **2** | Explore the architecture, features, and file system of the Linux Operating System. | CO1 |
| **3** | Study various UNIX Commands. | CO1 |
| **4** | Understand the working of the VI editor and describe its modes, commands, and common file editing operations in UNIX/Linux. | CO1 |
| **5** | Write a program to print the VI editor file data. | CO2 |
| **6** | Write a shell program to implement a calculator. | CO2 |
| **7** | Write a shell script to see current date, time, username and directory. | CO2 |

| | | |
|---|---|---|
| **8** | Write a program to check whether a number is odd or even using Shell Programming. | CO3 |
| **9** | Write a program to find out the factorial of a number. | CO3 |
| **10** | Write a program to generate Fibonacci Series. | CO3 |
| **11** | Write a program to find the greatest number out of the seven numbers using a for loop. | CO3 |
| **12** | Write a program to implement Do-While Loop. | CO3 |
| **13** | Write a program to Implement any file allocation technique (Linked, Indexed or Contiguous) | CO4 |
| **14** | Write a program to Implement any CPU scheduling technique (FCFS, SJF, SRJF, Priority and Round -Robin) | CO4 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CSE-213A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Python Programming Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To introduce students to the basics of Python programming including syntax, data types, control structures, and file operations.<br>● To enable students to use Python data structures and modular programming techniques effectively.<br>● To provide hands-on experience with data analysis using NumPy and Pandas libraries.<br>● To develop skills in GUI programming, simple graphics, and image processing using Python. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Understand the installation process, basic features and programming constructs in Python. | Level 2: Understand |
| **CO2** | Apply Python programming techniques to implement algorithms for mathematical operations, searching, sorting and other real life problems. | Level 3: Apply |
| **CO3** | Apply NumPy and Pandas for data manipulation, statistical operations. | Level 3: Apply |
| **CO4** | Analyze Python's graphics, image processing, and GUI programming concepts to develop interactive applications. | Level 4: Analyze |

**List of Experiments:**

| **Sr. No.** | **Content** | **COs** |
|---|---|---|
| **1** | Study the basic features and installation of Python. | CO1 |
| **2** | Write a Python program to compute the G.C.D. of two numbers. | CO1 |
| **3** | Write a Python program to find the square root of a number. | CO1 |
| **4** | Write a Python program to find the power of a number. | CO1 |
| **5** | Write a Python program to find the maximum in a list of numbers. | CO2 |
| **6** | Write a Python program to implement linear search and binary search in a list. | CO2 |
| **7** | Write a Python program to sort the element using selection sort, insertion sort and merge sort. | CO2 |

| | | |
|---|---|---|
| **8** | Write a Python program to compute first “n” prime numbers. | CO2 |
| **9** | Write a Python program to find the most frequent word in a text file. | CO2 |
| **10** | Write a Python program to create and perform operations on arrays using NumPy. | CO3 |
| **11** | Write a Python program to apply Pandas for manipulating a dataset and performing grouped statistical operations. | CO3 |
| **12** | Write a Program in Python for a random walk using turtle. | CO4 |
| **13** | Create simple graphics using Turtle: draw shapes and take random walks. | CO4 |
| **14** | Perform image processing: copy, blur, and reduce images using PIL or OpenCV | CO4 |
| **15** | Design a GUI application using Tkinter with input, output, and buttons. | CO4 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

### Virtual Lab Links:

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Arithmetic Operations | https://python-iitk.vlabs.ac.in/exp/arithmetic-operations/ |
| Built-in Functions | https://python-iitk.vlabs.ac.in/exp/built-in-functions/ |
| Loops | https://python-iitk.vlabs.ac.in/exp/loops/ |
| Strings | https://python-iitk.vlabs.ac.in/exp/strings/ |
| File Handling | https://python-iitk.vlabs.ac.in/exp/file-operators/simulation.html |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-ECE-224A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Digital Electronics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>● Learn the basics of digital electronics and use logic gates and ICs.<br>● Design and check different combinational and sequential logic circuits.<br>● Understand the working operation of adders, subtractors, multiplexers, flip-flops, and counters in digital systems.<br>● Learn to build and test ADC, DAC, and practical counters for various applications. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify and apply operational principles of logic gates used in digital systems. |
| **CO2** | Apply K-map techniques to simplify Boolean expressions and design efficient combinational and sequential circuits. |
| **CO3** | Verify the truth tables and behavior of various combinational circuits with different states and inputs. |
| **CO4** | Design and develop counters and shift registers using flip flops for various practical applications used in digital systems. |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | To study & design basic gates. |
| **2** | To study and realize logic functions with the help of universal gates. |
| **3** | To realize and minimize five & six variables using K-Map method. |
| **4** | To verify the operation of Multiplexer & De-multiplexer. |
| **5** | To perform half adder and full adder. |
| **6** | To perform half subtractor and full subtractor. |
| **7** | To verify the truth table of S-R, J-K, T & D Type flip flop. |
| **8** | To design & verify the operation of 3 bit synchronous counter. |
| **9** | To design & verify the operation of synchronous UP/DOWN decade counter using JK flip. |

| | |
|---|---|
| **10** | To design & verify operation of Asynchronous counter. |
| **11** | To design and implement a circuit to detect a count sequence. |
| **12** | To design & verify operation of ADC & DAC. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

**Virtual Lab Links:**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| To study & design basic gates. | https://de-iitr.vlabs.ac.in/exp/truth-table-gates/ |
| To study and realize logic functions with the help of universal gates. | https://de-iitr.vlabs.ac.in/exp/half-full-adder/ |
| To verify the operation of Multiplexer & De-multiplexer. | https://de-iitr.vlabs.ac.in/exp/multiplexer-demultiplexer/ |
| To perform half adder and full adder | https://de-iitr.vlabs.ac.in/exp/half-full-adder/ |
| To perform half subtractor and full subtractor. | https://de-iitr.vlabs.ac.in/exp/half-full-subtractor/index.html |
| To verify the truth table of S-R, J-K, T & D Type flip flop. | https://de-iitr.vlabs.ac.in/exp/truth-tables-flip-flops/ |
| To design & verify the operation of 3-bit synchronous counter. | https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/ |
| To design & verify operation of Asynchronous counter. | https://de-iitr.vlabs.ac.in/exp/4bit-synchronous-asynchronous-counter/ |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MC-201A** | | | | |
| Category | Mandatory Courses | | | | |
| Course Title | **Environmental Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 2 | 0 | 1 | - | |
| Course Objectives | The objectives of this course are<br>• Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources.<br>• Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health.<br>• Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society.<br>• Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship. | | | | |
| Practical/Field Visits | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |
| **Remarks** | The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.<br>The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **CO** | **Skill Demonstrated** | **Level** |
|---|---|---|
| CO1 | Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws, and human-environment interactions. | Level 1: Remember |
| CO2 | Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics, and related legislation for sustainable development. | Level 2 : Understand |
| CO3 | Apply principles of environmental management, pollution control, disaster preparedness, and sustainable practices in real-world and field-based environmental contexts. | Level 3: Apply |
| CO4 | Analyze environmental problems, population growth impacts, climate change, welfare programs, and the role of information technology in promoting public health and environmental sustainability. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

The Multidisciplinary nature of environmental studies. Definition scope and importance.
**Natural Resources:** Renewable and non-renewable resources, Natural resources and associated problems.

**a) Forest resources:** Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.
**b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.
**c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
**d) Food resources:** World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies. e) Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.
f) **Land resources:** Land as are source, land degradation, man induced landslides, soil erosion and desertification.
Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles

## Unit-II

**Ecosystems**: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids**,** Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
**Bio diversity and its conservation:** Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

## Unit-III

**Environmental Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards.

**Solids Waste Management:** Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies.

**Disaster Management:** Floods, Earthquake, Cyclone and Landslides.
**Social issues and the Environment:** From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies.
**Environmental Ethics:** Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

## Unit-IV

**Human population and the Environment:** Population growth, Variation among Nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies.

**Field Work (Field work equal to10 lecture hours)-** Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc.

**Suggested Readings**:


1. Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner
2. The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
3. Hazardous Waste Incineration by R.C. Brunner, McGraw Hill Inc., 1989
4. Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
5. Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press, 1995, 1140p.
6. Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House, Delhi, 1995, 284p.
7. Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
8. Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publ. Co. Pvt. Ltd., 1987, 345p.
9. Environmental Chemistry by B.K. Sharma, Goel Publ. House, Meerut, 2001.
10. Survey of the Environment, The Hindu.
11. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
12. Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
13. Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA, 1998, 499p.
14. A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Environment Science: Introduction | https://www.youtube.com/watch?v=5QxxaVfgQ3k |
| | Natural Resources | https://www.youtube.com/watch?v=CXCT2R1K6Ts |
| | Ecosystem | https://www.youtube.com/watch?v=1dBU6HB8G6s |
| Unit-II | Biodiversity and its conservation | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| Unit-III | Sustainable Water Management In Urban Areas | http://digimat.in/nptel/courses/video/127106004/L29.ht |
| | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |
| Unit-IV | Population and population growth | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| | National Family Welfare Programme | https://www.youtube.com/watch?v=X5F99L8ZEtc |

| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **PCC-CSE-202A** | | | | | |
| Category | Professional Core Courses | | | | | |
| Course Title | **Discrete Mathematics** | | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** | |
| | 3 | 1 | 0 | **4** | | |
| Course Objectives | The objectives of this course are<br>● To introduce the concept of mathematical logic, concept of sets, relation and functions.<br>● To introduce the concept of algorithm and number theory.<br>● To understand the group theory and related examples.<br>● To applying discrete structures to areas such as algorithms, data structures, digital logic, and cryptography. | | | | | |
| Course Prerequisite | Mathematics up to 12$^{th}$Standard and Engineering Mathematics-I &II | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define the basic terms used in discrete mathematics and structures. | Level 1: Remember |
| **CO2** | Understand the fundamental techniques, laws, logics, relations, graphs and trees. | Level 2: Understand |
| **CO3** | Solve mathematical problems based on the concept of set theory, relations, functions and basic counting techniques. | Level 3: Apply |
| **CO4** | Classify lattices, logarithms, functions, algebraic structures, graphs and trees. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Sets, Relation, Function and Propositional Logic:** Operations and Laws of Sets, Cartesian Products, Representation of relations, Binary Relation, Equivalence Relation, Partial Ordering Relation, POSET, Hasse Diagram, Lattices and its types, Function, Bijective functions, Inverse and Composite Function, Finite and infinite Sets, Countable and Uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem, Propositions, Logical operations, Conditional Statements, Tautologies, Contradictions, Logical Equivalence.

**Unit-II**

**Basic Counting Techniques and Recurrence Relation:** Pigeon-hole principle, Permutation and Combination, the Division algorithm: Prime Numbers, The GCD: Euclidean Algorithm, The Fundamental Theorem of Arithmetic., Linear recurrence relation with constant coefficients, Homogenous Solutions, Particular Solutions, Total Solutions, Solving recurrence relation using generating functions.

## Unit-III

**Algebraic Structures:** Definitions and examples of Algebraic Structures with one Binary Operation: Semi Groups, Monoids, Groups; Congruence Relation and Quotient Structures, Permutation Groups, Cyclic groups, Normal Subgroups, Definitions and examples of Algebraic Structures with two Binary Operation: Rings, Integral Domain, Fields; Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form.

## Unit-IV

**Graphs and Trees:** Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Multigraph and Weighted graph, Shortest path in Weighted graphs, Eulerian paths and circuits, Hamiltonian path and circuits, Planar Graphs, Euler's formula, Graph Colouring, Trees, Binary trees and its traversals, Trees Sorting, Spanning tree, Minimal Spanning tree.

**Suggested Readings:**


1. Discrete Mathematics and its Applications by Kenneth H. Rosen, Tata McGraw – Hill.
2. A Text Book of Discrete Mathematics and Structures by Satinder Bal Gupta, University Science Press, Delhi.
3. Elements of Discrete Mathematics: A Computer Oriented Approach by C. L. Liu and D. P. Mohapatra, Tata McGraw – Hill.
4. Discrete Mathematical Structures with Applications to Computer Science by J.P. Tremblay and R. Manohar, TMG Edition, Tata McGraw-Hill.
5. Discrete Mathematics by Babu Ram, Pearson Publication.
6. Discrete Mathematics by Seymour Lipschutz and Marc Lipson, Schaum's outline.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Sets | https://youtu.be/s-hRgTgdVe4?si=oN4wGgPzbqYvh-pv |
| | Functions | https://youtu.be/ceiMP4otA28?si=00SmukP2_XlqgeKK |
| | Representation of relations | https://youtu.be/wGLTV8MgLlA?si=KQ3UQ6hnj8szYIvN |
| | Propositions Calculus | https://youtu.be/WQ40fJskFIE?si=jVpwPuZ8pUW78QWj |
| Unit-II | Permutation and Combination, the Division algorithm | https://youtu.be/BI84sbsOtGQ?si=ZTFN88-qrGlOwquH |
| | The GCD: Euclidean Algorithm | https://youtu.be/BI84sbsOtGQ?si=ZTFN88-qrGlOwquH |
| | Pigeon-hole principle | https://youtu.be/a-O-ioYy1rI?si=_bIKGfCet8sM8csj |
| | Linear recurrence relation | https://youtu.be/CsvJPEgzF18?si=lpJz5yj1X8cVuTui |
| | Total Solutions, Solving recurrence relation using generating functions | https://youtu.be/ZxqBgiW1VBw?si=8_5FRbpei6fKRDX1 |
| Unit-III | Algebraic Structures: Definitions and examples of Algebraic Structures with one Binary Operation | https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI |
| | Groups; Congruence Relation and Quotient Structures | https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI |
| | Definitions and examples of Algebraic Structures with two Binary Operations | https://youtube.com/playlist?list=PLq76ktDFTJEKPnC7dWNEOYHytKvrQ4en0&si=B1K2ne130ijMGoU5 |
| Unit-IV | Graphs and their properties | https://youtu.be/3zOtLEeHygg?si=oXeg4i1GEzZ640wx |

| | | |
|---|---|---|
| | Eulerian paths and circuits, Hamiltonian path | https://youtu.be/3zOtLEeHygg?si=oXeg4i1GEzZ640wx |
| | Trees, Binary trees and its traversals | https://youtu.be/3zOtLEeHygg?si=oXeg4i1GEzZ640wx |
| | Trees Sorting, Spanning tree, Minimal Spanning tree | https://youtu.be/3zOtLEeHygg?si=oXeg4i1GEzZ640wx |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE-204A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Computer Organization and Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To provide a solid foundation in data representation and internal data formats used in digital systems.<br>● To introduce the fundamental concepts of register transfer, bus structures, and microoperations.<br>● To develop an understanding of computer organization and architecture.<br>● To explain the principles of input-output organization and memory systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe key terminologies of data representation, micro operations, computer architecture, input/output organization, and memory systems. | Level 1: Remember |
| **CO2** | Explain the functioning of various components of a computer system including CPU organization, instruction execution, pipelining, and memory hierarchy. | Level 2: Understand |
| **CO3** | Apply knowledge of instruction formats, register transfer, and addressing modes to execute basic operations and solve system-level computing problems. | Level 3: Apply |
| **CO4** | Analyze the performance and structure of computing systems for evaluation of CPU design choices, pipeline efficiency, memory access methods, and data transfer mechanisms. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Data representation:** Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, Decimal codes, Alphanumeric codes,
**Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Micro-operations, Arithmetic Logic Shift Unit.

## Unit-II

**Basic Computer Organization and Design:** Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

**Central Processing Unit:** General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

**Unit-III**

**Pipelining:** Basic Concepts of Pipelining, Throughput and Speedup, Performance Metrics (CPI, MIPS, MFLOPS), Pipeline Hazards.
**Parallel Processors:** Introduction to Parallel Processors, Concurrent access to memory and cache coherency.

**Unit-IV**

**Input-output Organization:** I/O device interface, I/O Interface Standards - PCI, USB; I/O transfers - program controlled, interrupt driven and DMA, Privileged and Non-Privileged Instructions, Software Interrupts.
**Memory organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Virtual Memory.

**Suggested Readings:**


1. Computer System Architecture by M. Morris Mano, Pearson.
2. Computer Organization and Design: The Hardware/Software Interface by David A. Patterson and John L. Hennessy, Elsevier.
3. Computer Organization and Embedded Systems by Carl Hamacher, McGraw Hill Higher Education.
4. Computer Architecture and Organization by John P. Hayes, McGraw Hill Education.
5. Computer Organization and Architecture: Designing for Performance by William Stallings, Pearson Education.


**Useful Video links**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Data Representation | https://youtu.be/Vc2KqHQKDNs |
| | Binary Codes | https://youtu.be/Y5yprWIPDps |
| | Shift Microoperations | https://youtu.be/U5aCveZ8VzE |
| Unit-II | Instruction Cycle | https://youtu.be/L2SLS9FgTx0 |
| | Control Signals and Timing Sequence | https://youtu.be/LNLjGgsDjBk |
| | Hardwired controlled Control Unit | https://youtu.be/b5thcNYBrQc |
| Unit-III | Pipelining Introduction | https://youtu.be/3p8kZpT56lQ |
| | Pipeline Hazards | https://youtu.be/l7auULi7zls?si=1GWqyUriRajfg2Xv |
| | Cache coherence and memory consistency | https://youtu.be/QfZa8gKzFJA |
| Unit-IV | DMA Transfer | https://youtu.be/CSkN0wj0zZU |
| | Memory Hierarchy | https://youtu.be/X-XwOXdUPU4 |
| | Cache Memory | https://youtu.be/XZF4khqXmNI |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE-206A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Object Oriented Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To understand OOP principles and distinguish them from procedural programming.<br>● To implement C++ classes using key features like constructors, access specifiers, and class types.<br>● To apply inheritance, manage memory, and use composition in class design.<br>● To utilize polymorphism, operator overloading, and type conversion for flexible program design. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the fundamentals of object oriented programming. | Level 1: Remember |
| **CO2** | Understand the basic concept of object oriented programming. | Level 2: Understand |
| **CO3** | Apply the concepts of object oriented programming like C++ and associated library to develop object oriented programs | Level 3: Apply |
| **CO4** | Analyze object-oriented programming principles to design efficient and scalable C++ applications. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.
**Classes and Objects:** Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

## Unit-II

**Inheritance:** Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.
**Pointers and Dynamic Memory Management:** Declaring and initializing pointers, accessing data through

pointers, pointer arithmetic, pointers to objects, array of objects, pointers to object members, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.

## Unit-III

**Constructors and Destructors:** Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.
**Operator Overloading and Type Conversion:** Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.
**Virtual functions & Polymorphism:** Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

## Unit-IV

**Exception Handling:** Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, re-throwing an exception, specifying exceptions.
**Templates and Generic Programming:** Template concepts, Function templates, class templates, illustrative examples. Introduction to STL, Inheritance of class template, class template containership, class template with overloaded operators.

**Suggested Readings:**


1. C++ Programming language by Bjrane Stroustrup,3rd edition, Pearson education Asia(1997).
2. Object oriented Programming in C++ by LaforeR.,4th Ed. Techmedia, New Delhi(2002).
3. Let us C++ by Yashwant Kenetkar,1stEd.,Oxford University Press(2006).
4. A structured approach using C++ by B.A. Forouzan and R.F. Gilberg, Cengage Learning, New Delhi.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Object-Oriented Programming. | https://youtu.be/K3g4srbkUNM?feature=shared |
| | Classes and Objects in C++ | https://youtu.be/Fvb0dPTm3fk?feature=shared |
| | Introduction to Paradigms of OOP | https://youtu.be/d62teoIJtOw?feature=shared |
| Unit-II | Inheritance - Single Inheritance | https://youtu.be/gzCOAmbR9cc?feature=shared |
| | Multilevel Inheritance | https://youtu.be/PaqAhlb5XVw?feature=shared |
| | Polymorphism | https://youtu.be/piK6my-0frA?feature=shared |
| Unit-III | Constructors in C++ | https://youtu.be/ItkQswAvOLI?feature=shared |
| | Access Specifiers in C++ | https://youtu.be/xKtO4yipsIY?feature=shared |
| | Overloading-Operator and Constructor | https://youtu.be/WUiKCKc-3v0?feature=shared |
| Unit-IV | Exception Handling in C++ | https://youtu.be/nGFzkmUvO_I?feature=shared |
| | Template Class in C++ | https://youtu.be/jNmyE17nRYo?feature=shared |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE-208A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Database Management System** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To introduce basic concepts, architecture, and characteristics of database systems.<br>• To understand relational algebra and SQL for querying and manipulating relational data.<br>• To understand storage strategies, indexing methods, and transaction processing mechanisms.<br>• To explore database security models and advanced database systems like distributed and object-oriented databases. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the DDL, DML commands, Database servers, storage strategies, security methods and components of the database. | Level 1: Remember |
| **CO2** | Understand the fundamental concepts of DBMS such as Query languages, transaction processing, type of databases etc. | Level 2: Understand |
| **CO3** | Apply the knowledge of DBMS to solve real life situations/problems & architecture. | Level 3: Apply |
| **CO4** | Analyze the characteristics of normal forms, concurrency control schemes, various data models and their architecture schemes. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Database system architecture:** Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

## Unit-II

**Relational query languages:** Relational algebra, Tuple and domain relational calculus,SQL3, DDL and DML constructs, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All , view and its types. Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

**Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.
**Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

**Unit-III**

**Storage strategies:** Indices, B-trees, hashing, Single level indexes, Multi-level indexes.
**Transaction processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

**Unit-IV**

**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.
**Advanced topics:** Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

**Suggested Readings:**


1. Database System Concepts, 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.
2. Principles of Database and Knowledgebase Systems, Vol 1 by J. D. Ullman, Computer Science Press.
3. Fundamentals of Database Systems, 5th Edition by R. Elmasri and S. Navathe, Pearson Education.
4. Foundations of Databases, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to DBMS | https://youtu.be/rbwXdTsCk2c?si=8aCkEWM1wxl_JzxY |
| | Conceptual Modelling( E-R Model) | https://youtu.be/ftDZ_44jhQo?si=EnOaAZcBlQy5gEFb |
| **Unit-II** | SQL Query-I | https://youtu.be/k-KHHN7nDI8?si=uI-OxCDU6HCtBJdX |
| | SQL Query-II | https://youtu.be/cGQaaVlbcCQ?si=4XqWh-U3ZP6zM0PV |
| | Integrity Constraint | https://youtu.be/8lRc-Pt_krk?si=WtHUs7-ttVklwIjj |
| | Functional Dependency | https://youtu.be/wQB_6o1UQa0?si=g5oklTN7TLkmDtnE |
| **Unit-III** | Storage and file structure | https://youtu.be/1IWtpmIniHQ?si=dsSJeneOH7qClarD |
| | Indexing and Hashing | https://youtu.be/PYsA4xTL3e4?si=nEs-G3mC4136a-WC |
| | Concurrency Control | https://youtu.be/L0m4k1ApZtA?si=HMq1dzXnlUEhBFF3 |
| **Unit-IV** | DAC - MAC and RBAC security models | https://www.youtube.com/watch?v=n8anyniHbvI |
| | Introduction to Data Warehousing and OLAP | https://youtu.be/m-aKj5ovDfg?list=PL9426FE14B809CC41 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-CSE-210A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Artificial Intelligence** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts, history, and problem-solving nature of artificial intelligence.<br>• To provide an understanding of core AI techniques for search, knowledge representation, reasoning, planning, and learning.<br>• To develop the ability to apply appropriate AI methods to solve representative computational problems.<br>• To familiarize students with modern AI systems, expert systems, neural networks, and emerging trends in artificial intelligence. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define fundamental concepts of artificial intelligence, problem characteristics, knowledge representation, learning paradigms, and current AI trends. | Level 1: Remember |
| **CO2** | Explain search strategies, knowledge representation schemes, reasoning under uncertainty, planning approaches, and learning methods used in artificial intelligence. | Level 2: Understand |
| **CO3** | Apply appropriate AI techniques such as search algorithms, logical reasoning, probabilistic methods, and learning models to solve representative AI problems. | Level 3: Apply |
| **CO4** | Analyze AI problems to select suitable problem-solving, reasoning, planning, or learning approaches and evaluate their effectiveness. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Definition of AI, History of AI, nature of AI problems, examples of AI problems.
**Problem solving by search:** Uninformed Search: Depth First Search (DFS), Breadth First Search (BFS). Informed Search: Best First Search, A*. Local Search: Hill Climbing. Problem Reduction Search: AO*. Population Based Search: Ant Colony Optimization, Genetic Algorithm. Game Playing: MinMax Algorithm, Alpha-Beta Pruning.

**Unit-II**

**Knowledge Representation:** Types of Knowledge, Knowledge Representation Techniques/schemes: Propositional Logic, Predicate Logic, Semantic nets, Frames, Knowledge representation issues, Rule based systems.

## Unit-III

**Reasoning under Uncertainty:** Basics of Probability Theory, Probabilistic Reasoning, Bayesian Reasoning, Dempster-Shafer Theory.
**Planning:** Introduction to Planning, Representation of Planning, Partial-order Planning.

## Unit-IV

**Learning:** Introduction to Learning, Types of Learning: Learning by Induction, Rote Learning, Symbol Based Learning, Identification Trees, Explanation Based Learning, Transformational Analogy, Introduction to Neural Networks, Expert Systems, Current trends in Artificial Intelligence.

**Suggested Readings:**


1. Artificial Intelligence: A Modern Approach, Third Edition by Stuart Russell and Peter Norvig, 2010, Pearson Education.
2. Elaine Rich, Kevin Knight, & Shivashankar B Nair, Artificial Intelligence, McGraw Hill, 3rd ed.,2009.
3. Introduction to Artificial Intelligence & Expert Systems, Dan W Patterson, PHI, 2010.
4. Artificial intelligence, Patrick Henry Winston, 1992, Addition Wesley.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to AI | https://youtu.be/iF1tOCEXLXY |
| | DFS, BFS | https://youtu.be/TMLyKcBtHuo |
| | Hill Climbing | https://youtu.be/ZOvRZ7UJMjk |
| | A* Algorithm | https://youtu.be/yMcZvZayJUA |
| **Unit-II** | Propositional Logic | https://youtu.be/5fZ_RnhvGMQ |
| | Semantic Nets | https://youtu.be/RTmafl2rzEw |
| | Rule based System | https://youtu.be/6kRYg1QVcWo |
| **Unit-III** | Bayesian Reasoning | https://youtu.be/cMN6ykIYF_U |
| | Probability Theory | https://nptel.ac.in/courses/117105085 |
| | Partial-order Planning | https://www.youtube.com/watch?v=kyCibTQQQBE |
| **Unit-IV** | Introduction to Neural Networks | https://www.youtube.com/watch?v=QlhHqMnd9Wo |
| | Expert Systems | https://www.youtube.com/watch?v=nE5c5w4aizU |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-CSE-212A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Object Oriented Programming Lab Using C++** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>● To enable students to develop C++ programs using classes, member functions, and constructors to apply object-oriented principles to real-world problems.<br>● To implement static members, constant members, and various constructors in C++ for designing efficient and robust class structures.<br>● To apply operator overloading, inheritance, polymorphism, and exception handling techniques for building maintainable and flexible C++ applications.<br>● To create and utilize templates and manage dynamic memory allocation and deallocation in C++ for efficient program development. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Understand object-oriented concepts for programming in C++. | Level 2: Understand |
| **CO2** | Implement classes, member functions, and constructors in C++ to solve real-world problems using object-oriented principles. | Level 3: Apply |
| **CO3** | Demonstrate the use of operator overloading, inheritance, polymorphism, and exception handling in C++ to create robust and maintainable code. | Level 3: Apply |
| **CO4** | Analyze advanced OOP features in C++ programming language for better programs. | Level 4: Analyze |

**List of Experiments:**

| **Sr. No.** | **Contents** | **COs** |
|---|---|---|
| **1** | Study Object Oriented Programming Concepts in C++. | CO1 |
| **2** | Write a program that uses a class where the member functions are defined inside a class. | CO1 |
| **3** | Write a program that uses a class where the member functions are defined outside a class. | CO1 |
| **4** | Write a program to demonstrate the use of static data members. | CO1 |
| **5** | Write a program to demonstrate the use of const data members. | CO1 |
| **6** | Write a program to demonstrate the use of zero argument and parameterized constructors. | CO2 |

| | | |
|---|---|---|
| **7** | Write a program to demonstrate the use of dynamic constructor | CO4 |
| **8** | Write a program to demonstrate the use of explicit constructors. | CO2 |
| **9** | Write a program to demonstrate the use of initializer list. | CO2 |
| **10** | Write a program to demonstrate the overloading of increment and decrement operators. | CO2 |
| **11** | Write a program to demonstrate the overloading of binary arithmetic operators. | CO2 |
| **12** | Write a program to demonstrate the overloading of memory management operators. | CO4 |
| **13** | Write a program to demonstrate the multilevel inheritance. | CO3 |
| **14** | Write a program to demonstrate the virtual derivation of a class. | CO3 |
| **15** | Write a program to demonstrate the runtime polymorphism. | CO4 |
| **16** | Write a program to demonstrate the exception handling. | CO4 |
| **17** | Write a program to demonstrate the use of function templates. | CO4 |
| **18** | Write a program to demonstrate the use of class templates. | CO4 |
| **19** | Write a program to find the mean of two numbers of different classes using the Friend function. | CO3 |
| **20** | Write a program to swap two numbers of the same class using the Friend function. | CO3 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment under topic beyond syllabus.

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| Write a program that uses a class where the member functions are defined inside a class. | https://www.youtube.com/watch?v=c9vSNQtQVaA&list=PLduM7bkxBdOekXfkEqIBAivzG99V2LrAS&index=3 |
| Write a program to demonstrate the use of zero argument and parameterized constructors | https://www.youtube.com/watch?v=gL7GBhvbvIo&list=PLduM7bkxBdOekXfkEqIBAivzG99V2LrAS&index=7 |
| Write a program to demonstrate the use of const data members | https://www.youtube.com/watch?v=8HQHZVLbVUg&list=PLduM7bkxBdOekXfkEqIBAivzG99V2LrAS&index=17 |
| Write a program to demonstrate the overloading of increment and decrement operators. | https://www.youtube.com/watch?v=Lvl6xi0JAkA&list=PLduM7bkxBdOekXfkEqIBAivzG99V2LrAS&index=24 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-CSE-214A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Database Management System Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>● To introduce basic concepts, architecture and characteristics of database system<br>● To introduce relational model concepts and PL/SQL programming<br>● To introduce relational database design and Normal forms based on functional dependencies. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Explain the basics of SQL, PL/SQL Block and Procedures. | Level 2: Understand |
| **CO2** | Write the SQL Queries, PL/SQL Block to satisfy some conditions and exception. | Level 3: Apply |
| **CO3** | Apply the concepts of relationships in relational databases. | Level 3: Apply |
| **CO4** | Analyze the use of views, sequences, indexes, constraints, and relationships to ensure data integrity and performance. | Level 4: Analyze |

**List of Experiments:**

| **Sr. No.** | **Contents** | **COs** |
|---|---|---|
| **1** | Study the basic features, syntax and components of SQL. | CO1 |
| **2** | Create a database and write SQL queries to retrieve information from the database. | CO2 |
| **3** | Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions. | CO2 |
| **4** | Use Aggregate Functions- COUNT, SUM, AVG, MIN, MAX with GROUP BY and HAVING Clause. | CO2 |
| **5** | Create Views, Synonyms, Sequence, Indexes, Save point. | CO4 |
| **6** | Create an Employee database to set various constraints. | CO4 |
| **7** | Create relationships between the databases. | CO4 |
| **8** | Study the PL/SQL blocks. | CO1 |

| | | |
|---|---|---|
| **9** | Write a PL/SQL block to satisfy some conditions by accepting input from the user. | CO3 |
| **10** | Write a PL/SQL block that handles all types of exceptions. | CO3 |
| **11** | Create Procedures. | CO3 |
| **12** | Create and implement database triggers and functions. | CO3 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

**Virtual Lab links:**

| **Experiment Name** | **Link** |
|---|---|
| Using Aggregate Functions-COUNT, SUM, AVG, MIN, MAX with GROUP BY and HAVING Clause | https://youtu.be/muwEdPsx534?si=6Ys2whV9ekMGng93 |
| Creation of Views, Synonyms, Sequence, Indexes, Save point. | https://www.youtube.com/watch?v=tdRihGrzOg4 |
| PL/SQL block code that handles all types of exceptions. | https://www.youtube.com/watch?v=0fzTqyk3dmQ |
| Creation of database triggers and functions | https://www.youtube.com/watch?v=hTRr-tVVfZ4 |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CSE-216A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Artificial Intelligence Lab using Python** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>● To introduce the foundational concepts of Artificial Intelligence and familiarize students with classical AI techniques for problem solving.<br>● To equip students with the ability to model real-world problems using AI representations such as state-space, search trees, and logic-based systems.<br>● To provide hands-on experience in implementing AI algorithms using Python for solving puzzles, games, and optimization problems. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the fundamental concepts and working principles of classical AI search algorithms such as BFS, DFS. | Level 2: Understand |
| **CO2** | Apply search algorithms to solve standard AI problems such as Tic-Tac-Toe, and Water Jug problem using Python. | Level 3: Apply |
| **CO3** | Implement heuristic-based and problem-specific algorithms like A and AO* for solving real-world path finding and decision problems. | Level 3: Apply |
| **CO4** | Analyze various AI techniques in context to their suitability for solving complex problems such as Monkey-Banana, Missionaries-Cannibals, and 8-Queens. | Level 4: Analyze |

**List of Experiments:**

| Sr. No. | Content | COs |
|---|---|---|
| **1** | Study and explain the logic and flow of BFS and DFS search algorithms. | CO1 |
| **2** | Write a Program to implement Breadth First Search using Python. | CO1<br>CO2 |
| **3** | Write a Program to implement Depth First Search using Python. | CO1<br>CO2 |
| **4** | Write a Program to implement A* algorithm using Python. | CO3 |
| **5** | Write a Program to implement AO* algorithm using Python. | CO3 |
| **6** | Write a Program to implement Tic-Tac-Toe game using Python. | CO2 |
| **7** | Write a Program to implement 8-Puzzle problem using Python. | CO3 |

| | | |
|---|---|---|
| **8** | Write a Program to implement Water-Jug problem using Python. | CO2 |
| **9** | Write a Program to implement Travelling Salesman Problem using Python. | CO3 |
| **10** | Write a Program to implement Tower of Hanoi using Python. | CO2 |
| **11** | Write a Program to implement Monkey Banana Problem using Python. | CO4 |
| **12** | Write a Program to implement Missionaries-Cannibals Problems using Python. | CO4 |
| **13** | Write a Program to implement 8-Queens Problem using Python. | CO4 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topic beyond syllabus.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-CSE-218A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Cloud Computing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To introduce the fundamental concepts, characteristics, and service models of cloud computing including SaaS, PaaS, and IaaS.<br>● To explain key cloud technologies such as virtualization, web services (SOAP and REST), and cloud platforms like Amazon EC2, Google App Engine, and Microsoft Azure.<br>● To develop skills in managing cloud data systems including distributed file systems, databases, and parallel processing models like Map Reduce.<br>● To analyze cloud security principles, quality of service (QoS) issues, and intercloud challenges, preparing students to design secure and efficient cloud solutions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts, characteristics, and service models of cloud computing, including key technologies such as virtualization, cloud platforms, and security principles. | Level 1: Remember |
| **CO2** | Explain the concepts, architecture and components of cloud computing environments, and interpret the role of virtualization and web services in cloud technologies. | Level 2: Understand |
| **CO3** | Apply cloud computing concepts, technologies and tools, to deploy and manage cloud-based applications and services effectively. | Level 3: Apply |
| **CO4** | Analyze cloud computing principles, concepts, challenges in data management, virtualization, security, QoS, and intercloud to optimize cloud performance and reliability. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Comparison among SAAS, PAAS, IAAS, Cloud computing platforms: Infrastructure as service: Amazon EC2,Platform as Service: Google App Engine, Microsoft Azure.

## Unit-II

Introduction to Cloud Technologies, Study of Hypervisors, SOAP, REST, Comparison of SOAP and REST, Web services, mashups-Web services, Mashups: user interface services, Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization, Multi-entity support, Multi-schema approach, Multi-tenancy using cloud data stores.

## Unit-III

Data in the cloud: Relational databases, Cloud file systems: GFS and HDFS, Big Table, HBase and Dynamo, Map-Reduce and extensions: Parallel computing, The map-Reduce model. MICEF Computing (Mist, IOT, Cloud, Edge and FOG Computing): Concept and Application.

## Unit-IV

Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud, Cloud computing security architecture, Issues in cloud computing, Issues in Intercloud environments, QoS Issues in Cloud, Streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment, Inter Cloud issues, load balancing, resource optimization.

**Suggested Readings:**


1. Cloud Computing Bible by Sosinsky Barrie, Wiley India, 2011.
2. Cloud computing: Principles and paradigms by Buyya, Rajkumar, James Broberg, and Andrzej M. Goscinski, eds., Vol. 87, John Wiley & Sons, 2010.
3. Cloud Computing Black Book by Jayaswal, Kailash, John Wiley & Sons, 2014.
4. Cloud Computing: A Practical Approach by Velte, Anthony T., Toby J. Velte, and Robert Elsenpeter, McGraw-Hill, Inc. 2019.
5. Cloud Computing: A Complete Guide by Gerardus Blokdyk, Starcooks, 2019.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Cloud Computing | https://youtu.be/NzZXz3fJf6o?si=sUar9lIahtt8Papd |
| | SAAS, PAAS, IAAS | https://youtu.be/NzZXz3fJf6o?si=sUar9lIahtt8Papd |
| **Unit-II** | Cloud Computing Web Services | https://youtu.be/NzZXz3fJf6o?si=sUar9lIahtt8Papd |
| **Unit-III** | Cloud file system, GFS | https://youtu.be/NzZXz3fJf6o?si=sUar9lIahtt8Papd |
| | Map reduce | https://youtu.be/NzZXz3fJf6o?si=sUar9lIahtt8Papd |
| **Unit-IV** | Cloud Security | https://youtu.be/LcAPj95KeSA?si=38TKf0ZZKZyNlCGH |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-CSE-220A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Nature Inspired Computing Techniques** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To introduce the fundamental concepts and biological motivations behind nature-inspired computing.<br>● To explore various algorithms derived from evolutionary, swarm-based, immune, and DNA models.<br>● To develop the ability to apply nature-inspired techniques to solve real-world computational problems.<br>● To cultivate analytical skills for evaluating the behavior and effectiveness of bio-inspired algorithms. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| **COs** | **Skill Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Define key concepts and terminology of nature-inspired computing techniques. | Level 1: Remember |
| **CO2** | Explain the working principles of biologically inspired algorithms and models. | Level 2: Understand |
| **CO3** | Apply nature-inspired algorithms to computational and optimization problems. | Level 3: Apply |
| **CO4** | Analyze the performance and behavior of nature-inspired approaches in varied scenarios. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Introduction, Overview of Philosophy, Nature to Nature Computing, A Brief Overview of Three Branches, Individuals, Entities and agents, Parallelism and Distributivity Interactivity, Adaptation- Feedback, Self Organization, Complexity, Emergence, Bottom-up Vs Top-Down Approach, Determination, Chaos and Fractals.

**Unit-II**

Evolutionary Computing, Hill Climbing, Simulated Annealing, Simulated Annealing, Genetics Principles, Standard Evolutionary Algorithm, Genetic Algorithms, Reproduction, Crossover Mutation, Evolutionary Programming, Genetic Programming.

## Unit-III

Swarm Intelligence – Introduction, Ant Colony Optimization, Ant Foraging Behavior, Ant Colony Optimization, SACO algorithm, Ant Colony Algorithm (ACA), Scope of ACO algorithms, Swarm Robotics, Social Adaptation of Knowledge, Particle Swarm Optimization. Immune System-Introduction to Immune System, Physiology and main components, Pattern Recognition and Binding, Immune Network Theory, Danger Theory, Immune Algorithms, Genetic algorithms, Bone Marrow Models, Forest's Algorithm, Artificial Immune Networks.

## Unit-IV

DNA Computing, DNA Molecule, Adleman's experiment, PAM Model, Splicing Systems, From Classical to DNA Computing, Universal DNA Computers, Scope of DNA Computing, Lipton's Solution to SAT Problem, Recent Trends and real world applications.

**Suggested Readings:**


1. Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications by Leandro Nunesde Castro, Chapman &Hall/CRC, Taylor and Francis Group, 2007.
2. Bio- Inspired Artificial Intelligence: Theories, Methods and Technologies by Floreano D. and Mattiussi C., MIT Press, Cambridge, 2008.
3. Handbook of Nature-Inspired and Innovative Computing by Albert Y. Zomaya, Springer, 2006.
4. Ant Colony Optimization by Marco Dorrigo, Thomas Stutzle, PHI, 2005.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Nature to Nature Computing | https://youtu.be/LBGninIdu1k?feature=shared |
| | Chaos and Fractals | https://www.youtube.com/watch?v=INXuVxhJfc4 |
| Unit-II | Hill Climbing | https://youtu.be/ZOvRZ7UJMjk |
| | Simulated Annealing | https://youtu.be/TC9WNwM2noM |
| | Genetic algorithms | https://www.youtube.com/watch?v=WueuYdDqUt0 |
| | Evolutionary Programming | https://www.youtube.com/watch?v=Yma8Y-W0SYE |
| Unit-III | Ant Colony Optimization | https://www.youtube.com/watch?v=u7bQomllcJw |
| | Particle Swarm Optimization. | https://www.youtube.com/watch?v=HmDjfL3R39M |
| | Immune Network Theory | https://www.youtube.com/watch?v=b5LojEVC97M |
| | The Danger Theory | https://www.youtube.com/watch?v=urd4uWJ2rH4 |
| Unit-IV | DNA Computing | https://www.youtube.com/watch?v=vefBhhjodpE |
| | Adleman's experiment | https://www.youtube.com/watch?v=C_f7ky0mBsk |
| | PAM Model | https://www.youtube.com/watch?v=c0751ITCi5g |
| | DNA Computing | https://www.youtube.com/watch?v=vefBhhjodpE |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-CSE-222A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Human Computer Interaction** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand the basics and significance of HCI and user interface design.<br>• To understand the screen design process based on human factors.<br>• To understand various interface components and emerging interaction technologies.<br>• To understand usability principles, design rules, and evaluation methods in HCI. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts, definitions, and scope of Human-Computer Interaction, user interfaces, and the history of graphical user interfaces. | Level 1: Remember |
| **CO2** | Explain the importance of human characteristics, interaction speeds, and screen design principles in the context of effective user interface development. | Level 2: Understand |
| **CO3** | Apply standard design rules, usability principles, and interface patterns to create user-friendly screen layouts and interactive interfaces. | Level 3: Apply |
| **CO4** | Analyze various evaluation techniques, including expert analysis and user participation, to assess and improve the usability of human-computer interfaces. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Definition and scope of HCI, Importance and applications of HCI, Importance of user Interface – definition, importance of good design, Benefits of good design, A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

## Unit-II

**Design process:** Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions. Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information

simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

**Unit-III**

**Windows:** New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colours, Voice-based interaction (Alexa, Siri, and Google Assistant), Augmented Reality (AR) and Virtual Reality (VR) interfaces.

**Unit-IV**

**HCI in the software process:** the software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction.

**Suggested Readings:**


1. The essential guide to user interface design by Wilbert O Galitz, Wiley Dream Tech.
2. Human – Computer Interaction by Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell Bealg, Pearson Education
3. Designing the user interface by Ben Shneidermann, 3rd Edition, Pearson Education Asia.
4. Interaction Design Prece by Rogers, Sharps, Wiley Dreamtech.
5. User Interface Design by Soren Lauesen, Pearson Education.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Definition and scope of HCI | https://www.youtube.com/watch?v=sAShrCXzgC8 |
| | Graphical User Interface | https://youtu.be/aaGPJzO9FIk?feature=shared |
| **Unit-II** | Design process-Human interaction with computers | https://youtu.be/uFYuHHglC6U?feature=shared |
| | Screen Designing | https://www.youtube.com/watch?v=lpIBwp7txhY |
| **Unit-III** | Multimedia | https://www.youtube.com/watch?v=fAJzLuce_ms&t=106s |
| | Virtual Reality (VR) interfaces | https://youtu.be/aNC5YMUTcQ4?feature=shared |
| **Unit-IV** | Software life cycle | https://www.youtube.com/watch?v=c1QR6EapK4k |
| | Evaluation techniques | https://www.youtube.com/watch?v=PMr3wWfAH0c |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-CSE-224A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Cyber Security** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>● To understand the key cyber security terms and common attack types.<br>● To understand the CIA triad, non-repudiation, and incident response phases.<br>● To configure basic firewalls and IDS/IPS tools in a lab setup.<br>● To analyze attack scenarios via the Cyber Kill Chain and propose mitigations | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define and recall fundamental cyber security concepts, key terms, and common threat types. | Level 1: Remember |
| **CO2** | Explain the roles, processes, and frameworks used in risk assessment, incident response, and governance. | Level 2: Understand |
| **CO3** | Apply and configure basic security controls using firewalls and IDS/IPS tools. | Level 3: Apply |
| **CO4** | Analyze real-world attack scenarios to identify vulnerabilities and recommend appropriate countermeasures. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Cyber security:** Cyber security Definition, Key Terms, Security Threats, Vulnerability Assessments, Roles in Security, Cyber security Today, Critical Thinking in Cyber security.
**Overview of actors and their motives:** Hacking organizations, Major types of cyber-attacks, Network Security Model, Security services, Security Mechanisms, Threat Examples, Malware and Ransomware, Threat Protection, Internet Security Threats, Security Threat, The Cyber Kill Chain, Social Engineering, Cyber warfare.

## Unit-II

**Overview of key security concepts:** CIA Triad, Non - Repudiation - How does it apply to CIA? Access Management, Key Concepts – Incident Response, Incident Response Process, Introduction to Frameworks and Best Practices, IT Governance Process, Cyber security Compliance and Audit Overview.
**Overview of key security tools:** Packet Filtering, Firewalls Application Gateway, Firewalls - XML Gateway, Firewalls - Stateless and Stateful, Antivirus/Antimalware.

## Unit-III

**Overview of People, Process and Technologies:** IT Security, Frameworks and their purpose, Roles in Security, Introduction to Process, Overview Business Process Management. Overview of Information Technology Infrastructure Library (ITIL), Key ITIL Processes, identification and AAA, Access Control Methods, Access Control - Physical and Logical, Open Web Application Security Project (OWASP)

## Unit-IV

**Intrusion Detection and Prevention:** Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.
**Firewalls and Intrusion Prevention Systems:** Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

**Suggested Readings:**


1. Cyber Security Essentials by Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, 1st ed., Sybex Wiley, 2019.
2. Introduction to Cyber Security Guide to the World of Cyber Security by Anand Shinde, Notion Press, 2021.
3. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belapure, Wiley Publishers, 2011.
4. Computer Security Principles and Practice by William Stallings, Lawrie Brown, 3rd Edition, Pearson Education, 2015.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Major types of cyber-attacks | https://www.youtube.com/watch?v=Dk-ZqQ-bfy4&t=102s |
| | Cyber security | https://youtu.be/WAImfXGwhOs?feature=shared |
| **Unit-II** | Firewalls - Stateless and Stateful | https://www.youtube.com/watch?v=nh4C7u3xGGY |
| | Incident Response Process Cyber Security | https://www.youtube.com/watch?v=LMs7wmQQ8as |
| **Unit-III** | Information Technology Infrastructure Library | https://youtu.be/8jyD53vtp0I?feature=shared |
| | Open Web Application Security Project | https://www.youtube.com/watch?v=QZrPxPNMer8 |
| **Unit-IV** | Need for Firewalls | https://youtu.be/F5KwJEVGIxg?feature=shared |
| | Network -Based Intrusion Detection | https://www.youtube.com/watch?v=Azjy4JVadKI |

**DEPARTMENT OF ELECTRICAL ENGINEERING**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

## Minutes of 2nd meeting of Board of Studies of Electrical Engineering Department

The 2nd meeting of Board of Studies of Electrical Engineering Department was held on 27.05.2025 at 10:00 A.M in the Conference Hall of the Institute.

The following members were present for the BOS meeting:

| S. No. | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Mr. Joginder Singh | HOD, GITAM, Kablana | Chairperson |
| 2 | Dr. Alok Prakash Mittal | Subject Expert (Adjunct Professor, NSUT Delhi), Outside Parent University | Member |
| 3 | Dr. Naresh Kumar Yadav | Subject Expert (Professor, DCRUST Murthal), Outside Parent University | Member |
| 4 | Dr. Vipin Kumar | Subject Expert (Assistant Professor, UIET, MDU Rohtak), University Nominee | Member |
| 5 | Mr. Abhishake Jain | Assistant Professor, GITAM Kablana | Member |
| 6 | Mr. Deshveer | Assistant Professor, GITAM Kablana | Member |
| 7 | Mr. Ankush Tyagi | Assistant Professor, GITAM Kablana | Member |
| 8 | Mr. Brijesh Jha | Assistant Professor, GITAM Kablana | Member |
| 9 | Ms. Deepika | Assistant Professor, GITAM Kablana | Member |
| 10 | Mr. Ishu | Assistant Professor, GITAM Kablana | Member |
| 11 | Mr. Ravi | Assistant Professor, GITAM Kablana | Member |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Agenda wise Discussion and Resolutions**

**Item No. 1**
Confirmation of the minutes of 1st Meeting of the Board of Studies of Electrical Engineering Department held on 02.01.2025.

**The minutes of 1st meeting of the Board of Studies of Electrical Engineering Department held on 02.01.2025(Annexure-I Page No. 1 to 2 already circulated) be confirmed.**

**Item No. 2**
Follow up action of the decisions taken in the 1st Meeting of Board of Studies held on 02.01.2025.

**The Follow up action of the decisions taken in the 1st Meeting of Board of Studies held on 02.01.2025 be noted.**

| Sr. No. | Particulars | Follow-up Action |
|---|---|---|
| **Board of Studies meeting dated 02.01.2025** | | |
| 1 | Approval of the scheme of evaluation and syllabus of M. Tech (EPS) 1st year for session 2024-25 vide reso. No. 2 of its meeting held on 02.01.2025. | Approved the SOE and syllabus of M. Tech (EPS) 1st year for session 2024-25 have been uploaded on Institute website and informed to all concerned. |
| 2 | Approval of the syllabus prescribed for B. Tech 1st year courses offered by the Electrical Engineering Department for session 2024-25vide reso. No. 3 of its meeting held on 02.01.2025. | Approved the syllabus prescribed for B. Tech 1st year courses offered by the Electrical Engineering Department for session 2024-25 have been uploaded on Institute website and also informed to all concerned. |
| 3 | Panel of examiners for theory and practical of B.Tech and M.Tech Program for session 2024-25 vide reso. No. 4 of its meeting held on 02.01.2025. | Approved the panel of examiners for theory and practical of B.Tech and M.Tech Program have been uploaded on Institute website and informed to all concerned. |

**Item No. 3**

Scheme of Examinations and Syllabus of 2nd year B.Tech Electrical Engineering from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year B.Tech Electrical Engineering from Academic Session 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for the approval (Annexure II Pages 3-54).**

**Item No. 4**

Scheme of Examinations and Syllabus of 2nd year M.Tech Electrical Power Systems from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year M.Tech Electrical Power Systems from Academic Session 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure III Pages 55-74)**

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**Item No. 5**

Review of the Panel of Examiners for Theory and Practical's of B.Tech and M.Tech programs for Academic Session 2025-26.

**The panel of examiners Theory and Practical's of B.Tech and M.Tech programs for Academic Session 2025-26 be reviewed and approved. The same can be sent to the Controller of Examinations of the Institute for the Information (Annexure IV Pages75-76).**

**Item No. 6**

Any other item with the permission of the chair.

6.1 To approve the Scheme of Examinations and Syllabus of Basics of Electrical and Electronics Engineering to be offered to First year B.Tech students from Academic Session 2025-26.

**Resolved that the Scheme of Examinations and Syllabus of Basics of Electrical and Electronics Engineering to be offered to First year B.Tech students from Academic Session 2025-26 and the same the recommended to the Board of Studies of Applied Science and Humanities for further necessary actions (Annexure V Pages 77-80).**

6.2 To approve the Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Electrical Engineering Department for various PG Programs offered by the Institute for Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year of Multidisciplinary Open Elective-II courses offered by the Electrical Engineering Department for various PG Programs offered by the Institute for Academic Session 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure VI Pages 81-84).**

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Electrical Engineering Department**

**Endst No.** GITAM/BOSEE/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs

HOD EE

**Chairperson**
**Board of Studies**
**Electrical Engineering Department**

HOD EE

## Scheme of Studies and Examination
## B. Tech (Electrical Engineering) – 3rd Semester
## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Internal Assessment | External Examination | Practical | Total | |
| 1 | Humanities and Social science, including Management Courses | HSMC-02A | Economics for Engineers | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-EE-201A | Analog Electronics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-EE-203A | Electric Circuit Analysis | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-EE-205A | Measurement and Instrumentation | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-EE-207A | Electrical Machines-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Professional Core Courses | PCC-EE-209A | Electrical Engineering Materials | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Mandatory Courses | MC-201A | Environmental Science | 2 | 0 | 1 | - | 0 | 40 | | 60 | | 3 |
| 8 | Professional Core Courses | LC-EE-211A | Analog Electronics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Courses | LC-EE-213A | Electric Circuit Analysis Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Professional Core Courses | LC-EE-215A | Measurement and Instrumentation Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 11 | Professional Core Courses | LC-EE-217A | Electrical Machines-I Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| | | TOTAL CREDIT | | | | | | 23 | | | | 800 | |

GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD EE

# Scheme of Studies and Examination
## B. Tech (Electrical Engineering) – 4th Semester
## w.e.f. 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Internal Assessment | External Examination | Practical | Total | |
| 1 | Basic Science Course | BSC-MEE-202A | Engineering Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-EE-204A | Electrical Machines-II | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-EE-206A | Digital Electronics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-EE-208A | Transmission and Distribution | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Elective Courses | - | Refer to Table-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Engineering Science Course | PCC-CSE-207A | Python Programming (Common with CSE 3rd Sem) | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Courses | LC-EE-210A | Electrical Machines-II Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Courses | LC-EE-212A | Digital Electronics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Courses | LC-EE-214A | Transmission and Distribution Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Engineering Science Course | LC-CSE-215A | Python Programming Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| | | TOTAL CREDIT | | | | | | 23 | | | | 800 | |

**Note:** Each Student has to undergo for industrial training related to core electrical engineering areas for the duration of 4 to 6 weeks after the end of semester exam. Students must submit training report along with certificate from the organization, which will be evaluated in 5th sem.

GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD EE

**Table I (Professional Elective Courses)**

| Sr. No. | Course Code | Course |
|---|---|---|
| 1 | PEC-EE-216A | Wind and Solar Energy Systems |
| 2 | PEC-EE-218A | Electromagnetic Field Theory |
| 3 | PEC-EE-220A | Special Electrical Machines |
| 4 | PEC-EE-222A | High Voltage Engineering |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **HSMC-02A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Economics for Engineers** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Introduce the basic concepts of economics and their relevance to science, engineering, and national development.<br>• Develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures.<br>• Equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions.<br>• Familiarise students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe economic concepts, the connection between economics and engineering and technological development, along with economic laws relevant to resource-based decision making in society. | Level 1: Remember |
| **CO2** | Explain economic growth theories and illustrate the role of engineering and technology in supporting economic development. | Level 2: Understand |
| **CO3** | Apply theories of consumption and production to the design and development of engineering products. | Level 3: Apply |
| **CO4** | Analyze market conditions, evaluate cost structures and financial aspects to assess the feasibility of engineering projects. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

**Unit-I**

**Definition of Economics**: Various Definitions, Types of Economics, Micro and Macro Economics, Nature of Economic Problem, Production Possibility Curve, Economic Laws and their Nature, Relationship between Science, Engineering, Technology and Economic Development.

**Demand:** Meaning of Demand, Law of Demand, Elasticity of Demand, Meaning, Factors affecting the Elasticity of Demand, Practical Application and Importance.

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## Unit-II

**Production:** Meaning of Production and Factors of production, Law of Variable Proportions, Returns to Scale, Internal and External Economies and Diseconomies of Scale, Various concepts of Cost of Production- Fixed Cost, Variable Cost, Money Cost, Real Cost, Accounting Cost, Marginal Cost, Opportunity Cost, Shape of Average Cost, Marginal Cost, Total Cost etc. in short run and long run.

## Unit-III

**Market:** Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).
**Supply:** Supply and Law of Supply, Role of Demand and Supply in Price Determination and Effect of Changes in Demand and Supply on Prices.

## Unit-IV

**Indian Economy:** Nature and Characteristics of Indian Economy as underdeveloped, developing and mixed economy (brief and elementary introduction).
**Privatization:** Meaning, Merits and Demerits.
**Globalization of the Indian Economy:** Merits and Demerits
**Banking:** Concept of a Bank, Commercial Bank, Central Bank, Functions of a Bank, Difference between Commercial and Central Bank.

**Suggested Readings:**

- Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
- Indian Economy by S.K. Misra & V.K. Puri, Himalaya Publishing House.
- Indian Economy: Principles and Policies by Sri Rangam, Sri Ram, & Rohit Deo, Pearson Education.
- Managerial Economics by R. Cauvery, S. Chand & Company Pvt. Ltd.
- Microeconomic Theory by Andreu, Whinston, D. Michael, Green, R. Jerry, Oxford University Press.
- Principles of Economics by E. Karl, C. Ray, Oster, & E. Sharon, Pearson Education.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Fundamental concepts of microeconomics, including definitions, types, and the nature of economic problems. | https://www.youtube.com/watch?v=IFtOcNbej0o&list=PLFNFJbo2hfBGRTCMuroZGykNzacwmAH2L |
| Unit-II | Production and Cost of production | https://www.youtube.com/watch?v=VU1zySe-8NA |
| Unit-III | Theory of Markets | https://www.youtube.com/watch?v=HylqSa58lqQ |
| Unit-IV | Nature and characteristics of the Indian economy, highlighting aspects of underdevelopment and development. | https://www.youtube.com/watch?v=ME-0GOhhZcs&list=PLFW6lRTa1g83winAoIK92HL4xTytJaW7S |

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|---|---|---|---|---|---|
| Course Code | **PCC-EE-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Analog Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand response of BJT and MOSFET.<br>• To develop the ability to design and implement linear and non-linear OP-AMP-based applications<br>• To design oscillator and power amplifier circuits using RC, LC, and crystal-based feedback configurations.<br>• To impart knowledge of feedback principles, including negative feedback properties, feedback topologies | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the working principles and I-V characteristics of semiconductor devices such as diodes, BJTs, and MOSFETs | Level 2: Understand |
| **CO2** | Explain and evaluate the ideal and practical characteristics of operational amplifiers (OP-AMPs) | Level 2: Understand |
| **CO3** | Apply power amplifiers and voltage regulators for the use of efficient power management in analogue circuits. | Level 3: Apply |
| **CO4** | Analyse the process, principles and characteristics of operational amplifiers and IC fabrication for designing electronic circuits and the effect of different feedback topologies on amplifier parameters | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each, and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

**Unit-I**

**P-N Junction Diode:** I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits, BJT & MOSFET: Structure and I-V characteristics, switch, amplifier: small-signal model, biasing circuits, current mirror, Small signal equivalent circuits, high-frequency equivalent circuits

**Unit-II**

**Oscillators:** Introduction, Barkhausen Criterion, Oscillator with RC Feedback circuit (RC Phase Shift, Wien Bridge), Tuned Collector, LC Feedback circuits (Hartley, Colpitts), Conditions for Sustained Oscillations & Frequency of Oscillations, Crystal Oscillator.

**Power Amplifier:** Definition, Application & Types of Power Amplifiers (Class A, B, C, & D), Push Pull Amplifiers, Distortion & Efficiency of Power Amplifier, Integrated Circuit Power Amplifier.

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## Unit-III

**Operational Amplifier Fundamentals:** Block Diagram Representation, Ideal OP-AMP, OP-AMP Equivalent Circuit, Ideal Voltage Transfer Curve, Input Offset Voltage, Input Bias Current, Input Offset Current, Output Offset Voltage, Thermal Drift, Effect of Variation in Power Supply Voltages on Offset Voltage, Common Mode Configuration and CMRR, Frequency Response of OP-AMP: Open Loop Response, Close Loop Response, Input and Output Impedances, Effect of Finite Gain Bandwidth Product, Slew Rate, OP-AMP as Integrator & Differentiator.

## Unit-IV

**Operational Amplifier Applications and Feedback:** Linear and non-linear applications- Instrumentation Amplifier, voltage regulator, Active Filters, ADC and DAC, Square wave and triangular wave generator, Multivibrators. The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, and the shunt-shunt and shunt series feedback amplifier.

### Suggested Readings


- Integrated Electronics by Millman Halkias, TMH.
- Electronics Device & Circuit by Robert Boylestad, & Louis Nashelsky, Pearson Education.
- Electronics Device & Circuit Theory by I.J. Nagrath, PHI Learning.
- Electronics Device & Integrated Circuit by A.K. Singh, PHI Learning.
- A Textbook of Electronic Devices and Circuits by J.B. Gupta, S.K. Kataria and Sons.
- Integrated Electronics: Analog and Digital Circuits and Systems by Millman, Jacob, TMH.
- Applications and Design with Analog Integrated Circuits by Jacob, Michael, Pearson Education.


### Useful Video Links

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | RC Coupled Amplifiers | https://youtu.be/BSR26SU3R2U |
| Unit-II | Power Amplifiers | https://youtu.be/huDZjQcEBMg |
| Unit-III | Voltage regulators | https://youtu.be/R_QnIAEk7Go |
| Unit-IV | Operational Amplifier | https://youtu.be/clTA0pONnMs |

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|---|---|---|---|---|---|
| Course code | **LC-EE-211A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Analog Electronics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand the characteristics and AC analysis of RC coupled amplifiers, oscillators, regulators and timers<br>• Developing Knowledge of Rectifiers, Regulators, and Power Supplies.<br>• Analysing and Designing Amplifiers and Oscillators<br>• Application of Operational Amplifiers and Timer Circuits in Signal Processing | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply theoretical knowledge to assemble, test, and troubleshoot electronic circuits | Level 3: Apply |
| **CO2** | Analyze and interpret the VI characteristics of Zener diodes, MOSFETs, and transistors | Level 4: Analyse |
| **CO3** | Able to evaluate the performance of rectifiers and filters by calculating theoretical and practical ripple factors | Level 5: Evaluate |
| **CO4** | Able to differentiate and compare various feedback topologies | Level 6: Create |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To plot VI characteristics of a Zener diode. |
| 2 | To study rectifier and the effect of filters on the output of rectifier. Also, calculate the theoretical and practical ripple factor. |
| 3 | To analyze and study different types of feedback topology. |
| 4 | To analyze and study RC phase shift oscillator. |
| 5 | To analyze and study Wein's bridge oscillator. |
| 6 | To plot the characteristics of MOSFET. |
| 7 | To plot input and output characteristics of transistor configurations. |
| 8 | To analyze and study inverting and non-inverting op-amp amplifiers. |
| 9 | To analyze and study the 555 timer as a square wave generator. |
| 10 | To analyze and study the frequency response of RC coupled amplifier. |
| 11 | To analyze and study the working of Push-Pull amplifiers. |

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|---|---|
| 12 | To analyze and study op-amp amplifiers as a differentiator. |
| 13 | To analyze and study op-amp amplifiers as an integrator. |

**Virtual Lab Links**

| Experiment Name | Virtual Lab Link |
|---|---|
| To analyze and study op-amp amplifiers as an integrator. | https://ade2-iitr.vlabs.ac.in/exp/mathematical-operations/ |
| To analyze and study op-amp amplifiers as a differentiator | https://ade2-iitr.vlabs.ac.in/exp/mathematical-operations/ |
| 555 timer as a square wave generator | https://aec-iitkgp.vlabs.ac.in/exp/monostable-multivibrator/ |
| Inverting and non-inverting op-amp amplifiers | https://ade2-iitr.vlabs.ac.in/exp/characteristic-parameters/ |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

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|---|---|---|---|---|---|
| Course Code | **PCC-EE-203A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Electric Circuit Analysis** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop analytical skills for circuit analysis using network theorems and fundamental laws.<br>• To evaluate forced and free responses, time constants, and transient states of RL, RC, and RLC circuits under AC and DC excitations, using classical methods and Laplace transform techniques.<br>• To perform steady-state analysis and power calculations in AC and three-phase circuits.<br>• To acquire the ability to synthesise passive networks and characterized two-port networks. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall Basic electrical laws, terminology and mathematical tools. | Level 1: Remember |
| CO2 | Understand the basic electric circuit and also to synthesise passive networks and characterize two-port networks. | Level 2: Understand |
| CO3 | Apply the fundamental laws (KCL, KVL) and analyse AC circuits using various network theorems. | Level 3: Apply |
| CO4 | Analyse steady state and transient conditions using Laplace transform. Electrical circuit parameters with or without using Laplace Transform. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each Unit.

**Unit-I**

**Network Theorems in AC Circuit:** Circuit elements, KCL, KVL, Nodal and mesh Analysis, Independent and dependent sources, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Millman's theorem, Reciprocity theorem, Substitution theorem, Tellegens theorem.

**Unit-II**

**Transient State Analysis:** Forced and free response, Time constants, Transient behavior of circuit elements under switching conditions and their representations, Solution of first and second-order circuits, Evaluations of initial and final states in series and parallel RL, RC and RLC circuits with AC and DC excitation, Laplace transform and its adaptation to networks.

**Unit-III**

**Steady State Analysis:** Sinusoidal steady state analysis; Sinusoidal response of series and parallel RL, RC and RLC circuits, Phasors and phasor diagrams, Power in AC circuits, Three-phase circuits, Resonance.

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## Unit-IV

**Synthesis of passive networks:** Hurwitz polynomials, Positive real functions; definition and properties, Synthesis of LC, RC, RL networks, Foster's I and II form, Cauer's I and II form, Network graphs.
Two Port Network: Impedance parameter, Admittance parameter, Transmission parameter, Hybrid parameter, Inverse hybrid parameter, Inverse transmission parameter, Relationship between parameter sets, Interconnection of two-port networks.

### Suggested Readings


- Fundamentals of electric circuits by Alexander, K. Charles, & Matthew Sadiku, McGraw Hill Education.
- Network Analysis by M E. Van-Valkenburg, Prentice Hall.
- Circuits and Networks by A Sudhakar, Tata McGraw-Hill.
- Engineering Circuit Analysis by W. Hayt, Tata McGraw-Hill.
- Electric Circuit by D.A. Bell, Oxford University press.
- Introduction to Modern Network Synthesis by M E. Van-Valkenburg, Wiley and Sons.
- Introduction to Modern Network Synthesis by Suresh Kumar, Dorling Kindsley.


### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Basic Circuit Elements | https://youtu.be/zkWvL1pPkMY |
| | Mesh and Nodal Analysis | https://youtu.be/TBmX3d8zuXU |
| | Network Theorems | https://youtu.be/LPttepJwgNE |
| Unit-II | Transient State Analysis | https://youtu.be/jT7R1Ez6Vg?list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn |
| | First and Second Order Circuits | https://youtu.be/alkm4B9JPWw |
| | Laplace transformation and its application | https://youtu.be/uJujJlkro6s |
| Unit-III | Sinusoidal steady state Analysis | https://youtu.be/c6U3Vnq6IL4 |
| | Active and Reactive power in A.C circuit | https://youtu.be/4SnFYwxsr8M |
| Unit-IV | Graph Theory | https://youtu.be/0BQ2yyC6Lc8?list=PLbRMhDVUMngfNnABo5mre45ZbHqJE2sUn |
| | Two port networks | https://youtu.be/geM6Qz61MBA |

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|---|---|---|---|---|---|
| Course code | **LC-EE-213A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Electric Circuit Analysis Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Enhance problem-solving abilities by verifying network theorems, Nodal and Mesh analysis techniques for systematic circuit analysis.<br>• Analyse transient responses of RL and RC circuits and interpret their time-domain behaviour.<br>• Learn to synthesise a network from a given network function and experimentally verify its response.<br>• Evaluate and experimentally verify Z, Y, and T parameters of two-port networks. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Apply various circuit analysis techniques, Nodal Analysis, Mesh Analysis and fundamental theorems. | Level 3: Apply |
| CO2 | Analyse the transient response of RL and RC circuits and examine resonance phenomena in series and parallel AC circuits. | Level 4: Analyse |
| CO3 | Evaluate Z, Y, and T parameters of two-port networks and determine equivalent parameters for various interconnections. | Level 5: Evaluate |
| CO4 | Design and verify network responses by synthesising a given network function and interpreting current locus diagrams of RL, RC, and RLC series circuits to correlate theoretical and practical circuit behaviour. | Level 6: Create |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To study Nodal Analysis. |
| 2 | To study Mesh Analysis. |
| 3 | To verify Millman's theorem and Reciprocity theorem. |
| 4 | To verify Substitution theorem and Tellegen's theorem. |
| 5 | To verify Thevenin's theorem and Norton's theorem. |
| 6 | To verify Maximum Power Transfer Theorem. |
| 7 | To Study transient state response of RL and RC circuit. |
| 8 | To plot current locus diagram of RL, RC and RLC series circuit. |
| 9 | To synthesize a network of give network function and verify its response. |
| 10 | To study resonance in series and parallel AC circuits. |
| 11 | To evaluate and verify Z, Y and T parameters of a two port network. |
| 12 | To determine equivalent parameters of various interconnections of a two port network. |

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## Virtual Lab Links

| Experiment Name | Virtual Lab Link |
|---|---|
| To study Nodal Analysis. | https://pltw.multisim.com/content/rhoaBoJsuRZbvGTWpdmz3E/lab-3-kirchhoffs-laws-and-mesh-and-nodal-analysis/ |
| To study Mesh Analysis. | https://pltw.multisim.com/content/rhoaBoJsuRZbvGTWpdmz3E/lab-3-kirchhoffs-laws-and-mesh-and-nodal-analysis/ |
| To verify Millman's theorem and Reciprocity theorem. | https://asnm-iitkgp.vlabs.ac.in/exp/verification-of-network-theorems/ |
| To verify Substitution theorem and Tellegen's theorem. | https://asnm-iitkgp.vlabs.ac.in/exp/verification-of-network-theorems/ |
| To Study transient state response. | https://asnm-iitkgp.vlabs.ac.in/exp/transient-state-response/ |
| To plot current locus diagram of RL, RC and RLC series circuit. | https://asnm-iitkgp.vlabs.ac.in/exp/current-locus-diagrams/ |
| To synthesize a network of give network function and verify its response. | https://asnm-iitkgp.vlabs.ac.in/exp/network-function-synthesis/ |
| To study resonance in circuits. | https://asnm-iitkgp.vlabs.ac.in/exp/resonance-in-circuits/ |
| To evaluate and verify Z, Y and T parameters of a two port network. | https://asnm-iitkgp.vlabs.ac.in/exp/two-port-network/ |
| To determine equivalent parameters of various interconnections of a two port network. | https://asnm-iitkgp.vlabs.ac.in/exp/two-port-network/ |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

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| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-EE–205A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Measurement and Instrumentation** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand the fundamental concepts, standards, and characteristics of electrical measurements, including accuracy, precision, sensitivity, and error analysis.<br>• To impart knowledge of Conventional Measuring Instruments such as PMMC, MI instruments, wattmeters, energy meters, power factor meters, and frequency meters.<br>• To provide knowledge of digital instruments, multimeters, instrument transformers, transducers (resistive, capacitive, inductive, and piezoelectric), and display devices (CROs).<br>• To train students in the use of advanced measurement methods for low and high resistances and AC quantities through Wheatstone, Kelvin Double, Megger, Maxwell, Schering, Wein, and other bridges. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall about Voltage, Current, Power, Power Factor Frequency, instrument standards, error in instruments and transducers. | Level 1: Remember |
| CO2 | Understand AC & DC Instruments, Transducers, CRO and Bridges. | Level 2: Understand |
| CO3 | Apply Bridges and instruments to measure electric circuit parameters. | Level 3: Apply |
| CO4 | Analyses the resistance, inductance, capacitance finding methods, error, Torque etc. in instruments. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Fundamental of Electrical Measurements:** Standards, True value, Static and dynamics characteristics of measuring instruments: definitions of accuracy, precision, hysteresis, sensitivity, fidelity.
Static & Dynamics errors: Sources of Errors in measurements, classification of error- techniques to reduce errors, loading effects of instruments.

**Classification of Instruments:** Absolute& secondary Instruments; Indicating; Recording & Integrating instruments: Based upon principle of instruments, comparison between gravity &spring controls; comparison of damping methods & their suitability, bearing supports, pivot – less supports (simple & taut –band), scale information.

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## Unit-II

**Measuring Instruments:** Classification of instruments, working principle of potentiometers, measurements of voltage, current, power, working principle and construction, torque equation, Damping, range extension of PMMC, Moving Iron (MI) & loading effects.
**Wattmeter & Energy Meter:** Construction, operating principle, torque equation, Errors. Single phase energy meter & Compensation, & Creep in energy meter. Single Phase Induction Type Wattmeter.
**Power Factor & Frequency Meters:** Construction, operating, Principle, Torque equation, Advantages & disadvantages of single-phase power factor meters (Electrodynamics & Moving Iron types) & Frequency meters (Electrical Resonance Types, Ferro dynamics & Electrodynamics types).

## Unit-III

**Digital Instruments:** Comparison of Analog & Digital techniques – Digital Voltmeter –Multimeter's Instruments Transformer.
**Transducers and Display Devices:** Classification of Transducers- Resistive, Capacitive, & Inductive transducers – Piezoelectric and Digital Transducers. Working principle and specifications of Analog CRO and digital CRO.

## Unit-IV

**Low & High Resistance Measurements**: Limitations of Wheatstone bridge, Kelvin Double bridge (DC Bridge). Difficulties in high resistance measurements, measurements of high resistance by direct deflection, loss of charge methods, Megohm Bridge, Meggar.
**AC Bridges:** General balance equation, circuit diagram, phasor diagram, advantages, disadvantages, applications of Maxwell's, inductance–capacitance, Hay's, Owen's, Schering & Wein's bridges, Shielding & earthing, Wagner's device.

### Suggested Readings


- A course in Electrical and Electronic Measurements and Instrumentation by A. K. Sawhney, & Puneet Sawhney, Dhanpat Rai & Company.
- LabVIEW graphical programming by Jennings, Richard, & Fabiola De La Cueva, McGraw-Hill Education.
- Electronic Instrumentation and Measurements by A. David Bell, Oxford University Press.
- Electrical Measurements and Measuring Instruments by E. W. Golding, F. C. Widdis, 6th Edition, Medtech.


### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Sources of Errors in measurements | https://www.jove.com/v/14506/types-of-errors-detection-and-minimization |
| | Loading effects of instruments | https://www.electricalengineering.xyz/loading-effect-of-electrical-measurement-instruments/ |
| Unit-II | Single phase energy meter | https://emimnit.wordpress.com/2016/10/16/single-phase-energy-meter/?utm_source=chatgpt.com |
| | Introduction of virtual instruments | https://www.youtube.com/watch?v=iGYOlnOP6vw |
| Unit-III | Comparison of analog & digital techniques | https://www.youtube.com/watch?v=rkOWP9oVaXk |
| | Oscilloscope & its application | https://www.tek.com/en/documents/primer/oscilloscope-basics?utm_source=chatgpt.com |
| Unit-IV | Limitation of Wheatstone bridge | https://www.shiksha.com/online-courses/articles/learning-wheatstone-bridge-principle/?utm_source=chatgpt.com |
| | General balance equation , CKT diagram, phasor diagram | https://www.electrical4u.com/wheatstone-bridge-circuit-theory-and-principle/ |

HOD EE

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|---|---|---|---|---|---|
| Course code | **LC-EE-215A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Measurement and Instrumentation Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To understand the construction, working principles, and proper connections of various electrical and electronic measuring instruments.<br>• To develop the ability to calibrate electrical measuring instruments for accurate measurement.<br>• To acquire practical skills in measuring electrical quantities, power, power factor, and circuit parameters using conventional and advanced methods.<br>• To understand the application of transducers for the measurement of physical parameters and their characteristics. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the construction, working and connection of different types of meters, transducers, strain gauges and star delta starters. | Level 2: Understand |
| **CO2** | Calibrate standard electrical measuring instruments such as voltmeters, ammeters, wattmeters, and energy meters using appropriate calibration techniques to ensure accurate measurements. | Level 3: Apply |
| **CO3** | Measure electrical quantities such as resistance, inductance, capacitance, power, and power factor using bridges, CT/PT arrangements, and analyze the accuracy of measurements. | Level 4: Analyse |
| **CO4** | Determine the characteristics of transducers such as LVDTs and capacitive sensors, and apply them for displacement and liquid level measurements. | Level 4: Analyse |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To study construction of different types of meters & study how to connect them in a circuit. |
| 2 | To calibrate a Voltmeter & an ammeter using a potentiometer. |
| 3 | Calibration of AC Wattmeter by Standard Voltmeter and Ammeter. |
| 4 | Calibration of single-phase energy meter. |
| 5 | To Measure Power & P.F by using 3 ammeter & 3 voltmeter methods. |
| 6 | To Measure Power & P.F by two wattmeter method. |
| 7 | To measure low resistance by Kelvin double bridge. |
| 8 | Measurement of Inductance using Maxwell Bridge. |
| 9 | To Measure capacitance by De Sauty bridge. |

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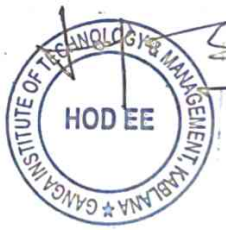
|---|---|
| **10** | To Measure power with help of CT & PT. |
| **11** | Determine output characteristics of LVDT and Measure displacement using LVDT. |
| **12** | Measurement of liquid level; using capacitive transducer. |
| **13** | To Measure high resistance by loss of charge methods. |
| **14** | Determine the unknown Inductance & Q factor by Hay's bridge. |
| **15** | Study blocks wise construction of analog Oscilloscope & function generator. |
| **16** | To study LAB VIEW. |

**Virtual Lab Links**

| Experiment Name | Virtual Lab Link |
|---|---|
| To study LAB VIEW. | https://www.iitk.ac.in/oscillations/index.html |
| Study blocks wise construction of analog Oscilloscope & function generator. | https://aec-iitkgp.vlabs.ac.in/?utm_source=chatgpt.com |
| Determine output characteristics of LVDT and Measure displacement using LVDT. | https://virtual-labs.github.io/exp-lvdt-coep/index.html?utm_source=chatgpt.com |
| To Measure power with help of CT & PT. | https://vp-dei.vlabs.ac.in/vp-dei/Dreamweaver/?utm_source=chatgpt.com |
| To measure low resistance by Kelvin double bridge. | https://elms-iitr.vlabs.ac.in/exp/kelvin-sdouble-bridge/simulation/index.html |
| To measure high resistance by the loss of charge methods. | https://virtual-labs.github.io/exp-loss-of-charge-method |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



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|---|---|---|---|---|---|
| Course Code | PCC-EE-207A | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | Electrical Machines-I | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To learn the basic principles of converting electrical and mechanical energy in machines.<br>• To study the construction, operation, and performance of DC machines.<br>• To understand the working, testing, and efficiency of transformers. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall key concepts of electromechanical energy conversion and machine structures. | Level 1: Remember |
| CO2 | Explain the operation of DC machines and transformers. | Level 2: Understand |
| CO3 | Apply theoretical concepts to solve practical problems related to voltage, EMF, torque, efficiency, and testing of DC machines and transformers. | Level 3: Apply |
| CO4 | Analyze performance characteristics of DC machines and transformers, such as torque-speed curves, voltage regulation, and losses. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Introduction to Magnetic Circuit:** Faraday's Law of Electromagnetic Induction, Lenz's Law and Fleming's rule, Basic construction of a DC machine: magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

## Unit-II

**DC Machine:** motoring and generation: Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed, V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

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## Unit-III

**Transformers**: Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses, Autotransformers - construction, principle, applications and comparison with two winding transformers.

## Unit-IV

**Three-Phase Transformer**: Construction, types of connection and their comparative features, Parallel operation of single-phase and three-phase transformers, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

### Suggested Readings


- Electric Machinery by A. E. Fitzgerald and C. Kingsley, McGraw Hill Education.
- Performance and design of DC machines by A. E. Clayton and N. N. Hancock, CBS Publishers.
- Performance and design of AC machines by M. G. Say, CBS Publishers.
- Electrical Machinery by P. S. Bimbhra, Khanna Publishers.
- Electric Machines by I. J. Nagrath and D. P. Kothari, McGraw Hill Education.
- Electric Machines by Ashfaq Husain and Haroon Ashfaq, Dhanpat Rai & Co.
- A Text Book of Electrical Technology by B.L. Theraja & A.K. Theraja, S.Chand.
- DC Machines and Transformers by Deshveer Narwal, M. Balasubbareddy, Atul Katiyar, & Nitish Kumar, SIPH.


### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Principle of Rotating Electrical Machines | https://youtu.be/Rd5q7a7IXvs |
| | Pitch factor and Winding Factor | https://youtu.be/cyl9uLt4swo |
| Unit-II | Introduction to DC Machine | https://youtu.be/PRdLNTQ2fRE |
| | Armature Winding | https://youtu.be/GdwG6Padf2M |
| Unit-III | Starting of DC Motor | https://youtu.be/DgQE286XwHw |
| | Speed Control of DC Shunt Motor | https://youtu.be/J3EUw7J16c8 |
| Unit-IV | Short Circuit Test | https://youtu.be/puQ7lzZJ_3s |
| | Voltage Regulation | https://youtu.be/NnBbKE7VHRQ |

HOD EE

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|---|---|---|---|---|---|
| Course code | **LC-EE-217A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Electrical Machines-I Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To understand the working of DC machines and transformers.<br>• To perform key tests to analyze machine performance.<br>• To develop practical skills in handling electrical equipment. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Understand the principles of DC machines and transformers. | Level 2: Understand |
| CO2 | Apply testing methods to assess machine performance. | Level 3: Apply |
| CO3 | Analyze machine behavior under different conditions. | Level 4: Analyze |
| CO4 | Evaluate speed control and transformer operation methods. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To perform an open-circuit test of a single-phase transformer. |
| 2 | To perform short-circuit test of a single-phase transformer. |
| 3 | To perform a load test on the single-phase transformer |
| 4 | To study the conversion of 3 phase to six phase using 3 single phase transformers. |
| 5 | To study the parallel operation of two single-phase transformers. |
| 6 | To perform polarity test on the single-phase transformer. |
| 7 | To study the Load Characteristics of DC shunt generator. |
| 8 | To study the Load Characteristics of DC series motor. |
| 9 | To perform the speed control of a DC Motor by field resistance Control and Armature control method. |
| 10 | To perform speed control of a DC motor by using Ward-Leonard Method. Draw the graph between armature voltage and speed of motor. |
| 11 | To study Hopkinson's test of DC Shunt machine. |
| 12 | To study the magnetisation characteristics of DC Shunt Generator. Draw the graph between the armature voltage and field current. |

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## Virtual Lab Links

| Experiment Name | Virtual Lab Link |
|---|---|
| To study the Load Characteristics of DC shunt generator | https://ems-iitr.vlabs.ac.in/exp/load-characteristics-dc-shunt/ |
| To study the speed control of DC Motor by field resistance Control. | https://ems-iitr.vlabs.ac.in/exp/dcmotor-field-resistance-control/simulation.html |
| To study the speed control of D.C. Shunt motor by armature control method. | https://ems-iitr.vlabs.ac.in/exp/dcshunt-motor-armature-control/ |
| To perform speed control of DC motor by using Ward-Leonard Method. Draw the graph between armature voltage and speed of motor. | https://ems-iitr.vlabs.ac.in/exp/dcmotor-ward-leonard/simulation.html |
| To study the magnetisation characteristics of DC Shunt Generator. Draw the graph between the armature voltage and field current. | https://ems-iitr.vlabs.ac.in/exp/magnetization-characteristics-dcshunt/ |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



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|---|---|---|---|---|---|
| Course code | **PCC-EE-209A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Electrical Engineering Materials** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester- III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To develop a comprehensive understanding of the electrical and thermal conductivity properties of materials, including metals and semiconductors.<br>• To explore and evaluate the magnetic and dielectric properties of materials, including their applications and behavior under different conditions.<br>• To analyze magnetic materials and their practical utilization.<br>• To develop an understanding of semiconductor physics for electrical and electronic applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skill demonstrated | RBT Level |
|---|---|---|
| CO1 | Describe the factors influencing resistivity and electron motion in an electric field for electrical conductivity in metals. | Level 1: Remember |
| CO2 | Explain dielectric polarisation, dielectric constant, and their effects on capacitors and monatomic gases. | Level 2: Understand |
| CO3 | Illustrate the types of magnetism in magnetic materials. | Level 3: Apply |
| CO4 | Analyze dielectric losses, loss tangent, and their frequency and temperature dependence on dielectric materials. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Conductivity of Metal:** Introduction, factors affecting the resistivity of electrical materials, motion of an electron in an electric field, Equation of motion of an electron, current carried by electrons, mobility, thermionic emission, photoelectric emission, field emission, effect of temperature on electrical conductivity of metals, electrical conducting materials, thermal properties, thermal conductivity of metals, thermoelectric effects.

## Unit-II

**Dielectric Materials:** Introduction, effect of a dielectric on the behavior of a capacitor, polarization, the dielectric constant of monatomic gases, dielectric losses, significance of the loss tangent, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system, ionic conductivity in insulators, insulating materials, ferroelectricity, piezoelectricity.

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## Unit-III

**Magnetic Materials:** Introduction, Classification of magnetic materials, diamagnetism, Paramagnetism, ferromagnetism, magnetization curve, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials, magnetic resonance.

## Unit-IV

**Semiconductors:** Energy band in solids, conductors, semiconductors and insulators, types of semiconductors, Intrinsic semiconductors, impurity type semiconductor, diffusion, the Einstein relation, hall effect, thermal conductivity of semiconductors, electrical conductivity of doped materials.

### Suggested Readings

- An Introduction to Electrical Engineering by C. S. Indulkar and S. Thiruvengadam, S. Chand Publications.
- Engineering Materials by Kenneth G. Budinski, Prentice Hall of India, New Delhi.
- Electrical Engineering Materials by A. J. Dekker, Pearson Publications.
- A Text Book of Electrical and Electronics Engineering Materials by P. L. Kapoor, Khanna Publishers.
- A Textbook of Electrical Engineering Materials by R. K. Rajput, Laxmi Publications.

### Useful Video Links:

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Expression for electrical conductivity in metals | https://www.youtube.com/watch?v=wzWJwjjvu9I |
| Unit-II | Insulating Materials | https://www.youtube.com/watch?v=-fAphSvtVKA |
| Unit-III | Magnetic Materials | https://www.youtube.com/watch?v=-fAphSvtVKA |
| Unit-IV | Semiconductor materials | https://www.youtube.com/watch?v=-5iR1H2nxvo |

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|---|---|---|---|---|---|
| Course Code | **MC-201A** | | | | |
| Category | Mandatory Courses | | | | |
| Course Title | **Environmental Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 2 | 0 | 1 | - | |
| Course Objectives | The objectives of this course are to<br>• Create awareness of the multidisciplinary nature and importance of environmental studies, including the sustainable management and conservation of natural resources.<br>• Develop an understanding of ecosystem dynamics, biodiversity, pollution types, and their impacts on environmental and human health.<br>• Foster critical thinking on social, ethical, and legislative aspects of environmental protection, emphasizing the role of individuals and society.<br>• Engage students in practical learning through fieldwork and case studies to apply environmental concepts for sustainable development and responsible citizenship. | | | | |
| Practical/Field Visits | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |
| **Remarks** | The subject of Environmental Studies will be included as a qualifying paper in all UG Courses and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded. The duration of the course will be 40 lectures. The examination will be conducted along with the semester examinations.<br>The marks in this qualifying paper will not be included in determining the percentage of marks obtained for the award of degree. However, these marks will be shown in the detailed marks certificate of the students. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe key concepts of environmental studies, types of natural resources, ecosystem structures, pollution types, major environmental laws, and human-environment interactions. | Level 1: Remember |
| **CO2** | Explain the interrelationships among ecosystems, biodiversity, pollution, social issues, environmental ethics, and related legislation for sustainable development. | Level 2: Understand |
| **CO3** | Apply principles of environmental management, pollution control, disaster preparedness, and sustainable practices in real-world and field-based environmental contexts. | Level 3: Apply |
| **CO4** | Analyze environmental problems, population growth impacts, climate change, welfare programs, and the role of information technology in promoting public health and environmental sustainability. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

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## Unit-I.

**Natural Resources:** Renewable and non-renewable resources, Natural resources and associated problems.

**a) Forest resources:** Use and over-exploitation: deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.

**b) Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.

**c) Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

**d) Food resources:** World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertilizer pesticide problems, Water logging, salinity, case studies. e) Energy resources: Growing energy needs; renewable and non- renewable energy sources, use of alternate energy sources, case studies.

f) **Land resources:** Land as are source, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources, equitable use of resources for sustainable life styles

## Unit-II

**Ecosystems**: Producers, Consumers and Decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, Food web sand ecological pyramids, Introduction, types, characteristic features, structure and function of Forest ecosystem, Grass land ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

**Bio diversity and its conservation:** Introduction, Definition, Genetic, Species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wild life, man-wild life conflicts, Endangered and endemic species of India, In-situ and ex-situ conservation of biodiversity.

## Unit-III

**Environmental Pollution:** Definition, Causes, Effects and Control Measures of Air Pollution, Water Pollution, Soil Pollution, Marine Pollution, Noise Pollution, Thermal Pollution, Nuclear Hazards.

**Solids Waste Management:** Causes, Effects and Control Measures of Urban and Industrial Wastes, Role of an Individual in Prevention of Pollution, Pollution Case Studies.

**Disaster Management:** Floods, Earthquake, Cyclone and Landslides.

**Social issues and the Environment:** From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain Water Harvesting, Watershed Management, Resettlement and Rehabilitation of People, its problems and concerns case studies.

**Environmental Ethics:** Issues and possible solutions, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies, Waste land reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of pollution) Act, Water (Prevention and Control of pollution) Act, Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

## Unit-IV

**Human population and the Environment:** Population growth, Variation among Nations, Population explosion-Family Welfare Programme, Environment and human health, Human Rights. Value Education, HIV/AIDS, Woman and Child Welfare Role of Information Technology in Environment and human health. Case Studies.

**Field Work (Field work equal to10 lecture hours)-** Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-urban/Rural/Industrial/ Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hills, slopes, etc.

**Suggested Readings:**

- Environmental Biology by K.C. Agarwal, Nidi Pub. Ltd., Bikaner.

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- The Biodiversity of India by Bharucha, MA Pin Publishing Pvt. Ltd., Ahmedabad.
- Hazardous Waste Incineration by R.C. Brunner, McGraw Hill.
- Environmental Chemistry by A.K. De, Wiley Eastern Ltd.
- Global Biodiversity Assessment by V.H. Heywood & R.T. Watson, Cambridge University Press.
- Environmental Protection and Laws by H. Jadhav & V.M. Bhosale, Himalaya Pub. House.
- Matter Hazardous by A.K. Mhaskar, Techno-Science Publications.
- Waste Water Treatment by M.N. Rao & A.K. Datta, Oxford & IBH Publication.
- Environmental Chemistry by B.K. Sharma, Goel Publication. House, Meerut.
- Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II by R.K. Trivedi, Enviro Media.
- Introduction to Air Pollution by R.K. Trivedi & P.K. Goel, Techno-Science Publications.
- Environmental Management by K.D. Wagner, W.B. Saunders Co., Philadelphia, USA.
- A Textbook of Environmental Education by Dr. J.P. Yadav, G.V.S. Publishers.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Environment Science: Introduction | https://www.youtube.com/watch?v=5QxxaVfgQ3k |
| | Natural Resources | https://www.youtube.com/watch?v=CXCT2R1K6Ts |
| | Ecosystem | https://www.youtube.com/watch?v=1dBU6HB8G6s |
| Unit-II | Biodiversity and its conservation | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| Unit-III | Sustainable Water Management In Urban Areas | http://digimat.in/nptel/courses/video/127106004/L29.ht |
| | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |
| Unit-IV | Population and population growth | https://archive.nptel.ac.in/courses/102/104/102104068/ |
| | National Family Welfare Programme | https://www.youtube.com/watch?v=X5F99L8ZEtc |

HOD EE

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|---|---|---|---|---|---|
| Course Code | **BSC-MEE-201A** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Mathematics-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III/IV** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are to<br>• Understand and classify first and second-order linear partial differential equations, and apply appropriate solution techniques including complementary function and particular integral methods.<br>• Solve and analyze physical models such as wave and diffusion equations using methods like separation of variables. | | | | |
| Course Pre-requisite | Mathematics up to 12th Standard and Engineering Mathematics-I& II | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define partial differential equations and probability distributions, including their properties and physical relevance. | Level 1: Remember |
| CO2 | Classify second-order PDEs using complementary functions and particular integrals. | Level 2: Understand |
| CO3 | Apply probability concepts, including conditional probability and Bayes' Theorem, for real-world problems using discrete and continuous distributions. | Level 3: Apply |
| CO4 | Analyze numerical methods (Bisection, Newton-Raphson, Euler, Runge-Kutta) for solving equations and ODEs with a focus on accuracy and efficiency. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Definition of Partial Differential Equations, First order linear partial differential equations, Partial Differential Equations of higher order: Second-order linear partial differential equations and their classification, Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method, Initial and boundary conditions, Separation of variables method to simple problems in Cartesian coordinates.

**Unit-II**

Solution of polynomial and transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical integration,

HOD EE

Trapezoidal rule and Simpson's 1/3rd and 3/8 rules, Taylor's series, Euler and modified Euler's methods, Runge-Kutta method of fourth order for solving first and second order ordinary differential equations. Matrix inversion.

**Unit-III**

Measures of central tendency, Moments, Skewness and Kurtosis Basic concept of Probability, Conditional probability, Bayes' theorem, Discrete random variables, Binomial distribution, Poisson distribution, Expectation of discrete random variables, Variance of a sum, Correlation coefficient, Continuous random variables and their properties, Distribution functions, Normal Distribution.

**Unit-IV**

Testing of hypothesis, Test of significance, Large sample test for single proportion, Difference of proportions, Tests for single mean, Difference of means and Difference of standard deviations, Test for ratio of variances, Chi-square test for goodness of fit and Independence of attributes

## Suggested Readings:


- B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers
- B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Limited
- N. P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications
- P. Kandasamy, K. Thilagavathy, K. Gunavathi, Numerical Methods, S. Chand and Company
- S. S. Sastry, Introductory Methods of Numerical Analysis, PH
- Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.


## Useful Video links:

| Unit No. | Topics | Links |
|---|---|---|
| Unit I | Definition of Partial Differential Equations. | https://www.youtube.com/watch?v=KlZqe4UC 1jk |
| | Solution to homogenous and non- homogenous linear partial differential equations | https://www.youtube.com/watch?v=5eZbgxmp K3Q&t=520s |
| | Initial and boundary conditions of partial differential equations of second order | https://www.youtube.com/watch?v=PVUfuiuW aZQ |
| Unit II | Bisection method, Regula-Falsi method and Newton-Raphson method | https://www.youtube.com/watch?v=3j0c_FhOt 5U&list=PLU6SqdYcYsfIk1VhXxIYNPFU67 ym6gae8 |
| | Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae | https://www.youtube.com/watch?v=Y- yMQvYpltU https://www.youtube.com/watch?v=zdyUwzO m1zw https://www.youtube.com/watch?v=2h0R0Uka 1HI |
| | Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules | https://www.youtube.com/watch?v=EA76ON WBgK4&list=PLhSp9OSVmeyJBkLSO51JFP SEIIoeRiaJy |
| Unit III | Basic concept of Probability, Conditional probability, Bays' theorem | https://youtu.be/60vHy2lA4o4 https://www.youtube.com/watch?v=ZFMcWe_ SNyI https://www.youtube.com/watch?v=- ELHOnLwE9U |
| Unit IV | Testing of Hypothesis & Levels of significance, Large Sample Test | https://auece.digimat.in/nptel/courses/video/11 1105090/L72.html |
| | Chi-Square Test | https://youtu.be/SICsNb-VXds?feature=shared |
| | Miscellaneous | https://onlinecourses.nptel.ac.in/noc22_ma81/p review |

Abhishek VS

Bijha

HOD EE

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PCC-EE-204A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Electrical Machines-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand the construction, working principles, and performance of induction machines.<br>• To learn the operation, characteristics, and control of synchronous machines.<br>• To gain basic knowledge of special machines and their industrial applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the construction, working principles and types of single-phase induction machines and synchronous machines. | Level 1: Remember |
| **CO2** | Explain the operation, characteristics, and applications of synchronous machines and induction machines. | Level 2: Understand |
| **CO3** | Apply the starting methods, speed control and applications of induction machines, synchronous machines and special machines like stepper, reluctance, and hysteresis motors. | Level 3: Apply |
| **CO4** | Analyze the construction, emf & torque equation, and regulation methods, speed control methods of synchronous and induction machines. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and the remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Poly-Phase Induction Motor:** Basic concepts of rotating electrical machines, Constructional features, Principal of operation, production of rotating magnetic field, speed and slip, frequency of rotor voltage and current, induction emfs, circle diagram, starting methods, double cage and deep bar motors. Methods of speed control - stator voltage control, stator resistance control, frequency control, rotor resistance control, slip power recovery control, efficiency, cogging or magnetic locking, limitations and applications of I.M.

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## Unit-II

**Single-Phase Induction Motors:** Introduction, Principle of operation, double revolving field theory, cross-field theory, starting methods, different types of single-phase induction motors, and equivalent circuit of a single-phase induction motor. Induction Generator: Principle of operation, types and applications.

**Special Machines:** Reluctance motors, Hysteresis motors, servomotors, linear induction motors, stepper motors, step angle and their applications.

## Unit-III

**Synchronous Generator:** Principle, construction of cylindrical rotor and salient pole machines, winding, EMF equation, Armature reaction, testing, model of the machine, regulation – synchronous reactance method, Potier triangle method. Output power equation, power angle curve, Transient and sub-transient reactance, synchronization, parallel operation.

## Unit-IV

**Synchronous Motor:** Principles of synchronous motor, power angle curve, V-curve, starting, hunting, cause and effect of hunting, damper winding, synchronous condenser, Applications: Industrial applications, speed control applications and power factor correction.

### Suggested Readings

- Principle of Electrical Machines by V K Mehta, Rohit Mehta, S Chand.
- Electric Machines by Ashfaq Hussain, Dhanpat Rai.
- Electric Machines by I.J. Nagrath, & D.P. Kothari, TMH, New Delhi.
- Generalized theory of Electrical Machines by P.S. Bhimbra, Khanna Publication.
- Electric Machinery by Fitzgerald and Kingsley, MGH.

### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Poly-phase Induction Motor | https://youtu.be/leXNHZM-CZE |
| | Speed and Slip | https://youtu.be/DANGZvHOgj0 |
| Unit-II | Single Phase Induction motors | https://youtu.be/KPMy_L7oyOk |
| | Equivalent circuit of 1 phase I.M | https://youtu.be/h8386o98deY |
| Unit-III | Construction of synchronous machine | https://youtu.be/D-uPPjFBKDI |
| | Armature reaction and synchronous reactance | https://youtu.be/FCKx-1xR4To |
| Unit-IV | Synchronous motor operation, phasor diagram | https://youtu.be/edJFTap0zYw |
| | Phasor diagram of salient pole synchronous motor under various conditions | https://youtu.be/hx_QAyjgrNM |

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|---|---|---|---|---|---|
| Course code | **LC-EE-210A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Electrical Machines-II Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To study performance and circuits of induction and synchronous motors.<br>• To explore speed control and voltage effects on motor performance.<br>• To understand voltage regulation and load-sharing in generators.<br>• To learn alternator synchronization and fault analysis techniques. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Explain the performance and circuits of induction and synchronous machines. | Level 2: Understand |
| **CO2** | Apply and demonstrate different load test and speed control methods for induction machines and synchronous machines. | Level 3: Apply |
| **CO3** | Analyze the different performance curves like torque-speed and V-curves to optimize machine performance. | Level 4: Analyze |
| **CO4** | Assess the operation of synchronous generators in parallel, perform synchronization, and determine key parameters like voltage regulation. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To perform the open circuit test and block rotor test on 3 phase induction motor and draw the circle diagram |
| 2 | To perform the speed control of an induction motor by rotor resistance control. |
| 3 | To conduct the load test to determine the performance characteristics of the I.M. |
| 4 | To compute the torque v/s speed characteristics for 3-phase induction motor. |
| 5 | To perform the open circuit test and blocked rotor test on a single-phase induction motor and determine equivalent circuit parameters |
| 6 | To perform O.C. test on synchronous generator and determine the full load regulation of a three phase synchronous generator by impedance method. |
| 7 | To perform and Measure Synchronous Impedance and Short Circuit Ratio of Synchronous Generator. |
| 8 | Study of Power (Load) sharing between two Three Phase alternators in parallel operation Condition. |
| 9 | To plot V- Curve of synchronous motor. |

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|---|---|
| **10** | Synchronization of two Three Phase Alternators by a) Synchro scope Method b) Three dark lamp Method c) Two bright one dark lamp Method. |
| **11** | Determination of sequence impedances of synchronous machine for various stator voltages. |

**Virtual Lab Links**

| **Experiment Name** | **Virtual Lab Link** |
|---|---|
| To Study No Load Test on Three Phase Induction Motor. | https://em-coep.vlabs.ac.in/exp/no-load-test-induction-motor/ |
| To Study blocked rotor test on 3 Phase Induction Motor. | https://em-coep.vlabs.ac.in/exp/blocked-rotor-test-induction-motor/ |
| To study the torque speed characteristics of a three phase induction motor. | https://bes-iitr.vlabs.ac.in/exp/three-phase-induction-motor/ |
| To Study Open Circuit Test on Three Phase Alternator. | https://em-coep.vlabs.ac.in/exp/open-circuit-phase-alternator/index.html |
| To Study Short Circuit Test on Three Phase Alternator. | https://em-coep.vlabs.ac.in/exp/short-circuit-phase-alternator/index.html |
| To plot V Curves and Inverted V curves of Three Phase Synchronous Motor | https://em-coep.vlabs.ac.in/exp/synchronous-motor/ |
| To Study Load Test on Three Phase Alternator | https://em-coep.vlabs.ac.in/exp/load-test-phase-alternator/index.html |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.

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|---|---|---|---|---|---|
| Course Code | **PCC-EE-206A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Digital Electronics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To learn the fundamentals of logic simplification using logic gates, Boolean algebra, De Morgan's theorem, and canonical forms (SOP & POS)<br>• To understand mastering number systems, complements, and operations on complement numbers, along with techniques like Karnaugh Maps (up to 6 variables) and the Quine-McCluskey (QM) method for systematic logic reduction<br>• To Design and Analyze Combinational Logic Circuits and Implement Sequential Logic Systems<br>• To Explore Data Conversion Techniques and Programmable Logic Devices | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the knowledge of Boolean algebra, K-MAP, ASM, FSM and QM methods for simplification and optimization of digital circuits. | Level 1: Remember |
| **CO2** | Understand the combinational logic circuits and logic gates for arithmetic operations, code conversion, and control applications. | Level 2: Understand |
| **CO3** | Apply the knowledge of logic circuits, arithmatic operations, latches, flip-flops and counters in synchronous and asynchronous modules for memory storing applications. | Level 3: Apply |
| **CO4** | Analyse the memories and programmable logic devices for understanding the architectural blocks of FPGA and CPLD. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all Units and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Logic Simplification:** Logic Gates (AND, OR, NAND, NOR etc.), Review of Boolean Algebra and De Morgan's Theorem, Digital codes, Realization Using Gates, Number system, SOP & POS forms, Canonical forms complements of a number, addition and subtractions of a complements numbers,. Karnaugh maps up to 6 variables, Q M Method, Error detection and correction code.

## Unit-II

**Combinational Logic Design:** Half and Full Adders, Half and Full Subtractors, Multiplexers, Demultiplexers, Encoder, Decoder, Magnitude Comparators, Priority encoder , Parallel Adders, Adder with Look Ahead Carry, BCD Adder.

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## Unit-III

**Sequential Logic Design:** Latches, building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF Edge triggered FF, conversions of FF, Ripple and Synchronous counters, Ring and Johnson counter, UP & DOWN counter, Sequence Generator, Shift registers.

## Unit-IV

**A/D and D/A Converter:** Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters: Quantization, parallel - comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

**Programmable Logic Devices:** ROM, PLA, PAL, SRAM, DRAM. FPGA and CPLDs.

### Suggested Readings


- Modern Digital Electronics by R.P. Jain, Tata McGraw Hill, 4th edition.
- Switching Theory & Logic Design by A. Anand Kumar, PHI.
- Digital Electronics Circuit and System by V K Puri, TMH.
- Digital Circuits and Systems by D.V. Hall, Tata McGraw Hill.
- Principle of Digital Electronics by K Meena, PHI learning.
- Logic & Computer Fundamentals by Morris Mano,4th Edition, Pearson Education.


### Useful Video Links

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Boolean Algebra | https://www.youtube.com/shorts/xtAYbY_Pz7I |
| Unit-II | Multiplexer | Introduction to Multiplexer \| What are Multiplexers \| Digital Electronics |
| | Combinational Circuits | https://www.youtube.com/watch?v=fXrbYMDevDU |
| Unit-III | Sequential Circuits | https://www.youtube.com/watch?v=S0mKCNLmCh4&list=PLgwJf8NK-2e4mEQv0ttgW-am4wiqrpdcX |
| | Counter | https://www.youtube.com/watch?v=NTCrCYPoA5A&list=PLgwJf8NK-2e6lcDg0NxW-_yO6Bl5dPBp8 |
| Unit-IV | Finite state machines | https://www.youtube.com/watch?v=LOZxYBOKRLg |

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|---|---|---|---|---|---|
| Course code | **LC-EE-212A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Digital Electronics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are to<br>• Understand digital logic fundamentals by studying basic and universal gates and minimising Boolean functions using K-map.<br>• Analyse and design combinational circuits such as adders, subtractors, multiplexers, and demultiplexers.<br>• Design and verify sequential circuits including flip-flops, counters, and sequence detectors.<br>• Gain practical knowledge of data conversion through the design and verification of ADC and DAC. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the working of basic logic gates and realize logic functions using universal gates. | Level 2: Understand |
| **CO2** | Analyze logic expressions up to five and six variables using the Karnaugh Map (K-Map) method for optimal circuit design. | Level 4: Analyse |
| **CO3** | Implement and validate the truth tables of S-R, J-K, T, and D type flip-flops to understand sequential circuit fundamentals. | Level 4: Analyse |
| **CO4** | Design and test data conversion circuits, such as ADC and DAC for digital-analogue interfacing and 3-bit synchronous counters, synchronous UP/DOWN decade counters using JK flip-flops, and asynchronous counters. | Level 6: Create |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To study & design basic gates. |
| 2 | To study and realize logic functions with the help of universal gates. |
| 3 | To realize and minimize five & six variables using K-Map method. |
| 4 | To verify the operation of Multiplexer & De-multiplexer. |
| 5 | To perform Half adder and Full adder |
| 6 | To perform Half Subtractor and Full Subtractor. |
| 7 | To verify the truth table of S-R, J-K, T & D Type flip-flop. |
| 8 | To design & verify the operation of 3 bit synchronous counter. |
| 9 | To design & verify the operation of synchronous UP/DOWN decade counter using JK flip |
| 10 | To design & verify operation of Asynchronous counter. |
| 11 | To design and implement a circuit to detect a count sequence. |
| 12 | To design & verify operation of ADC & DAC. |

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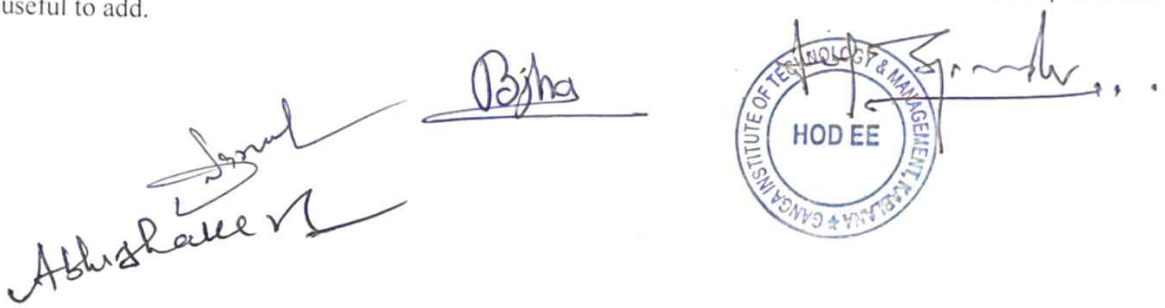
**Virtual Lab Links**

| Experiment Name | Virtual Lab Link |
|---|---|
| To study & design basic gates. | https://de-iitr.vlabs.ac.in/exp/truth-table-gates/ |
| To verify the truth table of S-R, J-K, T & D Type flip-flop. | https://de-iitg.vlabs.ac.in/exp/truth-tables-flip-flops/ |
| To perform Half adder and Full adder | https://de-iitg.vlabs.ac.in/exp/half-adder-full-adder/ |
| To perform Half Subtractor and Full Subtractor. | https://de-iitr.vlabs.ac.in/exp/half-full-subtractor/ |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



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|---|---|---|---|---|---|
| Course Code | **PCC-EE-208A** | | | | |
| Category | Professional Core Courses | | | | |
| Course Title | **Transmission and Distribution** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To provide knowledge of the evolution, structure, and components of modern power systems, including substations, bulk grids, micro-grids, and AC/DC distribution systems.<br>• To develop the ability to calculate line parameters, analyze transmission line models, voltage regulation, reactive power compensation, and evaluate distribution system performance.<br>• To understand sag and stress analysis, effects of environmental conditions, and insulation design for reliable and safe power transmission.<br>• To study cable types, corona effects, and HVDC transmission technology for efficient and advanced power delivery. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Recall the Distribution system, Transmission line with skin effect, Ferranti and proximity effect and Cables | Level 1: Remember |
| **CO2** | Understand performance of transmission lines & insulators. | Level 2: Understand |
| **CO3** | Apply Grading of cables and HVDC links. | Level 3: Apply |
| **CO4** | Analyze line parameter, sag & stress, corona in transmission lines. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Introduction:** Evolution of Power Systems and Present-Day Scenario. Structure of a power system, Bulk Power Grids and Micro-grids, indoor and outdoor substations, equipment for substations, layout, auxiliary supply.
**Distribution Systems**: Radial, ring mains and network distribution system, comparison of various types of ac and dc systems.

## Unit-II

**Transmission Lines and their performance:** Calculation of line parameters, Ferranti effect, proximity effect. Short, medium and long transmission lines, performance of transmission lines, circle diagram, capacity of synchronous condenser, tuned lines, voltage control.

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## Unit-III

**Mechanical Design and Insulators:** Sag and stress calculations, effect of ice and wind, dampers. Types of insulators, insulating materials, voltage distribution over insulator string, equalizer ring.

## Unit-IV

**Cables:** Types of LV and HV cables, grading of cables, capacitance, ratings. CORONA: Phenomenon, critical voltage, power loss, reduction in losses, radio-interference, HVDC transmission – types of links, advantages and limitations.

### Suggested Readings


- Power System Analysis & Design by J. D. Glover, M.S. Sarma and T. J. Overbye, Cengage Learning India Pvt. Ltd.
- Power Systems Analysis by A.R. Bergen, & V. Vittal, Pearson Education.
- Power System Stability & Control by P. Kundur, Tata McGraw Hill, 2006.
- Electric Power Systems by B.M. Weedy, & B.J. Cory, Wiley India.
- Elements of Power System Analysis by J. J. Grainger, & W.D. Stevenson., Tata McGraw-Hill Publishing Company Limited.


### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Structure of Power systems | https://youtu.be/Yg6XsepGCKY?list=PLD4ED2FAF3C155625 |
| Unit-II | Transmission line parameters | https://youtu.be/lr1jgbR5ca8?list=PLD4ED2FAF3C155625 |
| Unit-III | Sag and Tension Analysis | https://youtu.be/Gz10k08xdDk |
| Unit-IV | Grading of cables | https://youtu.be/Csw1OTdWu_8?list=PLD4ED2FAF3C155625 |

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|---|---|---|---|---|---|
| Course code | **LC-EE-214A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | **Transmission and Distribution Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To enable the design and performance evaluation of transmission and distribution systems.<br>• To enhance understanding of power transmission line phenomena and operational characteristics.<br>• To develop proficiency in modeling and analyzing power system components using MATLAB.<br>• To analyze and compare the performance of distribution systems under various configurations. | | | | |
| Course Pre-requisite | Physics of 12th Standard | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply Power system blocks in MATLAB, corona loss in transmission line, mechanical design of transmission line. | Level 3: Apply |
| **CO2** | Analyse the proximity and skin effect. | Level 4: Analyze |
| **CO3** | Assess Line Parameters, ABCD Parameters, performance of transmission line, Ferranti effect. | Level 5: Evaluate |
| **CO4** | Design long and short transmission lines using MATLAB. | Level 6: Create |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | To synthesise the Power System blocks in MATLAB. |
| 2 | To design short and long transmission line using MATLAB. |
| 3 | To study and calculate the transmission line parameters. |
| 4 | To study the Corona loss in the power distribution system. |
| 5 | To study the proximity and skin effect. |
| 6 | To find ABCD parameters of a model of transmission line. |
| 7 | To study performance of a transmission line under no load condition & load at different power factors. |
| 8 | To observe the Ferranti effect in a model of transmission line. |
| 9 | To study performance characteristics of a typical DC distribution system in radial & ring main configurations. |

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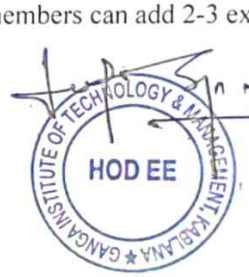
|---|---|
| 10 | To study mechanical design of the transmission line. |

## Virtual Lab Links

| Experiment Name | Virtual Lab Link |
|---|---|
| To study the Power System blocks in MATLAB. | https://in.mathworks.com/help/sps/ref/powersystemssimulationonramp.html?utm |
| To design short and long transmission line using MATLAB. | https://support.mathworks.com/matlabcentral/fileexchange/43340-long-transmission-line-matlab-simulation-by-rohit-kanojia?utm |
| To study the corona loss in power distribution system. | https://vm-dei.vlabs.ac.in/index_home.php |
| To study the proximity and skin effect. | https://sa-nitk.vlabs.ac.in/exp/plc-normal-load-operation/theory.html?utm_ |
| To find ABCD parameters of a model of transmission line. | https://asnm-iitkgp.vlabs.ac.in/exp/two-port-network/procedure.html |
| To study performance of a transmission line under no load condition & under load at different power factors. | https://www.academia.edu/31466035/A_Virtual_Electric_Power_Transmission_Line_Lab |
| To study performance characteristics of typical DC distribution system in radial & ring main configuration. | https://sa-nitk.vlabs.ac.in/exp/monitoring-feeder-parameter/theory.html |
| To study mechanical design of transmission line. | https://Intedutech.com/power-transmission-line-engineering/?utm |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| Course Code | PCC-CSE-207A | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | Python Programming (Common with CSE 3rd Sem) | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-IV |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To introduce Python programming basics, including syntax, data types, and control structures.<br>• To develop skills in Python data structures, functions, and recursion.<br>• To explore Python's graphical programming, image processing, and GUI development.<br>• To explain object-oriented programming, exception handling, and multithreading concepts. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall fundamental Python programming concepts including syntax, data types, control structures, functions, object-oriented principles, and multithreading. | Level 1: Remember |
| CO2 | Explain the use of Python data structures, file operations, graphical libraries, and GUI components for developing structured programs. | Level 2: Understand |
| CO3 | Develop Python programs using logic, functions, graphics, OOP, and multithreading to solve real-world problems. | Level 3: Apply |
| CO4 | Analyze and compare programming constructs and design techniques for efficient Python applications. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Introduction:** Installing Python; basic syntax, interactive shell, editing, saving, and running a script; data types; variables, assignments; numerical types; arithmetic operators and expressions; Loops and selection statements, Control statements String manipulations: subscript operator, indexing, slicing a string; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file.

## Unit-II

**Lists, Tuple, dictionary and Design with functions:** Basic list operators, replacing, inserting, removing an element; searching and sorting lists; Tuple: creating tuples, accessing elements, tuple immutability, operations, tuple methods, tuples vs. lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries. Hiding redundancy, complexity; arguments and return values; Program structure and design. Recursive functions.

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## Unit-III

**Simple graphics and image processing:** Simple graphics, Turtle operations, Manipulating turtle screen, Drawing two dimensional shapes, examining an object attributes, Taking a random walk, Color and RGB scheme, Image processing: Image manipulation operations, properties of images, image module, copying, blurring and reducing image.

**Graphical User Interfaces using Tkinter:** Terminal based and GUI based programs, Introduction to Tkinter, Simple GUI-Based Programs, Windows and Window Components, Input and Output with Entry Fields, Defining and Using Instance Variables, Other Useful GUI Resources.

## Unit-IV

**Object Oriented concepts:** Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modelling; persistent storage of objects, Inheritance, polymorphism, operator overloading; abstract classes; exception handling, try block.

**Multithreading:** Threads and Processes, Sleeping Threads, Producer, Consumer, and Synchronization, The Readers and Writers Problem, Shared Cell Class, Thread-Safe Class.

### Suggested Readings


- Fundamentals of Python: First Programs by Kenneth Lambert, Course Technology, Cengage Learning, 2012.
- Introduction to Computer Science Using Python: A Computational Problem-Solving by Dierbach, C. Focus, John Wiley & Sons, (2012).
- Let Us Python by A. Kanetkar, & Y. Kanetkar, BPB Publications.
- Python – The Complete Reference by M. C. Brown, McGraw Hill Education.
- Core Python Programming by R. N. Rao, Dream Tech Press.
- Python Programming: Using Problem Solving Approach by R. Thareja, Oxford University Press.
- Python Programming by S. Sridhar, J. Indumathi, & V. M. Hariharan, Pearson Education.


### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Variables and Input Statement | https://youtu.be/ruQb8jzkGyQ |
| Unit-II | List operators | https://youtu.be/jMShssechMI |
| Unit-III | Graphical User Interfaces using Tkinter | https://youtu.be/-GhzpvvIXIM?list=PLS1QulWo1RIY6fmY_iTjEhCMsdtAjgbZM |
| Unit-IV | Fundamentals of Object Oriented Programming | https://youtu.be/K3g4srbkUNM?list=PLLy_2iUCG87Ah844iZW3w3nzWSTA8KSZA |

HOD EE

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CSE-215A** | | | | |
| Category | Lab Course | | | | |
| Course title | **Python Programming Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To introduce students to the basic syntax, data types, control structures, and functions in Python programming.<br>• To enable students to implement mathematical, searching, and sorting algorithms using Python programming constructs.<br>• To provide hands-on experience with file handling, object-oriented programming, and Python libraries such as Turtle, OpenCV, and Tkinter.<br>• To develop students' ability to analyze algorithmic logic, debug programs, and optimize solutions using Python. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Practical Examination | 25 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Understand fundamental Python programming constructs such as input/output, operators, control flow, and functions. | Level 2: Understand |
| CO2 | Write Python programming techniques to implement algorithms for mathematical operations, searching, and sorting. | Level 3: Apply |
| CO3 | Apply file handling, libraries (Turtle, OpenCV, Tkinter) and OOP concepts in Python to solve practical problems. | Level 3: Apply |
| CO4 | Analyze the logic, performance, and correctness of Python solutions for problems involving algorithms and data. | Level 4: Analyze |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | Write a Program to compute the G.C.D of two numbers. |
| 2 | Write a Program to find the square root of a number. |
| 3 | Write a Program to find the power of a number. |
| 4 | Write a Program to find the maximum in a list of numbers. |
| 5 | Write a Program to implement linear search in a list. |
| 6 | Write a Program to implement binary search in a list. |
| 7 | Write a Program to sort the element using selection sort. |
| 8 | Write a Program to sort the element using insertion sort. |
| 9 | Write a Program to sort the element using merge sort. |
| 10 | Write a Program to first "n" prime numbers. |
| 11 | Write a Program to find the most frequent word in a text file. |
| 12 | Write a Program in Python for a random walk using turtle. |
| 13 | Write a Program in Python using Tkinter/OpenCV to rotate an image. |
| 14 | Create a GUI based login page in Python language. |

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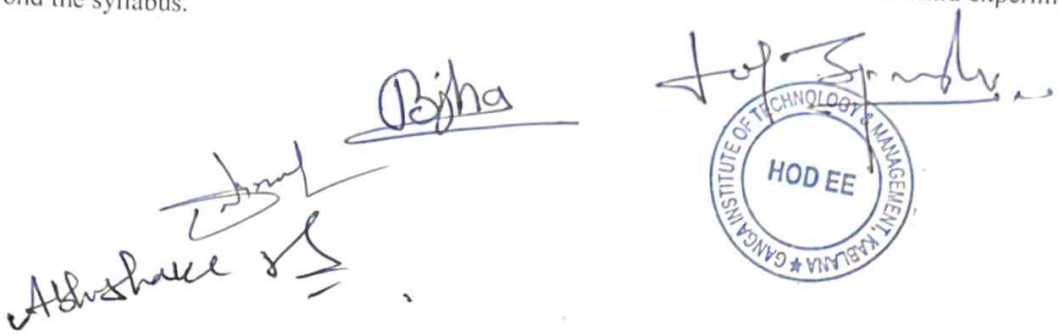
| | |
|---|---|
| 15 | Write a program to implement inheritance in Python. |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiments under topics beyond the syllabus.



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-EE-216A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Wind and Solar Energy Systems** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamentals of wind energy, including wind characteristics, energy conversion principles, turbine classification, and system components.<br>• To understand modern wind turbine technologies and the characteristics of various electrical generators used in wind energy systems, such as induction and synchronous generators.<br>• To provide knowledge of solar thermal energy systems, including solar radiation measurement, collector types, orientation, and thermal performance analysis for practical applications.<br>• To familiarise students with solar photovoltaic technology, covering solar cell fundamentals, types, performance evaluation, and Maximum Power Point Tracking (MPPT) for efficient PV system design. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the basics terminology of wind energy, wind turbines, solar energy. | Level 1: Remember |
| **CO2** | Explain wind turbines, instruments for measuring solar radiation, solar collectors, solar cells and solar MPPT techniques. | Level 2: Understand |
| **CO3** | Apply the concept of wind turbines, solar MPPT techniques to extract maximum power. | Level 3: Apply |
| **CO4** | Analyse generator characteristics, V-I characteristics of PV panel. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Wind Energy:** Basic History of wind power, Indian and Global statistics, Characteristics of Wind, principles of wind energy conversion, components of wind energy conversion system, classification of wind turbines- horizontal axis and vertical axis, Betz limit ratio, advantages and disadvantages of wind energy system.

## Unit-II

**Wind Turbine Technologies:** Review of modern wind turbine technologies, Fixed and Variable speed wind turbine, Squirrel-cage Induction generator, Wound rotor induction generators, Doubly Fed Induction Generator, Synchronous Generators, Permanent Magnet Synchronous Generators and their characteristics.

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## Unit-III

**Solar Thermal:** Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data. Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

## Unit-IV

**Solar Photovoltaic:** Photovoltaic energy conversion, solar cell fundamentals, solar cell classification- Amorphous, mono-crystalline, polycrystalline, performance of solar cell, V-I characteristics of a PV panel, Maximum Power point Tracking (MPPT) algorithm.

### Suggestions Redding

- Non-Conventional Energy Sources by G.D. Rai, Khanna publishers, 2014.
- Wind Energy Theory and Practice by Siraj Ahmed publisher PHI learning Pvt Ltd.
- Renewable Energy Sources and Emerging Technologies by D.P Kothari, K.C Singal, Rakesh Ranjan , PHI learning Pvt Ltd.
- Renewable Energy resources by Tiwari, & Ghosal, Narosa.
- Solar Photo Voltaics Fundamentals, Technology and application by Chetan Singh Solanki, PHI learning Pvt Ltd.
- Renewable Energy Resources by John Twidell and Tony Weir, Taylor and Francis.

### Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Power Generation from Wind Energy | https://youtu.be/k7LX0a67V8A |
| Unit-II | Turbine Terms | https://youtu.be/z7HV-ixAjs4 |
| Unit-III | Solar Radiation | https://youtu.be/Og4LEc7SpdQ |
| Unit-IV | Solar Collectors | https://youtu.be/__co3m8nVUg |

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| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-EE-218A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Electromagnetic Fields** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Familiarise the students with various coordinate systems and electromagnetic vector fields.<br>• Impart knowledge on the concepts of electrostatic, magneto static and electrodynamic Fields.<br>• Disseminate concepts related to electromagnetic waves, Waveguides and applications of electromagnetic fields.<br>• Understand transmission line equation and wave propagation in different medium. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Describe Vector algebra, line, area and volume Integral. | Level 1: Remember |
| **CO2** | Understand vector theorems, different coordinate systems and transformation. | Level 2: Understand |
| **CO3** | Apply concept of electrostatic, magneto static laws, and boundary conditions. | Level 3: Apply |
| **CO4** | Analyze Transmission line equations and wave propagation in different medium. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Vector Analysis:** Review of scalars, vectors, vector multiplication- dot and vector products, component of a vector, Co-ordinate system- Cartesian, cylindrical and spherical co-ordinate system. Transformation of different co-ordinate system. Gradient, Curl and Divergence. Divergence theorem, Stroke's theorem. Line integrals, Surface integrals, Volume integrals, Differential length, area and Volume in Cartesian, cylindrical and spherical co-ordinate system. Dirac- Delta function.

## Unit-II

**Electrostatic Fields:** Overview of electrostatic field, Coulomb's Law and field intensity. Electric fields due to point charge, continuous charge distributions like line charge, surface charge and volume charge distributions. Electric flux density, Gauss's Law and its Application. Electric potential, Relationship between E and V - Maxwell's equation. Scalar potential. Electric Dipole, Electric field intensity due to electric dipole. Electric flux lines. Properties of Electric flux lines due to point charge and dipole. Energy density in Electrostatic field. Convection and Conduction currents and current densities. Conductors, Point form of Ohm's law. Polarization in Dielectric. Continuity equation of current and Relaxation time. Electrostatic Boundary conditions, Poisson's and Laplace's equations, General

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procedure for solving Poisson's and Laplace's equations. Resistance and capacitance, Capacitance of parallel plate capacitor, coaxial cable, Spherical capacitor.

### Unit-III

**Magneto Static Fields:** Introduction to magneto static fields, Biot-Savart's law. Ampere's circuit law and its application- Maxwell's equation. Magnetic flux density, Maxwell's equation for static EM fields. Magnetic scalar and vector potentials, Forces due to magnetic fields - Force on a charged particle, Force on a current element and Force between two current elements, Magnetic Torque and Moment, Magnetic Dipole, Magnetisation in materials- Classification of magnetic materials, Magnetic boundary conditions. Inductance for simple geometry. Magnetic energy, magnetic circuits. Statement and Interpretation of Maxwell's equation.

### Unit-IV

**Time Dependent Fields:** General introduction, Faraday's Law .Transformer and motional emf stationary loop in time varying B field (Transformer emf), Moving loop in static B field (Motional emf). Moving loop in time varying fields, Displacement current. Maxwell's equation in Final forms, Time varying Potentials. Time harmonic fields. Introduction of Electromagnetic wave propagation, waves in general, wave propagation in lossy dielectric. Plane waves in loss less Dielectric, Plane waves in free space, Plane waves in good conductors.
Power and Poynting vector. Reflection of Plane wave at normal incidence. Reflection of Plane wave at Oblique incidence - Parallel Polarization and Perpendicular Polarization.

## Suggestions Redding

- Engineering Electromagnetics by W H Hayt Jr, J A Buck, & M Jaleel Akhtar, McGraw Hill Education.
- Outline of Electromagnetics by Mahmood Nahvi, A. Joseph, & Edminister, Schaum's, McGraw Hill Education.
- Fundamental of Electromagnetic by Karl E. Lonngren, Sava Savov, & Randy J. Jost, Scitech Publishing Inc.
- Electromagnetics by J. Edminister, & Vishnu Priye, Schaum's Series.

## Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Review of scalar and vector fields | https://www.youtube.com/watch?v=gEa38ldV_a0&pp=0gcJCdgAo7VqN5tD |
| | Stoke's theorem. | https://www.youtube.com/watch?v=MZILJp2iKUs |
| Unit-II | Electric flux density, | https://www.youtube.com/watch?v=gJtxcGEg5R0 |
| | Gauss's Law. Application of Gauss's law | https://www.youtube.com/watch?v=whv_d-fBCg0 |
| Unit-III | Biot-Savart's law, Ampere's law | https://www.youtube.com/watch?v=4YEQ98NUWOY |
| | Forces due to magnetic fields; Vector potential | https://www.youtube.com/watch?v=Nwnj1JSvfnk |
| Unit-IV | Faraday's Law | https://www.youtube.com/watch?v=del8cJiCKEo |
| | Maxwell's equation | https://www.youtube.com/watch?v=ibF0L6X53tg |

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|---|---|---|---|---|---|
| Course Code | **PEC-EE-220A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Special Electrical Machines** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To learn the fundamental principles, constructional features, and performance characteristics of poly-phase and single-phase AC machines, including induction motors, commutator motors, servo motors, and synchronous motors.<br>• To impart knowledge of advanced control techniques for efficient machine operation.<br>• To familiarize students with special-purpose electrical machines and their applications.<br>• To prepare students for industrial and research-oriented applications in modern electrical drives. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the knowledge of advanced control techniques for efficient machine operation. | Level 1: Remember |
| **CO2** | Explain the construction, operating principles, and performance characteristics of various poly-phase and single-phase AC machines | Level 2: Understand |
| **CO3** | Apply different control techniques (stator voltage control, rotor resistance control, frequency control, slip power recovery, etc.) for achieving constant torque and constant power operation in induction motors. | Level 3: Apply |
| **CO4** | Analyse performance and characteristics of special-purpose machines including stepper motors, switched reluctance motors, and permanent magnet machines for specific industrial and automation applications. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Poly-Phase AC Machines:** Construction and performance of double cage and deep bar three phase induction motors, production of rotating magnetic field, induction motor action, e.m.f. induced in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power), stator voltage control, stator resistance control, frequency control, rotor resistance control, slip power recovery control, induction motor as an induction generator.

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## Unit-II

**Single-Phase Induction Motors:** Construction, equivalent circuit, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor start capacitor-run and shaded pole motors.

**Single-Phase Commutator Motors:** Construction, principle of operation, characteristics of universal and repulsion motors; Linear Induction Motors. Construction, principle of operation, applications.

**Two Phase AC Servo Motors:** Construction, torque-speed characteristics, performance and applications.

## Unit-III

**Stepper Motors:** Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

**Switched Reluctance Motors:** Construction; principle of operation; torque production, modes of operation, drive circuits.

## Unit-IV

**Permanent Magnet Machines:** Permanent magnet DC motors, sinusoidal PM AC motors, brushless DC motors and their important features and applications, PCB motors. Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors.

**Suggestions Redding:**

- Principle of Electrical Machines by V K Mehta & Rohit Mehta, S Chand.
- Electric Machines by Ashfaq Hussain, Dhanpat Rai.
- Electric Machines by I.J. Nagrath, & D.P. Kothari, TMH, New Delhi.
- Generalized theory of Electrical Machines by P.S. Bhimbra, Khanna Publication
- Electric Machinery by Fitzgerald, & Kingsley, MGH.
- Principles of Electrical Machines and Power Electronics by P.C. Sen, John willey & Sons.
- Fundamentals of Electric Drives by G.K. Dubey, Narosa Publishing House.

**Useful Video Links**

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Static Slip power Recovery | https://youtu.be/6DetdwlDKhc |
| Unit-II | Single phase Induction Motor | https://youtu.be/trlmCvmUybk |
| Unit-III | Variable Reluctance Motor | https://youtu.be/1IiY6YlPHck |
| Unit-IV | Permanent Magnet Machines | https://youtu.be/dGvSJ25bor4 |

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| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PEC-EE-222A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **High Voltage Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To develop a fundamental understanding of conduction and breakdown mechanisms in different dielectric media.<br>• To impart knowledge of generation and measurement techniques for high voltages and currents.<br>• To impart knowledge of generation and measurement techniques for high voltages and currents.<br>• To familiarise students with high-voltage testing procedures for various electrical apparatus. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Remember the conduction and breakdown of dielectrics. | Level 1: Remember |
| **CO2** | Understand the generation and measurement of high voltage and current. | Level 2: Understand |
| **CO3** | Apply non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus | Level 3: Apply |
| **CO4** | Analyse the overvoltage phenomenon and insulation coordination in electric power systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each Unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each Unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

## Unit-I

**Conduction and Breakdown in Gases:** Collision Process, Ionization Processes, Townsend's Current Growth Equation, Current Growth in the Presence of Secondary Processes, Townsend's Criterion for Breakdown, Experimental Determination of Coefficients $\alpha$ and $\gamma$, Breakdown in Electronegative Gases, Time Lags for Breakdown, Streamer Theory of Breakdown in Gases, Paschen's Law, Breakdown in Non-Uniform Fields and Corona Discharges.

**Conduction and Breakdown in Liquid Dielectrics:** Liquids as Insulators, Pure Liquids and Commercial Liquids, Conduction and Breakdown in Pure Liquids, Conduction and Breakdown in Commercial Liquids.

**Breakdown in Solid Dielectrics:** Introduction, Intrinsic Breakdown, Electromechanical Breakdown, Thermal Breakdown.

## Unit-II

**Generation of High Voltages and Currents:** Generation of High Direct Current Voltages, Generation of High Alternating Voltages, Generation of Impulse Voltages, Generation of Impulse Currents, Tripping and Control of Impulse Generators.

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**Measurement of High Voltages and Currents:** Measurement of High DC Voltages, Measurement of High AC and Impulse Voltages, Measurement of High DC, AC, and Impulse, Cathode Ray Oscillographs for Impulse Voltage and Current Measurements.

### Unit-III

**Overvoltage Phenomenon and Insulation Coordination in Electric Power Systems:** National Causes for Over-voltages - Lightning Phenomenon, Overvoltage due to Switching Surges, System Faults and Other Abnormal, Principles of Insulation Coordination on High Voltage and Extra High Voltage Power Systems.

**Non-Destructive Testing of Materials and Electrical Apparatus:** Introduction, Measurement of Dielectric Constant and Loss Factor, Partial Discharge Measurements.

### Unit-IV

**HV Testing of Electrical Apparatus:** Testing of Insulators and Bushings, Testing of Isolators and Circuit Breakers, Testing of Cables, Testing of Transformers, Testing of Surge Arrestors, Radio Interference Measurements, Testing of HVDC Valves and Equipment.

## Suggestions Redding

- High Voltage Engineering by M.S. Naidu, & V. Kamaraju, McGraw Hill Latest Edition.
- High Voltage Engineering Fundamentals by E. Kuffel, W.S., & J. Zaengl, Kuffel Newness Latest Edition.
- High Voltage Engineering by C.L. Wadhwa, New Age International Latest Edition.
- High Voltage Engineering by A.M. Farouk, Rizk CRC Press Latest Edition.

## Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Breakdown in dielectrics | https://youtu.be/5S6xQT05Cw4 |
| Unit-II | Introduction to HVDC Transmission | https://youtu.be/yP7OACmLP48 |
| Unit-III | Design and Selection of Insulation | https://youtu.be/ga8moSgeO34 |
| Unit-IV | HV Testing of Equipment | https://youtu.be/sDBstxApMqE |

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# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examinations

## M.Tech (Electrical Power Systems) – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Mandatory Learning courses | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Elective Courses | Refer Table -IV | ..... | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Multidisciplinary Open Elective Courses | Refer Table -V | ..... | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Project Courses | PROJ-MTEPS-211A | Project | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100 | 3 |
| 5 | Seminar | SM-MTEPS-213A | Seminar-III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 6 | Dissertation | DISS-MT-EPS-215A | Literature Survey (Dissertation stage 1) | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | |
| | | | | | | | | Total Credits | 16 | | | 550 | |

### Table IV (Professional Elective Courses)

| Sr. No. | Course Code | Course |
|---|---|---|
| 1 | PEC-MTEPS-203A | Advanced Power System Protection |
| 2 | PEC-MTEPS-205A | Power Quality |
| 3 | PEC-MTEPS-207A | Digital Control System |
| 4 | PEC-MTEPS-209A | Demand side Energy Management |

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**Multidisciplinary Open Elective-II Courses (Offered by Electrical Engineering Department)**

| Sr. No. | Course Code | Course Name | Offered by the Department |
|---|---|---|---|
| 1 | OEC-143A | MATLAB | Electrical Engineering |
| 2 | OEC-145A | Sources of Energy - II | Electrical Engineering |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## M.Tech (Electrical Power Systems) – 4th Semester

*w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTEPS-202A | Dissertation and viva (Dissertation Stage 2) | - | - | - | - | 20 | 250 | | 500 | 750 | |
| | | | | | | | Total Credits | 20 | | | | 750 | |

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| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | |
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe research problems, objectives, and data sources based on fundamental research methodology principles. | Level 1: Remember |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. | Level 2: Understand |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. | Level 3: Apply |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

**Unit-II**

Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

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## Unit-III

Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing.

## Unit-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology.

### Suggested Readings


- Research Methodology: Methods and Techniques (4th ed.) by Kothari C. R., & Garg,G, New Age International Publishers.
- Research Methodology: A step-by-step Guide for Beginners (4th ed.) by Kumar, R, SAGE Publications India. ISBN: 978-9351501337
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed. ) by Bouchoux, D.E, Cengage Learning.
- Intellectual Property Rights under WTO by T. Ramappa, S.Chand.
- Fundamentals of Intellectual Property Rights : For Students, Industrialist and Patent Lawyers by Ramakrishna B & Anil Kumar H.S., Notion Press.


### Useful Video Links

| Unit No. | Topic | Links |
|---|---|---|
| Unit-I | Sources of research problem | https://www.youtube.com/watch?v=v9X_gILr1w8 |
| Unit-II | Effective literature studies | http://www.digimat.in/nptel/courses/video/109104135/L31.html |
| Unit-III | Sampling Methods | https://www.youtube.com/watch?v=qNqrHO3woyE |
| Unit-IV | Patent Rights | https://tkiet.digimat.in/nptel/courses/video/110106 081/L22.html |

HOD EE

| Course Code | PEC-MTEPS-203A | | | | |
|---|---|---|---|---|---|
| Category | Professional Elective Courses | | | | |
| Course Title | **Advanced Power System Protection** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>• To enable students to identify and define the operation of static and microprocessor-based relays in protection systems.<br>• Equip students to design and apply overcurrent protection schemes.<br>• To familiarise students with advanced protection methods for machines, transformers, and bus zones in Electrical Power Systems.<br>• To provide a comprehensive understanding of distance protection techniques for transmission lines. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Identify the operation of static and microprocessor-based relays and their applications in electrical protection systems. | Level 1: Remember |
| **CO2** | Explain advanced protection methods for AC machines, transformers, and bus zones, including communication-based relay schemes. | Level 2: Understand |
| **CO3** | Implement distance protection techniques using impedance, reactance, and MHO relays for transmission line protection. | Level 3: Apply |
| **CO4** | Analyse and apply overcurrent protection schemes such as instantaneous, definite time, and directional relays. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Classification of Static Relays:** Basic construction of static relays, Classification of protective schemes, Comparison of Static relays with electromagnetic relays, Amplitude comparator, Phase comparator, Principle of Duality.

**Static over Current Relays:** Instantaneous, Definite time, Inverse time, Directional, IDMT, Very inverse Time-Extremely inverse time over current relays, Time current characteristics of over current relays, applications.

**Microprocessor based Protective Relays:** Introduction-over current relays-Impedance relay-Directional relay-Reactance relay.

## Unit-II

**Distance Protection:** Impedance Relay - Operating principle, relay Characteristic, Protective Schemes, Static Impedance Relay, Static reactance relay, static MHO relay, effect of arc resistance, effect of power surges, effect of

line length and source impedance on performance of distance relays, Quadrilateral relay, Elliptical relay, selection of distance relays.

**Protection against over Voltages:** Protection of transmission lines, stations, and substations against direct lightning strokes-protection against travelling waves-Insulation coordination.

## Unit-III

**Amplitude and Phase Comparators (2-inputs):** Rectifier bridge circulating and opposed Voltage type, Averaging, phase splitting type, Sampling type of amplitude Comparison. Block spike type, Phase splitting type, Transistor integrating type, Rectifier bridge type, Vector product type Phase comparison.

**Pilot Relaying Schemes:** Wire pilot protection: circulating current scheme, balanced voltage scheme, translay scheme, half wave comparison scheme, Carrier current protection, phase comparison type-carrier aided distance protection, operational comparison of transfer trip and blocking schemes-optical fibre channels.

## Unit-IV

**AC Machines and Bus Zone Protection:** Protection of Alternators: stator protection, rotor protection, over-voltage protection, over-speed protection, Transformer protection: earth faults in transformers, percentage differential protection, protection against magnetic inrush current-generator and transformer unit protection, Bus zone protection- differential current protection, high impedance relay scheme, frame leakage protection.

### Suggested Readings


- Power System Protection: Static Relays. by T. S. Madhava Rao, McGraw-Hill, 1981.
- Power System Protection and Switchgear by Badri Ram & D.N. Vishwakarma, McGraw Hill Education.
- Power System Protection and Switchgear by B Ravindranath & M Chander, New Age International Publishers.
- Switch Gear Protections and Power Systems by Sunil S.Rao, Khanna Publishers.
- Power System Protection and Switchgear by S.M. Chaudhari, Tech Knowledge Publications.
- Fundamentals of Power System Protection by Y.G. Paithankar & S.R Bhide, PHI.
- Switchgear and Protection by M V Deshpande, McGraw Hill Education-Europe.


### Useful Video Links

| Unit No. | Topic | Links |
|---|---|---|
| Unit-I | Principle of Duality | https://www.youtube.com/watch?v=KhSZmFpBkSw |
| Unit-II | Protective Schemes | http://www.digimat.in/nptel/courses/video/108107167/L03.html |
| Unit-III | Phase comparison type-carrier aided distance protection | http://acl.digimat.in/nptel/courses/video/108107167/L09.html |
| Unit-IV | Protection of Alternators | http://digimat.in/nptel/courses/video/108107167/L01.html |

HOD EE

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|---|---|---|---|---|---|
| Course Code | PEC-MTEPS-205A | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Power Quality** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To understand power and voltage quality issues.<br>• To analyze voltage sags, interruptions, and protection techniques.<br>• To examine harmonics, system response, and grounding issues.<br>• To evaluate distributed generation and power quality monitoring. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall power quality issues such as voltage sags, harmonics, transients and their impact on electrical systems. | Level 1: Remember |
| **CO2** | Understand the methods and techniques for mitigating power quality disturbances, including protection devices and harmonic filters. | Level 2: Understand |
| **CO3** | Apply solutions to improve power quality, focusing on end-user level strategies and distributed generation integration. | Level 3: Apply |
| **CO4** | Analyse the effects of distributed generation on power quality and assess the performance of electrical systems using monitoring tools. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Power and Voltage Quality:** General Power Quality terms, Introduction to Power Quality Problems, Power frequency variations, the power quality evaluation procedure, Voltage quality- Transients, long and short duration Voltage variations, Voltage imbalance, waveform distortion, Voltage Flicker.

## Unit-II

**Voltage Sags and Interruptions:** Sources of sags and Interruptions, Estimating Voltage sag performance, Fundamental Principles of Protection, Solutions at the end-user level, Evaluating Ride-through Alternatives, Motor-Starting Sags.

## Unit-III

**Fundamentals of Harmonics:** Harmonic distortion, Voltage versus Current distortion, Harmonic indexes, Harmonic sources from commercial loads, Harmonic sources from industrial loads, Locating Harmonic sources. System response characteristics. Effects of Harmonic Distortion. Wiring and Grounding: Resources, Definitions, Reasons for Grounding, Typical wiring and grounding problems, Solution to wiring and grounding problems.

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## Unit-IV

**Distributed Generation and Power Quality:** Resurgence of Distributed Generation (DG), DG Technologies, Interface to the Utility System, Power Quality Issues, Operating Conflicts, DG on distribution Networks, Siting DG distributed Generation, Interconnection standards.

**Power Quality Monitoring:** Monitoring Considerations. Historical Perspective of Power Quality Measurement Equipment. Assessment of Power Quality.

### Suggested Readings


- Electrical Power Systems Quality : by Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H. Wayne Beaty, McGraw Hill.
- Power Quality by C. Sankaran, CRC Press.
- Power Quality by Bipin Singh and Simmi P. Burman, Katson Pub.
- Power Quality in Electrical Systems by Alexander Kusko, Tata McGraw Hill.
- Power Quality in Electrical Systems by Ms. J. Hanest Angel Priyadharshini, Mrs. K. Bhanuteja, Dr. Rajesh Thipparaju, Dr. P. Hemachandu, SIPH.
- Power Quality and Harmonics Management in Modern Power Systems by M. Rawa, Z. M. Ali, and S. H.E. Abdel Aleem, Eds'. IntechOpen.


### Useful Video Links

| Unit No. | Topic | Links |
|---|---|---|
| Unit-I | Power Quality Problems | https://www.youtube.com/watch?v=o5ksmUHnMRs |
| Unit-II | Sources of sags | http://www.digimat.in/nptel/courses/video/108105104/L26.html |
| Unit-III | Harmonic distortion. | https://www.youtube.com/watch?v=2VMrBBuWqSA |
| Unit-IV | DG Technologies. | https://jkccollege.digimat.in/nptel/courses/video/108108034/L02.html |

HOD EE

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|---|---|---|---|---|---|
| Course Code | **PEC-MTEPS-207A** | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Digital Control System** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To enable students to understand discrete-time control system concepts and signal processing.<br>• To impart knowledge about Z-transform and state-space methods for analysis and design.<br>• To provide a comprehensive understanding of digital controller implementation using microprocessors and DSPs.<br>• To impart knowledge of state-space representation and analysis of discrete-time systems, focusing on controllability, observability, pole placement, and state observer design, enabling students to design advanced digital control systems using modern control techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the fundamentals of digital control systems and signal processing. | Level 1: Remember |
| **CO2** | Understand the state-space models of discrete systems, and design controllers and observers using pole placement and other modern control techniques. | Level 2: Understand |
| **CO3** | Apply Z-transform techniques for system modeling and stability analysis. | Level 3: Apply |
| **CO4** | Analyze the implementation of control systems using microprocessors and digital signal processors, considering practical issues like finite word length and quantization effects. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Discrete Data and Digital Control Systems:** Basic elements, advantages and disadvantages, examples, - Impulse sampling and data hold – transfer functions of Zero order hold and First order hold. Reconstructing original signals from sampled signals – sampling theorem, ideal low pass filter, frequency response characteristics of the zero-order hold. Transient response specifications, steady state error analysis. Design based on frequency response method, Analytical design method.

## Unit-II

**Z-Transform Techniques:** The Z-transform, Z transforms of some elementary functions, Important properties and theorems of the Z-transform, The inverse Z-transform, S-transform method for solving difference equations, the pulse transfer function, realization of digital controllers. Mapping between the s-plane and the z-plane, the Jury stability test, stability analysis by use of the bilinear transformation and Routh stability criterion, Liapunov stability analysis of discrete time systems.

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## Unit-III

**State Space Model:** Concept of the state space method, State space representations of discrete-time Systems, solving discrete-time state space equations. Discretisation of continuous-time state-space equations. Controllability, Observability, Principle of Duality, Design via pole placement, necessary and sufficient condition. Ackerman's formula, Dead Beat response, State observers – necessary and sufficient condition for state observation, full order state observer, minimum order state observer.

## Unit-IV

**Microprocessor and DSP Control:** Microprocessor control of control systems, single-boar controllers with custom-designed, DMC – 105 board, digital signal processors, TMS 320 DSMTEPS, development system and support tools, Effects of finite word length and quantization on controllability and closed loop pole placement. Effect of quantization, least upper bound on quantization error.

### Suggested Readings

- Control System Engineering by I.J. Nagrath & M. Gopal, New Age International Publishers.
- Control System Engineering by Norman S. Nise, Wiley.
- Linear Control System (with MATLAB Applicatons) by B.S. Manke, Khanna Publishers.
- Digital Control Engineering by M Gopal, New Age International Publishers.
- Discrete-time Control Systems by K.Ogata (2nd ed.), Pearson Education Asia.
- Digital Control Systems by B.C.Kuo, Oxford University Press.
- Digital Control Systems by Constantine H. Houpis & Gary B. Lamont, McGraw Hill.

### Useful Video Links

| Unit No. | Topic | Links |
|---|---|---|
| Unit-I | Transfer functions of Zero | https://www.youtube.com/watch?v=jgAqhjoQ5A8 |
| Unit-II | Z transforms | https://www.youtube.com/watch?v=pTTTOuUps7I |
| Unit-III | State space representations of discrete-time Systems | https://m.youtube.com/watch?v=Tj8dVeswiyk |
| Unit-IV | Microprocessor control of control systems | http://digimat.in/nptel/courses/video/108105102/L59.html |

HOD EE

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|---|---|---|---|---|---|
| Course Code | PEC-MTEPS-209A | | | | |
| Category | Professional Elective Courses | | | | |
| Course Title | **Demand Side Energy Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>• To enable students to learn energy audit techniques and economic evaluation methods.<br>• To impart knowledge of energy conservation strategies in industries and utilities.<br>• To provide a comprehensive understanding of designing and optimize energy-efficient lighting, HVAC, and water heating systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall energy audit methods and economic evaluation techniques, such as cost-benefit analysis, payback periods, and NPV. | Level 1: Remember |
| CO2 | Explain energy-efficient lighting systems, including the use of LED technology and lamp selection for optimized energy usage. | Level 2: Understand |
| CO3 | Apply energy-saving strategies in electrical systems and industrial settings, focusing on load management and power factor improvement. | Level 3: Apply |
| CO4 | Analyze the energy-efficient solutions for heating, ventilation, air-conditioning, and water heating, along with energy storage systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Energy Audit:** Definitions, need, concepts, types of energy audit, energy index, cost index, pie charts, Sankey diagrams.

**Energy Economics:** Introduction, Cost benefit risk analysis-Payback Period-Straight line depreciation-Sinking fund depreciation, Reducing balance depreciation, Net present value method-Internal rate of return method, Profitability index for benefit cost ratio.

## Unit-II

**Energy Conservation in Electric utilities and Industry:** Energy and load management devices-Conservation strategies; conservation in electric utilities and industry: Introduction-Energy conservation in utilities by improving load factor- Utility voltage regulation-Energy conservation in Industries-Power factor improvement.

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**Energy–efficient Electric Motors (EEMs):** Energy efficient motors-construction and technical features-case studies of EEMs concerning cost effectiveness-performance characteristics; Economics of EEMs and system life cycle-direct savings and payback analysis-efficiency factor or efficiency evaluation factor

## Unit-III

**Energy Audit of Lighting Systems:** Fundamentals of Lighting, Different Lighting Systems, Ballasts, Fixtures (Luminaries), Reflectors, Lenses and Louvres, Lighting Control Systems, Lighting System Audit, Energy Saving Opportunities.

**Energy Audit Applied to Buildings:** Energy Saving Measures in New Buildings, Water Audit, Method of Audit, General Energy Savings Tips Applicable to New as well as Existing Buildings.

## Unit-IV

**Space Heating, Ventilation, Air-Conditioning (HVAC) and Water Heating:** Introduction-Heating of buildings, Transfer of Heat-Space heating methods, Ventilation and air-conditioning, Insulation, Cooling load, Electric water heating systems, Energy conservation methods.

**Co-generation and Storage:** Combined cycle cogeneration, energy storage: pumped hydro schemes, compressed air energy storage (CAES), storage batteries, superconducting magnetic energy storage (SMES).

**Suggested Readings:**


- Energy Management Hand book by Wayne C.Turner, John Wiley and sons publications
- Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw-Hill Publishing Company Ltd. New Delhi
- Energy efficient electric motors selection and application by John C. Andreas, Marcel Dekker Inc.
- Hand book on Energy Audit and Management by Amit kumar Tyagi, Published by TERI (Tata Energy Research Institute)
- Energy Management by Paul W.O' Callaghan, McGraw Hill Book Company.
- Energy conversion systems by Rakesh Das Begamudre, New Age International Publishers
- Energy Management by W.R. Murphy & G.Mckey, Butterworths.
- Energy Management by Umesh Rathore, Katson Books.


**Useful Video Links:**

| Unit No. | Topic | Links |
|---|---|---|
| Unit-I | Energy audit | https://www.youtube.com/watch?v=kEP6S6RGstE |
| Unit-II | Load management | http://www.digimat.in/nptel/courses/video/109106407/L13.html |
| Unit-III | Replacement of existing systems-priorities | https://nptel.ac.in/courses |
| Unit-IV | Transfer of Heat-Space heating methods | http://www.digimat.in/nptel/courses/video/112101097/L04.html |

HOD EE

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|---|---|---|---|---|---|
| Course Code | **PROJ-MTEPS-211A** | | | | |
| Category | Project Courses | | | | |
| Course Title | **Project** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Identify suitable research topics in Electric Power Systems Engineering for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe complex engineering problems relevant to project work based on domain knowledge and real-world challenges. | Level 1: Remember |
| **CO2** | Explain the workflow, technical background, and tools required for planning and executing engineering projects. | Level 2: understand |
| **CO3** | Apply appropriate methods, tools, and techniques to carry out project development and prepare technical documentation. | Level 3: Apply |
| **CO4** | Analyze the key stages of project development to ensure systematic execution and identify performance issues. | Level 4: Analyze |
| **CO5** | Evaluate alternative approaches and select suitable methodologies to achieve optimal and feasible project outcomes. | Level 5: Evaluate |
| **CO6** | Design innovative and practical engineering solutions to address societal and industrial needs. | Level 6: Design |

**Project Guidelines:**

- Students shall undertake projects individually or in small teams (2–4 members).
- Projects must be approved by the department project committee before commencement.
- Regular progress reviews will be conducted throughout the semester.
- A final report with less than 10% plagiarism, a working prototype, and oral presentation are required for evaluation.

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| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MTEPS-213A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar-III** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Develop students' ability to effectively present research topics and findings by effective communication.<br>• Improve problem-solving and critical thinking skills of the students.<br>• Expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | -- | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Identify the trends and advancements in the related field. | Level 1: Remember |
| CO2 | Understand research literature with in-depth reviews of key studies and methodologies. | Level 2: Understand |
| CO3 | Apply the knowledge to identify, formulate the problem to propose the solution. | Level 3: Apply |
| CO4 | Analyze and synthesise research findings to the agreed area of research carried out and impact on society, economy and environment. | Level 4: Analyze |
| CO5 | Evaluate a sound technical knowledge of their research field. | Level 5: Evaluate |

**Overview:**
This course is designed to help M. Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

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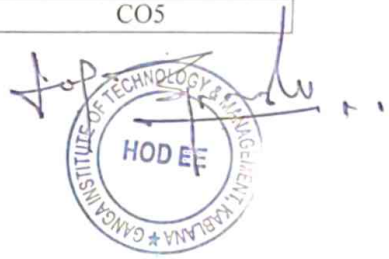
**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | CO1 |
| 2 | Literature Survey | 10 | CO2 |
| 3 | Content Relevancy | 10 | CO3 |
| 4 | Presentation Skills | 10 | CO4 |
| 5 | Q&A Response | 10 | CO5 |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTEPS-215A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Literature Survey (Dissertation Stage-I)** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Introduce students to identifying in relevant research topics in Electrical Engineering.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | - | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Identify the research topic/area relevant to the field of Electric Power systems to carry out independent research. | Level 1: Remember |
| CO2 | Understand the research process, literature review, result formulation and writing conclusions concerning existing literature. | Level 2: Understand |
| CO3 | Apply appropriate tools, references and writing skills for effective report writing related to research work. | Level 3: Apply |
| CO4 | Analyze and synthesize research findings to the agreed area of research carried out. | Level 4: Analyze |
| CO5 | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. | Level 5: Evaluate |
| CO6 | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. | Level 6: Create |

**Note:** Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Stage-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

HOD EE

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|---|---|---|---|---|---|
| Course Code | **DISS-MTEPS-202A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation Stage-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Introduce research fundamentals and help to identify the relevant topics in Electrical Engineering.<br>• Understand structure of research methodology, literature review, and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total Marks | 750 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Identify the research topic/area relevant to the field of Electric Power Systems to carry out independent research. | Level 1: Remember |
| **CO2** | Understand the research process, literature review, result formulation and writing conclusions with reference to existing literature. | Level 2: Understand |
| **CO3** | Apply appropriate tools, references and writing skills for effective report writing related to research work. | Level 3: Apply |
| **CO4** | Analyze and synthesize research findings to the agreed area of research carried out. | Level 4: Analyze |
| **CO5** | Evaluate the research methods and available knowledge to propose appropriate solutions to the specific research problem. | Level 5: Evaluate |
| **CO6** | Design engineering solutions by developing improved results, properly documenting them in a thesis or report, and publishing them in journals or conferences. | Level 6: Create |

**Dissertation Stage-II Guidelines:**

Dissertation Stage-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided

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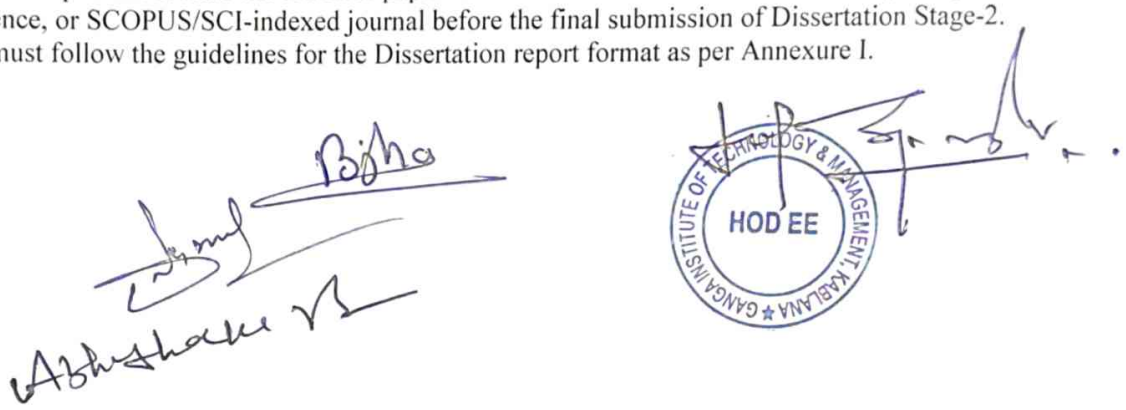
to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a reputed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Stage-2.
- The student must follow the guidelines for the Dissertation report format as per Annexure I.



| Course Code | OEC-143A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Open Elective Courses | | | | |
| Course Title | MATLAB | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are to<br>• Learn fundamental MATLAB operations, variable management, and using built-in functions for computation.<br>• Master creating and manipulating arrays and matrices, including element-wise operations.<br>• Develop skills in plotting and formatting various types of data visualizations, such as 2D, 3D, and polar plots.<br>• Gain proficiency in writing functions, using control structures, and understanding the difference between script and function files. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Understand MATLAB scripts to perform arithmetic operations and mathematical functions. | Level 2: Understand |
| CO2 | Apply MATLAB plotting functions such as plots, histograms, and error bars to visualize data in one and two dimensions. | Level 3: Apply |
| CO3 | Analyze matrices, one-dimensional and two-dimensional arrays, and perform element-wise operations using MATLAB. | Level 4: Analyze |
| CO4 | Evaluate MATLAB programs using arithmetic operators, conditional statements, loops, and user-defined functions with local and global variables. | Level 5: Evaluate |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction:** Starting MATLAB, working in command window, Arithmetic operations, Display formats, Elementary Math Built-in functions, defining scalar variables, useful commands for managing variables, Script files, Examples of MATLAB applications.

**Unit-II**

**Creating arrays and Mathematical operations with arrays:** Creating 1- dimensional and 2- dimensional arrays, The Transpose operator, Array addressing, using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements, Built in functions for handling arrays, Strings and strings as variables, Addition and Subtraction, Array Multiplication and Division, Element-by-Element operations, using arrays in MATLAB built-in math functions, Built in functions for analyzing arrays, Generation of Random Numbers, Examples of MATLAB applications.

**Unit-III**

**Two Dimensional and Three-Dimensional Plots:** plot, fplot commands, formatting a plot, plots with logarithmic axes, error bars, special graphics, Histograms, Polar plots, putting multiple plots on the same page, Multiple figure windows, Examples, Line plots, Mesh and surface plots, plots with special graphics, The view command, Examples of MATLAB applications.

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## Unit-IV

**Programming in MATLAB:** Relational and Logical operators, conditional statements, the switch-case statement, Loops, Nested Loops and Nested conditional statements, the break and continue commands, creating a function file, structure of a function file, Local and Global variables, saving a function file, using a User-defined function, Examples of simple User-defined functions, comparison between script files and function files.

### Suggested Readings

- MATLAB: An Introduction with applications by Amos Gilat, Wiley India Pvt. Ltd, 4th Ed., 2012.
- Getting started with MATLAB by Rudra Pratap, Oxford University Press, 2010
- MATLAB and SIMULINK for Engineers by Agam Kumar Tyagi, Oxford University Press, 2012.

### Useful Video Links:

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | MATLAB | https://nptel.ac.in/courses/103106118 |
| Unit-II | Creating arrays and Mathematical operations with arrays | https://archive.nptel.ac.in/content/storage2/courses/108102044//matlab/module1/module1-1_middle.htm |
| Unit-III | Two Dimensional and Three Dimensional Plots | https://www.mathworks.com/help/matlab/learn_matlab/plots.html |
| Unit-IV | Programming for numerical computations | https://nptel.ac.in/courses/103106118 |

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| Course code | OEC-145A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Open Elective Courses | | | | |
| Course title | **Sources of Energy-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To understand the production and applications of biogas from biomass, including the types and operation of biogas plants.<br>• To explore the principles, performance, and limitations of wave and tidal energy systems.<br>• To study the properties, production, and environmental impacts of petroleum and coal, including clean coal technologies.<br>• To learn the basics of nuclear fission, fusion, and the functioning of nuclear reactors for energy production. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Understand the working principles, performance, and limitations of ocean thermal energy conversion and tidal wave energy systems | Level 2: Understand |
| **CO2** | Apply biomass energy by explaining the design, operation, and application of floating drum and fixed dome type biogas plants. | Level 3: Apply |
| **CO3** | Analyze coal and nuclear energy sources by evaluating coal composition, fixed carbon content, molecular structure, and nuclear fission/fusion processes for electricity generation. | Level 4: Analyze |
| **CO4** | Compare petroleum products based on their origin, extraction, physical properties, production processes, composition, and octane rating. | Level 5: Evaluate |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Bio-mass:** Introduction of biogas, Availability of bio-mass and its conversion theory, classification of biogas plants, principle & working of floating drum plant & fixed dome type plant- advantages & disadvantages. Biogas from plant waste, community biogas plants, utilization of biogas.

**Unit-II**

**Ocean Thermal Energy:** Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle, working, performance and limitations.

**Unit-III**

**Petroleum and Coal energy:** Petroleum, origin, composition, production, extraction, octane number, kerosene, LPG, lubricants natural gas, physical properties and uses of coal, generis of coal, molecular structure, determination of fixed carbon content, coal for generation of electricity, zero emission power plants, coal reserves and mining.

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**Petroleum and Coal energy**: Petroleum, origin, composition, production, extraction, octane number, kerosene, LPG, lubricants natural gas, physical properties and uses of coal, generis of coal, molecular structure, determination of fixed carbon content, coal for generation of electricity, zero emission power plants, coal reserves and mining.

**Unit-IV**

**Nuclear Energy:** Nucleus and its constituents, charge mass, isotopes, isobars, mass defect, binding energy and nuclear stability, radiation and nuclear reactions. Nuclear fission, chain reaction, U235, U238, controlled nuclear fission and nuclear reactors, fast breeder reactor, nuclear fusion, condition for nuclear fusion reaction, Hydrogen bomb, nuclear bomb.

## Suggested Readings


- Renewal Energy Resources by John Twideu and Tony Weir, BSP Publications, 2006
- Energy Resources: Conventional & non-conventional by M.V.R. Koteswara Rao, BSP Publications, 2006.
- Non-Conventional Energy Resources by D.S. Chauhan, New Age International.
- Renewal Energy Technologies: A Practical Guide for Beginners by C.S. Solanki, PHI Learning.
- Advances in energy system and Technology by Peter Auer, Vol I & II Edited by Academic Press.
- Non-conventional Energy sources by G.D. Rai, Khanna Publishers
- Introduction to Non-Conventional Energy Resources by Scitech Publications


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Bio-mass energy<br>Biomass types and characterization | https://archive.nptel.ac.in/courses/103/103/103103207/<br>https://archive.nptel.ac.in/courses/103/103/103103206/ |
| Unit-II | Ocean thermal energy | https://archive.nptel.ac.in/courses/108/105/108105058/ |
| Unit-III | Petroleum energy<br>Coal energy | https://archive.nptel.ac.in/courses/103/102/103102022/<br>https://archive.nptel.ac.in/courses/103/107/103107157/ |
| Unit-IV | Fundamentals of nuclear power<br>Radioactivity & nuclear reactions<br>Nuclear fission<br>Thermal reactors | https://archive.nptel.ac.in/courses/112/103/112103243/ |

GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD EE

**DEPARTMENT OF CIVIL ENGINEERING**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

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## Minutes of 2nd meeting of Board of Studies of Civil Engineering Department

The 2nd meeting of Board of Studies of Civil Engineering Department was held on 25.05.2025 at 10:00 A.M in the Conference Hall of the Institute.

The following members were present for the BOS meeting:

| Sr. No. | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Mr. Virender Singh | Chairperson | HOD & Assistant Professor, Civil, GITAM, Kablana |
| 2 | Dr. Isha Verma | Member | Subject Expert (Assistant Professor, Civil, UIET, MDU Rohtak), University Nominee |
| 3 | Dr. Vikas Garg | Member | Subject Expert ( Professor, Civil, Central University Mahendergarh), Outside Parent University |
| 4 | Dr. Mahesh Pal | Member | Subject Expert ( Professor, Civil, NIT Kurukshetra) Outside Parent University |
| 5 | Mr. Bhupender Malik | Member | Assistant Professor, Civil, GITAM Kablana |
| 6 | Md. Anzar Rabbani | Member | Assistant Professor, Civil, GITAM Kablana |
| 7 | Mr. Mukesh | Member | Assistant Professor, Civil, GITAM Kablana |
| 8 | Ms. Sheela Malik | Member | Assistant Professor, Civil, GITAM Kablana |
| 9 | Ms. Anju | Member | Assistant Professor, Civil, GITAM Kablana |
| 10 | Ms. Varsha Khanna | Member | Assistant Professor, Civil, GITAM Kablana |
| 11 | Mr. Akhilesh | Member | Assistant Professor, Civil, GITAM Kablana |
| 12 | Mr. Sachin Dalal | Member | Assistant Professor, Civil, GITAM Kablana |
| 13 | Mr.Himalaya | Member | Assistant Professor, Civil, GITAM Kablana |
| 14 | Mr. Prince | Member | Assistant Professor, Civil, GITAM Kablana |
| 15 | Ms. Jyoti | Member | Assistant Professor, Civil, GITAM Kablana |
| 16 | Ms. Pinki | Member | Assistant Professor, Civil, GITAM Kablana |
| 17 | Ms. Nirmala | Member | Assistant Professor, Civil, GITAM Kablana |
| 18 | Mr. Chetan | Member | Assistant Professor, Civil, GITAM Kablana |
| 19 | Dr. Tinku Biswas | Member | Industry/ Corporate Sector |
| 20 | Mr. Aman Dalal | Member | Alumni |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Agenda wise Discussion and Resolutions**

**Item No. 1**
Confirmation of the minutes of 1st Meeting of the Board of Studies of Civil Engineering Department held on 03.01.2025

**The minutes of 1st meeting of the Board of Studies of Civil Engineering Department held on 03.01.2025 (Annexure-I, Page 1-3 already circulated) be confirmed.**

**Item No. 2**
Follow up action report of the decisions taken in the 1st Meeting of Board of Studies held on 03.01.2025

**The follow up action of the decisions taken in the 1st Meeting of Board of Studies held on 03.01.2025 (Annexure-II, Page No. 4 already circulated) be confirmed.**

**Item No. 3**
Proposal to add one Professional Elective Course "FINITE ELEMENT METHOD (PEC-MTSD-118A)" in 2nd Semester M.Tech. Structural Design from academic year 2025-26

**Resolved that one course as Professional Elective Course "FINITE ELEMENT METHOD (PEC-MTSD-118A)" in M.Tech. Structural Design 2nd Semester from academic year 2025-26 (Annexure III, Pages 5-6) is to be added and further resolved that the same is recommended to the Academic Council for approval.**

**Item No. 4**
Scheme of Examinations and Syllabus of 2nd year M.Tech. Structural Design from Academic year 2025-26

**Resolved that Scheme of Examinations and Syllabus of 2nd year M.Tech. Structural Design from Academic year 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure IV, Pages 7-29).**

**Item No. 5**
Scheme of Examinations and Syllabus of Multidisciplinary Open Elective-II courses offered by the Civil Engineering Department for various PG Programs offered by the Institute for academic year 2025-26

**Resolved that Scheme of Examinations and Syllabus of 2nd year of Multidisciplinary Open Elective-II courses offered by the Civil Engineering Department for various PG Programs offered by the Institute for academic year 2025-26 be approved and further resolved that**

**the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure V, Pages 30-33).**

**Item No. 6**

Scheme of Examinations and Syllabus of 2nd year B.Tech. Civil Engineering from Academic year 2025-26

**Resolved that Scheme of Examinations and Syllabus of 2nd year B.Tech. Civil Engineering from Academic year 2025-26 be approved and recommended to the Academic Council for the approval (Annexure VI, Pages 34-75).**

**Item No. 7**

Review of the Panel of Examiners for Theory and Practical Examinations of B.Tech Civil Engineering and M.Tech. Structural Design programs for academic year 2025-26

**The panel of examiners for Theory and Practical Examinations of B.Tech Civil Engineering and M. Tech. Structural Design programs for academic year 2025-26 be reviewed and approved. The same can be sent to the Controller of Examinations of the Institute for the Information (Annexure VII, Pages 76-77).**

**Item No. 8**

Any other item with the permission of the chair.

8.1 To approve the Scheme of Examinations and Syllabus of the course name Basics of Civil Engineering to be offered to First year B.Tech. Civil Engineering students from Academic year 2025-26

**Resolved that the Scheme of Examinations and Syllabus of Basics of Civil Engineering to be offered to First year B.Tech. students from Academic year 2025-26 and the same the recommended to the Board of Studies of Applied Science and Humanities for further necessary actions (Annexure VIII, Pages 78-79).**

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Civil Engineering Department**

**Endst No.** GITAM/BOSCE/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC

- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs




**Chairperson**
**Board of Studies**
**Civil Engineering Department**

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-MTSD-118A** | | | | |
| Category | **Professional Elective courses** | | | | |
| Course title | **Finite Element Method** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are to<br>• To introduce the basics of FEM and its application to structural elements like bars and beams.<br>• To develop skills in formulating stiffness matrices using weighted residual and Galerkin methods.<br>• To understand various element types and apply FEM to plane stress, strain, and axi-symmetric problems.<br>• To implement FEM using computational tools and commercial FEA software. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| CO1 | Understand the basic principles of FEM and formulate stiffness matrices for bar and beam elements |
| CO2 | Apply the method of weighted residuals and Galerkin method to derive element equations. |
| CO3 | Analyze structural and solid mechanics problems using different element types and isoparametric formulations. |
| CO4 | Design commercial FEA software to model, solve, and interpret results for engineering problems. |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No | Contents |
|---|---|
| **Unit-I** | **Introduction:** History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress |
| **Unit-II** | **Beam Elements:** Flexure Element, Element Stiffness Matrix, Element Load Vector.<br>**Method of Weighted Residuals:** Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications. |
| **Unit-III** | **Types:** Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.<br>**Application to Solid Mechanics:** Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi- Symmetric Stress Analysis, Strain and Stress Computations. |
| **Unit-IV** | **Computer Implementation** of FEM procedure, Pre-Processing, Solution, Post-Processing, Use of Commercial FEA Software. |

**Suggested Readings:**


- Concepts and Applications of Finite Element Analysis, Cook R. D., Wiley J., New York, 1995.
- Finite Element Analysis, Buchanan G.R., McGraw Hill Publications, New York, 1995.
- Finite Element Methods in Engineering, Belegundu A.D., Chandrupatla, T.R., Prentice Hall India, 1991.
- Krishnamoorthy, C. S, Finite Element Analysis - Theory and Programming, McGrawHill, 1995.
- R. T. Chandrupatla and A. D. Belegundu, Introduction to Finite Elements in Engineering, PHI Learning Pvt Ltd, New Delhi, 1997.
- S. S. Bhavikatti, Finite Element Analysis, New Age Publishers, 2007.Chennakesava R. Alavala Finite
- Element Methods: Basic Concepts and Applications, Prentice Hall Inc., 2010.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Assembly of Global Stiffness Matrix | https://youtu.be/hiymSIY0GDk?si=8Y8HJ4z6WRl-yTOP |
| **Unit-II** | Method of Weighted Residuals | https://youtu.be/P5t-nYmlVRU?si=EFx4wwCBCj-CHVxQ |
| **Unit-III** | Isoparametric Element | https://youtu.be/PhedVyx_G8o?si=WH4BG7wC060DpUCF |
| **Unit-IV** | FEA Software | https://youtu.be/ul3ZbEeFHx8?si=gbG-kq7KqkHTkX2x |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.),**
**DELHI-NCR**
**Scheme of Studies and Examination**
**M.Tech (Structural Design) –3rd Semester**
***w.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Professional Core Courses | PCC-MTSD-201A | Structural Dynamics and Earthquake Engineering | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Mandatory Learning course | MLC-01A | Research Methodology and IPR | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Elective Courses | Refer Table -IV | ---------- | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Multidisciplinary Open Elective Courses | Refer Table -V | ---------- | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Lab Courses | LC-MTSD-215A | Computational Laboratory-III | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 6 | Project Courses | PROJ-MTSD-205A | Project Lab | 0 | 0 | 4 | 4 | 2 | 50 | | 50 | 100. | 3 |
| 7 | Seminar | SM-MTSD-207A | Seminar -III | 0 | 0 | 2 | 2 | 2 | 50 | | | 50 | |
| 8 | Dissertation (Literature Survey) | DISS-MTSD-209A | Dissertation Phase-I | 0 | 0 | 4 | 4 | 2 | 100 | | | 100 | |
| | | | **Total Credits** | | | | | **21** | | | | **700** | |

**Note:** Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department. Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.
The committee will evaluate both presentations and award Sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.





**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.), DELHI-NCR**

**Scheme of Studies and Examination**

**M.Tech (Structural Design) –4th Semester**

***w.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTSD-202A | Dissertation and viva (Dissertation Stage 2) | - | - | - | - | 20 | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20** | | | | **750** | |

Dissertation Stage-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Stage-2.
- The student must follow the guidelines for the Dissertation report format as per Annexure-I.



GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD-CIVIL

**(Professional Elective Courses): Table IV**

| S. N. | Course Code | Course Name |
|---|---|---|
| 1 | PEC-MTSD 209A | Design of Bridges |
| 2 | PEC-MTSD 213A | Design of Hydraulic Systems |
| 3 | PEC-MTSD 211A | High Rise Structures |

**Table-V**
**Multidisciplinary Open Elective –II Courses**

| .N. | Course Code | Course Name | Offered by Department |
|---|---|---|---|
| 1 | OEC-131A | Fundamental of Income Tax | Management Department |
| 2 | OEC-133A | Stress Management | Management Department |
| 3 | OEC-135A | Fundamental of Marketing | Management Department |
| 4 | OEC-137A | Business Analytics | Management Department |
| 5 | OEC-139A | Statistical Tools using SPSS | Applied Sc. & Humanities (Mathematics) |
| 6 | OEC-141A | Mathematical Techniques and Applications | Applied Sc. & Humanities (Mathematics) |
| 7 | OEC-143A | MATLAB | Electrical Engineering |
| 8 | OEC-145A | Sources of Energy -II | Electrical Engineering |
| 9 | OEC-147A | Natural and Manmade Disaster | Civil Engineering |
| 10 | OEC-149A | Optimization Techniques | Computer Sc. & Engineering |
| 11 | OEC-151A | Composite Materials | Mechanical Engineering |
| 12 | OEC-153A | Cost Management of Engineering Projects | Mechanical Engineering |
| 13 | OEC-155A | Voice and Data Network | Electronics and Communication Engineering |
| 14 | OEC-157A | IT for Professionals | Computer Sc. & Applications |

GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD-CIVIL

**M.Tech (Structural Design) –3rd Semester**
***w.e.f.* 2025-26**

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PCC-MTSD-201A** | | | | |
| Category | Professional Core Courses | | | | |
| Course title | Structural Dynamics and Earthquake Engineering | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are to<br>• To introduce the fundamental principles of structural dynamics and the behavior of structures under dynamic loads.<br>• To develop analytical and computational skills to analyze single and multi-degree of freedom systems.<br>• To impart knowledge about response spectrum and time-history methods of earthquake analysis.<br>• To familiarize students with nonlinear structural behavior, ductility, and software tools for dynamic analysis | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define dynamic parameters and equations of motion for SDOF and MDOF systems. | Level 1: Remember |
| CO2 | Explain response spectrum, time history and modal analysis concepts for seismic loading. | Level 2: Understand |
| CO3 | Apply dynamics principles to compute SDOF and MDOF response under various loads. | Level 3: Apply |
| CO4 | Analyze seismic response of multi-storey buildings using response spectrum, time history and software-based elasto-plastic models. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Equation of Motion for SDOF system subjected to base excitation, Equation of Motion for MDOF system subjected to base excitation, Response spectrum analysis, Time history analysis

**Unit-II**

Modal superposition for MDOF system, Step-by-step integration for MDOF system, Numerical evaluation of dynamic response, Computer implementation

**Unit-III**

Modal participation factor, Mass participation factor, Modal combination rules, Missing mass correction, Response spectrum analysis (detailed)

**Unit-IV**

Analysis of secondary systems, Evaluation of floor response spectra, Response of elasto-plastic system, Effect of yield force, Ductility, Use of NONLIN software, Earthquake response of multistory buildings, Torsional response of building

**Suggested Readings:**


- Chopra, A. K, "Dynamics of Structures", Prentice Hall, 1995.
- Clough, R.W.; Penzin, J.,"Dynamics of Structures", McGraw Hill, 1993.
- Humar, J. L., "Dynamics of Structures", Prentice Hall, 1990.
- Timoshenko, S., "Advanced Dynamics", McGraw Hill Book Co; NY, 1948.
- Paz M, "Structural Dynamics", CBS Publishers; N-Delhi, 1995.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1** | Equation of Motion for SDOF system subjected to base excitation, | https://www.youtube.com/watch?v=NrgzRbZMjuA |
| **2** | Modal superposition for MDOF system, Step-by-step integration for MDOF system | https://www.youtube.com/watch?v=ositbkD5J2M |
| **3** | Mode Participation Factor and Effective Mass | https://www.youtube.com/watch?v=TO0gD-GpTfU |
| **4** | Inelastic Seismic Response of Structures | https://www.youtube.com/watch?v=UHV77TS9X1A |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MLC-01A** | | | | |
| Category | Mandatory Learning Course | | | | |
| Course Title | **Research Methodology and IPR** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are:<br>• To enable students to identify and define research problems, formulate objectives and apply appropriate investigative approaches in research methodology.<br>• To impart knowledge of data sources, data collection methods, data processing and the application of statistical tools for research analysis.<br>• To develop awareness of research ethics, plagiarism issues and effective practices in technical writing, report preparation, and research documentation.<br>• To provide a comprehensive understanding of intellectual property rights, patent procedures, technology transfer and international frameworks for innovation protection. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Identify research problems, objectives, and data sources based on fundamental research methodology principles. | Level 1: Remember |
| **CO2** | Explain intellectual property rights, patent procedures, and international frameworks for technology transfer and innovation protection. | Level 2: Understand |
| **CO3** | Apply research ethics to prepare plagiarism-free technical reports, research papers, and proposals using effective writing and presentation techniques. | Level 3: Apply |
| **CO4** | Analyze research data through classification and tabulation to extract meaningful patterns and conclusions using statistical tools and methods. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

## Unit-II

Effective literature studies approaches, analysis, Plagiarism, Research ethics, Effective technical writing, how to write the report, Paper, Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

## Unit-III

Sampling Methods, Need, Meaning & Type of Sample, Sources of Data, Primary and Secondary, Classification and Tabulation of Data Processing, Analysis and Interpretation of Data, Chi Square Test, significance of statistics in Socio-legal Research, Use of Computer in the Research field work and report writing.

## Unit-IV

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property, Procedure for grants of patents, Patenting under PCT. Patent Rights: Scope of Patent Rights, Licensing and transfer of technology.

**Suggested Readings**


- Research Methodology: Methods and Techniques (4th ed.) by Kothari C. R., & Garg, G, New Age International Publishers.
- Research Methodology: A step-by-step Guide for Beginners (4th ed.) by Kumar, R, SAGE Publications India. ISBN: 978-9351501337
- Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets (6th ed. ) by Bouchoux, D.E, Cengage Learning.
- Intellectual Property Rights under WTO by T. Ramappa, S.Chand.


### Useful Video links

| Unit No. | Topic | Links |
|---|---|---|
| **Unit I** | Defining/formulating research problem, Research types, descriptive, analytical, action, empirical, research methodology | https://www.youtube.com/watch?v=oTc4_zjmev0<br>https://www.youtube.com/watch?v=tjDBPRoyDJA |
| **Unit II** | Types of Plagiarism<br>Research Ethics | https://www.youtube.com/watch?v=5--ssYqyWoE<br>https://www.youtube.com/watch?v=4tRCov8pVgQ |
| **Unit III** | Primary data and Secondary Data Sampling techniques | https://www.youtube.com/watch?v=caUiRsg5M6k<br>https://www.youtube.com/watch?v=sKtoW5cXt14 |

| | | |
|---|---|---|
| **Unit IV** | Patent Trademarks and Copyrights, What is Patent? Patent Filing Procedure in India. | https://www.youtube.com/watch?v=XQ8tRdcr0xQ<br>https://www.youtube.com/watch?v=azMNrhKRzww |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-MTSD-209A** | | | | |
| Category | **Professional Elective courses** | | | | |
| Course title | Design of Bridges | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are to<br>• Apply IRC specifications and general design considerations in the planning and selection of road bridge types.<br>• Analyze load distribution and structural behavior in short-span and long-span bridges including slab, tee-beam, and box girder bridges.<br>• Evaluate design parameters such as prestressing forces, eccentricity, and cable profiles in prestressed concrete bridge girders.<br>• Design prestressed bridge components using Courbon's theory and exact methods, including checks for stress, shear, and deflection. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Identify IRC specifications and standard loads for road bridges. | Level 1: Remember |
| CO2 | Explain load distribution in slab culvert, T-beam and box girder bridges. | Level 2: Understand |
| CO3 | Apply Courbon's theory and other methods to flexural and torsional effects in prestressed girders. | Level 3: Apply |
| CO4 | Analyze prestressed bridge girders, end blocks and cable zones for stress and deflection. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Introduction: Classification, investigations and planning, choice of type, I.R.C. specifications for road bridges, standard live loads, other forces acting on bridges, general design considerations.

**Unit-II**

Short Span Bridges: Load distribution theories, analysis and design of slab culverts, tee beam and slab bridges. Long Span Girder Bridges: Design principles of continuous bridges, box girder bridges, balanced cantilever bridges.

**Unit-III**

Design Of Prestressed Bridges: Flexural and torsional parameters–Courbon's theory– Distribution co-efficient by exact analysis – Design of girder section – maximum and minimum prestressing forces – Eccentricity – Live load and dead load shear forces–Cable Zone in girder – check for stresses at various sections – check for diagonal tension– Diaphragms – End block –short term and long term deflections.

**Unit-IV**

Design Of Plate Girder Bridges, Bearings And Substructures: Design of riveted and welded plate girder bridges for highway and railway loading – wind effects – main section, splicing, curtailment, stiffeners – Different types of bearings –Design of earings – Design of masonry and concrete piers and abutments – Types of bridge foundations – Design of foundations.

**Suggested Readings:**


- Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 2008.
- Johnson Victor, D. "Essentials of Bridge Engineering", Oxford and IBH Publishing Co. New Delhi, 1990
- Jagadeesh.T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd. 2004.
- Raina V.K." Concrete Bridge Practice" Tata McGraw Hill Publishing Company, New Delhi, 1991.
- Bakht, B. and Jaegar, L.G., "Bridge Analysis Simplified", McGraw Hill, 1985.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1** | Introduction: Classification, investigations and planning, choice of type, I.R.C. specifications for road bridges | https://www.youtube.com/watch?v=RB2k5hSYO3U&list=PLXKZsEFKU _ HHtsCMaAIPB3tr5Ht2Bdge&index=1 |
| **2** | Load distribution theories, analysis and design of slab culverts | https://www.youtube.com/watch?v=RX-WImcb73Y |
| **3** | Design Of Prestressed Bridges | https://www.youtube.com/watch?v=QCothhObKxM |
| **4** | Design Of Plate Girder Bridges | https://www.youtube.com/watch?v=Ch2vAzvXbKI&t=2681s |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-MTSD-211A** | | | | |
| Category | **Professional Elective courses** | | | | |
| Course title | High Rise Structures | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are to<br>• To explain the behavior of tall building frames under lateral and gravity loads, including the effects of foundation settlement.<br>• To apply structural analysis techniques to shear walls, infilled frames, and coupled frame systems for lateral load resistance.<br>• To analyze structural components such as perforated cores, thin-walled tubes under torsion, and floor systems like Vierendel girders and diagrid floors.<br>• To evaluate the stability of frames and shear walls under elastic and inelastic conditions, including the assessment of thermal stress effects in tall buildings. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall tall building frame, lateral load and foundation settlement concepts. | Level 1: Remember |
| CO2 | Explain behavior of shear wall systems and three-dimensional analysis principles. | Level 2: Understand |
| CO3 | Apply analysis methods to perforated cores, thin-tube torsion and diagrid floor systems. | Level 3: Apply |
| CO4 | Analyze elastic and inelastic stability and thermal stresses in tall buildings. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Analysis of tall building frames, Lateral load analysis, multi bay frames, gravity loads, settlement of foundation.

**Unit-II**

Analysis of shear walls - plane shear walls, infilled frames, coupled frames, frames with shear walls. Principle of three dimensional analysis of tall buildings;

**Unit-III**

Perforated cores, Pure torsion in thin tubes, bending and warping of perforated cores. Analysis of floor system in tall buildings, Vierendal girders, diagrid floors.

**Unit-IV**

Elastic and inelastic stability of frames and shear walls. Analysis of thermal stresses.

**Suggested Readings:**

- B S Smith & A Coull, *Tall Building Structures:* - John Wiley & Sons.
- W. Schueller, *High Rise Building Structures*: John Wiley & Sons.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1** | Analysis of tall building frames | https://www.youtube.com/watch?v=VpJvgPVhoOs&list=PLjJwBYxz7Cymoiq357zxoxAq-2iENSJRs |
| **2** | Analysis of shear walls | https://www.youtube.com/watch?v=EyaqPMzC2SY |
| **3** | Pure torsion in thin tubes | https://www.youtube.com/watch?v=TwruPWhc5Q4 |
| **4** | Elastic and inelastic stability of frames | https://www.youtube.com/watch?v=m5Ig4_9gjUE |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-MTSD-213A** | | | | |
| Category | **Professional Elective courses** | | | | |
| Course title | Design of Hydraulic Systems | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are to<br>• Understand the purpose of hydraulic structures and how to prepare investigation reports.<br>• Learn to design and maintain dams, weirs, and barrages.<br>• Design intake structures and water conveyance systems for irrigation and power.<br>• Analyze and design pressure pipes and distribution systems using CAD and numerical methods. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | List functions and components of hydraulic structures. | Level 1: Remember |
| CO2 | Explain design principles of dams, barrages and intakes. | Level 2: Understand |
| CO3 | Apply design methods to canal networks and water conveyance systems. | Level 3: Apply |
| CO4 | Analyze pressure pipe and distribution systems using software. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

Objectives of hydraulic structures in Water resources systems, preliminary investigation and preparation of the reports.

**Unit-II**

Design of water storage structures ; (1)High dams-gravity dams , over flow and non over flow section.(2) Low dams- weirs, earthen dams, vented dams (Barrage), instrumentation and maintenance of dam structures.

**Unit-III**

Collection and conveyance of water. Design of intakes, conveyance system of Irrigation, drinking and hydro power. Design of canal net work.

**Unit-IV**

Hydraulic design of pressure pipes, hydrostatic tests on pipes, design of distribution systems- pressure in distribution systems, nomo graphs, Hardy cross and numerical methods, computer added design (CAD).

**Suggested Readings:.**

- Creager, Justin & Hinds, *Engineering for Dams*, Vols - I, II, III.
- Varshney, *Hydraulic and Irrigation Structures*.
- Varshney, *Hydraullic and Irrigation Structures*.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1** | Objectives of hydraulic structures in Water resources systems | https://www.youtube.com/watch?v=jXw5_wSiy20 |
| **2** | High dams-gravity dams | https://www.youtube.com/watch?v=XflNeCDMEUs |
| **3** | Design of canal net work | https://www.youtube.com/watch?v=6uhC0zjb13Y |
| **4** | Hydraulic design of pressure pipes | https://www.youtube.com/watch?v=gYGDOwcauiw |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-MTSD-215A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Computational Laboratory-III** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are to<br>• To introduce the basic 3-D commands and file types used in AutoCAD for structural drafting.<br>• To develop understanding of scripting, customization, and interfacing AutoCAD with programming tools like C++.<br>• To apply Auto LISP programming and DXF file usage for structural detailing and data exchange.<br>• To explore professional structural engineering software and introduce artificial intelligence applications in the structural domain. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall AutoCAD 3-D commands and file types. | Level 1: Remember |
| CO2 | Explain AutoCAD script files and their integration with C++. | Level 2: Understand |
| CO3 | Apply AutoLISP to develop structural detailing drawings. | Level 3: Apply |
| CO4 | Analyze AutoCAD compatibility with other CAD software through DXF files. | Level 4: Analyze |
| CO5 | Evaluate structural design software such as STAAD.Pro and STRAP. | Level 5: Evaluate |
| CO6 | Create AI-assisted solutions for structural engineering problems. | Level 6: Create |

**List of Experiments**

1. Use basic 3-D commands to create structural elements
2. Identify and use shape files, font files, and menu customization in AutoCAD
3. Develop a simple interface between AutoCAD and C++ for automated drafting
4. Export and import DXF files for interoperability between CAD software
5. Write Auto LISP programs to automate reinforcement detailing
6. Model a simple structure in STAAD.Pro and perform structural analysis
7. Use structural software to design a beam or column as per IS codes
8. Demonstrate the basic use of AI tools (like neural networks or optimization techniques) in solving structural problems

**Useful Video links:**

| Exp. No. | Topics | Links |
|---|---|---|
| **1** | Use basic 3-D commands to create structural elements | https://www.youtube.com/watch?v=VubfYE9D7wU |
| **2** | Identify and use shape files, font files, and menu customization in AutoCAD | https://www.youtube.com/watch?v=De034khldcY |
| **3** | Develop a simple interface between AutoCAD and C++ for automated drafting | https://www.youtube.com/watch?v=dvjfWbvLclk |
| **4** | Model a simple structure in STAAD. Pro and perform structural analysis | https://www.youtube.com/watch?v=IONq0phpb3Y&list=PLWtJ8Twb6Z9P69uaaL89XGZabpKzU7Ar5 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **PROJ-MTSD-205A** | | | | |
| Category | Project | | | | |
| Course Title | **Project Lab** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| **Course Objectives** | The objectives of this course are to<br>• Identify suitable research topics in Civil Engineering for independent investigation.<br>• Understand research methodologies, documentation, and referencing aligned with existing literature.<br>• Develop technical writing skills using appropriate tools, formats, and referencing techniques.<br>• Analyze, interpret, and synthesize research findings within a defined research scope or topic. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify complex engineering problems for project work. |
| **CO2** | Explain project workflow, technical background and tools. |
| **CO3** | Apply methods and tools for project development and documentation. |
| **CO4** | Analyze project stages to ensure systematic execution. |
| **CO5** | Evaluate alternative approaches to select optimal methodologies. |
| **CO6** | Design innovative solutions for societal and industrial needs. |

Each student is required to carry out a hardware-based project and submit a project report on a topic related to Civil Engineering or an interdisciplinary area. The project title and objectives should be chosen by the student in consultation with their allocated Project Guide. The student must present their project in the form of a viva-voce in front of a Project Evaluation Committee. The Head of Department will constitute this committee for evaluation.

**Evaluation Criteria (Total: 50 marks)**

| Sr. No. | Evaluation Parameter | Marks |
|---|---|---|
| **1** | **Problem Definition and Relevancy** — clarity of problem, significance and alignment with discipline | **5** |
| **2** | **Proposed Solution and Implementation** — functionality, originality, technical depth | **5** |
| **3** | **Project Benefit and Impact** — benefits to society, industry, and environment | **10** |
| **4** | **Cost-Effectiveness and Practical Viability** — consideration of cost, resources, and practicality | **10** |
| **5** | **Presentation and Communication Skills (Viva-voce)** — ability to explain, answer questions, confidence, and depth of knowledge | **10** |
| **6** | **Project Report Quality** — clarity, completeness, format, and technical content | **10** |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SM-MTSD-207A** | | | | |
| Category | Seminar | | | | |
| Course Title | **Seminar & Technical Writing** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | **2** | |
| **Course Objectives** | The objectives of this course are to<br>• To develop students' ability to effectively present research topics and findings by effective communication.<br>• To improve problem-solving and critical thinking skills of the students.<br>• To expose students to the latest trends and advancements by reviewing and discussing contemporary research. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | - | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Identify trends and advancements in the related field. | Level 1: Remember |
| CO2 | Summarize key studies, methodologies and research literature. | Level 2: Understand |
| CO3 | Apply problem formulation to propose solutions, considering societal, economic and environmental impact. | Level 3: Apply |
| CO4 | Analyze findings to prepare a well-organized report with effective communication and critical thinking. | Level 4: Analyze |

**Overview:**

This is a course designed to help M. Tech students develop research presentation skills. The focus is on selecting a topic or research paper relevant to their specialization, conducting an in-depth review, and effectively presenting the research findings.

**General Guidelines:**

| | |
|---|---|
| **Topic Selection** | Each student is required to choose the research topic based on published review paper(s) or literature related to their relevant field. The same topic cannot be selected by multiple students. |
| **Approval Process** | The selected paper or topic must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar**

| Sr. No. | Parameters | Marks Allotted | Relevant COs |
|---|---|---|---|
| 1 | Clarity of the topic | 10 | CO1 |
| 2 | Literature Survey | 10 | CO2 |
| 3 | Content Relevancy | 10 | CO3 |
| 4 | Presentation Skills | 10 | CO4 |
| 5 | Q&A Response | 10 | CO4 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTSD-209A** | | | | |
| Category | Dissertation | | | | |
| Course Title | **Dissertation (Phase-1)** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 4 | 2 | |
| **Course Objectives** | The objectives of this course are to<br>• Introduce students to identifying relevant research topics in Civil Engineering.<br>• Explain the research process, including literature review, documentation, and structured writing.<br>• Develop proficiency in using research tools, reference management, and academic writing techniques.<br>• Enhance ability to analyze, synthesize, and present research findings in a chosen domain. | | | | |
| Assessment | 100 Marks | | | | |
| End Semester Examination | | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic or area in Civil Engineering for independent research. |
| **CO2** | Explain the research process, literature review and conclusion writing. |
| **CO3** | Apply tools, references and writing skills to prepare research reports. |
| **CO4** | Analyze research findings in the agreed area. |
| **CO5** | Evaluate research methods to propose solutions to the research problem. |
| **CO6** | Design engineering solutions and document them in a thesis or publication. |

Each student will undertake their dissertation under the supervision of one or more supervisors. The dissertation topic must be approved by a committee constituted by the Head of the concerned Department.

Students are required to deliver two seminar presentations: the first, at the beginning of Dissertation Phase-I, to outline the scope of the work and finalize the topic; the second, towards the end of the semester, to present the progress and work completed during the semester.

The committee will evaluate both presentations and award sessional marks out of 100. Students who fail to secure the minimum passing marks must improve their grade before proceeding to the 4th semester. Failure to do so will require the student to repeat Dissertation Phase-I in the next regular 3rd semester.

**M.Tech (Structural Design) –4th Semester**
***w.e.f.* 2025-26**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Dissertation | DISS-MTSD-202A | Dissertation and viva (Dissertation Stage 2) | - | - | - | - | 20* | 250 | | 500 | 750 | |
| **Total Credits** | | | | | | | | **20*** | | | | **750** | |

Dissertation Stage-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250, will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.

If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.

At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.

The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Stage-2.
- The student must follow the guidelines for the Dissertation report format as per Annexure-I.

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DISS-MTSD-202A** | | | | |
| Category | Lab Courses | | | | |
| Course Title | Dissertation | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 20 | 20 | |
| **Course Objectives** | The objectives of this course are to<br>• Introduce research fundamentals and help identify relevant topics in Civil Engineering.<br>• Understand structured research methodology, literature review, and documentation of results and conclusions.<br>• Develop skills in using research tools, technical writing, referencing, and report formatting.<br>• Analyze, evaluate, and present research findings through effective report or thesis preparation. | | | | |
| Assessment | 250 Marks | | | | |
| End Semester Examination | 500 Marks | | | | |
| Total | 750 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to:

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Identify the research topic or area in Civil Engineering for independent research. |
| **CO2** | Explain the research process, literature review and conclusion writing. |
| **CO3** | Apply tools, references and writing skills to prepare research reports. |
| **CO4** | Analyze research findings in the agreed area. |
| **CO5** | Evaluate research methods to propose solutions to the research problem. |
| **CO6** | Design engineering solutions and document them in a thesis or publication. |

Dissertation Stage-1 will continue as the final dissertation in the 4th semester. Sessional marks, out of 250,
will be awarded by an internal committee constituted by the Head of the Department. The assessment will be based on presentations, reports, and related materials submitted to the committee. Failure to appear before the committee will result in disqualification from submitting the dissertation.
If a student scores less than 40% in the sessional assessment, they must revise and resubmit the dissertation after incorporating all required corrections and improvements. The revised dissertation will be evaluated in the next academic session.
At the end of the semester, each student is required to submit three soft-bound copies of their Master's dissertation to the office of the Head of the Department. One copy will be retained for departmental records, one will be provided to the supervisor, and one will be sent by mail to the external examiner, following their appointment and notification from the university.
The dissertation will be evaluated by a committee consisting of the Head of the Department, the dissertation supervisor(s), and one external examiner. The external examiner will be appointed by the Chairman of the Board of Studies. If the appointed examiner is unable to attend, the Director of the

Institute, upon the recommendation of the Head of the Department, is authorized to appoint a substitute examiner from another institution or the parent institute.

Students must defend their dissertation through a presentation before the evaluation committee, which will assign marks accordingly.

**Note:**

- The scheme for awarding grades will be provided by the department to the examiner(s).
- The plagiarism of the dissertation report must be below 10%; otherwise, the report will not be accepted.
- Each student must publish at least one research paper related to their dissertation work in a peer-reviewed journal, IEEE conference, or SCOPUS/SCI-indexed journal before the final submission of Dissertation Stage-2.
- The student must follow the guidelines for the Dissertation report.

| | | | | | |
|---|---|---|---|---|---|
| Course code | **OEC-134A** | | | | |
| Category | **Multidisciplinary Open Elective courses** | | | | |
| Course title | **Disaster Management** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-II** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are to<br>• Make the students familiar with the causes, phases, and types of disasters and effects of natural and human factors on geo-hazards, coastal changes, and seismic activities.<br>• Enable the students to understand forecasting, management, and risk reduction strategies to mitigate their impact.<br>• Make the students aware of causes, characteristics, and risks of earthquakes, volcanic eruptions, and landslides, and explore early warning systems and risk mitigation strategies.<br>• Learn about international efforts and policies for disaster reduction, including the UN's humanitarian coordination and challenges in financing and insurance for disaster response. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define causes, phases and characteristics of disasters and geo-hazards. | Level 1: Remember |
| CO2 | Explain processes, impacts and mitigation of natural disasters. | Level 2: Understand |
| CO3 | Apply risk mitigation, forecasting and management strategies to reduce disaster impact. | Level 3: Apply |
| CO4 | Analyze disaster reduction policies, financing and coordination challenges. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Disaster**- Causes and phases of disaster, Rapid onset and slow onset disasters. Nature and responses to geo-hazards, trends in climatology, meteorology and hydrology. Seismic activities. Changes in Coastal zone, coastal erosion, beach protection. Coastal erosion due to natural and manmade structures.

**Unit-II**

**Floods and Cyclones:** causes of flooding, Hazards associated with flooding. Flood forecasting. Flood management, Integrated Flood Management and Information System (IFMIS), Flood control. Water related hazards- Structure and nature of tropical cyclone, Tsunamis – causes and physical characteristics, mitigation of risks.

## Unit-III

**Earthquakes:** Causes and characteristics of ground-motion, earthquake scales, magnitude and intensity, earthquake hazards and risks, Volcanic land forms, eruptions, early warning from satellites, risk mitigation and training. Landslides.

## Unit-IV

**Mitigation efforts:** UN draft resolution on Strengthening of Coordination of Humanitarian Emergency Assistance, International Decade for Natural Disaster Reduction (IDNDR), Policy for disaster reduction, problems of financing and insurance.

**Suggested Readings:**


- Earthquakes by B.A. Bolt, W. H. Freeman and Company, 1988.
- Disaster Management: A Disaster Manager's Handbook by N.W. Carter, Asian Development Bank,1992.
- Earthquake: A Natural Disaster by Ashutosh Gautam, Ashok Publishing House, 1994.
- Disaster Risk Reduction in South Asia edited by P. Sahni and M. Malagola, Prentice-Hall of India, 2003.
- Disaster Management edited by V.K. Sharma, Indian Institute of Public Administration (IIPA), 1995.
- Disaster Management Approaches and Strategies by T. Singh, Akansha Publishing House, 2006.
- Towards Basics of Natural Disaster Reduction by D.K. Sinha, Research Book Centre, 2006.
- Environmental Health, Assessing Risk and Reduction Disaster (3rd ed.) by K. Smith, Routledge, 2001.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Causes and phases of disaster | https://youtu.be/ueHvGqY8I78?si=IJDVCFpW9Yez1xLZ |
| **Unit-II** | Floods and Cyclones | https://youtu.be/DFMa_IgYUa8?si=DppHS9vzT6M3_qXa |
| **Unit-III** | risk mitigation and training | https://youtu.be/JHowlkB1btY?si=bJt0B1X2FCjlUxfX |
| **Unit-IV** | Policy for disaster reduction | https://youtu.be/BRfBFa0-SsI?si=EV562mxJSe6f-7tY |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **OEC-147A** | | | | |
| Category | **Multidisciplinary Open Elective courses** | | | | |
| Course title | **Natural and Manmade Disaster** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are to<br>• Learn about natural disasters like earthquakes, tsunamis, and volcanic eruptions, and their mitigation.<br>• Study the formation, impact, and management of cyclones, storms, forest fires, and floods.<br>• Understand nuclear and chemical accidents, and pollution prevention techniques.<br>• Explore climate change impacts, international cooperation, and disease outbreak management. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define types, causes and effects of natural and human-induced disasters. | Level 1: Remember |
| CO2 | Explain disaster formation, impacts, early warning and preparedness. | Level 2: Understand |
| CO3 | Apply management techniques to mitigate environmental degradation, pollution and hazards. | Level 3: Apply |
| CO4 | Analyze global disaster responses, climate change, epidemics and cooperation. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Disaster Classification:** Types and categories of disasters, Environmental degradation.
**Natural Geological Disasters:** Earthquakes: causes, effects, and mitigation,
**Tsunamis:** formation and warning systems, Volcanic eruptions: types and hazard management, Landslides and avalanches: risk

**Unit-II**

**Cyclones and Storms:** Formation, tracking, and impact, Early warning and preparedness
**Forest Fires:** Causes, prevention, and control, Impact on ecosystems
**Droughts and Desertification:** Types, impacts, and management, Long-term mitigation strategies
**Floods:** Types, prediction, and control measures, Flood plain management.

## Unit-III

**Human-induced disasters:**
**Nuclear Disasters:** Types of accidents and safety protocols, Radiation protection and emergency response.
**Chemical Disasters**: Industrial safety and regulations, Emergency procedures.
**Environmental Pollution:** Soil and water contamination, Prevention and remediation.

## Unit-IV

**Global Environmental Disasters:** Climate change impacts, International cooperation.
**Epidemics:** Disease outbreak management, Public health measures.

**Suggested Readings:**


- Disaster Flood by Shaik Iftikhar Ahmed, Twenty First Century Publications
- Natural Hazard by Edwards Bryant, U.K. Publisher (likely Cambridge University Press or similar)
- Disaster Management by W. Nick Carter, Asian Development Bank, Manila
- Floods in India by Central Water Commission, New Delhi (1987)
- Manual on Flood Forecasting by Central Water Commission, New Delhi (1989)
- Vulnerability Atlas of India by Government of India, (Likely Building Materials and Technology Promotion Council, 1997)
- Vulnerable India: A Geographical Study of Disasters by Anu Kapur, Sage Publications, New Delhi (2010)
- Disasters in India: Studies of Grim Reality by Anu Kapur, Rawat Publications, Jaipur (2005)
- Disaster Management in India: Challenges and Reflections edited by Pardeep Sahni et al., Prentice Hall of India (2002)
- The Seismic Future of Cities by Roger Bilham, Earthquake Engineering Journal, Vol. 7, pp. 839–887 (2009)
- Criteria for Earthquake Resistant Design of Structures by Bureau of Indian Standards, IS Code (2002)
- Vulnerability Atlas of India by Government of India (Ministry of Housing & Urban Poverty
- Alleviation), Building Materials and Technology Promotion Council


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Natural Geological Disasters | https://youtu.be/Xsg8aydKyto?si=p-cMsUNrvU4cHdZf https://youtu.be/FYEQSBownPY?si=xxx8mf8U8P84yzM w |
| **Unit-II** | Cyclones and Storms | https://youtu.be/0GGuIM0Q0xc?si=BWexBRr5d0bY1Q Mg https://youtu.be/-JyB8q9e-XU?si=gRBipYWod0sol26O |
| **Unit-III** | Nuclear Disasters | https://youtu.be/QaOMddzwGGk?si=dlgm3AFKwBsI9PMk |
| **Unit-IV** | Epidemics | https://youtu.be/bkEAWJwGFBQ?si=bOfYpdce4upkOY OU https://youtu.be/fVmJk19d3YE?si=5cgrVMegcqeChRvP |

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**

**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Evaluation Scheme & Syllabus For
# B.Tech Civil Engineering
# (2nd Year)
# (Effective from the Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**

# Scheme of Studies and Examination
# B.Tech (Civil Engineering) – 3rd Semester
## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Internal Assessment | External Examination | Practical | Total | |
| 1 | Basics Science Courses | BSC-MCE-201A | Mathematics-III | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Humanities and Social science including Management Courses | HSMC-02A | Economics for Engineers | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-CE-203A | Building Construction and Material | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-CE-205A | Fluid Mechanics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-CE-207A | Surveying | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Engineering Science Courses | ESC-CE-209A | Engineering Mechanics | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Mandatory Courses | MC-201A* | Environmental Science* | 2 | 0 | 1 | 3 | - | 40 | 60 | | ---- | 3 |
| 8 | Professional Core Courses / (Lab Course) | LC-CE-211A | Building Drawing Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Engineering Science Courses (Lab Course) | LC-CE-213A | Engineering Mechanics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Professional Core Courses (Lab Course) | LC-CE-215A | Fluid Mechanics Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 11 | Professional Core Courses (Lab Course) | LC-CE-217A | Surveying Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| | | **TOTAL CREDIT** | | | | | | **23** | | | | **800** | |

**Note:*MC-201A is a mandatory non –credit course in which the students will be required passing marks in theory.**

# Scheme of Studies and Examination
# B.Tech (Civil Engineering) – 4th Semester
# *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Contact Hrs. per week | Credit | Examination Schedule (Marks) | | | | Duration of Exam (Hours) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Internal Assessment | External Examination | Practical | Total | |
| 1 | Humanities and Social science including Management Courses | HSMC-01A | Fundamental of Management and Organizational Behaviour | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 2 | Professional Core Courses | PCC-CE-202A | Hydraulic Engineering | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 3 | Professional Core Courses | PCC-CE-204A | Structural Analysis | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Professional Core Courses | PCC-CE-206A | Advanced Surveying | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 5 | Professional Core Courses | PCC-CE-208A | Material Testing and Evaluation | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 6 | Professional Elective Courses | ---------- | Refer Table-I | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| 7 | Professional Core Courses (Lab Courses) | LC-CE-210A | Hydraulic Engineering Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 8 | Professional Core Courses (Lab Courses) | LC-CE-212A | Structural Analysis Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 9 | Professional Core Courses (Lab Courses) | LC-CE-214A | Advanced Surveying Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| 10 | Professional Core Courses (Lab Courses) | LC-CE-216A | Material Testing and Evaluation Lab | 0 | 0 | 2 | 2 | 1 | 25 | | 25 | 50 | 3 |
| | | **TOTAL CREDIT** | | | | | | **23** | | | | **800** | |

**Note 1:**

At the end of the 4th semester, each Civil Engineering student must undergo practical training related to core civil engineering areas such as construction site management, surveying, building materials testing, structural detailing, transportation works, or water supply projects. The training should be completed in a relevant organization like a construction company, government department, or engineering firm, with a minimum of 30 contact hours over 4 to 6 weeks. Students must submit a typed report and a training certificate from the organization, which will be evaluated in the 5th semester

**(Professional Elective Courses): Table I**

| S. No | Course Code | Course Name |
|---|---|---|
| 1 | PEC-CE-218A | Design of Concrete Structures |
| 2 | PEC-CE-220A | Climate Hazards and Disaster Mitigation |

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| | | | | | | |
|---|---|---|---|---|---|---|
| Course Code | **BSC-MCE-201-A** | | | | | |
| Category | Basic Science Courses | | | | | |
| Course Title | **Engineering Mathematics-III** | | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** | |
| | 3 | 1 | 0 | **4** | | |
| **Course Objectives** | The objectives of this course are to make the students<br>• To understand and apply fundamental mathematical methods for solving differential equations, numerical problems, and transform-based models.<br>• To develop logical reasoning and analytical skills through discrete mathematics and algebraic structures for engineering and scientific applications. | | | | | |
| Course Pre-requisite | Mathematics up to 12th Standard and Engineering Mathematics-I & II | | | | | |
| Assessment | 40 Marks | | | | | |
| End Semester Examination | 60 Marks | | | | | |
| Total | 100 Marks | | | | | |
| Duration of Exam | 03 Hours | | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated |
|---|---|
| **CO1** | Apply methods for solving first and second order partial differential equations to model physical phenomena such as heat flow and wave motion. |
| **CO2** | Implement numerical techniques to solve algebraic equations, interpolation problems, and evaluate definite integrals. |
| **CO3** | Analyze and solve ordinary differential equations using Laplace transform techniques. |
| **CO4** | Demonstrate understanding of discrete mathematical concepts and algebraic structures, including groups, subgroups, and their properties |

**Note: :** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (2from each unit/section) of 1.5 marks each and remaining eight questions of 12marks each to beset by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Partial Differential equations:** First order linear partial differential equations, First order non- linear partial differential equations, Charpit's method, Second order linear partial differential equations and their classifications, Method of separation of variables and its applications to wave equation, One dimensional heat equations and Two dimensional heat flow (steady state solutions only) |
| **Unit-II** | **Numerical methods:** Solution of Polynomial and Transcendental equations – Bisection method, Regula-Falsi method and Newton-Raphson method, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae, Numerical integration, Trapezoidal rule and Simpson's 1/3rd and 3/8 rules |

| | |
|---|---|
| **Unit-III** | **Transform Calculus:** Laplace Transform, Properties of Laplace transform, Laplace transform of periodic functions, Inverse Laplace transform by different methods, Convolution theorem, Evaluation of integrals by Laplace transform, Solving ordinary differential equations by Laplace transform method |
| **Unit-IV** | **Discrete Maths:** Pigeon-hole principle, Permutation, Combination, Algebraic structures with one binary operation- Semi group, Monoid and Group, Cosets, Lagrange's theorem, Cyclic group, Normal subgroup |

**Suggested Readings:**

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit I** | First order linear partial differential equations | https://youtu.be/vQFFShhNyPo?si=noaoVs9vpiRm9nD2 |
| | First order non-linear partial differential equations, Charpit's method | https://youtu.be/kEN_Ze8QNdM?si=_cs7Qn3cpNV4QWEu |
| | Second order linear partial differential equations and their classifications | https://youtu.be/kEN_Ze8QNdM?si=Rq69griDh-Zzr7dn |
| | Method of separation of variables and its applications to wave equation, One dimensional heat equations and Two dimensional heat flow | **https://youtu.be/kEN_Ze8QNdM?si=wv6-dO0Ph3gyoycg** |
| **Unit II** | Solution of Polynomial and Transcendental equations | https://youtu.be/3j0c_FhOt5U?si=ZOx4OqOnj4kycbRi |
| | Interpolation | https://youtu.be/rWyTk9eubKM?si=DeOVGwmD72myPGkp |
| | Numerical integration | https://youtu.be/iviiGB5vxLA?si=u4l274cZxDZSw9Wm |
| **Unit III** | Laplace Transform | https://youtu.be/OA1OJrfpP20?si=iiu38t0ChNja5IEb |
| | Laplace transform of periodic functions | https://youtu.be/MM3vi7mQ60U?si=G5HNHLP4X1cePeRu |
| | Inverse Laplace transform by different methods | https://youtu.be/EDVJotmT584?si=r_8HyZkyRlLVUPfb |
| | Solving ordinary differential equations by Laplace transform method | https://youtu.be/KaRx67h5xzk?si=otp94t8VjHzzE_in |
| **Unit IV** | Permutation and Combination, the Division algorithm: | https://youtu.be/BI84sbsOtGQ?si=ZTFN88-qrGlOwquH |
| | Pigeon-hole principle | https://youtu.be/a-O-ioYy1rI?si=_bIKGfCet8sM8csj |
| | Algebraic Structures with one Binary Operation | https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI |
| | Groups | https://youtu.be/3zOtLEeHygg?si=k9s9ejEkVLKRc1kI |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **HSMC-02A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Economics for Engineers** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives** | The objectives of this course are to<br>• Introduce the basic concepts of economics and their relevance to science, engineering, and national development.<br>• Develop a foundational understanding of microeconomic principles such as demand, supply, production, cost, and market structures.<br>• Equip students with tools to apply economic reasoning to real-world pricing, output, and market decisions.<br>• Familiarize students with macroeconomic elements like the Indian economy, banking system, privatization, and globalization. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Describe economic concepts, the connection between economics with engineering and technological development, along with economic laws relevant to resource based decision making in society. | Level 1: Remember |
| CO2 | Explain economic growth theories and illustrate the role of engineering and technology in supporting economic development. | Level 2: Understand |
| CO3 | Apply theories of consumption and production to the design and development of engineering products. | Level 3: Apply |
| CO4 | Analyze market conditions, evaluate cost structures and financial aspects to assess<br>the feasibility of engineering projects. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Definition of Economics**: Various Definitions, Types of Economics, Micro and Macro Economics, Nature of Economic Problem, Production Possibility Curve, Economic Laws and their Nature, Relationship between Science, Engineering, Technology and Economic Development.

**Demand:** Meaning of Demand, Law of Demand, Elasticity of Demand, Meaning, Factors affecting the Elasticity of Demand, Practical Application and Importance.

## Unit-II

**Production:** Meaning of Production and Factors of production, Law of Variable Proportions, Returns to Scale, Internal and External Economies and Diseconomies of Scale, Various concepts of Cost of Production- Fixed Cost, Variable Cost, Money Cost, Real Cost, Accounting Cost, Marginal Cost, Opportunity Cost, Shape of Average Cost, Marginal Cost, Total Cost etc. in short run and long run.

## Unit-III

**Market:** Meaning of Market, Types of Market- Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly (main features).
**Supply:** Supply and Law of Supply, Role of Demand and Supply in Price Determination and Effect of Changes in Demand and Supply on Prices.

## Unit-IV

**Indian Economy:** Nature and Characteristics of Indian Economy as underdeveloped, developing and mixed economy (brief and elementary introduction).
**Privatization:** Meaning, Merits and Demerits.
**Globalization of the Indian Economy:** Merits and Demerits
**Banking:** Concept of a Bank, Commercial Bank, Central Bank, Functions of a Bank, Difference between Commercial and Central Bank.

**Suggested Readings:**


1. Modern Microeconomics: Theory and Applications by H.L. Ahuja, S. Chand & Company Pvt. Ltd.
2. Indian Economy by S.K. Misra & V.K. Puri, Himalaya Publishing House
3. Indian Economy : Principles and Policies by Srirangam, SriRam, ; Rohit Deo, Pearson Education
4. Managerial Economics by R. Cauvery et al., S. Chand & Company Pvt. Ltd.
5. Microeconomic Theory by Andreu; Whinston, Michael D; Green, Jerry R, Oxford University Press.
6. Principles of Economics by Case, Karl E; Fair, Ray C ; Oster, Sharon E, Pearson Education


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Fundamental concepts of microeconomics, including definitions, types, and the nature of economic problems. | https://www.youtube.com/watch?v=IFtOcNbej0o&list=PLFNFJbo2hfBGRTCMuroZGykNzacwmAH2L |
| **Unit-II** | Production and Cost of production | https://www.youtube.com/watch?v=VU1zySe-8NA |
| **Unit-III** | Theory of Markets | https://www.youtube.com/watch?v=HylqSa58lqQ |
| **Unit-IV** | Nature and characteristics of the Indian economy, highlighting aspects of underdevelopment and development. | https://www.youtube.com/watch?v=ME-0GOhhZcs&list=PLFW6lRTa1g83winAoIK92HL4xTytJaW7S |

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|---|---|---|---|---|---|
| Course code | **PCC-CE-203A** | | | | |
| Category | **Professional Core Courses** | | | | |
| Course title | **Building Construction and Material** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are:<br>• To provide knowledge of building components and construction techniques.<br>• To understand properties and applications of construction materials.<br>• To develop ability to select suitable materials for various construction requirements.<br>• To familiarize students with construction practices and standards. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define building materials, components, and construction terminology. | Level 1: Remember |
| CO2 | Understand construction practices and functional requirements of buildings. | Level 2: Understand |
| CO3 | Apply suitable materials and construction techniques. | Level 3: Apply |
| CO4 | Analyze building components for durability and sustainability. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 8 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 12 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## COURSE CONTENT
### Unit-I

**Module 1: Masonry Construction**

Introduction and history to masonry construction, and terminology, Classification and properties of bricks: traditional and fly ash bricks, hollow bricks, AAC blocks, Bonds in brickwork, Laying and curing practices, Defects in masonry, Stone masonry: types, structural applications, finishes, Composite masonry and applications, Glass block masonry: uses. Introduction to green building concept.

**Module 2: Stones and Tiles**

Stones: Classification, requirements of good structural stone, quarrying, blasting, dressing of stones and seasoning of stone; Tiles: Manufacturing of tiles: ceramic, vitrified, and cement-based, Use of terracotta and faience in modern construction.

## Unit-II

**Module 3: Timber, paints and varnishes**

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, Plywood and fiber boards, Important Indian timbers; Basic constituents of paints, types of paints, constituents of varnishes, characteristics and types of varnishes.

**Module 4: Roofs and Floors**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. Doors and Windows: Locations, sizes, types of doors and windows including UPVC, fixtures and fasteners for doors and windows.

## Unit-III

**Module 5: Cavity, Partition Walls and Foundations**

Cavity walls and its position, advantages of cavity wall, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. Types of foundations, sub-surface investigation, Foundation in water logged areas, Masonry wall foundation, Introduction to deep foundations.

**Module 6: Stairs & Stair cases**

Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators.

## Unit-IV

**Module 7: Damp-Proofing, Water-Proofing and Fire protection**

Dampness and its causes, prevention of dampness, materials used, Damp-proofing treatment in buildings; Water proofing: water- proofing treatment of roofs including Latest Materials; Fire protection: Fire resisting construction, fire protection requirements for buildings.

**Module 8: Sound insulation and Acoustics**

Classification, measurement and transmission of sound, sound insulation of buildings, Acoustical materials and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other emerging materials including properties and uses.

**Suggested Readings:**


1. Building Construction By Sushil Kumar, Standard Pub., N. Delhi
2. Building Material By Rangawala
3. Construction Engineering By Y.S. Sane
4. Building Construction By Gurcharan Singh, Standard Pub., N. Delhi


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | **Basics of Civil Engineering** | https://youtu.be/CsKddkqgwVk?si=6EFtfcMai-Q30sMm&t=97 |
| 2 | **seasoning of timber** | https://youtu.be/tjYDnrMSHX0?si=b03FVrA0Gv3o_I-f |
| 3 | **Types of doors and windows** | https://youtu.be/VqveWrgpT0g?si=aHaAZpTW2M4JQhZl |
| 4 | **Damp-Proofing** | https://youtu.be/rkO9eqvFG-4?si=4xBa38PhH8fdQWza |

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|---|---|---|---|---|---|
| Course code | **ESC-CE-209A** | | | | |
| Category | **Engineering Science courses** | | | | |
| Course title | **Engineering Mechanics** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are:<br>• To introduce fundamental principles of statics and mechanics of rigid bodies.<br>• To develop ability to analyze forces, moments, and equilibrium conditions.<br>• To apply mechanics principles to solve engineering problems.<br>• To build foundation for advanced structural subjects. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define basic concepts of force, stress, strain, and equilibrium. | Level 1: Remember |
| CO2 | Understand stress-strain behavior and internal force systems. | Level 2: Understand |
| CO3 | Apply mechanics principles to solve structural problems. | Level 3: Apply |
| CO4 | Analyze beams, trusses, and failure theories. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 8 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 12 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## COURSE CONTENT

### Unit-I

**Module 1: Force Systems and Friction**

System of forces, Free-body diagrams (FBDs), Equilibrium equations for 2D and 3D systems, Internal forces in structures (axial force, shear force, bending moment), Friction and its applications.

**Module 2: Simple and Compound Stresses and Strains**

Properties of Materials, i.e. tensile test, idealized stress- strain diagrams, isotropic, linear, elastic, Concept of stresses and strains, relationship between elastic constants, Poisson's Ratio, Hoop stress, Stress and extension of uniform bar and tapered bar under its own weight and due to load, stresses produced in compound bars due to axial loads, Factor of Safety, Thermal stress and strain calculations, Shear stresses and shear strain.

Normal stress, tangential Stresses, Stresses induced due to Uniaxial loads, stresses induced by state of simple shear, stresses induced due to biaxial loads, Mohr's Circle (Graphical Method), Principal stresses and principal planes, Maximum shear stresses, Proof stress.

### Unit-II

**Module 3: Shear Force and Bending Moment in Beams and Frames**

Type of loads, Shear force and bending moment, relation between Shear force and bending moment, Definition and Sign conventions, axial force, Shear force and Bending moment diagrams

**Module 4: Bending stresses and Shear stresses in Beam**
Pure bending, bending stresses, combined bending and direct stresses, Middle Third rule, composite beams, Variation of shear stresses for various cross-sections of a beam.

**Unit-III**

**Module 5: Torsion and Thin Cylinder**
Torsion equation, its applications to the hollow and solid circular shafts, comparison of solid and hollow Shafts, shafts in series and parallel. Combined torsion and bending of circular shafts. Introduction to thin cylinder, Stresses in thin cylinder vessels subjected to internal pressure Circumferential stresses (Hoop Stresses), longitudinal stress.

**Module 6: Column and Strut**
Criteria for stability of columns, Buckling of columns, Euler's formula for various end restraints, Rankine's formula, eccentrically loaded struts, struts with initial curvature, struts with lateral loading.

**Unit-IV**

**Module 7: Analysis of Plane Trusses**
Different types of trusses, Analysis of plane determinate trusses by method of joints, method of sections and analysis of Space Trusses using Tension Coefficient Method.

**Module 8: Failure Theories**
Theories of failure: maximum principal stress theory, maximum principal strain theory, maximum shear stress theory, maximum strain energy theory, distortion energy theory, comparison of the failure theories.

**Suggested Readings:**


1. Strength of Material by G.H. Ryder, MacMillan Publishers India Ltd.
2. Mechanics of Materials by E.J. Hearn, Elsevier Publications.
3. Mechanics of Materials by Punmia and Jain, Laxmi Publications (P) Ltd.
4. Mechanics of Materials by R.C.Hibbeler, Pearson Higher Education.
5. Strength of Materials by Timoshenko and Young,, East West Press.
6. Mechanics of materials by V Gupta, Narosa publishing house.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | **Simple Stresses and Strains** | https://youtu.be/DzyIEz3dKXQ?si=_k7krOEATzbR uU1Z |
| 2 | **Compound stress and strains** | https://youtu.be/EDdUiNHLF2o?si=- qcKtD_1pof_AEA4 |
| 3 | **Buckling of columns** | https://youtu.be/vhXJ6ZcKb5c?si=jHZ2- 2e595JXXwSC |
| 4 | **Different types of trusses** | https://youtu.be/ef- 5HtnBubU?si=pqpXD05mgSuGrabd |

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|---|---|---|---|---|---|
| Course code | **PCC-CE -205A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Fluid Mechanics** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are:<br>• To introduce properties and behavior of fluids at rest and in motion.<br>• To develop understanding of fluid statics and fluid dynamics principles.<br>• To enable analysis of pipe flow and open channel flow problems.<br>• To prepare students for hydraulic engineering applications. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define properties and basic concepts of fluids. | Level 1: Remember |
| CO2 | Understand fluid statics, kinematics, and dynamics. | Level 2: Understand |
| CO3 | Apply governing equations to fluid flow problems. | Level 3: Apply |
| CO4 | Analyze boundary layers, drag, and similitude. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining 8 questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## COURSE CONTENT

### Unit-I

**Module 1: Basic Concepts and Definitions**

Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, cavitations; surface tension, capillarity, Bulk modulus of elasticity, compressibility, types of fluids.

**Module 2: Fluid Kinematics**

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; rotation and circulation; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates, Flow Net.

### Unit-II

**Module 3: Fluid Statics**

Fluid Pressure: Pressure density height relationship, pressure at a point, Pascal's law, gauge and absolute pressure, Pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, pressure gauges,

**Module 4: Hydrostatic pressure and force**
Hydrostatic pressure and force: horizontal, vertical and inclined surfaces, centre of pressure. Buoyancy and stability of floating bodies, metacentric height

**Unit-III**

**Module 5: Fluid Dynamics**
Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; limitations of Bernoulli's equation, Practical applications of Bernoulli's equation: Venturimeter and Orifice meter, Pitot tube, notiches and Weirs. Orifice and mouth piece.

**Module 6: Dimensional Analysis and Hydraulic Similitude**
Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modelling, similar and distorted models.

**Unit-IV**

**Module 7: Boundary Layer Analysis**
Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries, Local and average friction coefficients Separation and Control.

**Module 8: Drag and Lift**
Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil, flow around a sphere-Stokes' law.

**Suggested Readings:**


1. Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
2. Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald 3 Fluid Mechanics Through Problems by R.J.Garde
3. Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker
4. Fluid Mechanic and Hydraulic machines R.K. BANSAL


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Kinematic and dynamic viscosity | https://youtu.be/fa0zHI6nLUo?si=7Ha_VvTzah3yEtNw |
| 2 | U-Tube Manometer | https://youtu.be/sHmjE21Fp9w?si=ro7UE417K2Z7cTli |
| 3 | laminar and turbulent flow | https://youtu.be/jwSdYP17PAY?si=Pd1Pg3ZxWpjqY6Ta |
| 4 | Buckingham theorem | https://youtu.be/whsqICmFA_Y?si=7EHW8H91wiACHcfv |

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|---|---|---|---|---|---|
| Course code | **PCC-CE-207A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Surveying** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are:<br>• To impart knowledge of fundamental surveying principles and measurement techniques used in civil engineering practice.<br>• To develop competency in the use of chain, compass, level, theodolite, and related surveying instruments.<br>• To enable computation and adjustment of levelling, traversing, and contouring data.<br>• To develop skills in preparation and interpretation of survey maps, plans, and field records.<br>• To introduce modern surveying tools such as total station and their applications in engineering projects. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define surveying principles and instruments. | Level 1: Remember |
| CO2 | Understand methods of levelling, traversing, and contouring. | Level 2: Understand |
| CO3 | Apply surveying techniques in field measurements. | Level 3: Apply |
| CO4 | Analyze survey data and errors. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 8 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 12 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## COURSE CONTENT

### Unit-I

**Module 1: Surveying Fundamentals and Direction Measurement**

Definition and objectives of surveying, principles and classification of surveying, instruments for linear measurement, methods of linear measurement – chaining and taping, errors in linear measurement and tape corrections , types of compass – prismatic and surveyor's compass, bearings – whole circle and reduced bearing, meridians – true, magnetic and arbitrary, magnetic declination, local attraction – causes, detection and correction, methods of compass traversing, checks in traversing, adjustment of closed traverse with examples.

**Module 2: Levelling and Geodetic Trigonometric levelling**

Terms used in levelling, types of levels and staff, principles of levelling, reduction of levels and booking of staff readings, examples

Height and distances- base of the object accessible and inaccessible, geodetical observation, correction due to curvature and refraction, axis signal correction, difference in elevation between two points.

## Unit-II

**Module 3: Plane Table Surveying**
Plane table accessories, Types and methods of plane table surveying, sources of error, advantages and disadvantages of plane table surveying;

**Module 4: Contouring**
Contours and characteristics of contour lines, Contour interval and Factor affecting CI .locating contours, interpolation of contours, Use of contour maps.

## Unit-III

**Module 5: Angle Measurement**
Theodolite, parts of theodolite, Temporary adjustment of Theodolite, measurement of horizontal and vertical angles by different methods, theodolite traversing, adjustments of closed traverse.

**Module 6: Tachometric surveying**
Principle of of tacheometric surveying, different instrument used in tacheometry, stadia and tangential method of tacheometry, tacheometric constants and their determinations, examples.

## Unit-IV

**Module 7: Curves**
Classification of curves, elements of simple circular curve, location of tangent points- chain and tape methods, instrumental methods, Examples; types of transition curves; Vertical Curves: Necessity and types of vertical curves, setting out of a vertical curve.

**Module 8: Total Station – Basic Concepts**
Definition and purpose of Total Station, main components – electronic theodolite, EDM and other method of distance measurement.

**Suggested Readings:**


1. Surveying volume I and II: B C Punmia.
2. Engineering Surveying (Sixth Edition): W. Schofield.
3. Text Book of Surveying: C. Venkataramiah.
4. Introduction to GPS: The Global Positioning System: Ahmed El-Rabbany.
5. Surveying by Duggal.
6. Various Online resources including NPTEL.


**Useful Video links:**

| Unit. No. | Topics | Links |
|---|---|---|
| 1 | Basics of Surveying and Linear measurement | https://youtu.be/chhuq_t40rY?si=O-rZ0GyeQRQ0I1Ht |
| 2 | Terms used in leveling | https://youtu.be/La5A5PLQjaQ?si=e6zg_3GViavxOn |
| 3 | Methods of plane table surveying | https://youtu.be/COldgKBaiqw?si=8ONvMgLWwjP8Ql2p |
| 4 | Tachometric surveying | https://www.youtube.com/watch?v=HuJMSS3T070&list=PL5UuHQx1lpk3VBalpNcdAgxXSwG9QGyZp |

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|---|---|---|---|---|---|
| Course code | **LC-CE-211A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Building Drawing Lab.** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are:<br>• To develop understanding of building components and standard building bye-laws used in planning and drawing.<br>• To develop skills in preparation of detailed building drawings such as plans, elevations, and sections.<br>• To enable interpretation and drafting of working drawings for residential and public buildings.<br>• To familiarize students with drawing standards, symbols, and dimensioning practices used in construction. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall building components, drawing conventions, symbols, and building bye-laws. | Level 1: Remember |
| CO2 | Explain the functional requirements and planning principles of residential buildings. | Level 2: Understand |
| CO3 | Prepare detailed building drawings including plans, elevations, and sections as per standards. | Level 3: Apply |
| CO4 | Analyze building layouts for space planning, ventilation, lighting, and compliance with bye-laws. | Level 4: Analyze |

## LIST OF EXPERIMENTS

1. Different Bonds in brick work.
2. Plan and Sectional Elevation of different Doors and Windows. different Ventilators
3. Plan and Sectional Elevation of Floors.
4. Plan and Sectional Elevation of different roofs.
5. Plan and Sectional Elevation of different Stair-Cases.
6. Cavity and partition Wall.
7. Grillage foundation.
8. Preparation of building drawing as per vastu and building norms , mentioning its salient features including the following details: a) Ground floor plan b) Two Sectional Elevations c) Front and Side Elevations

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| 1 | Different Bonds in brick work. | English Bond Brick Work explained with mini Bricks \| types of brick bonds \| Architecture Attack |
| 2 | Plan and Sectional Elevation of different Stair-Cases. | https://www.youtube.com/watch?v=NzKenIvnrWI |
| 3 | Plan and Sectional Elevation of different Doors and Windows. | https://www.youtube.com/watch?v=RZ7YD_kmof0<br><br>https://www.youtube.com/watch?v=HCmhL6BBek4 |
| 4 | Plan and Sectional Elevation of Floors. | https://www.youtube.com/watch?v=snhnB6BQZS0 |

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|---|---|---|---|---|---|
| Course code | **LC-CE-213A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **ENGINEERING MECHANICS LAB** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are:<br>• To provide practical exposure to mechanics principles through experiments.<br>• To develop skills in conducting experiments and interpreting results.<br>• To correlate theoretical concepts with experimental observations. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall basic mechanical instruments, components, and experimental terminology used in engineering mechanics. | Level 1: Remember |
| **CO2** | Understand the principles of equilibrium, friction, and mechanical behavior of bodies. | Level 2: Understand |
| **CO3** | Perform experiments related to forces, moments, friction, and centroids using standard procedures | Level 3: Apply |
| **CO4** | Analyze experimental data and compare results with theoretical values. | Level 4: Analyze |

## LIST OF EXPERIMENTS

1. To determine elastic properties of a beam.
2. Torsion of cylindrical rods (Shaft).
3. To determine and analyse deflection of curved beams.
4. Experimental and analytical study of behaviour of struts with various end conditions.
5. To determine deflection of trusses – Horizontal and vertical deflection of various joints of a pin jointed truss.
6. Experimental and analytical study of a 3bar pin jointed Truss.
7. Experimental and analytical study of an elastically coupled beam.
8. To plot stress- strain curve for mild steel – Demonstration.

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| **1** | To determine elastic properties of a beam. | https://www.youtube.com/watch?v=nC0Sk36SZ0w |
| **2** | To determine and analyse deflection of curved beams. | https://www.youtube.com/watch?v=cGTebUY2xQc |
| **3** | Experimental and analytical study of behavior of struts with various end conditions. | https://www.youtube.com/watch?v=wgCXC-8UOU0 |
| **4** | Experimental and analytical study of a 3bar pin jointed Truss. | https://www.youtube.com/watch?v=Lwzcwm3oL8A |

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|---|---|---|---|---|---|
| Course code | **LC-CE-215A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Fluid Mechanics Lab.** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are:<br>• To conduct experiments related to fluid flow and measurement.<br>• To verify theoretical principles through experimentation.<br>• To analyze experimental data and hydraulic performance. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall hydraulic instruments, measuring devices, and fluid properties. | Level 1: Remember |
| CO2 | Understand principles of fluid flow, pressure, and discharge measurement. | Level 2: Understand |
| CO3 | Conduct experiments on flow through pipes, notches, orifices, and flow meters. | Level 3: Apply |
| CO4 | Analyze experimental data to determine flow characteristics and energy losses. | Level 4: Analyze |

**LIST OF EXPERIMENTS**

1. Verification of Bernoulli's Theorem
2. Calibration of V notch
3. Calibration of Rectangular notch
4. Calibration of Trapezoidal notch
5. Study of Pressure Measuring Devices
6. Determination of Metacentric height
7. Hydrostatics Force on Flat Surfaces/Curved Surfaces
8. Venturimeter
9. Orifice meter
10. Determination of coefficient Cd, Cv, and Cc

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| **1** | Verification of Bernoulli's Theorem | https://www.youtube.com/watch?v=m90wPNvxAIg |
| **2** | Calibration of V notch | https://www.youtube.com/watch?v=ILY4QMQIY5s |
| **3** | Calibration of Rectangular notch | https://www.youtube.com/watch?v=0u-jamQjVk0 |
| **4** | Calibration of Trapezoidal notch | https://www.youtube.com/watch?v=ZOVlvLVYDjE |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CE-217A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Surveying Lab** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are:<br>• To develop practical skills in the use of surveying instruments such as chain, compass, level, theodolite, and total station.<br>• To train students in conducting field surveys for measurement of distances, angles, elevations, and contours.<br>• To enable accurate recording, computation, and adjustment of field data in levelling and traversing.<br>• To develop competency in preparation of field books, survey maps, plans, and contour drawing. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall surveying instruments, symbols, and field terminology. | Level 1: Remember |
| CO2 | Understand principles of levelling, traversing, contouring, and mapping. | Level 2: Understand |
| CO3 | Perform field surveys using conventional surveying instruments. | Level 3: Apply |
| CO4 | Analyze field observations and compute reduced levels, coordinates, and areas. | Level 4: Analyze |

**LIST OF EXPERIMENTS**

1. Chain Traversing and Compass Traversing
2. Differential Levelling
3. Fly Levelling
4. Cross Sectioning
5. Profile levelling
6. Plane Table surveying: Radiation and Intersection
7. Resection- 2 and 3-point problem with plane Table
8. Contouring and preparation contour map.
9. Demonstration of total station.

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| 1 | Chain Traversing | https://www.youtube.com/watch?v=hpbt71TljEA |
| 2 | Compass Traversing | https://www.youtube.com/watch?v=TKzEBJ1qkz8 |
| 3 | Fly Levelling | https://www.youtube.com/watch?v=KDG9IJBP_bE |
| 4 | Cross Sectioning | https://www.youtube.com/watch?v=irNlaNP63nA |

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|---|---|---|---|---|---|
| Course Code | **HSMC-01A** | | | | |
| Category | Humanities and Social Science including Management Courses | | | | |
| Course Title | **Fundamental of Management and Organizational Behaviour** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• Introduce students to foundational management theories, functions, and organizational concepts to build a strong conceptual framework.<br>• Develop understanding of individual and group behavior, motivation, communication, and leadership in organizational settings.<br>• Equip students with practical skills to manage interpersonal processes, conflicts, and team dynamics effectively.<br>• Foster critical analysis of organizational structures, cultures, and change mechanisms to enhance adaptability and effectiveness in organizations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | Define fundamental management concepts, functions, organizational processes, and organizational behavior elements. | Level 1: Remember |
| CO2 | Explain the roles, skills, and interrelationships in management, individual behaviors, group dynamics, and communication processes within organizations. | Level 2: Understand |
| CO3 | Apply principles of management, motivation techniques, leadership styles, and conflict management strategies to solve organizational behavior challenges. | Level 3: Apply |
| CO4 | Analyze organizational structure, culture, change processes, and behavioral dynamics to support effective decision-making and organizational development. | Level 4: Analyse |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction of Management:** Meaning, Definitions, Nature of Management; Managerial Levels, Skills and Roles in an Organization.
**Functions of Management:** Planning, Organizing, Staffing, Directing & Controlling, Interrelationship of Managerial Functions, Scope of Management, Importance of Management, Difference between Management and Administration.

## Unit-II

**Introduction of Organization:** Meaning and Process of Organization, Management v/s Organization.

**Fundamentals of Organizational Behavior:** Concepts, Evolution, Importance and Relationship with other Fields, Contemporary Challenges and Opportunities of OB**.**
**Individual Processes and Behavior:** Personality, Concept, Determinants and Applications.
**Perception:** Concept, Process and Applications
**Learning:** Brief Introduction
**Motivation:** Concept, Techniques and Importance

## Unit-III

**Interpersonal Processes**: Teams and Groups, Definition of Group, Stages of Group Development, Types of Groups, Meaning of Team, Merits and Demerits of Team, Difference between Team and Group, Conflict-Concept, Sources, Types, Management of Conflict.
**Leadership:** Concept, Function, Styles, Qualities of Leadership.
**Communication**: Meaning, Process, Channels of Communication, Importance and Barriers of Communication.

## Unit-IV

**Organizational Processes:** Organizational Structure, Meaning and Types of Organizational Structure and their effect on Human Behavior.
**Organizational Culture**: Elements, Types and Factors affecting Organizational Culture.
**Organizational Change:** Concept, Types and Factors affecting Organizational Change, Resistance to Change.

**Suggested Readings:**


1. Fundamentals of Management by Robbins, S.P. and Decenzo, Pearson Education, New Delhi.
2. Organizational Behaviour by Robbins, S.P. & Judge, T.A., Prentice Hall of India, New Delhi.
3. Management concept practice and cases by Ghuman Karminder, Aswathappa K., Tata McGraw Hill, New Delhi
4. Fundamental of Management by Chhabra T. N., Sun India Publications, New Delhi.
5. Organizational Behaviour by Stephen P Robin, Pearson Education.
6. Organizational Behaviour by McShane, Steven L, Tata McGraw Hill, New Delhi.
7. Organizational Behaviour by FC Sharma, Shree Mahavir Publications.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1** | Nature and Scope of Management | https://nptel.ac.in/courses/110105146 |
| **2** | Perception and Personality | https://nptel.ac.in/courses/110103433 |
| **3** | Group Dynamics | https://archive.nptel.ac.in/courses/110/106/110106145/ |
| **4** | Organizational Change, Resistance to Change. | https://nptel.ac.in/courses/110105146 |

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|---|---|---|---|---|---|
| Course code | **PCC-CE-202A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Hydraulic Engineering** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester- IV** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To understand principles of open channel flow and hydraulic machines.<br>• To analyze flow characteristics in channels and pipelines.<br>• To study performance of turbines and pumps.<br>• To apply hydraulic principles in water resources engineering | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall fundamental concepts of open channel flow, hydraulic machines, and related hydraulic parameters. | Level 1: Remember |
| CO2 | Explain principles of uniform and non-uniform flow, specific energy, momentum, and performance of turbines and pumps. | Level 2: Explain |
| CO3 | Apply hydraulic principles and equations to analyze open channel flow and hydraulic machine problems. | Level 3: Apply |
| CO4 | Analyze flow characteristics and evaluate performance parameters of hydraulic turbines and pumps | Level 4: Analyze |
| CO5 | Evaluate hydraulic systems for efficiency, stability, and operational suitability. | Level 5: Evaluate |

**Note:** Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 8 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 12 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Module 1: Laminar Flow**

Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity.

**Module 2: Turbulent Flow**

Reynolds experiment, Transition from laminar to turbulent flow, Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes.

## Unit-II

**Module 3: Flow through Pipes**

Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, siphon, power transmission through pipes, Analysis of pipe networks: water hammer in pipes and control measures, branching of pipes.

## Unit-III

**Module 4: Open Channel Flow: Uniform flow**

Definition, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channel flow.

Uniform Flow- Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient 'n', most economical section of channel, Computation of Uniform flow, Normal depth.

**Module 5: Open Channel Flow: Non-Uniform Flow**

Specific energy, Specific energy curve, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Channel Transitions, Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile.

## Unit-IV

**Module 6: Hydraulic Jump**

Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump.

**Module 7:**

Surges, Positive and negative surges, Dynamics of Fluid Flow- Momentum principle, applications: Force on plates, pipe bends, and moments of momentum equation.

**Suggested Readings**


1. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth,
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Open channel Flow, K. Subramanya, Tata McGraw Hill.
4. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
5. Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers, 1971
6. Fluid Mechanic and Hydraulic machines R.K. BANSAL


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Laminar flow | https://youtu.be/jwSdYP17PAY?si=mGMDPnUAtCJoSDb |
| 2 | Loss of head through pipes | https://youtu.be/G3fVsnFf8Fo?si=ay7IciEIN3GoATWJ |
| 3 | Uniform flow | https://youtu.be/Q8BDFh_XqX8?si=bdkzKyT3PVLy4nGI |
| 4 | Hydraulic Jump | https://youtu.be/oWYVaho9jK0?si=h9lt84zgvZI89b6n |

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|---|---|---|---|---|---|
| Course code | **PCC-CE-204A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Structural Analysis** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 1 | 0 | 4 | |
| **Course Objectives:** | The objectives of this course are<br>• To introduce analysis of determinate and indeterminate structures.<br>• To develop ability to determine internal forces and deflections.<br>• To apply classical methods for structural analysis.<br>• To prepare students for design-oriented subjects. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO2 | Understand structural analysis methods. | Level 2: Understand |
| CO3 | Apply analysis techniques to beams and frames. | Level 3: Apply |
| CO4 | Analyze indeterminate structures. | Level 4: Analyze |
| CO5 | Evaluate structural responses under loads | Level 5: Evaluate |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining 8 questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**MODULE 1: Deflection of Statically determinate structures**

Deflection of determinate beams by Double Integration Method, Conjugate Beam Method and Moment Area Methods, Principle of Virtual work (Unit load method) and Castigliano's theorem.

**MODULE 2: Deflection of Statically determinate Frame & Truss**

Deflection of determinate pin jointed trusses and rigid jointed frames by principle of virtual work, Strain Energy and Castigliano's theorem. Williot Mohr diagram method and Maxwell's laws of reciprocal theorem

**Unit-II**

**MODULE 3: Travelling Loads**

Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying following moving loads: A Single Concentrated Load, Uniformly Distributed Load, Two Concentrated Loads, fixed distance apart Series of Concentrated Loads, Enveloping parabola, equivalent UDL for BM and SF in each of the above cases.

**MODULE 4: Influence Line**

Influence lines for reactions, BM & SF for simply supported beam and Panelled Girders. Influence lines for forces in trusses with top horizontal and curved both, Reversal of stresses, Use of influence lines for calculating design forces due to dead load and moving live loads. Influence lines using Muller Breslau principle.

**Unit-III**

**MODULE 5: Arches**

Concept of arches as structural elements, classification of arches – three-hinged, two-hinged, fixed arches, determination of horizontal thrust, bending moment and shear force diagrams for three-hinged arches (parabolic and circular – subjected to point loads and uniformly distributed loads), determination of horizontal thrust for two-hinged arches, brief introduction to fixed arches

**MODULE 6: Column Analogy Method & Cable and Suspension Bridge**

Elastic centre, properties of analogous column, application to beam & frames. Introduction of Cable and suspension Bridge uniformly loaded cables, Temperature stresses, and three hinged stiffening Girder and two hinged stiffening girder

**Unit-IV**

**MODULE 7: Indeterminate Structures & Deflection methods**

Introduction to Indeterminate Structures, Determination of kinematic and static indeterminacy of beams, frames and trusses, Slope Deflection and Moment Distribution Methods- Analysis of continuous beams & portal frames, Portal frames with inclined members.

**MODULE 8: Kani's Method**

Analysis of continuous beam and simple frames, Analysis of frames with different column lengths and end condition of the bottom storey.

**Suggested Readings**


1. Statically Indeterminate Structures by C.K. Wang, McGraw Hill Book Co., New York.
2. Advanced Structural Analysis by A.K. Jain, Nem Chand & Bros., Roorkee.
3. Indeterminate Structures by R.L. Jindal, S. Chand & Co., New Delhi.
4. Theory of Structures, Vol. I, by S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Deflection of determinate beams by Double Integration Method | https://youtu.be/ajGlZCND4rM?si=aoKNyj9Pt3wtx4 |
| 2 | Maximum Shear Force and Bending Moment diagrams for simply supported beams carrying moving loads | https://youtu.be/zYEjDnVnnHs?si=QeeacW9- z1E3ngNd |
| 3 | Determination of horizontal thrust, shear force and bending moment diagram for arches | https://youtu.be/F8u5zgdo_C4?si=UDm2Z14drPxvNf_d |
| 4 | Indeterminate Structures & Deflection methods | https://youtu.be/8nGgpKz07yk?si=xcYNj- Qxs3NUVnHm |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PCC-CE-206A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Advanced Surveying** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are:<br>• To develop advanced knowledge of surveying methods such as triangulation, tacheometry, and curve setting.<br>• To train students in the use of modern surveying instruments including total station and GPS/GNSS.<br>• To enable computation and adjustment of advanced survey data for engineering projects.<br>• To introduce remote sensing and photogrammetry concepts for mapping applications. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall advanced surveying concepts, instruments, and terminology. | Level 1: Remember |
| CO2 | Understand adjustment computations and RS principles. | Level 2: Explain |
| CO3 | Apply modern surveying techniques. | Level 3: Apply |
| CO4 | Analyze spatial and remote sensing data. | Level 4: Analyze |
| CO5 | Evaluate geospatial information for engineering use. | Level 5: Evaluate |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining 8 questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

### Module 1: Triangulation and Trilateration

Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, Trilateration- Principle, Methods, advantages and disadvantages, introduction to total station.

### Module 2: Survey Adjustment and computations

Definitions, types of error, weight of an observation, law of weights, most probable values, principle of least squares, method of correlates, normal equation, adjustment of triangulation figures by method of least squares.

## Unit-II

### Module 3: Astronomy

Definitions of astronomical terms, celestial coordinate systems, Napier's rule of circular parts, star at elongation, star at prime vertical, star at horizon, star at culmination, Astronomical triangle, various time systems: equation of time-its cause and effect,

## Unit-III

**Module 4: Elements of Photogrammetry**

Introduction, types of photographs, aerial camera, scale of a photograph, height displacements of vertical photographs, flight planning and its uses, crab and drift, number of photographs, relief displacements, Stereoscopic vision and stereoscopes, height determination from parallax measurement, flight planning, principle of photo interpretation, photogrammetric monitoring.

## Unit-IV

**Module 5: Introduction to remote sensing**

Definition of Remote Sensing, types of remote sensing, remote sensing system and components. EMR source and characteristics, active and passive remote sensing, EMR propagation through medium, Role of atmosphere, Atmospheric windows, EMR interaction with objects, Spectral signature, EMR interaction with vegetation, soil and water. Satellite orbits and platforms: Geostationary and sun synchronous satellites, Resolution, Applications of remote sensing in civil engineering.

**Module 6: Geographic Information System (GIS) and Global Positioning System (GPS)**

Definition and objectives of GIS, components of GIS, spatial data models: raster and vector, data inputting in GIS, linkage between spatial and non-spatial data, spatial data analysis: vector and raster-based spatial data analysis, integration of Remote Sensing (RS) and GIS data, Digital Elevation Model (DEM), GIS software packages, Introduction to GPS – Working Principle of GPS, components, types of GPS receivers, Error in GPS, applications in civil engineering.

**Suggested Readings**


1. Chang.T.K. 2002: Geographic Information Systems, Tata McGrawHill
2. Punmia, B.C. 2005: Surveying I and II, Luxmi Publications
3. Charles D. Ghilani: Adjustment Computations: Spatial Data Analysis (Fifth Edition)
4. Paul R Wolf: Elements of Photogrammetry
5. G S Srivastava: An introduction to Geoinformatics
6. Basudeb Bhatta: Remote Sensing and GIS
7. G. L. Hosmer: Text-book on Practical Astronomy


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Triangulation systems | https://www.youtube.com/watch?v=-23Rvzey1Ko |
| 2 | Definitions of astronomical terms, celestial coordinate systems | https://youtu.be/14- YsGiCNwI?si=Vf44PAY6qm_u3wg9 |
| 3 | Elements of Photogrammetry | https://youtu.be/qDmu_r12TU8?si=B6U5pXihH35N Z-dI |
| 4 | Introduction to remote sensing | https://youtu.be/cn5CWu_zt_s?si=HF-xcIbvPwahitgF |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PCC-CE-208A** | | | | |
| Category | **Professional Core courses** | | | | |
| Course title | **Material Testing and Evaluation** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To understand testing procedures of construction materials.<br>• To determine mechanical properties of materials.<br>• To evaluate material performance for structural applications.<br>• To develop skills in interpreting laboratory test results. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define properties of cement, concrete, and steel. | Level 1: Remember |
| CO2 | Understand behavior of materials under loads. | Level 2: Understand |
| CO3 | Apply material testing procedures. | Level 3: Apply |
| CO4 | Analyze test results and durability issues. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining 8 questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

### Module 1: Introduction to Engineering Materials

Cements, M-Sand, Concrete – plain, reinforced, steel fibre/glass fibre-reinforced, lightweight concrete, High Performance Concrete, Polymer Concrete, Ceramics and Refractories, Bitumen and asphaltic materials, Glass and Plastics, Structural Steel and other Metals. Emerging Construction Materials – Geopolymer Concrete, Self-Healing Concrete, Bacterial Concrete, Ultra-High Performance Concrete (UHPC), 3D-Printed Concrete.

### Module 2: Limes, cement and mortars

Lime: classification of lime, manufacturing, testing of lime, storage of lime, Cement: cement composition, types of cement, manufacturing of ordinary portland cement, special types of cement, storage of cement, testing of cement. Mortars: Proportions of lime and cement mortars, mortars for masonry and plastering.

## Unit-II

### Module 3: Concrete making materials

Proportions of cements, aggregates, water and admixtures; properties of fresh and hardened concrete, variability of concrete strength, extreme weather concreting, prestressed concrete; Durability of concrete - alkali aggregate reaction, reinforcement corrosion, freezing and thawing, etc.

**Module 4: Mix Design**

Principles of concrete mix design, basic considerations, Factors in the choice of mix design, outline of mix design procedure, ACI mix design practice, USBR method, British mix design method IS guidelines.

## Unit-III

**Module 5: Steel and its testing**

Types of steel, mechanical behaviour and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; tensile test – standards for different material (brittle, quasi-brittle, elastic and so on); Bending and torsion test, procedure and standards, Strength of ceramic, Internal friction, creep – fundaments and characteristics; Brittle fracture of steel – temperature transition approach; concept of fracture mechanics; fracture toughness testing.

## Unit-IV

**Module 6: Testing and Evaluation Procedures**

Testing of concrete mixes, description for various concrete, steels, aggregates ; Elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Shrinkage, Creep.

**Module 7: Construction equipments and Heavy Construction**

Construction of large structures, dams, bridges, multi storeyed buildings etc, Construction Equipments - crushers, hot mix, plants, dozers etc, Introduction to heavy construction equipment.

**Suggested Readings**


1. Handbook of mix design - BIS
2. Concrete Technology by M.S. Shetty.
3. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth- Heinemann
4. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition
5. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications
6. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
7. E.N. Dowling (1993), Mechanical Behaviour of Materials,Prentice Hall International Edition
8. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Introduction to Engineering Materials | https://youtu.be/gqp3cNOp5yQ?si=qwMzQKxgcsh3T9Sf |
| 2 | Durability of concrete | https://youtu.be/2Q7-o0HZTOE?si=mzkEcjsC_0N_oH2y |
| 3 | Steel and its testing | https://youtu.be/DxTu9HsjQKg?si=OzRhirDJtbdQy5zn |
| 4 | Testing of concrete mixes | https://youtu.be/2SaZlCn4uxI?si=iGQO-Lx2by7WmL1B |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CE-210A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Hydraulic Engineering Lab.** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are<br>• To conduct experiments on open channel flow and hydraulic machines.<br>• To evaluate discharge, velocity, and efficiency parameters.<br>• To interpret hydraulic system performance | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall laboratory equipment and flow measuring devices used in hydraulic engineering. | Level 1: Remember |
| CO2 | Understand principles of open channel flow and hydraulic machines. | Level 2: Understand |
| CO3 | Perform experiments related to flow in channels, pipes, and hydraulic devices. | Level 3: Apply |
| CO4 | Analyze experimental results to determine flow parameters and efficiencies. | Level 4: Analyze |

## LIST OF EXPERIMENTS

1. To determine the coefficient of drag by Stokes law for spherical bodies.
2. To study the phenomenon of cavitation in pipe flow.
3. To determine the critical Reynolds number for flow through commercial pipes.
4. To determine the coefficient of discharge for flow over a broad crested weir.
5. To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
6. To study the scouring phenomenon around a bridge pier model
7. To study the scouring phenomenon for flow past a spur.
8. To determine head loss due to various pipe fittings.

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| **1** | To determine the coefficient of drag by Stokes law for spherical bodies. | https://youtu.be/lneevkjxlUQ?si=x3hVDLUmLTCkaV3A |
| **2** | To study the phenomenon of cavitation in pipe flow. | https://youtu.be/wo1sWgjJ06w?si=FrBKpBkBqaOoPY7J |
| **3** | To determine the critical Reynolds number for flow through commercial pipes. | https://youtu.be/KDCtmq3q6_c?si=-hlPeTytwf1dFfr5 |
| **4** | To determine the coefficient of discharge for flow over a broad crested weir. | https://youtu.be/5dJ5or3lXb4?si=qDTVA9DE8tM9Ohna |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CE-212A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Structural Analysis Lab** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are<br>• To perform structural experiments and software-based analysis.<br>• To understand structural behavior under various loading conditions.<br>• To analyze experimental and analytical results | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO2 | Understand behavior of structural elements under different loading conditions. | Level 2: Understand |
| CO3 | Perform experiments or software-based analysis of beams, frames, and trusses. | Level 3: Apply |
| CO4 | Analyze internal forces, deflections, and support reactions. | Level 4: Analyze |
| CO5 | Evaluate structural response by comparing analytical, experimental, or software results. | Level 5: Evaluate |

## LIST OF EXPERIMENTS

1. To verify moment area theorem regarding slope and deflection in a beam
2. To verify Maxwell's Reciprocal Theorem.
3. Begg`s deformeter- verification of Muller Breslau principle
4. Experiment on a two – hinged arch for horizontal thrust and influence line for horizontal thrust
5. Analytical and experimental study of three hinged arch
6. Experimental and analytical study of unsymmetrical bending of a cantilever beam
7. Sway in portal frames – Demonstration

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| **1** | To verify moment area theorem regarding slope and deflection in a beam. | https://youtu.be/zXpWmyWEScs?si=tL1HtBYb2y0dM AEx |
| **2** | To verify Maxwell's Reciprocal Theorem. | https://youtu.be/dce7cO4q45U?si=kjIfjI0H9vb4ESQF |
| **3** | Begg`s deformeter- verification of Muller Breslau principle | https://technicalcivil.com/muller-breslau-principle-video/ |
| **4** | Experiment on a two – hinged arch for horizontal thrust and influence line for horizontal thrust | https://youtu.be/OPsKQvcp9Qw?si=yLYUm7mxO- 27Uktm |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CE-214A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Advanced Surveying Lab.** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are<br>• To develop practical skills in using advanced surveying instruments such as total station, GPS/GNSS, and EDM.<br>• To train students in conducting advanced field surveys including triangulation, curve setting, and tacheometric surveys.<br>• To enable accurate computation, adjustment, and processing of advanced survey data.<br>• To develop competency in preparing digital maps, alignment layouts, and survey reports. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO2 | Explain operational principles of advanced surveying instruments | Level 2: Explain |
| CO3 | Perform advanced field surveys | Level 3: Apply |
| CO4 | Analyze survey data and perform necessary computations, adjustments, and error corrections. | Level 4: Analyze |
| CO5 | Evaluate accuracy, precision, and reliability of advanced survey measurements. | Level 5: Evaluate |

## LIST OF EXPERIMENTS

1. Study various parts of a theodolite
2. Measurement of horizontal and vertical angles with theodolite
3. Measurement of Tachometric constants.
4. Calculating horizontal distance and elevations using tachometer.
5. Exercise of triangulation including base line measurement.
6. Setting out simple circular curves by deflection angle method.
7. Study the various parts of a total station.
8. Measurements of distance, elevation, coordinate with total station.
9. Special problems with total station.

**Useful Video links:**

| Exp. No | Topics | Links |
|---|---|---|
| **1** | Measurement of horizontal and vertical angles with theodolite | https://youtu.be/Mb2jbdqMJHA?si=6x3x-rULjspFXrDa |
| **2** | Measurement of Tachometric constants. | https://youtu.be/-q_4kK2z3mA?si=gdgUlGi5hWAVo1aP |
| **3** | Calculating horizontal distance and elevations using tachometer. | https://youtu.be/cIZbyEaD_PA?si=DnjKIdUV2luMtqL0 |
| **4** | Study the various parts of a total station. | https://youtu.be/oFoegb0lx3o?si=lExcfpB30KYnw9T_ |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-CE-216A** | | | | |
| Category | **Lab Course** | | | | |
| Course title | **Material Testing and Evaluation Lab.** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 2 | 1 | |
| **Course Objectives:** | The objectives of this course are<br>• To perform laboratory tests on concrete, steel, and other materials.<br>• To evaluate strength and durability characteristics.<br>• To prepare comprehensive laboratory reports. | | | | |
| Class work | 25 Marks | | | | |
| Exam | 25 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall testing machines, specimen preparation methods, and testing standards. | Level 1: Remember |
| CO2 | Understand stress–strain behavior and failure modes of construction materials. | Level 2: Explain |
| CO3 | Perform laboratory tests on cement, concrete, steel, and other materials. | Level 3: Apply |
| CO4 | Analyze test data to determine strength and durability parameters. | Level 4: Analyze |

## LIST OF EXPERIMENTS

1. Standard consistency of cement using Vicat`s apparatus. 2.
   A) Fineness of cement by Sieve analysis and Blaine`s air permeability method.
   B) Fineness modulus of coarse and fine aggregates.
3. Soundness of cement by Le-Chatelier`s apparatus.
4. Setting time of cement, initial and final of cement.
5. Compressive strength of cement.
6.
   A) Measurement of specific gravity of cement.
   B) Measurement of Heat of Hydration of cement.
7. Moisture content and bulking of fine aggregate.
8. Workability of cement concrete by (a) Slump test (b) Compaction factor test (c) Flow table test.
9. Compressive strength of concrete by (a) Cube test, (b) Cylinder test
10. Indirect tensile strength of concrete-split cylinder test.
11. Modules of rupture of concrete by flexure test.
12. Bond strength between steel bar and concrete by pull-out test.
13. Non-destructive testing of concrete.

**Useful Video links:**

| Exp. No. | Topics | Links |
|---|---|---|
| 1 | Standard consistency of cement using Vicat`s apparatus | https://youtu.be/QUfWcEQzMsw?si=PtT3y4W0eSqz79OP |
| 3 | Soundness of cement by Le- Chatelier`s apparatus. | https://youtu.be/XoG4yq30htQ?si=mDGlY5wse_3MR8xc |
| 4 | Setting time of cement, initial and final of cement. | https://youtu.be/sQ4SJrE1oyA?si=4ZFdFKUgafPffhES |
| 5 | Compressive strength of cement. | https://youtu.be/bG88DAOreVA?si=WLjxoq-nMx_odmxw |
| 7 | Moisture content and bulking of fine aggregate. | https://youtu.be/Odfz20NkzGo?si=B2OQdbhbSvu_kTGa |
| 8 | Workability of cement concrete by Slump test | https://youtu.be/yzpWGrh9j6Y?si=1gMAvlxQBl7q9DCR |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-CE-218A** | | | | |
| Category | **Professional Elective Courses** | | | | |
| Course title | **Design of Concrete Structure** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To understand the behavior and design philosophy of reinforced concrete structures based on limit state principles.<br>• To develop ability to analyze and design RCC beams, slabs, columns, and footings as per relevant IS codes.<br>• To study structural detailing practices for safety, serviceability, and durability.<br>• To enable application of codal provisions in the design of structural components. | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall fundamental concepts of reinforced concrete behavior, design philosophy, and relevant IS code provisions | Level 1: Remember |
| CO2 | Explain limit state design principles for flexure, shear, bond, and serviceability requirements. | Level 2: Explain |
| CO3 | Apply codal provisions to analyze and design RCC beams and slabs under various loading conditions. | Level 3: Apply |
| CO4 | Analyze and design RCC columns and footings considering strength and stability requirements. | Level 4: Analyze |
| CO5 | Evaluate RCC designs for safety, serviceability and IS code compliance. | Level 5: Evaluate |
| CO6 | Design and prepare detailed reinforcement drawings for RCC structural components. | Level 6: Create |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining 8 questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Module 1: Design methodology in Reinforced Concrete & Working stress Method** Working stress and limit state methods, Limit state v/s working stress method, Building codes, Normal distribution curve, Characteristic strength and Characteristics loads, Design values, Partial safety factors and Factored loads, Stress-Strain relationship for concrete and steel. Working Stress Method: Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, steel beam theory, inverted flanged beams, design examples.

**Module 2: Limit State Method**

Basic assumptions, Analysis and design of singly and doubly reinforced rectangular flanged beams, minimum and maximum reinforcement requirement and design examples. Continuous Beams both method -Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear.

## Unit-II

**Module 3: Concrete Reinforcement and Detailing**

Requirements of good detailing, Cover to reinforcement, Spacing of reinforcement, Reinforcement Splicing, Anchoring reinforcing bars in flexure and shear, Curtailment of reinforcement. Analysis and Design of Sections in shear, bond and torsion, Diagonal tension, shear reinforcement, Development length, Anchorage and flexural bond, Torsional stiffness, equivalent shear, Torsional reinforcement, Design examples.

**Module 4: Serviceability Limit State**

Control of deflection, Cracking, Slenderness and vibrations, Deflection and moment relationship for limiting values of span to depth, Limit state of crack width, Design examples.

## Unit-III

**Module 5: Slabs**

General considerations, Design of one way and two ways slabs for distributed and concentrated loads, Non-rectangular slabs, Openings in slabs, Design Examples.

**Module 6: Retaining Walls**

Classification, Forces on retaining walls, Design criteria, Stability requirements, Proportioning of cantilever retaining walls, counter fort retaining walls, criteria for design of counter forts, Design examples.

## Unit-IV

**Module 7: Columns**

Effective length, Minimum eccentricity, Short columns, under axial compression, Uniaxial and biaxial bending, Slender columns. Design examples.

**Module 8: Footings**

Isolated and wall footings, Design examples. Foundations-Combined footings, raft foundation, design of pile cap and piles, under reamed piles, design examples.

**Suggested Readings**


1. Design Of Reinforced Concrete Structures By P.Dayaratnam, Oxford & IBH Pub.,N.Delhi.
2. Design of Reinforced Concrete-Limit State Design By A.K.Jain, Nem Chand & Bros.,Roorkee.
3. Design of Reinforced Concrete by I.C.Syal & A,K,Goel, A.H,Wheeler & Co. Delhi. Reinforced Concrete Design by S.N.Sinha, Tmh Pub.,N.Delhi.
4. Sp-16(S&T)-1980, Design Aids For Reinforced Concrete to IS:456, BIS, N.Delhi.
5. Reinfirced cement concrete design by Neelam Sharma , S.K.Kataria & sons, N.Delhi.
6. Sp-34(S&T)-1987 Handbook on Concrete Reinforcement And Detailing`, BIS, N.Delhi.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Working stress and limit state methods | https://youtu.be/ba3mZhOpsTM?si=cR5Ec7Nhv6-dHT2l |
| 2 | Concrete Reinforcement and Detailing | https://youtu.be/aJJedgPfFVI?si=mYBTzapnJBW1Ksba |
| 3 | Design of one way and two ways slabs | https://youtu.be/PDJPcQq3PZE?si=2dEvG1hldX9Y2yvn |
| 4 | Minimum eccentricity in column | https://youtu.be/ukIrYcFLyoc?si=FJLU2ajoaNQOg-y1 |

| | | | | | |
|---|---|---|---|---|---|
| Course code | **PEC-CE-220A** | | | | |
| Category | **Professional Elective Courses** | | | | |
| Course title | **Climate Hazards and Disaster Mitigation** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-IV** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are to:<br>• Introduce fundamental concepts of climate science, climate change, and extreme weather events relevant to civil engineering.<br>• Familiarize students with tools and techniques for observing, measuring, and analyzing climate extremes using climate data and models.<br>• Develop analytical skills to detect trends, assess risks, and estimate return periods of extreme events affecting infrastructure systems | | | | |
| Class work | 40 Marks | | | | |
| Exam | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:**

After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall basic principles of climate science and extreme weather events. | Level 1: Understand |
| CO2 | Explain climate change and the frequency and intensity of extreme events. | Level 2: Apply |
| CO3 | Apply climate data analysis and probability concepts to extreme events. | Level 3: Analyze |
| CO4 | Analyze trends, uncertainties and infrastructure impacts of climate extremes. | Level 4: Evaluate |

**Note:** Examiner will set nine questions in total. Questions one will be compulsory. Question one will have 8 parts (preferably 2 from each units/section) of 1.5 marks each and remaining 8 question of 12 marks each to be set by taking two questions from each units. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Module 1: Foundations of Climate Change and Extreme Events:**

Climate Science Basics – Weather vs. Climate, Introduction to Climate Change, Introduction to Climate Extremes: Definitions, Types, and Global Impact, Heatwaves and Cold Spells: Causes, Impacts, and Trends, Extreme Precipitation: Floods, Droughts, and Water Cycle Impacts, Tropical Cyclones, Storms, and Associated Weather Events.

**Module 2: Tools and Techniques for Observing and Measuring Climate Extremes:**

Climate Data Sources and Observational Tools (satellites, ground stations, remote sensing), Data Collection and Preprocessing: Handling Gaps, Errors, and Temporal Biases, Introduction to Climate Models: Types, Resolution, and Applications, Probability Distributions and Climate Data Analysis, Introduction to Extreme Value Theory (EVT) and its Applications, Analyzing Frequency and Intensity of Extreme Events.

## Unit-II

**Module 3: Analyzing and Detecting Changes in Climate Extremes:**

Time Series Analysis: Trends, Seasonality, Stationary and Correlations, Detection of Changes in Extreme Events: Statistical Techniques, Attribution Studies: Linking Extremes to Anthropogenic Climate Change, Risk Assessment Frameworks for Extreme Events, Calculating Return Periods for Rare Events (e.g., 100-year floods), Uncertainty Analysis in Climate Projections and Risk Assessments.

**Module 4: Case Studies on Recent Extreme Events**

The 2013 Uttarakhand and 2015 South India Floods, The Millennium Drought of Australia, The 2022 Heatwave Across Northern and Central India

**Unit-III**

**Module 5: Socioeconomic Impacts, Vulnerability, and Policy Responses:**

Economic Costs of Extreme Events: Damage and Recovery, Health and Social Impacts of Climate Extremes, Vulnerability and Adaptation in Developing Regions. Policy and Governance in Managing Climate Extremes, International Agreements and National Policies on Climate Change, Risk Reduction Strategies and Community Resilience, Adaptation Policies for Climate Extreme Events.

**Unit-IV**

**Module 6: Emerging Trends, Advanced Applications, and Future Directions**

Advances in Climate Extremes Research and Big Data Applications, Remote Sensing and AI in Detections of Climate Extremes, Role of Ecosystems in Mitigating Climate Extremes (e.g., mangroves for coastal flooding), Review of Statistical and Analytical Methods, Integrated Case Study Project: Analyzing a Recent Extreme Event, Course Wrap-Up and Discussion on Future Research Directions.

**Suggested Readings**


1. Intergovernmental Panel on Climate Change (IPCC). *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX)*. Cambridge University Press.
2. Wilks, D. S. *Statistical Methods in the Atmospheric Sciences*. Academic Press.
3. Coles, S. *An Introduction to Statistical Modeling of Extreme Values*. Springer.
4. Kundzewicz, Z. W. (Ed.). *Flood Risk in a Changing Climate*. IAHS Press.
5. Smith, K., & Petley, D. *Environmental Hazards: Assessing Risk and Reducing Disaster*. Routledge.
6. Burroughs, W. J. *Climate Change: A Multidisciplinary Approach*. Cambridge University Press.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| 1 | Climate Science Basics. | https://youtu.be/dbJz1KBYVbg |
| 2 | Climate Data Sources and Observational Tools. | https://youtu.be/aeu95dlnwm4?si=ejHFSZ0Y8MHt9pRD |
| 3 | Case Studies on Recent Extreme Events. | https://youtu.be/ouQOuIavOzM?si=JaimE14L96p0oRa8 |
| 4 | Advances in Climate Extremes Research | https://youtu.be/-x35OzfPgRE?si=1cINNc77vV2hs019 |

## DEPARTMENT OF APPLIED SCIENCE AND HUMANITIES

## GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

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**Minutes of 2nd meeting of Board of Studies of Department of Applied Science and Humanities**

The 2nd meeting of Board of Studies of Department of Applied Science and Humanities was held on 27th May 2025 at 11.00 am in Board Room of the Institute.

The following members were present for BOS meeting:

| S. No | Name | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Prof. Anurag Jain | Professor and Head, Department of Applied Science and Humanities, GITAM, Kablana | Chairperson |
| 2 | Prof. S.P. Khatkar | Professor, Emeritus, Department of Chemistry, M.D. University, Rohtak | University Nominee |
| 3 | Prof. Phool Singh | Professor, Department of Mathematics under SoET, Central University of Haryana, Mahendergarh | Subject Expert, Outside Parent University |
| 4 | Prof. Kulvinder Singh | Professor, Department of Physics, Deen Dayal Upadhyay College, Delhi University | Subject Expert, Outside Parent University |
| 5 | Prof. Aman Aggarwal | Director , GITAM, Kablana, | Special Invitee |
| 6 | Dr. Sweta Chauhan | Professor, Physics, GITAM, Kablana | Member |
| 7 | Dr. Prem Ballabh | Associate Professor, Chemistry, GITAM, Kablana | Member |
| 8 | Dr. Ankita Saini | Assistant Professor, Chemistry, GITAM, Kablana | Member |
| 9 | Dr. Aarti | Assistant Professor, Chemistry, GITAM, Kablana | Member |
| 10 | Mr. Aseem Harit | Assistant Professor, Mathematics, GITAM, Kablana | Member |
| 11 | Dr. Kuldeep | Assistant Professor, Mathematics, GITAM, Kablana | Member |



| | | | |
|---|---|---|---|
| 12 | Ms. Kshitij Upadhyay | Assistant Professor, Physics, GITAM, Kablana | Member |
| 13 | Ms. Suman Singh | Assistant Professor, English, GITAM, Kablana | Member |
| 14 | Ms. Aditi Kashyap | Assistant Professor, English, GITAM, Kablana | Member |
| 15 | Ms. Supriya | Assistant Professor, Mathematics, GITAM, Kablana | Member |
| 16 | Ms. Vidhi | Assistant Professor, Mathematics, GITAM, Kablana | Member |
| 17 | Dr. Naveen | Assistant Professor, Mathematics, GITAM, Kablana | Member |
| 18 | Dr. Ekta | Assistant Professor, Physics, GITAM, Kablana | Member |
| 19 | Dr. Jitender Kumar | HOD (FTS), GITAM, Kablana | Special Invitee |
| 20 | Mr. Joginder Singh | HOD (EE), GITAM, Kablana | Special Invitee |
| 21 | Dr. Rakesh Joon | HOD (ECE), GITAM, Kablana | Special Invitee |
| 22 | Dr. Nitin Kumar | HOD (CSE), GITAM, Kablana | Special Invitee |
| 23 | Mr. Vivek Khokkar | HOD (ME), GITAM, Kablana | Special Invitee |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Item No.2.1**

**Confirmation of the minutes of 1st meeting of Board of Studies (BOS) held on 10.01.2025.**

The minutes of 1st meeting of the Board of Studies of Department of Applied Science and Humanities held on 10.01.2025 **(Annexure-2.1 Page No. 1- 3)** already circulated be confirmed.

**Item No.2.2**

**Follow up action report on the decisions taken in the 1st meeting of Board of Studies held on 10.01.2025 (Annexure 2.2 Page 4) already circulated.**

The follow up action report on the decisions taken in the 1st meeting of Board of Studies held on 10.01.2025 be noted.

| Sr. No. | Particulars | Follow-up Action |
|---|---|---|
| 1 | Approval of the Ordinance, Scheme of Examinations and syllabi of B.Tech 1st year for session 2024-25. | Approved the Ordinance, Scheme of Examinations and syllabi of B.Tech 1st year for session 2024-25. |
| 2 | Panel of Examiners for Theory and Practical Examinations of B.Tech 1st year Program. | Approved the panel of examiners for Theory and Practical of Examinations of B.Tech 1st year Program. |

**Item No.2.3**

**Ordinance, Scheme of Examinations and Syllabi (B-Scheme) of B.Tech 1st year (Computer Science and Engineering, Computer Science and Engineering (Artificial intelligence and Machine learning), Computer Science and Engineering (Data Science), Electrical Engineering, Electronics and Communication Engineering, Civil Engineering, Mechanical Engineering, Fire Technology and Safety) as per NEP-2020 *w.e.f.* the Academic Year 2025-26.**

Resolved that Ordinance, Scheme of Examinations and Syllabi (B-Scheme) of B.Tech 1st year (Computer Science and Engineering, Computer Science and Engineering (Artificial Intelligence and Machine Learning), Computer Science and Engineering (Data Science), Electrical Engineering, Electronics and Communication Engineering, Civil Engineering, Mechanical Engineering, Fire Technology and Safety) as per NEP-2020 *w.e.f.* the Academic Year 2025-26 be approved and further resolved that the Ordinance, Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval **(Annexure 2.3 Pages 5-102).**

**Item No. 2.4**

**Scheme of Examinations and Syllabi for the following Courses under A-Scheme for the Academic Year 2025-26.**

| S.No | COURSE CODE | COURSE NAME | PROGRAM | SEMESTER |
|---|---|---|---|---|
| 1 | BSC-MCE-201A | Mathematics-III | B.Tech Civil Engineering | III |
| 2 | BSC-MEE-201A | Engineering Mathematics-III | B.Tech Electrical Engineering | III/IV |
| 3 | BSC-MECE-209A | Mathematics-III | B.Tech Electronics and Communication Engineering | III |

| | | | | |
|---|---|---|---|---|
| 4 | BSC-ME-209A | Mathematics-III | B.Tech Mechanical Engineering | III |
| 5 | BSC-MFTS-201A | Engineering Mathematics-III | B.Tech Fire Technology and Safety | III |
| 6 | BSC-MCSE-201A | Engineering Mathematics-III | B.Tech Computer Science and Engineering, Computer Science and Engineering (Artificial Intelligence and Machine Learning), Computer Science and Engineering (Data Science) | III |
| 7 | MC-201A | Environmental Science | B.Tech (All Branches) | III/IV |

Resolved that Scheme of Examinations and Syllabus of the above mentioned courses is approved and further resolved that the same is recommended to the Academic Council for approval **(Annexure 2.4 Pages 103-124).**

**Item No.2.5**

**Any other item with the permission of the Chair.**

No additional discussion was made.

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Department of Applied Sciences and Humanities**

Annexure 2.3

# ORDINANCE OF CURRICULUM AND CREDIT FRAMEWORK

# FOR B.TECH PROGRAMMES UNDER NEP 2020

## WITH EFFECT FROM

## THE

## SESSION 2025-26 ONWARDS




## GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

## AN AUTONOMOUS INSTITUTE | AFFILIATED TO M. D. UNIVERSITY

## ROHTAK

Undergraduate programmes of study leading to the award of respective Certificates/ Diplomas/ Degrees shall be offered and conducted by Ganga Institute of Technology and Management, an Autonomous Institute affiliated to Maharshi Dayanand University (MDU), Rohtak.

This Ordinance pertains to Bachelor of Engineering (B.E.) / Bachelor of Technology (B.Tech) programmes with the provision of Academic Bank of Credits (ABC) and Multiple Entry and Exit options, effective from the Academic Session 2025–26 and thereafter.

A key focus of the programme is to develop competencies that enable students to tackle real-world challenges. It emphasizes a hands-on approach through practical training, internships, and project-based learning. By equipping students with critical thinking, problem-solving skills and an entrepreneurial mindset, the curricula under the B.E./B.Tech. Programmes prepare graduates to contribute meaningfully to nation's development.

The National Education Policy (NEP) 2020 advocates a holistic and multidisciplinary education aim to develop all capacities of - intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner. Such a holistic approach is required at undergraduate level. The holistic four-year undergraduate education with multiple entry and exit provisions aligns undergraduate education with international standards and facilitates student mobility for higher studies, research, and global employability. The curriculum and credit Framework for B.E./B.Tech. Programmes are developed with the following features:

i. Opportunity for learners to choose courses of their interest in all disciplines
ii. Provision of multiple entry and exit options with a UG Certificate or UG Diploma, B.E./B.Tech Vocational or B.E. /B.Tech Or B.E./B.Tech with Minor/Honors Degree, depending on number of credits earned
iii. Flexibility for students to move among institutions through the implementation of Academic Bank of Credits (ABC)
iv. Flexibility to switch to alternative modes of learning (Offline, ODL, Online, Hybrid) as per the guidelines of AICTE
v. Versatile curricular framework for holistic development of Engineering graduates.

## 1. Definitions of Keywords

### a) Definition of Credit

| | |
|---|---|
| 1 Hr. Lecture (L) per week | 1 Credit |
| 1 Hr. Tutorial (T) per week | 1 Credit |
| 1 Hr. Practical (P) per week | 0.5 Credit |
| 2 Hrs. Practical/Lab per week | 1 Credit |

### b) Structure of Undergraduate Engineering Program

| Sr. No. | Category |
|---|---|
| 1 | Humanities and Social Sciences including Management Courses |
| 2 | Basic Science Courses |
| 3 | Engineering Science Courses |
| 4 | Program Core Courses (Branch Specific) |
| 5 | Professional Elective Courses relevant to chosen specialization/branch |
| 6 | Open Elective Courses (from Humanities, Technical Emerging or other Subjects) |
| 7 | Project Work, Seminar and Internship in Industry or elsewhere |
| 8 | Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition ] etc. (Non Credit) |

### c) Course Code and Definitions

| Course Code | Definitions |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Practical |
| HSMC | Humanities and Social Science Courses |
| BSC | Basic Science Courses |
| ESC | Engineering Science Courses |
| PCC | Program Core Courses |
| PEC | Program Elective Courses |
| OEC | Open Elective Courses |
| MC | Mandatory Courses |
| PROJ/SEM | Employment Enhancement Courses (Project/Summer Internship/Seminar) |

HOD AS

**d) Course Level Coding Scheme**

A three-digit number (odd numbers are for the odd semester courses and even number are for even semester courses) is used as a suffix with the Course Code for identifying the level of the course. Digit at the hundred's place signifies the year in which the course is offered.

e.g. 101,102… etc. for the first year.

201,202 … etc. for the second year.

301,302 … etc. for the third year.

401,402 … etc. for the fourth year.

The code may start with the implementation year.

**e) Course Level/Duration/System**

The following option will be made available to the students joining the chosen Engineering Programs with multiple entry and exit.

**A.** One Year: Undergraduate Certificate in the chosen branch of Engineering
**B.** Two Years: Undergraduate Diploma in the chosen branch of Engineering
**C.** Three Years: Bachelor of Vocational in the chosen branch of Engineering(B.Voc)
**D.** Four Years: Bachelor of Engineering/Bachelor of Technology(B.E/B.Tech) in the chosen branch of Engineering

The total number of credits for four-year B.Tech programs shall be 165-170. To get a minor/honors degree, a student needs to earn an extra 18-20 credits. For exit at different levels, a student needs to earn extra 6-8 credits.

**For example:**

| Level | Semester | Exit Option | Credits | Additional credits for exit students | List of Exit Courses |
|---|---|---|---|---|---|
| 4.5 | Semester 1&2 | U.G. Certificate | 42 | 6-8 | Chosen from the List Provided by the concerned branch. |
| 5.0 | Semester 3 &4 | U.G Diploma | 42 | 6-8 | -DO- |
| 5.5 | Semester 5 &6 | B.E/B.Tech Vocational | 44 | 6-8 | -DO- |
| 6.0 | Semester 7&8 | B.E/ B.Tech | 40 | ---- | |
| | | B.E/ B.Tech with- Minor/ Honor's | 18-20 | ------ | |



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## f) Structure of Awards

| No. of Credits | Internal Awards | External Awards/ Theory |
|---|---|---|
| 1 | 10 | 15 |
| 2 | 20 | 30 |
| 3 | 30 | 45 |
| 4 | 40 | 60 |

## g) Concept of Minor Degree

All branches of Engineering and Technology shall offer Elective Subjects in the Emerging/ Multidisciplinary/ Region Specific Areas as specified In the Approval Process Handbook (APH) of AICTE.

A. Undergraduate Degree Subjects in Emerging / Multidisciplinary/ Region Specific Areas shall be allowed as specialization from the same department. The minimum additional Credits for such areas shall be in the range of 18-20 (Including credit transferred from the SWAYAM platform) and the same shall be mentioned in the degree certificate, as specialization in that particular area. For example, doing extra credits for Cyber Security in Computer Science and Engineering shall earn B.E./B.Tech. (Hons.) Computer Science and Engineering with specialization in Cyber Security.

B. Minor specialization may be allowed in any Undergraduate Degree Courses where a student of another Department shall take the minimum additional Credits in the range of 18-20 and get a degree with a minor from another Department.

## h) Semester/Academic Year

A semester comprises 90 working days, and an academic year is divided into two semesters.

## i) Academic Bank of Credit (ABC)

An academic service mechanism to facilitate students to become its academic account holders, thereby paving the way for seamless student mobility between or within degree-granting Higher Educational Institutions through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed and flexible teaching-learning. ABC will digitally store the academic credits earned by students from HEIs registered with ABC for awarding degrees/diplomas/certificates taking into account credits earned by students. ABC will ensure the opening, closure and validation of Academic Bank Accounts, credit verification, credit accumulation, credit transfer, and redemption for students.

**j) Academic Bank Account**

An individual account with the Academic Bank of Credits opened and operated by a student, to which all academic credits earned by the Student from course(s) of study are deposited, recognized, maintained, accumulated, transferred, validated or redeemed for the purposes of the award of degree/diploma/certificates etc. by an awarding institution.

**k) Credit Point**

It is the product of the grade point and the number of credits for a course.

**l) Grade Point**

It is a numerical weight allotted to each letter grade on a 10-point scale.

**m) Letter Grade**

It is an index of the performance of students in a said course. Grades are denoted by letters O, A+, A, B+, B, C, P and F.

**n) Semester Grade Point Average (SGPA)**

It is a measure of performance of the work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

**o) Cumulative Grade Point Average (CGPA)**

It is a measure of the overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

## 2. Eligibility and Examination

The Institute will follow the guidelines regarding eligibilities of the AICTE, HSTES and MDU Rohtak.

### 2.1 Eligibility

#### 2.1.1 Admissions in First Year:

A person, who has passed 10+2 examination from the Board of School Education, Bhiwani or equivalent or any other examination recognized by M. D. University, Rohtak, as equivalent thereto, shall be eligible for admission in B.E./B.Tech. 1st year. Other conditions, such as rank in national level entrance examination, percentage of marks in the qualifying examinations, subject(s) combination, etc., shall be notified by AICTE/HSTES, Panchkula, applicable at the time of admission.

### 2.1.2 Lateral Entry Admissions:

Lateral Entry in the Third Semester shall be open to candidates who have passed Diploma in Engineering / B.Sc. as approved by the State Board of Technical Education, Haryana or equivalent and eligibility lay down by AICTE/HSTES, Panchkula, applicable at the time of admission.

**2.1.3. Admission to second degree program after completion of 1st B.E/B.Tech degree:** Admissions to an additional degree in B.E./ B.Tech. in the 3rd semester shall be open to candidates who have passed 4-year B.E./ B.Tech. Programme (AICTE approved) in any discipline with at least 50% marks in aggregate.

### 2.1.4. Admission to Working Professional Courses (in 2nd year):

Admission in B.Tech. programme for working professionals shall be open to the candidates with at least 1 years of work experience who have passed Diploma in Engineering of a minimum duration of 3 years from State Board of Technical Education, Haryana or equivalent / B.Sc.or any other examination recognized as equivalent thereto by the M.D.U. Rohtak with 50% marks in aggregate (47.5% in case of SC/ST of Haryana) or the rules laid down by AICTE/HSTES Panchkula/MDU Rohtak applicable at the time of admission. Other conditions like Distance/ Turnover of Company for Working Professionals will be applicable as per AICTE norms.

### 2.1.5 Branch sliding:

A candidate shall be given an opportunity to slide his/her branch in the 2nd year on the basis of the merit of the 1st semester result, depending on the availability of vacant positions in the respective branch of engineering as per the rules laid by the Institute/MDU Rohtak.

**Note:** Candidates placed under compartment/re-appear in the qualifying examination shall not be eligible for admission.

## 2.2. Examinations:

The duration of the B.Tech Programmes shall be four academic years, divided into eight semesters. The examination for the first, third, fifth, seventh and eighth semesters shall ordinarily be held in the month of December/January and for the second, fourth, sixth, eighth and seventh semesters, in the month of May/June on such dates as may be notified by the Controller of Examinations.

**2.2.1.** Supplementary examinations for the 1st, 2nd, 3rd, 4th, 5th, and 6th semesters shall be conducted along with their respective regular 1st, 2nd, 3rd, 4th, 5th, and 6th semester examinations. However, the supplementary examinations for the 7th and 8th semesters shall be conducted simultaneously. In addition, special examinations (make up Examinations) in Sept/Oct shall be conducted for reappear candidates who could not appear in the examinations due to genuine reasons such as emergencies, or who have failed to qualify in the regular or supplementary examinations.

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**2.2.2.** The examination schedule containing the dates of receipt of examination forms with and without late fee shall be notified by the Controller of Examinations from time to time.

**2.3** Every candidate shall be examined in the subject(s) as laid down in the syllabus and scheme of examination prescribed by the Academic Council from time to time. The fall/re-appear candidates will also appear in the exam, as per the syllabus applicable to regular students of that semester.

**2.4** Internal assessment shall be awarded as per the provisions in the Scheme of examination of the course concerned.

The criteria for awarding internal assessment shall be as under:

**a. Internal/Sessional examinations: 60%**

**b. Class Attendance: 20%**

| %age of Attendance | % of Marks for Attendance |
|---|---|
| Below 75 | 0 |
| 75 to < 80 | **25 to 50** |
| 80 to <85 | **50 to 75** |
| 85 to <90 | **75 to 100** |
| 90 and above | **100** |

**c. Class performance (Assignments, Quiz, questionnaires, seminar, etc):** 20%

The Head of the Department shall forward the internal assessment marks awarded by the teacher concerned on the basis of class test, written assignment and attendance in the classes etc. to the Controller of Examinations as per the following schedule:

i) The Internal Assessment/sessionals marks shall be supplied by the respective Heads of the Departments invariably within 20 days after commencement of the examination or as per schedule notified by Institute COE.

ii) Thereafter, a late fee per candidate per subject notified by Institute COE, shall be charged from the Department concerned.

iii) No Internal Assessment/Sessionals marks shall be entertained if the same are received in the Examination Branch after 30 days of the declaration of results. However, the Director may condone the delay with late fee after taking into consideration the merit of each case.

**2.5** The Head of the Department will preserve the records on the basis of which the internal assessment awards have been prepared for inspection, if needed by the Examination Branch and any external agency, up to three months from the date of declaration of the semester exam results.

**2.6** The candidate will be allowed to appear in the examination if he/she meets the following requirements: -

a. Bears a good character
b. Has been on the rolls of the Institution during the semester.

c. Has attended not less than 75% of lectures delivered in theory as well as practical. Relaxation in the shortage of lectures up to 20% will be allowed by the Head of the Department/Director of the Institute on the following grounds:
   i. Self-illness;
   ii. Illness/death of parents, brother, sister, or any of the close family members;
   iii. Any other reason beyond the control of the student, to the satisfaction of the Head of the Department.

**2.7** Unless specifically provided in the syllabus, the medium of instruction and examination shall be English.

**2.8** The minimum percentage of marks to pass the examination in each semester shall be:

a) 40% in each theory paper
b) 40% in each practical examination or viva-voce/Project/Training Report/Dissertation, wherever prescribed.
c) 40% in the aggregate of each theory paper and internal assessment (and practical, where practical is a component of the theory paper).

**2.9** The examination fee to be paid by the candidate for each semester shall be prescribed by the Institute from time to time.

**2.10** A candidate who fails to pass or, having been eligible, fails to appear in any semester examination, will be allowed to clear the re-appear paper(s) and also for improvement of result after passing a semester examination within a period of seven years. While reappearing to pass a semester examination, the candidate will be exempted from reappearing in the papers/practicals in which he/she has secured 40% pass marks.

**Note:** A candidate who has paid dues for the Higher Semester/Class but subsequently becomes ineligible for promotion shall not be required to pay the dues again on admission after meeting the above conditions.

**2.11** The internal assessment awards as well as viva-voce awards of a candidate who fails in any semester examination shall be carried forward to the next examination.

**2.12** Soon after the termination of the examination, the Controller of Examinations shall declare the result as early as possible. In cases where a candidate who was permitted to take the examination for a higher semester, but has not cleared the lower semester examination, his result for the higher semester examination will be declared provisionally.

**2.13** The grace marks will be allowed as per Institute Examination rules.

**2.14** The list of successful candidate after the eight semester examination shall be arranged as under in three divisions on the basis of aggregate marks obtained in 1st , 2nd 3rd 4th , 5th 6th 7th and 8th semester examinations taken together, and the division obtained by the candidate will be mentioned In his/her Degree:-

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a) Those who obtain 75% or more and pass the degree without any re-appear: **Distinction**

b) Those who obtain 60% or more marks: **First Division**

c) Those who obtain 50% or more marks but less than 60% marks: **Second Division**

d) Those who obtain less than 50% marks: **Third Division**

**Note:**

(i) A candidate who is permitted to migrate from any other Institute/University, the marks obtained by him in this Institute only will be taken into account. These marks, however, should be increased proportionately so as to raise them to the level of the maximum marks of the Institute

(ii) The candidate will be eligible for admission to higher studies, i.e. M.Tech, etc., after passing B.E/B.Tech. This degree will be considered equivalent to B.E./B.Tech. as the case may be.

**2.15** After passing each semester's examination, a candidate will be allowed to appear for improvement of result in during the special examinations which will be conducted in the month of August/September prescribed by COE, GITAM. Only improved marks (higher score) will be taken into account. The candidate will have to appear according to the current syllabus.

## 3. Learning assessment

A variety of assessment methods that are appropriate to a given discipline/subject area and a programme of study will be used to assess progress towards the course/programme learning outcomes. Evaluation will be based on continuous assessment, in which Sessional and terminal examinations will contribute to the final grade. Sessionals will consist of class tests, mid-semester examination(s), homework assignments, class presentations etc., as determined by the BOS. The proportion of external and internal assessment in any course shall be preferably 60%:40%.

**3.1 Letter Grades and Grade Points:** The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative GPA (CGPA) is based on the grades in all courses taken after joining the programme of study. The Institute may also mention marks obtained in each course and a weighted average of marks based on marks obtained in all the semesters taken together for the benefit of students.

| Marks (%) | Letter Grade | Grade Point |
|---|---|---|
| >90 | O(Outstanding) | 10 |
| >75 to 90 | A+(Excellent) | 9 |
| > 65 to 75 | A(Very good) | 8 |
| >55 to 65 | B+(Good) | 7 |
| > 50 to 55 | B(Above average) | 6 |
| > 40 to 50 | C(Average) | 5 |
| 40 | P (Pass) | 4 |
| Less than 40 | F(Fail) | 0 |
| | Ab(Absent) | 0 |

### 3.1.1 Computation of SGPA and CGPA

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses taken by a student, i.e.

$$\mathbf{SGPA\ (Si) = \Sigma(Ci \times Gi) / \Sigma Ci}$$

Where Ci is the number of credits of the $i^{th}$ course and Gi is the grade point scored by the student in the $i^{th}$ course.

**Example for Computation of SGPA**

| Semester | Course | Credit | Letter Grade | Grade Point | Credit(Credit* Grade) |
|---|---|---|---|---|---|
| I | Course 1 | 3 | A | 8 | 3×8=24 |
| I | Course 2 | 4 | B+ | 7 | 4×7=28 |
| I | Course 3 | 3 | B | 6 | 3×6=18 |
| I | Course 4 | 3 | O | 10 | 3×10=30 |
| I | Course 5 | 3 | C | 5 | 3×5=15 |
| I | Course 6 | 4 | B | 6 | 4×6=24 |
| | | **20** | | | **139** |
| | | | | | **139/20=6.95** |

The Cumulative Grade Point Average (CGPA) is also calculated in the same manner, taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\mathbf{CGPA = \Sigma(Ci \times Si) / \Sigma\ Ci}$$

Where Si is the SGPA of the $i^{th}$ semester and Ci is the total number of credits in that semester.

**Example for Computation of CGPA**

| Semester1 | Semester2 | Semester 3 | Semester 4 | Semester 5 | Semester 6 | Semester 7 | Semester 8 |
|---|---|---|---|---|---|---|---|
| Credit: 21<br>SGPA: 6.9 | Credit: 22<br>SGPA: 7.8 | Credit: 25<br>SGPA: 5.6 | Credit: 26<br>SGPA: 6.0 | Credit: 26<br>SGPA: 6.3 | Credit: 25<br>SGPA: 8.0 | Credit: 18<br>SGPA: 8.0 | Credit: 18<br>SGPA: 8.0 |
| **CGPA = 6.99 (21 x 6.9 + 22 x 7.8 + 25 x 5.6 + 26 x 6.0 + 26 x 6.3 + 25 x 8.0 + 18 x 8.0 + 18 x 8.0)/ 181** | | | | | | | |

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in transcripts.

Conversion of CGPA into Percentage: The CGPA to percentage conversion is as simple as multiplying the candidate's CGPA by 9.5.

**% of Marks = CGPA x 9.5**



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**4. Miscellaneous**

a. The Institute shall provide the facility of Academic Bank of Credits in consonance with UGC (Establishment and Operationalization of Academic Bank of Credits (ABC) Scheme in Higher Education) Regulations, 2021, as amended from time to time.
b. For any programme approved by the Academic Council, if a regulation is issued by the Academic Council, which is at variance with the provisions of this Ordinance; then the Ordinance shall prevail.
c. In addition to the provisions contained in this Ordinance, the Academic programmes shall also comply with essential requirements as prescribed by the AICTE and HSTES, Panchkula.
d. Relevant provisions regarding multiple entry-multiple exit options, academic bank of credits, etc., shall be applicable in accordance with the AICTE/HSTES/Institute/University Ordinance(s)/relevant UGC Regulations, as amended from time to time.
e. The student who leaves the program after completion of an odd semester/may be allowed to readmit in the next academic session in the corresponding even semester.

**Supernumerary seat(s) will be created for readmitting such students in the corresponding semester. For example, if a student exits the course after successful completion of the 3rd semester in one academic session, they will be allowed to take admission in the 4th semester in the next academic session.**

**5. Mobility Options and Credit Transfer through Academic Bank of Credits (ABC):**

a. Academic Bank of Credits a national-level facility to promote flexibility of curriculum framework and interdisciplinary or multidisciplinary academic mobility of students across Higher Education Institutions in the country, facilitates students to choose their own learning path to attain a Certificate or Diploma or Degree or Post-Graduate diploma or academic qualification, working on the principle of multiple entry-multiple exit as well as any-time, any-where, and any-level learning.
b. Each student shall have to register on Academic Bank of Credits (ABC) portal for creation of the unique ABC ID to avail multiple entry and multiple exit options and mobility across various disciplines and Higher Education Institutes.
c. Credits earned and deposited with Academic Bank of Credits (ABC) shall be valid for the purpose of redemption to a Certificate/Diploma/Degree, for a varying duration as specified by the credit awarding and credit accepting Higher Education Institution, subject to a maximum duration of seven years.
d. Provided that once any credit is redeemed for the award of a degree, diploma or certificate, such credit shall be irrevocably debited from the student's Academic Bank Account, and the credits earned by a student cannot be reused for the award of any other formal academic qualifications.
e. Students may customize or design their own degrees utilizing courses offered by one or more Higher Education Institutes registered with Academic Bank of Credits.
f. Provided that, the student shall be required to earn at least fifty percent of the credits from the Higher Education Institute awarding the degree, diploma or certificate;

g. Provided further that, the student shall be required to earn the required number of credits in the core subject area necessary for the award of the degree, diploma or certificate as specified by the Institute/University in which the student is enrolled.

h. A student shall be eligible for the award of degree, diploma or certificate, whichever applicable, only after fulfillment of the credit requirements, assessment processes, duration and other relevant provisions as laid down by the Institute/University.

i. A student can take the courses of any other Institute/University, subject to the equivalence of the core/elective courses and availability of seats, adopting the due administrative process and formal consent of the Institute through the Equivalence Committee(s).

j. The flexibility and mobility option doesn't entitle a student to be exempted or relaxed from any of the requisites (Sessional tests, attendance, assignments, end-semester examinations, programme duration, etc.) for the completion of the programme.

k. The mobility option should not be interpreted as inter-Institute/Inter university migration unless approved by both the Institutes/Universities.

l. The students shall be permitted to opt inter-disciplinary/multidisciplinary courses of their choice, learn at their pace, undergo additional courses, earn more than the required credits, and adopt an interdisciplinary/ multidisciplinary approach to learning.

m. The mobility across the disciplines is also subject to availability of seats, faculty, infrastructure, etc (as fixed by the Institute/Department from time to time.

n. Mobility of Credits earned by the students from GIAN (Global Initiative of Academic Networks) courses/ MOOCs (Massive Open Online Courses)/ SWAYAM (Study Webs of Active -Learning for Young Aspiring Minds)/ NPTEL/ Swachh Bharat Internship Programme/ etc. shall be credited in accordance with the provisions made under the respective schemes, as amended from time to time; subject to compatibility of course content & assessment process with the prior approval of the respective Board of Studies.

o. The student shall be given the equivalent credit weightage for the credits earned vide online learning credit courses through SWAYAM/NPTEL platform or any other platform specified by AICTE/UGC and as approved by the respective Board of Studies.

**Note:** The Institute may allow up to 40% of the total courses, being offered in a particular program in a Semester through the online learning courses offered through SWAYAM/NPTEL platform or any other platform specified by AICTE/UGC, subject to the following conditions:

a) The course contents are alike, to be decided by the concerned Board of Studies;
b) The courses are not offered in the Institute;
c) There is non-availability of suitable teaching staff to run the course in the Institute. The Institute shall give the equivalent credit weightage to the student for the credits earned via online learning credit courses through the SWAYAM/NPTEL platform or any other platform specified by AICTE/UGC, in the credit plan of the programme.



**6. Power to remove Difficulties:** If any difficulty arises in giving effect to the provisions of this Ordinance, the Director may, by order, make such provisions not inconsistent with the Act, Statutes, Ordinances or other Regulations, as appears to be necessary or expedient to remove the difficulty, however subject to ratification of such order by the Statutory bodies of the Institute.



# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA
## (JHAJJAR)
**An Autonomous Institute**

**'A' GRADE ACCREDITED BY NAAC**

# Evaluation Scheme & Syllabi of Bachelor of Technology

## First Year

## (With effect from Session: 2025-26)

**APPROVED BY AICTE, NEW DELHI AND AFFILIATED TO MDU, ROHTAK**

## 1. DEFINITION OF CREDIT

| | | |
|---|---|---|
| 1 | 1 Lecture (L) per week | 1 Credit |
| 2 | 1 Tutorial (T) per week | 1 Credit |
| 3 | 1 Practical (P) per week | 0.5 Credit |
| 4 | 2 Practical (Lab) per week | 1 Credit |

## 2. RANGE OF CREDIT

A range of credits from 160 to 180 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honors or additional Minor Engineering, if he/she completes additional 18-20 credits. These could be acquired through MOOCs.

## 3. STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAM (B.TECH)

| Sr. No. | Category | Breakup of Credits |
|---|---|---|
| 1 | Basic Science Courses | 21* |
| 2 | Engineering Science Courses | 22* |
| 3 | Professional Core Courses | 71* |
| 4 | Professional Elective Courses (Relevant to chosen specialization/branch) | 18* |
| 6 | Multidisciplinary Open Electives Courses | 9* |
| 7 | Humanities and Social Sciences including Management Courses | 15* |
| 8 | Project work, seminar and internship in industry or appropriate work place/ academic and research institutions in India/abroad | 14* |
| 9 | Mandatory Non Credit Courses – Audit Course (Including Environment Science, Indian Knowledge System, Constitution of India, Essence of Indian Traditional Knowledge, Yoga/NCC/NSS etc. | (Non-Credit) |
| | **Total Credits** | **170*** |

**Minor variation is allowed as per need of the respective disciplines.*



## 4. COURSE CODE AND DEFINITIONS

| Sr. No. | Category | Course Code |
|---|---|---|
| 1 | Basic Science Courses | BSC |
| 2 | Engineering Science Courses | ESC |
| 3 | Professional Core Courses | PCC |
| 4 | Professional Elective Courses (Relevant to chosen specialization/branch) | PEC |
| 5 | Indian Knowledge System | IKS |
| 6 | Multidisciplinary Open Electives Courses | MOEC |
| 7 | Humanities and Social Sciences including Management Courses | HSMC |
| 8 | Laboratory Courses | LC |
| 9 | Mandatory Non-Credit Courses – Audit Course | MC |
| 10 | Project | PR |
| 11 | Internship | INT |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## B.Tech – 1st Semester

*w.e.f.* 2025-26

| Sr. No. | Category | Notations | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in hrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | | Theory | Practical | | |
| 1 | Basic Science Courses | C | BSC-MAT-101B | Engineering Mathematics-I | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Basic Science Courses | A | Refer Table-I | Engineering Physics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| | | B | Refer Table-II | Engineering Chemistry | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Engineering Science Courses | A | ESC-CSE-102B | Programming for Problem Solving | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| | | B | ESC-EE-101B | Basics of Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| 4 | Engineering Science Courses | A | LC-ME-102B | Engineering Graphics and Design | 0 | 0 | 4 | 4 | 2 | 20 | | 30 | 50 | 3 |
| | | B | ESC-ME-102B | Manufacturing Process | 2 | 0 | 0 | 2 | 2 | 20 | 30 | | 50 | 3 |
| 5 | Humanities and Social Sciences including Management Courses | A | HSMC-ENG-101B | Communication Skills for Professionals | 2 | 0 | 0 | 2 | 2 | 20 | 30 | | 50 | 3 |
| | | B | HSMC-ASH-103B | Universal Human Values-II: Understanding Harmony and Ethical Human Conduct | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| 6 | Engineering Science Courses | A | Refer Table III | ---------- | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | |
| | | B | LC-ME-103B | Workshop Practice | 0 | 0 | 4 | 4 | 2 | 20 | | 30 | 50 | 3 |
| 7 | Basic Science Courses | A | Refer Table-IV | Engineering Physics Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| | | B | Refer Table-V | Engineering Chemistry Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| 8 | Engineering Science Courses | A | LC-CSE-102B | Programming for Problem Solving Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| | | B | LC-EE-102B | Basics of Electrical and Electronics Engineering Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |

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| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Humanities and Social Sciences including Management Courses | A | LC-ENG-102B | Language Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| | | B | LC-DT-101B | Design Thinking | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| 10 | Mandatory Non Credit Courses – Audit Courses | C | Refer Table - VI | ---------- | 0 | 0 | 2 | 2 | - | - | - | - | - | - |
| | | | | **TOTAL CREDITS** | | | | | **21** | | | | **525** | |

**Note:** The marks of Mandatory Non Credit Courses – Audit Course are not included in the total marks.



# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA, JHAJJAR (HR.)

## Scheme of Studies and Examination

## B.Tech 2nd Semester

*w.e.f.* 2025-26

| Sr. No. | Category | Notations | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Scheme (Marks) | | | | Exam Duration in hrs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture (L) | Tutorial (T) | Practical (P) | | | Assessment | End Semester Examination | | Total | |
| | | | | | | | | | | | Theory | Practical | | |
| 1 | Basic Science Courses | C | Refer Table-VII | Engineering Mathematics-II | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Basic Science Courses | A | Refer Table-II | Engineering Chemistry | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| | | B | Refer Table-I | Engineering Physics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Engineering Science Courses | A | ESC-EE-101B | Basics of Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| | | B | ESC-CSE-102B | Programming for Problem Solving | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| 4 | Engineering Science Courses | A | ESC-ME-102B | Manufacturing Process | 2 | 0 | 0 | 2 | 2 | 20 | 30 | | 50 | 3 |
| | | B | LC-ME-102B | Engineering Graphics and Design | 0 | 0 | 4 | 4 | 2 | 20 | | 30 | 50 | 3 |
| 5 | Humanities and Social Sciences including Management Courses | A | HSMC-ASH-103B | Universal Human Values-II: Understanding Harmony and Ethical Human Conduct | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| | | B | HSMC-ENG-101B | Communication Skills for Professionals | 2 | 0 | 0 | 2 | 2 | 20 | 30 | | 50 | 3 |
| 6 | Engineering Science Courses | A | LC-ME-103B | Workshop Practice | 0 | 0 | 4 | 4 | 2 | 20 | | 30 | 50 | 3 |
| | | B | Refer Table- III | ---------- | 3 | 0 | 0 | 3 | 3 | 30 | 45 | | 75 | 3 |
| 7 | Basic Science Courses | A | Refer Table -V | Engineering Chemistry Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| | | B | Refer Table-IV | Engineering Physics Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| 8 | Engineering Science Courses | A | LC-EE-102B | Basics of Electrical and Electronics Engineering Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| | | B | LC-CSE-102B | Programming for Problem Solving Lab | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Humanities and Social Sciences including Management Courses | A | LC-DT-101B | Design Thinking | 0 | 0 | 2 | 2 | 1 | 10 | | 15 | 25 | 3 |
| | | B | LC-ENG-102B | Language Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| 10 | Mandatory Non Credit Courses – Audit Courses | C | Refer Table -VI | ---------- | 0 | 0 | 2 | 2 | - | - | - | - | - | - |
| | | | | **TOTAL CREDITS** | | | | | **21** | | | | **525** | |

**Notes:** The marks of Mandatory Non Credit Courses – Audit Course are not included in the total marks.

**Important Notes**: Significance of the Notations used in this scheme

- C = These courses are common to both the groups (Group-A and Group-B).
- A = Other compulsory courses for Group-A.
- B = Other compulsory courses for Group-B.

**Table I**

| Courses | Remarks |
|---|---|
| BSC-PHY-101B: Mechanics, Optics and Superconductors<br>BSC-PHY-102B: Introduction to Electromagnetism and Optics<br>BSC-PHY-103B: Semiconductor Physics and Optics | **BSC-PHY-101B: Mechanics, Optics and Superconductors** for Mechanical Engineering, Civil Engineering and Fire Technology and Safety Engineering<br>**BSC-PHY-102B: Introduction to Electromagnetism and Optics** for Electrical Engineering and Electronics and Communication Engineering<br>**BSC-PHY-103B: Semiconductor Physics and Optics** for Computer Science Engineering, CSE-AI&ML, CSE-Data Science |

**Table II**

| Courses | Remarks |
|---|---|
| BSC-CH-101B: Engineering Chemistry -I<br>BSC-CH-102B: Engineering Chemistry -II | **BSC-CH-101B: Engineering Chemistry-I** for Mechanical Engineering, Civil Engineering and Fire Technology and Safety Engineering<br>**BSC-CH-102B: Engineering Chemistry-II** for Electrical Engineering, Electronics and Communication Engineering, Computer Science Engineering, CSE-AI&ML, CSE-Data Science |

**Table III**

| Courses | Remarks |
|---|---|
| ESC-ME-101B | Basics of Mechanical Engineering |
| ESC-CE-101B | Basics of Civil Engineering |
| ESC-FTS-101B | Fundamentals of Fire and Safety Engineering |
| ESC-CSE-101B | Basics of Computer Science and Engineering |
| ESC-AI-101B | Basics of Artificial Intelligence |
| ESC-DS-101B | Basics of Data Science |

**Table IV**

| Courses | Remarks |
|---|---|
| LC-PHY-101B Mechanics, Optics and Superconductors Lab<br>LC-PHY-102B Introduction to Electromagnetism and Optics Lab<br>LC-PHY-103B Semiconductor Physics and Optics Lab | **LC-PHY-101B: Mechanics, Optics and Superconductors Lab** for Mechanical Engineering, Civil Engineering and Fire Technology and Safety Engineering<br>**LC-PHY-102B: Introduction to Electromagnetism and Optics Lab** for Electrical Engineering and Electronics and Communication Engineering<br>**LC-PHY-103B: Semiconductor Physics and Optics Lab** for Computer Science Engineering, CSE-AI&ML, CSE-Data Science |

**Table V**

| Courses | Remarks |
|---|---|
| LC-CH-101B: Engineering Chemistry-I Lab<br>LC-CH-102B: Engineering Chemistry-II Lab | **LC-CH-101B: Engineering Chemistry-I Lab** for Mechanical Engineering, Civil Engineering and Fire Technology and Safety Engineering<br>**LC-CH-102B: Engineering Chemistry-II Lab** for Electrical Engineering, Electronics and Communication Engineering, Computer Science Engineering, CSE-AI&ML, CSE- Data Science |

**Table VI**

| Courses | Remarks |
|---|---|
| MC-101B: Yoga and Sports<br>MC-102B: Fire Ground Operation-I<br>MC-103B: IDEA Lab Workshop<br>MC-104B: Fire Ground Operation-II | **MC-101B:** Yoga and Sports for the students of B.Tech other than B.Tech Fire Technology and Safety Engineering<br>**MC-102B:** Fire Ground Operation-I for the students of B.Tech Fire Technology and Safety Engineering (First Semester)<br>**MC-103B:** IDEA Lab Workshop for the students of B.Tech other than B.Tech Fire Technology and Safety Engineering<br>**MC-104B:** Fire Ground Operation-II for the students of B.Tech Fire Technology and Safety Engineering (Second Semester) |

**Note:** Refer Table VI, Students who opt for MC-101B in the first semester must choose MC-103B in the second semester, and vice versa.

**Table VII**

| Courses | Remarks |
|---|---|
| BSC-MAT-102B: Engineering Mathematics-II<br>BSC-MAT-103B: Engineering Mathematics-II | **BSC-MAT-102B: Engineering Mathematics-II** for Computer Science and Engineering, CSE-AI&ML, CSE- Data Science<br>**BSC-MAT-103B: Engineering Mathematics-II** for Mechanical Engineering, Civil Engineering, Electrical Engineering, Electronics and Communication Engineering, Fire Technology and Safety Engineering |



| Course Code | **BSC-MAT-101B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Mathematics-I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop understanding of matrices, multivariable calculus, and ordinary differential equations concepts and applications.<br>• To equip students with skills to apply linear algebra, calculus, and differential equations in real-world scenarios. | | | | |
| Course Pre-requisite | Mathematics upto 12th Standard, Basic Knowledge of Mathematics | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the basics of linear algebra, differential calculus and differential equations. | Level 1: Remember |
| CO2 | Explain the properties and applications of linear algebra, differential calculus and differential equations. | Level 2: Understand |
| CO3 | Solve mathematical problems using the concepts of matrices, multivariable calculus and differential equations. | Level 3: Apply |
| CO4 | Analyze mathematical problems and systems to identify patterns, validate properties and interpret solutions in applied contexts. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Linear Algebra-Matrices:** Elementary matrices, elementary transformations, Rank of a matrix, inverse using elementary transformations, system of linear equations, linear and orthogonal transformations, eigen values and eigen vectors, properties of eigen values, Cayley-Hamilton theorem, diagonalization of matrices, Applications of matrices.

## Unit-II

**Multivariable Differential Calculus:** Limit, Continuity and Partial derivatives, Homogeneous functions, Euler's Theorem, Total differential, Composite functions, Jacobians, Taylor's and Maclaurin's expansion for the functions of two variables, Maxima and Minima, Lagrange's method of undetermined multipliers.

## Unit-III

**Ordinary Differential Equations of First Order:** Linear and Bernoulli's equations, Exact differential equations, Equations reducible to exact differential equations, Applications of differential equations of first order and first degree to simple electric circuits, Newton's law of cooling, Heat flow and Orthogonal trajectories.

## Unit-IV

**Ordinary Differential Equations of Second and Higher Order:** Linear differential equations of second and higher order, Complete solution, Complementary function and Particular integral, Method of variation of parameters to find particular integral, Cauchy's and Legendre's linear equations, Power series solutions, Legendre's and Bessel's functions.

**Suggested Readings:**


- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- A textbook of Engineering Mathematics (Calculus & Linear Algebra) by H. Arora, S. K. Kataria & Sons.
- Advanced Engineering Mathematics by H. K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Engineering Mathematics by P. Sangwan, Vayu Education of India.
- Engineering Mathematics for first year by T. Veerarajan, Tata McGraw-Hill Publishing Company Limited.




**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Rank of a matrix | https://youtu.be/_RDF7My0Lfg?si=jKIVC67ONrJgcgCK |
| | Eigen values & Eigen vectors | https://youtu.be/h5urBuE4Xhg?si=B-bpVVFJMbxJAFwq |
| | | https://youtu.be/LB-itmKrXag?si=0K4uF63wqZXDGC9y |
| | | https://youtu.be/ATUN2BuukSs?si=G3bONxeV6JBvBFSt |
| | Eigen values & Eigen vectors: Diagonalization | https://youtu.be/k7rjICzxJ24?si=bonLfqlueLjjNy_n |
| Unit-II | Limit of function of two variables | https://youtu.be/ZBfu5_I-6mA?si=blx1gTuXOlpAu1TR |
| | | https://youtu.be/Nz1EJQtFsG4?si=G6HFeprXNTCMcqc6 |
| | Continuity of function of two variables | https://youtu.be/_98Di71evws?si=BTZpJB_Ti-QJr2jH |
| | Partial Derivatives-I | https://youtu.be/6tQTRlbkbc8?si=onT7x_3JAVV_8OeJ |
| | Partial Derivatives-II | https://youtu.be/8ZAucbZscNA?si=kSnabqSiT9PsKpRL |
| | Composite and Homogeneous Functions | https://youtu.be/qCQQT2P5ojY?si=dgUqT2iXA0epoprK |
| | Taylor's Theorem for functions of two variables | https://youtu.be/r6lDwJZmfGA?si=q8lockcYhAgTzhkO |
| Unit-III | Linear and Bernoulli's equations | https://youtu.be/QC3z-NUkOcE?feature=shared |
| | Exact Differential Equations | https://youtu.be/6r5jfT8xrXM?si=bOrUJM-thhDIgfNF |
| | | https://youtu.be/Wx19LXs77mM?si=AdeHPdSOSengepm I |
| | Equations reducible to exact differential equations | https://youtu.be/dtbLHtoh_M0?feature=shared<br>https://youtu.be/SxYI7EzLVDA?feature=shared |
| Unit-IV | Linear Differential Equations (First Order) | https://youtu.be/AEHTsXRaQmE?si=vuiCdUZ41dsKjcED |
| | Higher Order Linear Differential Equations | https://youtu.be/btOCUmJkrrg?si=r184ISpfnBQd1Kc7 |
| | Cauchy-Euler Equations | https://youtu.be/b5io9_bJvEM?si=lZUGRuhLjGkphfQ2 |
| | Power Series Solutions | http://sdnbvc.digimat.in/nptel/courses/video/111106100/L 24.html |
| | Bessel Differential Equation | http://sdnbvc.digimat.in/nptel/courses/video/111106100/L28.html |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **BSC-PHY-101B** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Mechanics, Optics and Superconductors** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To make the students familiarize with the concepts and techniques of Mechanics, Optics and Superconductors.<br>• To enhance the ability of students to solve the complex engineering problems of their discipline using the principles and methods of Physics. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of Physics | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts of mechanics, thermal physics, wave optics and superconductors. | Level 1: Remember |
| **CO2** | Explain the concepts of mechanics, thermal physics, wave optics and superconductors. | Level 2: Understand |
| **CO3** | Solve engineering problems by using the methods and techniques of Mechanics, wave optics, superconductivity and magnetization. | Level 3: Apply |
| **CO4** | Analyze different engineering problems related to mechanics, thermal physics, optics, magnetic materials and superconductors. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Force and its effects:** Newton's laws of motion - mass, inertia and force, units and measurement of force, application of Newton's second and third laws in two dimensions, free body diagram, velocity and acceleration vectors in two dimensions, characteristics of force vector representation, Bow's notation, types of forces in nature.

**Force Systems:** Space force systems, Coplanar, concurrent and non-concurrent forces, Resultant and components of forces, concept of equilibrium, parallelogram law of forces, super-position and transmissibility of forces, Lami's theorem.

## Unit-II

**Thermal Physics:** Temperature and its measurement, heat, specific heat, latent heat, introduction to modes of heat transfer, thermal expansion, wavelength distribution of Black body radiation, Planck's constant, Stefan Boltzmann Law, Wien Displacement law, Kirchhoff's Law.

Phonons: Lattice vibration heat transfer, specific heat of solids, classical, Einstein and Debye Model, Ideal quantum gases: Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac statistics.

### Unit-III

**Interference:** Coherent sources, conditions for sustained interference, Interference due to Division of wave- front and Division of Amplitude, Interference in Parallel thin Films and wedge-shaped films, Necessity of an extended source, Newton's Rings and its applications to determine wavelength and refractive index.

**Diffraction:** Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Diffraction grating, absent spectra, Rayleigh's criterion of resolution, Resolving power and dispersive power of grating.

### Unit-IV

**Magnetic Materials and Superconductors:** Smart Materials, Magneto-rheology, Orbital diamagnetism, Magnetic moments, orbital diamagnetism, Classical theory of Para magnetism, Ferromagnetism, molecular field theory and domains, applications of magnetic materials, Type I and II Superconductors, Meissener Effect, BCS theory, London equation, Applications of superconductivity.

**Suggested Readings:**


- Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury 7th Edition, McGraw Hill Education India Private Limited.
- Engineering Physics, Second edition by H. K. Malik and A.K Singh, McGraw Hill Education India Private Limited.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Applied Physics for Engineers by Neeraj Mehta, PHI Learning private Limited, New Delhi.
- Mechanics by D.S. Mathur, S. Chand Publishing.
- Optics by Ajoy K. Ghatak7th Edition, McGraw Hill Education India Private Limited.
- AText Book of Optics by Brijlal & Subramanian, S. Chand Publishing.
- A Textbook of Engineering Physics by M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy.




**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Free Body Diagram | https://www.youtube.com/watch?v=9Yzsl05LGtw |
| | Force Systems-I | https://www.youtube.com/watch?v=6u_rjLjv-MY&t=153s |
| | Force Systems –II | https://www.youtube.com/watch?v=Fudcc0JoXdo |
| Unit-II | Wein's Law, Stephen Boltzmann Law, Blackbody Radiation Function | https://www.youtube.com/watch?v=TIFGm-QusM4 |
| | Thermal Expansion | https://www.youtube.com/watch?v=Lzrjqy4PImE |
| | Kirchhoff's Law | https://www.youtube.com/watch?v=5o91GiS5uHE |
| | Phonons | https://www.youtube.com/watch?v=J4CwGFpgt1I |
| Unit-III | Coherence | https://www.youtube.com/watch?v=5Za948EKAes |
| | Interference | https://www.youtube.com/watch?v=_vnEfLfXxIs |
| | Interference | https://www.youtube.com/watch?v=_vnEfLfXxIs |
| | Interference due to Division of wave-front | https://www.youtube.com/watch?v=P01aKhKxdx8 |
| | Interference due to Division of Amplitude | https://www.youtube.com/watch?v=n65gZGwiZtk |
| | Diffraction | https://www.youtube.com/watch?v=rZATW8dpiQA |
| Unit-IV | Superconductors | https://www.youtube.com/watch?v=SHoGVsezNI&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h |
| | London Equation | https://www.youtube.com/watch?v=QQzvQooUtJo&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h&index=7 |



| Course Code | **BSC-PHY-102B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Introduction to Electromagnetism and Optics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To familiarize the students with concepts and techniques of electromagnetism and optics.<br>• To enhance the ability of students to apply physics fundamentals to various modern applications in their discipline. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of Physics | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the basic concepts of optics, Laser, Electromagnetism, Semiconductors and Superconductors. | Level 1: Remember |
| CO2 | Explain the concepts of Optics, Laser, Electromagnetism, Semiconductors and Superconductors. | Level 2: Understand |
| CO3 | Solve engineering problems using the Principles and Techniques of optics, Laser, Electromagnetism, Semiconductors and Superconductors. | Level 3: Apply |
| CO4 | Analyze different engineering problems related to optics, laser, optical fiber, Electromagnetism, Semiconductors and Superconductors. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Interference:** Coherent sources, conditions for sustained interference, Interference due to Division of wave- front and Division of Amplitude, Interference in Parallel thin Films and wedge-shaped films, Necessity of an extended source, Newton's Rings and its applications to determine wavelength and refractive index.

**Diffraction:** Difference between interference and diffraction, Fraunhofer and Fresnel diffraction. Fraunhofer diffraction through a single slit, Diffraction grating, absent spectra, Rayleigh's criterion of resolution, Resolving power and dispersive power of grating.

## Unit-II

**Polarization:** Polarized and un-polarized light, Malu's Law, Brewster Law, Double Refraction, Nicol Prism, quarter and half wave plate, Production and detection of Plane, Elliptically and Circularly polarized light, Application of polarization, Optical activity and specific rotation.

**Laser:** Interaction of radiation with matter, Einstein's coefficients, Laser action, Characteristics of Laser, Spatial and temporal coherence, Ruby Laser, He-Ne Laser, Recent applications of Laser in engineering and technology.

## Unit-III

**Basic laws of electricity and magnetism**: Gradient, Divergence and Curl (Electric field and Magnetic field), line, surface and volume charge distribution, Gauss divergence theorem, Stoke's theorem (No derivation), Continuity equation for current density, Displacement current, Dielectrics, Electric polarization, Relation between three electric vectors, Maxwell's equation in differential and integral form (vacuum and non- conducting medium), their derivation and physical significance, Energy in an electromagnetic field, Poynting vector and Poynting theorem.

## Unit-IV

**Type of electronic materials**: Metals, Semiconductor and Insulators, Intrinsic and Extrinsic semiconductors, Fermi level and Fermi Energy, Dependence of Fermi level on carrier concentration and temperature, carrier generation and recombination, carrier transport: diffusion and drift, P-N Junction, Semiconductor materials of interest for optoelectronics devices.

**Superconductors**: Introduction to superconductors, temperature dependence of resistivity, Type I and Type II superconductors, Meissner effect, London equations, BCS theory (elementary idea), Application of superconductors.

**Fiber Optics:** Optical fiber, Acceptance angle, Numerical aperture-number, Classification of optical fibers, Attenuation and Dispersion in optical fibers, Applications of optical fiber.

**Suggested Readings:**


- A Text Book of Optics by Brijlal & Subramanian, S. Chand Publishing.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Applied Physics for Engineers by Neeraj Mehta, PHI Learning private Limited, New Delhi.
- Optics by Ajoy K. Ghatak 7th Edition, McGraw Hill Education India Private Limited.
- Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury 7th Edition, McGraw Hill Education India Private Limited.
- Introduction to Electrodynamics, D.J. Griffith, 4thEdition, Pearson Education India Learning Private Limited.
- Engineering Physics, Second edition by H. K. Malik and A. K Singh, McGraw Hill Education India Private Limited.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Coherence | https://www.youtube.com/watch?v=5Za948EKAes |
| | Interference | https://www.youtube.com/watch?v=_vnEfLfXxIs |
| | Interference due to Division of wave- front | https://www.youtube.com/watch?v=P01aKhKxdx8 |
| | Interference due to Division of amplitude | https://www.youtube.com/watch?v=n65gZGwiZtk |
| | Diffraction | https://www.youtube.com/watch?v=rZATW8dpiQA |
| Unit-II | Malu's Law, Brewster Law | https://www.youtube.com/watch?v=cmCB_FOEstQ |
| | Double Refraction | https://www.youtube.com/watch?v=Pt5wvYyguq0 |
| | Einstein Coefficients | https://www.youtube.com/watch?v=PQTMBlHhCY8&list=P |
| Unit-III | Gradient, Divergence and Curl | https://www.youtube.com/watch?v=v3ZC4Mo1fS0 |
| | Stoke's Theorem | https://www.youtube.com/watch?v=QPw4GYz5Unc |
| | Electric Polarization | https://www.youtube.com/watch?v=GJNynbp5bxk |
| | Maxwell Equations | https://www.youtube.com/watch?v=XUR-dnDa7eI |
| Unit-IV | Semiconductors | https://www.youtube.com/watch?v=JA3sCmrv11M&list=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2 |
| | London Equation | https://www.youtube.com/watch?v=QQzvQooUtJo&list=PLw dnzlV3ogoU1IvWa-_5u9iGVimN2uT3h&index=7 |
| | Superconductors | https://www.youtube.com/watch?v=SHoGV- sezNI&list=PLwdnzlV3ogoU1IvWa-_5u9iGVimN2uT3h |

HOD AS

| Course Code | BSC-PHY-103B | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Semiconductor Physics and Optics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To familiarize the students with concepts and techniques of semiconductor physics and optics.<br>• To enhance the ability of students to apply physics fundamentals to various modern applications in their discipline. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of Physics | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts of quantum mechanics, semiconductor physics, fiber optics and laser. | Level 1: Remember |
| **CO2** | Describe the concepts of quantum mechanics of electrons in solid, semiconductor physics, fiber optics and lasers. | Level 2: Understand |
| **CO3** | Apply methods and techniques of semiconductor physics, quantum mechanics, fiber optics and Laser to solve engineering problems. | Level 3: Apply |
| **CO4** | Analyze different engineering problems related to quantum theory, semiconductors, optical fiber and lasers. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Quantum Theory**: Introduction to wave-particle duality, De-Broglie matter waves, Heisenberg's uncertainty principle and its applications, Phase and Group velocity, Wave function and its significance, normalization of wave function, Time-dependent and time-independent Schrödinger's wave equations, Eigen functions and Eigen values, Expectation Value, Particle in one-dimensional rigid box, Basics of Bose-Einstein and Fermi- Dirac distribution.

## Unit-II

**Free Electron theory**: Classical and Quantum free electron theory, Density of states, Fermi level and Fermi energy, Fermi-Dirac probability distribution function, Kronig-Penney Model, E-K Diagrams, Effective Mass, and Classification of materials on the basis of energy band, concept of phonons, Direct and indirect band gaps.

## Unit-III

**Physics of Semiconductors**: Intrinsic and extrinsic semiconductor, carrier concentration in intrinsic and extrinsic semiconductors, dependence of Fermi level on carrier concentration and temperature, carrier transport (diffusion and drift), P-N Junction diode, Energy band diagram, V-I Characteristics; Construction and Working of Photodiode, LED & Solar cell, Semiconductor materials of interest for optoelectronics devices, Hall Effect and its Applications.

## Unit-IV

**Fiber Optics**: Introduction to fiber optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fiber, Attenuation and Dispersion in optical fibers, Applications of optical fiber in communication and other fields.

**Laser**: Interaction of radiation with matter, Einstein's coefficients, Requisites of Laser, Elements of a laser, Ruby Laser, He-Ne Laser, Recent applications of Laser in Engineering and Technology.

**Suggested Readings:**


- Introduction to Quantum Mechanics by David J. Griffiths, Pearson Education.
- A Text Book of Optics by Brijlal & Subramanian, S. Chand Publishing
- Applied Physics for Engineers by Neeraj Mehta, PHILearning private Limited, New Delhi
- Semiconductor Optoelectronic Devices by Bhattacharya, Prentice hall of India.
- Modern Physics for Engineers by S. P. Taneja, R. Chand & CO, New Delhi.
- Semiconductor Devices: Physics and Technology by S. M. Sze, Wiley.
- Engineering Physics, Second edition by H. K. and A.K Singh Mc Graw Hill Ed.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Wave Particle Duality | https://www.youtube.com/watch?v=Yf_4Qv-A55Q |
| | Heisenberg's uncertainty principle | https://www.youtube.com/watch?v=TcmGYe39XG0 |
| | Phase velocity and Group velocity | https://www.youtube.com/watch?v=yZW4dmn5kvM |
| | Eigen functions and Eigen values | https://www.youtube.com/watch?v=qp5X9sKDgAE |
| | Schrodinger Equation: Particle in a One Dimensional Box | https://www.youtube.com/watch?v=vy-qStGSy0g&t=10s |
| Unit-II | Free Electron Theory | https://www.youtube.com/watch?v=L-eOdZFt9BY |
| | Kronig-Penney Model | https://www.youtube.com/watch?v=ZemvjQdLffo |
| | Direct and indirect band gaps | https://www.youtube.com/watch?v=-ga2S2LOtjs |
| | Phonons | https://www.youtube.com/watch?v=J4CwGFpgt1I |
| Unit-III | Semiconductors | https://www.youtube.com/watch?v=JA3sCmrv11M&list=PLgMDNELGJ1CaNcuuQv9xN07ZWkXE-wCGP&index=2 |
| | Carrier Concentration of Intrinsic Semiconductors | https://www.youtube.com/watch?v=PxzXP4URY8s |
| | Charge carrier density in n-type and p-type semiconductors | https://www.youtube.com/watch?v=qvJr4N2s3Ro |
| | Hall Effect | https://www.youtube.com/watch?v=Tt8zwiniSPc |
| Unit-IV | Introduction to Optical Fiber, Numerical Aperture | https://www.youtube.com/watch?v=LOVvUFZmRCg |
| | Einstein Coefficients | https://www.youtube.com/watch?v=PQTMBlHhCY8&list=PLU0oJASIjGxdZMtypwhvGrnmuzNnNdcKt&index=4 |

| Course Code | **BSC-CH-101B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Chemistry-I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To impart the knowledge of fundamentals of water and soil chemistry and its associated properties.<br>• To provide the basic understanding on corrosion and the importance of green chemistry.<br>• To introduce the students with the concept, classifications and applications of different fuels, lubricants, ceramics and polymers.<br>• To develop the student's ability to apply knowledge of different instrumental methods for chemical analysis. | | | | |
| Course Pre-requisite | Chemistry of 12$^{th}$ Standard, Basic Knowledge of Chemistry | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts of applied and engineering chemistry. | Level 1: Remember |
| **CO2** | Explain the water treatment, soil composition, green technology, corrosion, engineering materials and analytical techniques. | Level 2: Understand |
| **CO3** | Solve the engineering problems by applying the methods and techniques of engineering chemistry. | Level 3: Apply |
| **CO4** | Analyze different engineering problems to address the real life issues. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Water Chemistry:** Physical and chemical properties of water, Introduction to hardness and its types, DO, COD, BOD, TDS, BIS and WHO standards, Methods of water softening (Lime soda process, Zeolite Process, Demineralization process), Sewage treatment plant process.

**Soil Chemistry:** Chemical composition of soils, Soil components, types and properties of soil colloids, Mechanism- diffused double layers, sorption processes, Cation and Base Exchange.

## Unit-II

**Corrosion:** Introduction, Pilling Bedworth rule, Types and mechanism of dry and wet corrosion, Forms of corrosion, Pourbaix diagram (Iron-water system), Factors affecting corrosion and methods of prevention-Design of material, Anodic and Cathodic Protection, Protective surface coating, Overview to Chemical and Electrochemical Surface Treatment.

**Green Chemistry:** Introduction, 12 Principles with their explanations and examples, Green Solvents

(Water, Ionic liquids, Supercritical carbon dioxide, Bio-based solvents), Importance of green synthesis, Examples of Microwave and Ultrasound Assisted reactions.

**Unit-III**

**Fuel:** Introduction to fuel and its properties, Calorific value, LCV, HCV, Determination of calorific value (Bomb's Calorimeter), Characteristic of good fuel, Knocking and chemical constitution of fuel, Octane and Cetane number, Overview on Gaseous Fuel: LPG, CNG, $H_2$, Syngas, Bio-diesel, Biogas and Landfill Gas.
**Combustion:** Chemistry of combustion, Introduction to explosive and flammable hazards and flame retardants chemicals.
**Lubricants:** Introduction to Lubricant, Classification (Liquid Lubricants, Solid Lubricants, Semi- solid Lubricants), Properties, Mechanism of Lubrication (Hydrodynamic Lubrication, Boundary Lubrication and Extreme Pressure Lubrication), Application of Lubricants.

**Unit-IV**

**Ceramics:** Introduction, Types of Ceramics, Cement and Glass-Chemical composition, Types, Properties, Manufacture and overview of technological applications.
**Polymers:** Introduction to Polymers, Classification of polymers, Types of polymer composites and engineering application of Thermoplastic (PVC, Polystyrene, Teflon), Thermosetting Plastics (Phenoplasts, Polyurethanes), Conducting and biodegradable Polymers.
**Analytical techniques:** Principle and Applications of Volumetric Titrimetry (Acid-base, complexometry, pH-metry), Thermogravimetry - TGA, and UV-Visible spectroscopy.

**Suggested Readings:**


- Essentials of Analytical Chemistry by Shobha Ramakrishnan and Banani Mukhopadhyay, Pearson Publications, 2018
- Engineering Chemistry by K. Sesha Maheshwaramma, Mridula Chugh. Pearson Publications, 2016
- Engineering Chemistry (NPTEL Web-book) by B. L. Tembe, Kamaluddin and M. S. Krishnan
- Introduction to polymer chemistry by G. S. Misra, New Age International Publishers, 2008
- New Trends in Green Chemistry by V. K. Ahluwalia, and M. R. Kidwai, Anamalaya Publishers, 2005
- Chemistry of Soils by G. Sposito, Oxford University Press, 2008
- Fuels and Combustion by Samir Sarkar, Universities Press, 2009




**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Water Chemistry | http://ecoursesonline.iasri.res.in/mod/page/view.php?id=124277 |
| | | https://archive.nptel.ac.in/courses/105/107/105107207/ |
| | | https://youtu.be/d_0Peuu6wI?si=0n45O3_MjSl61DXI |
| | Soil Chemistry | https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-_ar05/ |
| Unit-II | Corrosion | https://nptel.ac.in/courses/113104082 |
| | Green Chemistry | https://www.youtube.com/watch?v=0LtMaJvVt0s |
| Unit-III | Fuel, Combustion and Lubricants | https://archive.nptel.ac.in/courses/103/105/103105110/ |
| | | https://www.youtube.com/watch?v=7mH3jmdemIA |
| | | https://www.youtube.com/watch?v=p8XQeKQd6rA |
| | | https://www.youtube.com/watch?v=HTIzwP8BKC8 |
| Unit-IV | Material Chemistry | https://www.youtube.com/watch?v=LtlxTDOcbXI |
| | | https://nptel.ac.in/courses/113105028 |
| | | https://nptel.ac.in/courses/104103071 |
| | | https://nptel.ac.in/courses/104103019 |
| | | https://www.youtube.com/watch?v=xT9zzPR2dI0 |
| | | https://www.youtube.com/watch?v=XMGmnAc4KBs |
| | Titrimetry | https://www.youtube.com/watch?v=AvqYHCuOxLU |
| | TGA | https://nptel.ac.in/courses/115103030 |
| | | https://www.youtube.com/watch?v=h8g1K2z1yBw |
| | Ultraviolet and Visible Spectrophotometry | https://youtu.be/m33OeLsp8o0?si=PYpoSDyMYtjsJUpw |
| | | https://nptel.ac.in/courses/104101130 |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **BSC-CH-102B** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Chemistry-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To provide the students the knowledge of atomic-molecular structure, electrochemistry and their associated theories and applications.<br>• To provide fundamental understanding and importance of green chemistry and e-waste recycling approaches.<br>• To lay the foundation for concept, classifications and applications of different nanomaterials and polymers.<br>• To develop the student's ability to apply knowledge of different instrumental methods for chemical analysis. | | | | |
| Course Pre-requisite | Chemistry of 12th Standard, Basic Knowledge of Chemistry | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts of applied and engineering chemistry. | Level 1: Remember |
| **CO2** | Explain atomic and molecular structure, electrochemical process, green technology, e-waste, engineering materials and analytical techniques. | Level 2: Understand |
| **CO3** | Solve the engineering problems by applying the methods and techniques of engineering chemistry. | Level 3: Apply |
| **CO4** | Analyze different engineering problems to address the real life issues. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### Unit-I

**Atomic and Molecular Structure:** Overview of Electromagnetic radiation, Photoelectric Effect, De Broglie Equation, Schrodinger wave equation, Quantum numbers and Atomic orbitals, Molecular orbital energy level diagrams of diatomic molecules ($N_2$, $O_2$, $F_2$, CO, NO, CN), Pi-molecular orbitals of butadiene, Crystal field splitting energy diagram for octahedral and tetrahedral complexes, Band structures of solids and semiconductor doping, Band theory of Semiconductors.

### Unit-II

**Electrochemistry and Energy Systems:** Introduction, Electrode potential, Conductance, Overview to Nernst Equation, Electrochemical Cells (Galvanic and Concentration cells), Energy storage

HOD AS

systems (Batteries: Primary and Secondary Cell, Super capacitors: EDLC, Pseudo and Hybrid), Energy conversion devices (typical Inorganic and organic solar cells) and their materials, chemical reactions, working and applications.

### Unit-III

**Green Chemistry:** Introduction, 12 Principles with their explanations and examples, Green Solvents (Water, Ionic liquids, Supercritical carbon dioxide, Bio-based solvents) Importance of green synthesis, Examples of Microwave and Ultrasound Assisted reactions.
**E-Waste**: Introduction, sources of e-waste, Composition and Characteristics. Toxic materials used in manufacturing electronic and electrical products, Different approaches of recycling (thermal treatments, hydrometallurgical extraction, pyrometallurgical methods).

### Unit-IV

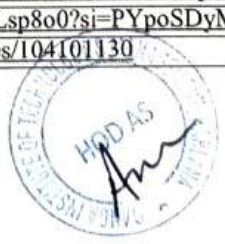
**Nanomaterials:** Introduction to Nanomaterial and its types, synthesis (vapor deposition, sol gel methods, combustion, microwave and ultrasound technique), classification- inorganic, semiconducting, carbon-based and quantum nanomaterials and their various applications.
**Polymers**: Introduction to Polymers, Classification of polymers, Types of polymer composites and engineering application of Thermoplastic (PVC, Polystyrene, Teflon), Thermosetting Plastics (Phenoplasts, Polyurethanes), Conducting and biodegradable Polymers.
**Analytical techniques:** Principle and Applications of Volumetric Titrimetry (Acid-base, complexometry, pH-metry), Conductometry and UV-Visible spectroscopy.

**Suggested Readings:**


- Essentials of Analytical Chemistry by Shobha Ramakrishnan and Banani Mukhopadhyay, Education Pearson, 2018
- Engineering Chemistry by K.Sesha Maheshwaramma, Mridula Chugh. Pearson Publications, 2016
- Engineering Chemistry (NPTEL Web-book) by B. L. Tembe, Kamaluddin and M. S. Krishnan
- Introduction to polymer chemistry by G. S. Misra, New Age International Publishers, 2008
- New Trends in Green Chemistry by V. K. Ahluwalia and M.R. Kidwai, Anamalaya Publishers 2005
- Introduction to Nanochemistry by Frank Owens Charles Poole, Wiley, 2010


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Atomic and Molecular Structure | https://archive.nptel.ac.in/courses/104/106/104106083/ |
| | | https://nptel.ac.in/courses/104106096 |
| | | https://nptel.ac.in/courses/104101130 |
| Unit-II | Electrochemistry and Energy Systems | https://nptel.ac.in/courses/104106137 |
| | | https://archive.nptel.ac.in/courses/104/106/104106137/ |
| | | https://www.youtube.com/watch?v=nh2xbyOaERw |
| | | https://archive.nptel.ac.in/courses/115/107/115107116/ |
| Unit-III | Green Chemistry | https://www.youtube.com/watch?v=0LtMaJvVt0s |
| | E-Waste Management | https://nptel.ac.in/courses/105105169 |
| Unit-IV | Material Chemistry | https://nptel.ac.in/courses/113105028 |
| | | https://nptel.ac.in/courses/104103019 |
| | Titrimetry | https://www.youtube.com/watch?v=AvqYHCuOxLU |
| | Conductometry | https://www.youtube.com/watch?v=A4XzBj2zmUg |
| | Ultraviolet and Visible Spectrophotometry | https://youtu.be/m33OeLsp8o0?si=PYpoSDyMYtjsJUpw |
| | | https://nptel.ac.in/courses/104101130 |



| Course Code | ESC-ME-102B | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Manufacturing Process** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To gain a comprehensive understanding of various manufacturing processes and engineering materials with their applications in industrial production.<br>• To acquire proficiency in cold and hot working techniques and select appropriate methods based on material properties and production needs.<br>• To develop proficiency in casting and welding processes, identifying defects and applying suitable techniques for effective metal joining and fabrication. | | | | |
| Assessment | 20 Marks | | | | |
| End Semester Examination | 30 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define terminologies related to manufacturing processes. | Level 1: Remember |
| CO2 | Explain the manufacturing processes, engineering materials, industrial safety measures and plant layouts. | Level 2: Understand |
| CO3 | Differentiate manufacturing processes based on their principles, material characteristics, requirements and applications. | Level 2: Understand |
| CO4 | Use appropriate manufacturing processes based on material properties, layout, design requirements, and production constraints. | Level 3: Apply |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 4 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 6 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Manufacturing Processes:** Introduction to Manufacturing Processes and their Classification, Industrial Safety; Introduction, Types of Accidents, Causes and Common Sources of Accident, Methods of Safety, First Aid, Objectives of Layout, Types of Plant Layout and their Advantages.

**Engineering Materials:** General Properties and Applications of Engineering Materials, Mild Steel, Medium Carbon Steel, High Carbon Steel, High Speed Steel and Cast Iron.

## Unit-II

**Cold Working (Sheet Metal Work):** Sheet Metal Operations, Measuring, Layout Marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining, Advantages and Limitations.

**Hot Working Processes:** Introduction to Hot Working, Principles of Hot Working Processes, Forging, Rolling, Extrusion, Wire Drawing.

## Unit-III

**Metal Casting**: Principles and Basic Steps in Casting Processes, Pattern materials, types and allowance, Study of moulding, sand moulding, tools, moulding materials, classification of moulds, core, elements of gating system, casting defects, description and operation of cupola: special casting processes e.g. die-casting, permanent mould casting, centrifugal casting, investment casting.

## Unit-IV

**Welding**: Introduction to welding, Classification of Welding Processes, GAS Welding- Oxy- Acetylene Welding, Resistance Welding- Spot and Seam Welding, Arc Welding- Metal Arc, TIG & MIG, Welding Defects and Remedies, Soldering & Brazing.

**Suggested Readings:**


- Manufacturing Engineering and Technology by S. Kalpakjian and S.R. Schmid, Pearson.
- Manufacturing Science by Amitabha Ghosh and A. K. Mallick East-West Press Pvt. Ltd. 2010.
- Manufacturing Technology (Foundation Forming & Welding) by P.N. Rao, Tata McGraw Hill.
- Principles of manufacturing materials and processes by J. S. Campbell, Tata McGraw Hill.
- Elements of Workshop Technology, Hajra & Choudhary, Media Promotors & Publishers Pvt. Ltd.
- Workshop Practices, H. S. Bawa, Tata Mc Graw Hill


**Useful Video Links:**

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Types of Plant Layout | https://www.youtube.com/watch?v=PRI0wNoUfqk |
| | Engineering Materials | https://www.youtube.com/watch?v=m9l1tVXyFp8 |
| Unit-II | Hot and Cold Working | https://www.youtube.com/watch?v=dNbVsmVgOnM |
| Unit-III | Patterns and Allowances | https://www.youtube.com/watch?v=H78qWl4sf54 |
| Unit-IV | Classification of Welding Processes | https://www.youtube.com/watch?v=NPi9L2fl4EI |

HOD AS

| Course code | HSMC-ASH-103B | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Sciences including Management Courses | | | | |
| Course title | **Universal Human Values-II: Understanding Harmony and Ethical Human Conduct** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objective of this course is to inculcate human values to grow as responsible human beings with a proper personality. | | | | |
| Course Pre-requisite | None | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define various terms related to harmony and ethical human conduct. | Level 1: Remember |
| CO2 | Explain the fundamental concepts, theories, policies, practices and responsibilities of the engineers. | Level 2: Understand |
| CO3 | Solve real-life problems related to human behavior based on his understanding of morals and values. | Level 3: Apply |
| CO4 | Analyze essentials of human values and skills, the role of harmony in family, society and universal order, self-exploration, happiness and prosperity. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

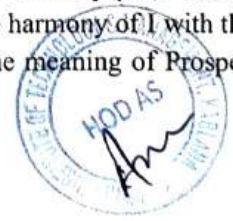
## Unit-I

**Introduction to Value Education**: Understanding the need, basic guidelines, content and process for Value Education,

Self-Exploration–what is it? – Its content and process; 'Natural Acceptance' and experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity – A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility – the basic requirements for the fulfilment of aspirations of every human being with their priority. Understanding Happiness and Prosperity rightly- A critical appraisal of the current Scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

## Unit-II

**Harmony in the Human Being**: Understanding human beings as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Self-regulation (Sanyam) and Health; correct appraisal of Physical needs, the meaning of Prosperity in detail. Programs to ensure Self-regulation (Sanyam) and Health.



## Unit-III

**Harmony in the Family and Society and Nature**: Understanding values in a human-human relationship; the meaning of Justice (nine universal values in relationships) and the program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence. Understanding the meaning of Respect, the difference between respect and differentiation; the other salient values in a relationship. Understanding the harmony in the society (society being an extension of the family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.

Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

## Unit-IV

**Understanding Harmony in Nature and Existence – Whole existence as Coexistence:** Understanding the Harmony in Nature. Interconnectedness and mutual fulfilment among the four orders of nature – recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

### Suggested Readings


- A Foundation Course in Human Values and Professional Ethics by R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019.
- Human Values by A.N. Tripathi, New Age International Publishers, New Delhi, 2004.
- Professional Ethics by R. Subramaniam, Oxford University Press.
- Ethics in Engineering by Mike W. Martin and Roland Schinzinger, Tata McGraw Hill, New Delhi, 2003.


**Useful Video links**

| Unit No. | Topics | Links |
|---|---|---|
| Unit -I | Exploring Human Values | https://nptel.ac.in/courses/109104068 |
| Unit -II | Understanding Human Being | https://onlinecourses.swayam2.ac.in/aic22_ge23/preview |
| Unit -III | Harmony in the Family and Society and Nature | https://onlinecourses.swayam2.ac.in/aic22_ge23/preview |
| Unit -IV | Understanding Harmony in Nature and Existence | https://onlinecourses.swayam2.ac.in/aic22_ge23/preview |

| Course Code | **ESC-EE-101B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Basics of Electrical and Electronics Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/ II** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To impart basic knowledge of the DC and AC circuits and their applications.<br>• To familiarize the students with the basic knowledge of measuring instruments, electrical machines and installations. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the technical terms related to Basic Electrical and Electronics Engineering. | Level 1: Remember |
| **CO2** | Explain the concept of DC & AC circuits, Measuring instruments, semiconductor devices. | Level 2: Understand |
| **CO3** | Apply various laws and theorems for solving the real life problems. | Level 3: Apply |
| **CO4** | Analyze the characteristics and properties of circuits, instruments and electrical systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**DC Circuits:** Ohm's Law, Kirchhoff's Law, Types of Sources, Mesh Analysis, Nodal Analysis, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, analysis of simple circuits with dc excitation, representation of Sinusoidal waveforms, RMS value and Average Value, phasor representation, power triangle, power factor, analysis of single-phase AC circuits consisting R, L and C. Three phase balanced circuits, voltage and current relation for star and delta connection.

## Unit-II

**Transformer:** Single Phase Transformer: Ideal and Practical Transformer with phasor diagram, losses, equivalent circuit, transformer tests and Efficiency, Auto transformer.

**Electrical Machine:** Construction and working Principle of DC machine, Synchronous Machine and three-phase induction machine, single phase induction motor (Capacitor start, capacitor start/capacitor run and split phase).



## Unit-III

**Semiconductor Devices and circuits:** P-N Junction diode: V-I characteristics, Bi-polar Junction Transistors: Introduction, CB, CE and CC configurations, Introduction to SCR, DIAC, TRIAC, MOSFET and UJT, Operation of Rectifier (half wave and full wave), Active Filters.

## Unit-IV

**Digital Electronics**: Introduction to Logic gates and universal gates, number system and Boolean algebra, SOP and POS form, Flip-Flops, Minimization of Logic functions, Karnaugh Maps, Logic implementation using Gates.

**Suggested Readings:**


- Fundamentals of Electric Circuits by C.K. Alexander and M.N.O. Sadiku; TATA McGraw-Hill.
- Principles of Electrical Engineering by V. Del Toro; Prentice Hall International.
- Electrical and Electronics Technology by Edward Hughes; Pearson.
- Basic Electrical Engineering by D P Kothari, I.J. Nagarath; Tata McGraw Hill
- Electrical Technology by B. L. Thareja and A. K. Thareja; S. Chand.
- Basic Electrical Engineering by Ritu Sahdev, Khanna Book Publishing
- Principles of Electronic Devices and Circuits by B. L. Theraja and R.S. Sedha, S.Chand.
- Electronics Device & Circuit Theory By Nagrath, I.J., PHI Learning


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Basic concepts and laws | https://archive.nptel.ac.in/courses/108/105/108105112/ |
| | Single Phase AC Circuits | https://archive.nptel.ac.in/courses/108/102/108102185/ |
| Unit-II | Ideal transformer and Phasor diagram | https://youtu.be/8r9B8COLeiU |
| | Equivalent circuit | https://youtu.be/dNCvDaJNXes |
| | Introduction to DC machine | https://youtu.be/PRdLNTQ2fRE |
| Unit-III | Diode circuits | https://youtu.be/fSV8dhjuaoM |
| | BJT | https://youtu.be/_KXldjWyYXI |
| | Rectifier | https://youtu.be/y5jjTQYQMmo |
| Unit-IV | Introduction to Digital electronics | https://youtu.be/pyFyUsAeYPQ |
| | Boolean Algebra | https://youtu.be/1kn6tY8TWBQ |
| | K-Map | https://youtu.be/jheob0v0CU4 |



| | | | | | |
|---|---|---|---|---|---|
| Course code | **LC-EE-102B** | | | | |
| Category | Engineering Science Courses | | | | |
| Course title | **Basics of Electrical and Electronics Engineering Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To make the students aware of fundamentals of Electrical Engineering essential for development of new technologies to all branches of Engineering.<br>• To develop practical skills in analyzing RLC circuits, rectifiers and transformers testing. | | | | |
| Course Pre-requisite | Physics of 12th Standard | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Understand the usage of common electrical measuring instruments. | Level 2: Understand |
| CO2 | Verify KCL, KVL & different theorems, V-I characteristics of semiconductor devices. | Level 3: Apply |
| CO3 | Determine the resonant frequency in RLC Circuits, rectifier operation. | Level 4: Analyze |
| CO4 | Evaluate tests on single phase transformer. | Level 5: Evaluate |

**List of Experiments**

| Sr. No. | Content |
|---|---|
| 1 | Basic Safety precautions, introduction and use of measuring instruments such as ammeter, voltmeter, wattmeter, practical resistors, capacitors, inductors, and multi- meter. |
| 2 | To verify Kirchhoff's voltage law and current law. |
| 3 | To verify Thevenin's theorem. |
| 4 | To verify Norton's theorem. |
| 5 | To verify Superposition theorem. |
| 6 | To determine the resonant frequency in RLC series AC circuit. |
| 7 | To determine the resonant frequency in RLC parallel AC circuit. |
| 8 | To perform open-circuit test and short-circuit test on a single-phase transformer. |
| 9 | To perform load test on a single-phase transformer. |
| 10 | To plot V-I characteristics of diode. |
| 11 | To plot V-I characteristics of BJT. |
| 12 | To measure power in three phase balanced circuit using two watt-meter method. |
| 13 | To perform half wave rectifier circuit operation. |
| 14 | To perform full wave rectifier circuit operation. |

**Virtual Lab Links**

| Experiment Name | Virtual Lab Link |
|---|---|
| To verify Thevenin's theorem. | https://asnm-iitkgp.vlabs.ac.in/exp/verification-thevenin-theorem/ |
| To verify Norton's theorem. | https://asnm-iitkgp.vlabs.ac.in/exp/verification-norton-theorem/ |
| To verify Superposition theorem. | https://asnm-iitkgp.vlabs.ac.in/exp/verification-superposition-theorem/ |
| To determine the resonant frequency in RLC series AC circuit. | https://asnm-iitkgp.vlabs.ac.in/exp/rlc-series-circuit/ |
| To Study the efficiency of single phase transformer by load test. | https://bes-iitr.vlabs.ac.in/exp/single-phase-transformer/ |
| Determination of Transformer equivalent circuit from Open Circuit and Short Circuit Test. | https://ems-iitr.vlabs.ac.in/exp/circuit-parameters-oc-test/ |
| VI Characteristics of a Diode | https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/ |
| To plot V-I characteristics of BJT. | https://be-iitkgp.vlabs.ac.in/exp/common-base-characteristics/ |
| Half wave Rectification | https://be-iitkgp.vlabs.ac.in/exp/half-wave-rectification/ |
| Full wave Rectification | https://be-iitkgp.vlabs.ac.in/exp/full-wave-rectification/ |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| Course Code | **HSMC-ENG-101B** | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Sciences including Management Courses | | | | |
| Course Title | **Communication Skills for Professionals** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To establish foundational communication skills by enhancing LSRW abilities.<br>• To enhance self-presentation and interview techniques for success in academic and professional settings. | | | | |
| Assessment | 20 Marks | | | | |
| End Semester Examination | 30 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes**: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Describe the fundamental concepts and key components of effective communication. | Level 1: Remember |
| CO2 | Explain the techniques for improving LSRW skills and overcoming communication barriers. | Level 2: Understand |
| CO3 | Apply communication principles to enhance LSRW skills and expand vocabulary for effective professional communication. | Level 3: Apply |
| CO4 | Apply self-presentation and interview skills to excel in professional interactions. | Level 3: Apply |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 4 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 6 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Fundamentals of Communication**: Definition, Nature and Importance of Communication, Communication Process, Types of Communication-Verbal and Non-verbal, 7 C's of communication, Barriers to Effective Communication and overcoming strategies, Communication Networks.

## Unit-II

**Enhancing LSRW Skills (Listening, Speaking, Reading, and Writing):** Listening Skills, Cognitive process of listening, Active Listening Techniques, Barriers to Effective Listening, Speaking Skills Effective Speaking Techniques, Public Speaking, Reading Skills, Reading Techniques, Comprehension Strategies, Writing Skills, Writing Techniques.



## Unit-III

**Basic Vocabulary**: Vocabulary Building Techniques, Word Formation- Prefix Suffixes, Expanding Vocabulary- Antonyms-Synonyms, Homophones -Homonyms, Words often confused, One-word Substitutes, Idioms and Phrases.

## Unit-IV

**Effective Self-Presentation and Interview Skills:** Self-Presentation Skills, Importance of self- image, Dress Code and Personal grooming, Effective Presentation Techniques, creating a Strong First Impression, Body Language, Strategies for building self-confidence, Interview Skills- Preparing for Interview Skills, Professional Etiquettes.

**Suggested Readings:**


- Business Communication by Shukla, Preeti, Mahaveer Publication, 2016.
- Word Power Made Easy by Norman Lewis, 2018, Goyal Publishers & Distributors Pvt Ltd.
- Business Communication by Magan, Sangeeta, International Book House, 2012.
- Business Communication by Meenakshi Raman and Prakash Singh, Oxford University Press.
- Effective Technical Communication by by M. Ashraf Rizvi, Tata McGraw-Hill Education, 2018.
- Business Communication Skills by Thakur Veera and Singh,Tripti, Thakur Publication, 2017.
- Communication Skills by Dr. F.C.Sharma, Mahavir Publishing Company, 2023-24.
- English for Professionals by Dr. Seema Miglani and Dr. Shikha Goel, Vayu Education of India, 2010.




## Useful Video Links

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Barriers to Communication | https://www.youtube.com/watch?v=CQ6D_bxZyxg&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXp aH&index=2 |
| | Verbaland Non-verbal Communication | https://www.youtube.com/watch?v=p1-etClsXdk&list=PLbMVogVj5nJSZB8BV29_sPwwk zMTYXpaH&index=5 |
| | Fundamentals of Communication | https://www.youtube.com/@rabianawaz5108 |
| Unit-II | Reading and Listening | https://www.youtube.com/watch?v=PAISeBhtYqI&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&in dex=5 |
| | Types of listening | https://www.youtube.com/watch?v=mdE3thfUQ8Y& list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q&index=15 |
| | Listening and Group Discussion | https://www.youtube.com/watch?v=JIKU_WT0Bls&list=PLbMVogVj5nJSZB8BV29_sPwwkzMTYXpaH&index=10 |
| | Effective Speaking | https://www.youtube.com/watch?v=B53VM3FKag0 &list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn &index=16 |
| | Public Speaking | https://www.youtube.com/watch?v=RB3MJt3dfrg |
| Unit-III | Vocabulary Building | https://www.youtube.com/watch?v=HATeh6e7Gv0 |
| | Phrasal Verbs | https://www.youtube.com/watch?v=rUVEYAsVwVo &list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn &index=21 |
| | Word formation | https://www.youtube.com/watch?v=ht-rk26E0mw&list=PLzf4HHlsQFwIQUeZq_ykEVB6q ZrTRnJZn&index=23 |
| Unit-IV | Formal Presentation | https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQFwIQUeZq_ykEVB6qZrTRnJZn&index=17 |
| | Interview Skills | https://www.youtube.com/watch?v=45uNWLmAZR8&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb&index=7 |
| | Presentation Skills | https://www.youtube.com/watch?v=z-ce7fcKe1E&list=PLbMVogVj5nJSZB8BV29 _sPw wkzMTYXpaH&index=31 |
| | Interview Skills | https://www.youtube.com/watch?v=45uNWLmA ZR8&list=PLbMVogVj5nJSZB8BV29_sPwwkz MTYX paH&index=22 |



| Course Code | **LC-ME-102B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Engineering Graphics and Design** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand techniques of drawings in various fields of engineering.<br>• To enhance the graphic skills of students.<br>• To develop skills in preparation of basic drawings.<br>• To provide skills in reading and interpretation of engineering drawings. | | | | |
| Assessment | 20 Marks | | | | |
| End Semester Practical Examination | 30 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define basic terminologies and concepts of engineering graphics & drawing. | Level 1: Remember |
| **CO2** | Explain the different types of engineering drawings, projections and standards. | Level 2: Understand |
| **CO3** | Apply principles of projection to solve the engineering problems related to design. | Level 3: Apply |
| **CO4** | Analyze the multi-view of orthographic projection to identify relationships between views. | Level 4: Analyze |

### Unit-I

**Introduction to Engineering Drawing:** Drawing instrument and their uses, lines, lettering and dimensioning, type of scale, plain and diagonal scale.

**Projection:** Introduction, principle of projection, method of projection, Planes of projection, Four quadrant, first and third angle projection, reference line, symbols for methods of projection, orthographic projection.

### Unit-II

**Projection of Point:** Introduction, point situated in first, second, third & fourth quadrant.

**Projection of lines:** Introduction, line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to other, line inclined to both the planes, traces.

### Unit-III

**Projection of Planes:** Introduction, types of planes, projection of planes, projection of planes perpendicular to both the reference planes, perpendicular to one plane and parallel to other plane, perpendicular to one plane and inclined to the other plane, Inclined to both planes.

**Projection of Solids:** Introduction, type of solid, projections of solids in simple position, projection of solids with axes inclined to one of the reference planes and parallel to the other, projections of solids with axes inclined to both H.P. and the V.P.

## Unit-IV

**Section of Solids:** Sectional planes, section of solids, true shape of section.

**Development of Surfaces:** Introduction, method of development, development of lateral surfaces of right solids, cube, prisms, cylinders, pyramids & cone.

**Overview of Computer Graphics:** Demonstrating the knowledge of CAD software such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension).

**Suggested Readings:**

- Elementary Engineering Drawing by Bhatt, N.D., Charotar Publishing Co.
- Engineering Graphics by K.L. Narayana and P. Kannaiah, Scitech Publications (India) Pvt.Ltd.
- Engineering Drawing by PS Gill, Katson Books.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit I | Introduction to engineering graphics, Uses of drawing equipment's, Symbols, Types of lines, Lettering | https://archive.nptel.ac.in/courses/124/107/124107157/ |
| Unit II | Projection of a point and line | https://drmcet.digimat.in/nptel/courses/video/112102304/L14.html |
| Unit III | Measures of Central Tendency | https://drmcet.digimat.in/nptel/courses/video/112102304/L17.html |
| Unit IV | Sectional views | https://drmcet.digimat.in/nptel/courses/video/112102304/L22.html |
| | Development of Surfaces | https://www.youtube.com/watch?v=GSCiOdybqv0 |



| Course Code | **ESC-CSE-102B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Programming for Problem Solving** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>• To understand different levels of programming languages, translators, and their functions in machine, assembly, and high-level languages.<br>• To develop problem-solving skills using algorithms, pseudocodes, flowcharts, and approaches like top-down, bottom-up, and modular.<br>• To learn C language concepts such as data types, control statements, functions, arrays, strings, and pointers.<br>• To equip the skills in the students for file handling, dynamic memory allocation, structures, unions, debugging, and real-world applications of C programming. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the fundamentals of C programming language. | Level 1: Remember |
| **CO2** | Understand the basic concepts of C programming language. | Level 2: Understand |
| **CO3** | Apply the concepts of C programming language and problem solving techniques to solve engineering problems. | Level 3: Apply |
| **CO4** | Analyze the performance of various elements in C language to solve programming problems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Programming Language:** Different levels of Programming languages- Machine language, Assembly language, Low level & High Level languages; language translator- Assembler, Compiler, Interpreter, Debugger, Linker, Loader.

**Problem Solving:** Problem definition, Introduction to problem solving, Program Design- Program development life cycle, Problem Solving approaches (Top-down, bottom-up, modular), Problem- solving techniques (Algorithms, Pseudocodes and Flowcharts representation), real world applications of problem solving.

## Unit-II

**Overview of C:** Introduction to C language, Data types, 'C' Tokens, Pre-processor, Header Files, Arithmetic expressions and precedence, I/O: Unformatted and formatted I/O functions in C, Types of errors, operators.

**Control statements:** if, if-else, nested if, switch case, Repetition / Iterations: entry and exit controlled loops, break, continue and go to statements.

## Unit-III

**Functions:** Definition and Types of functions (built in & user defined functions), Working of a function, Declaring, Defining and Calling User defined functions, Call by value, Call by reference, Function as an argument, Recursive functions with examples.

**Arrays:** Definitions, types, initialization, processing an array, String handling functions, passing arrays to functions, returning arrays from functions.

## Unit-IV

**Structures and Unions:** Definition, processing, passing to functions, and their uses.

**Pointers:** Idea of pointers, Definition, Dynamic memory allocation: calloc(), malloc(), free(), realloc(), basics of file handling.

**Suggested Readings:**

- Programming in C: A Practical Approach by A. Mittal, Pearson Education.
- Programming in ANSI C by E. Balaguruswamy, Tata McGraw-Hill
- Let Us C by Y. Kanetkar, BPB Publication.
- Schaum's Outline of Programming with C by B. Gottfried, McGraw-Hill
- C: The Complete Reference by H. Schildt, McGraw Hill Education
- The C Programming Language by B. W. Kernighan, D. Ritchie, Pearson Education India

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Programming Language | https://youtu.be/E6jtj-7xJoA?feature=shared |
| | Introduction to Language Translator | https://youtu.be/qcEBXrqFLe8?feature=shared |
| | Algorithms | https://youtu.be/5AHRXOtn9bY?feature=shared |
| | Flow Chart | https://youtu.be/O8vPR3zh5go?feature=shared |
| Unit-II | Introduction To C Programming | https://youtu.be/IoT0zP4YlMk?feature=shared |
| | Datatypes in C | https://www.youtube.com/watch?v=0GJD1Cu4Koc |
| | Types of errors | https://www.youtube.com/watch?v=vzkcKq1e_yw |
| | Control Statements | https://youtu.be/kfZEZj1IOBE?feature=shared |
| Unit- III | Functions | https://www.youtube.com/watch?v=CUBwN0rHxvg |
| | Call By value & Call By reference | https://youtu.be/8mDj5h1Wwbg?feature=shared |
| | Recursion | https://www.youtube.com/watch?v=DxrhZJAwYY4 |
| | Arrays | https://youtu.be/I9828WOCEMg?feature=shared |
| | String | https://youtu.be/V7AZuMuJmXY?feature=shared |
| Unit- IV | Structures | https://youtu.be/Pg49AN6MvhQ?feature=shared |
| | Pointers | https://www.youtube.com/watch?v=vbqEsRYpSh8&list=PLEAYkSg4uSQ2k6GwNhpgSHodGT8wfvgwu&index=30 |
| | File Handling | https://youtu.be/fWOnJFzOHYM?feature=shared |
| | Structures | https://youtu.be/Pg49AN6MvhQ?feature=shared |

| Course Code | **LC-PHY-101B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Mechanics, Optics and Superconductors Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To make the students aware of fundamentals of physics essential for the development of new technologies to engineering.<br>• To develop skills to handle different instruments used in various experiments of physics in technological field. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of Physics | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the principles of Hooke's Law, torsional oscillation, sextant and other physics concepts to determine the spring constant, modulus of rigidity and other parameters. | Level 2: Understand |
| **CO2** | Apply experimental methods to calculate values such as frequency of oscillations and thermal conductivity from experimental data. | Level 3: Apply |
| **CO3** | Analyze the results obtained from various experiments such as diffraction grating, Hall coefficient, energy gap and hysteresis loss. | Level 4: Analyze |
| **CO4** | Evaluate the effectiveness of different experimental methods to find Planck's constant and wavelength of light and relate findings to Theoretical concepts. | Level 5: Evaluate |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| **1** | To determine the spring constant by Hooke's Law. |
| **2** | To determine moment of inertia of irregular body using torsional oscillation method. |
| **3** | To determine the frequency of a simple pendulum or vibrating bar or turning fork. |
| **4** | To determine the wavelength of monochromatic light by Newton's rings. |
| **5** | To determine Planck's constant using photocell |
| **6** | To determine thermal conductivity of a metallic material |
| **7** | To determine the force applied to various objects using a spring balance and verify the unit of force (Newton). |
| **8** | To determine wavelength of light using diffraction grating. |

| | |
|---|---|
| 9 | To determine the specific rotation of sugar solution using polarimeter. |
| 10 | To determine the height of distant object using sextant. |
| 11 | To determine displacement and conducting currents through a dielectric. |
| 12 | To determine band gap of a semiconductor. |
| 13 | To determine Hysteresis loss of a ferromagnetic material |
| 14 | To study Hall Effect in semiconductors and measure the Hall coefficient. |

**Virtual Lab links:**

| Experiment Name | Virtual Lab Links |
|---|---|
| To determine Planck's constant | vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1 |
| To determine the thermal conductivity of a metallic material. | https://vlab.amrita.edu/index.php?sub=1&brch=194&sim=801&cnt=1 |

**Note:** At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-PHY-102B** | | | | |
| Category | Basic Science Courses | | | | |
| Course Title | **Introduction to Electromagnetism and Optics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To make the students aware of fundamentals of physics essential for the development of new technologies to engineering.<br>• To give exposure and training to handle different instruments used in various experiments of physics in technological field. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of physics | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the characteristics, working principle and applications of Semiconductor devices, solar cells and optical fibers. | Level 2: Understand |
| **CO2** | Apply experimental methods to study the forward and reverse characteristics of diodes, He-Ne laser and performance of solar cells. | Level 3: Apply |
| **CO3** | Analyze experimental data to calculate parameters such as planck' s constant, Hall coefficient, Numerical aperture and energy gap and wavelength of light and specific rotation. | Level 4: Analyze |
| **CO4** | Evaluate the performance of semiconductor and optical devices in different practical scenarios and relate findings to theoretical concepts. | Level 5: Evaluate |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1 | To study the forward and reverse characteristics of P-N junction diode. |
| 2 | To find thickness of hair using He-Ne laser. |
| 3 | To study the characteristics of Solar cell and find out the fill factor |
| 4 | To determine the wavelength of monochromatic light byNewton's rings. |
| 5 | To determine Planck's constant using photocell |
| 6 | To determine numerical aperture of an optical fiber. |
| 7 | To study Hall Effect in semiconductors and measure the Hall coefficient |
| 8 | To verify inverse square law with the help of a photovoltaic cell |

| | |
|---|---|
| 9 | To find capacitance of condenser using flashing and quenching experiment. |
| 10 | To determine specific rotation of sugar solution using polarimeter . |
| 11 | To determine energy gap by four probe method |
| 12 | To determine wavelength of light using diffraction grating. |

**Virtual Lab links:**

| Experiment Name | Virtual Lab Links |
|---|---|
| To determine Planck's constant | vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1 |
| To find thickness of hair using He-Ne laser | https://bop-iitk.vlabs.ac.in/exp/he-ne-laser-polarization/ |

**Note:** At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.



| Course Code | **LC-PHY-103B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Semiconductor Physics and Optics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To develop skills to measure various parameters using appropriate instruments.<br>• To gain comprehensive knowledge of different electronic components and integrated circuits. | | | | |
| Course Pre-requisite | Physics of 12th Standard, Basic Knowledge of Physics | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Describe the characteristics, working principles, and applications of semiconductor devices, solar cells, transistors and optical fibers. | Level 2: Understand |
| CO2 | Apply experimental methods to study the forward and reverse characteristics of diodes, the performance of solar cells and the behavior of transistors, JFETs, and capacitors. | Level 3: Apply |
| CO3 | Analyze experimental data to calculate and interpret parameters such as Planck's constant, Hall coefficient, numerical aperture and energy gap. | Level 4: Analyze |
| CO4 | Evaluate the performance of semiconductor devices in different practical scenarios and relate findings to theoretical concepts. | Level 5: Evaluate |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1 | To study the forward and reverse characteristics of P-N junction diode. |
| 2 | To describe the process of determining the thickness of hair using a He-Ne laser. |
| 3 | To investigate the performance characteristics of a solar cell and determine its fill factor. |
| 4 | To demonstrate the reverse characteristics of a Zener diode and its voltage regulation capabilities in a practical circuit setup. |
| 5 | To analyze the data obtained from the photoelectric effect experiment and interpret the results to calculate the value of Planck's constant. |
| 6 | To analyze Hall voltage, magnetic field and current to determine the hall coefficient and identify charge carrier. |
| 7 | To verify inverse square law with the help of a photovoltaic cell. |
| 8 | To find energy gap by four probe method. |

| | |
|---|---|
| 9 | To find numerical aperture of optical fiber. |
| 10 | To study common base and common emitter characteristics of PNP/NPN transistor |
| 11 | To study characteristics of JFET. |
| 12 | To determine capacitance of a capacitor by flashing and quenching. |

**Virtual Lab links:**

| Experiment Name | Virtual Lab Link |
|---|---|
| To determine Planck's constant | vlab.amrita.edu/index.php?sub=1&brch=195&sim=547&cnt=1 |
| To find thickness of hair using He-Ne laser | https://bop-iitk.vlabs.ac.in/exp/he-ne-laser- polarization/ |

**Note:** At least 10 experiments are to be performed by the students from the above list. The faculty members can add extra experiment if he/she feels important to add.



| Course Code | **LC-CH-101B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Chemistry-I Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To provide the fundamentals of chemistry essential for the development of new technologies to all branches of engineering.<br>• To give exposure and training to handle different apparatus and instruments used in various experiments of chemistry in technological field. | | | | |
| Course Pre-requisite | Chemistry of 12th Standard, Basic Knowledge of Chemistry | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Explain the use of various equipment, conditions and processes for performing chemistry experiments. | Level 2: Understand |
| CO2 | Apply chemical principles and mathematical calculations using laboratory instruments and appropriate formulas. | Level 3: Apply |
| CO3 | Examine the physical and chemical properties of various samples through laboratory experiments and measurements. | Level 4: Analyze |
| CO4 | Analyze the different properties of water samples, oils and pigments. | Level 4: Analyze |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | To interpret the viscosity of different samples. |
| 2 | To calculate the surface tension of given liquids. |
| 3 | To prepare urea formaldehyde resin. |
| 4 | To estimate the total alkalinity of the water sample. |
| 5 | To determine the hardness of a given water sample by EDTA method. |
| 6 | To calculate the saponification value of a given oil sample. |
| 7 | To examine the amount of Fe (II) present in the given solution by volumetric titration. |
| 8 | To prepare the biodiesel from vegetable/waste cooking oil. |
| 9 | To analyze Flash and Fire Points of different oil samples. |
| 10 | To analyze Aniline Point of different petroleum samples. |

**Virtual Lab Links**

| Experiment Name | Virtual Lab Links |
|---|---|
| Experiment on calorimetry | https://media.pearsoncmg.com/bc/bc_0media_chem/chem_sim/calorimetry/Calor.php |
| Experiment on spectrophotometry | https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=338& cnt=1<br>https://biomodel.uah.es/en/lab/abs/espectro.htm |
| To find BOD | https://ee1-nitk.vlabs.ac.in/List%20of%20experiments.html |
| To determine COD | https://vlab.amrita.edu/index.php?sub=2&brch=193&sim=1548&cnt=1 |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| Course Code | **LC-CH-102B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Chemistry-II Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>• To provide the fundamentals of chemistry essential for the development of new technologies to all branches of engineering.<br>• To give exposure and training to handle different apparatus and instruments used in various experiments of chemistry in technological field. | | | | |
| Course Pre-requisite | Chemistry of 12th Standard, Basic Knowledge of Chemistry | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Explain the use of various equipment, conditions and processes for performing chemistry experiments. | Level 2: Understand |
| **CO2** | Apply chemical principles and mathematical calculations using laboratory instruments and appropriate formulas. | Level 3: Apply |
| **CO3** | Examine the physical and chemical properties of various samples through laboratory experiments and measurements. | Level 4: Analyze |
| **CO4** | Analyze the different properties of water samples, oils and pigments. | Level 4: Analyze |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1 | To interpret the viscosity of different samples. |
| 2 | To calculate the surface tension of given liquids. |
| 3 | To prepare urea formaldehyde resin. |
| 4 | To estimate the total alkalinity of the water sample. |
| 5 | To determine the hardness of a given water sample by EDTA method. |
| 6 | To calculate the saponification value of a given oil sample. |
| 7 | To examine the amount of Fe (II) present in the given solution by volumetric titration. |
| 8 | To calculate the strength of strong acid by conductometric titrating it with a strong base. |
| 9 | Photoreduction of benzophenone to benzopinacol in the presence of sunlight. |
| 10 | To extract copper from waste PCBs. |

**Virtual Lab Links:**

| Experiment Name | Virtual Lab Links |
|---|---|
| Experiment on calorimetry | https://media.pearsoncmg.com/bc/bc_0media_chem/chem_sim/calorimetry/Calor.php |
| Experiment on Spectrophotometry | https://vlab.amrita.edu/index.php?sub=2&brch=190&sim=338&cnt= 1<br>https://biomodel.uah.es/en/lab/abs/espectro.htm |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-ME-103B** | | | | |
| Category | Engineering Science Courses | | | | |
| Course Title | **Workshop Practice** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• To provide exposure to the students with hands on experience on machines and tools.<br>• To have a study and hands-on-exercise on carpentry components.<br>• To have a practice of welding, foundry and fitting operations, etc. | | | | |
| Assessment | 20 Marks | | | | |
| End Semester Examination | 30 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe various manufacturing methods, operations and machine tools used in manufacturing Industries. | Level 2: Understand |
| **CO2** | Prepare the job on the different machines. | Level 3: Apply |
| **CO3** | Analyze the dimensional accuracies and dimensional tolerances possible with different manufacturing processes. | Level 4: Analyze |
| **CO4** | Design and develop small products/elements of their interest by assembling different components. | Level 6: Create |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| | **(A) General** |
| 1 | To study various measuring tools used in different shops. |
| 2 | To determine the least count of micrometer, Vernier caliper, screw gauge, height gauge etc. |
| | **(B) Manufacturing operations** |
| 3 | To study various manufacturing methods. |
| 4 | To study different machine tools used in manufacturing industries. |
| 5 | To prepare a job on a lathe involving facing, outside turning taper turning, step turning, radius making and parting-off. (Practice) |
| 6 | To prepare a job involving side and face milling on a milling machines. (Practice) |
| | **(C) CNC machining, Additive manufacturing** |
| 7 | To study basics of CNC Machine tool. |
| 8 | To study the basics of additive manufacturing. |
| 9 | To simulate CNC Part program for a CNC Milling machine.(Practice) |
| 10 | To simulate CNC Part program for a CNC Turning machine.(Practice) |

| | |
|---|---|
| | **(D) Fitting operations** |
| 11 | To Study various Fitting operations and tools used in Fitting shop. |
| 12 | To make a V-groove and V-notch in MS flat. (Practice) |
| | **(E) Carpentry operations** |
| 13 | To study steps various tools used in Carpentry shop. |
| 14 | To make wooden halving joint (or Cross-Joint) of soft wood. (Practice) |
| | **(F) Metal Casting operations** |
| 15 | To study various components of Sand Mould and operations involved in the casting process used in Foundry shop. |
| 16 | To test different properties of Sand Mould. (Practice) |
| | **(G) Welding operations** |
| 17 | To study various processes and tools used in welding shop. |
| 18 | To make a Butt joint using the given two M.S pieces by arc welding. (Practice) |
| 19 | To make a Lap joint using the given two M.S pieces by arc welding. (Practice) |

**Note:** At least one experiment may be performed from each of the categories from A to G (Preferably from Practice type). In total at least 10 experiments need to be performed by the students.



| Course code | ESC-CE-101B | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course title | Basics of Civil Engineering | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-I/II |
| | 3 | 0 | 0 | 3 | |
| Course Objectives: | The objectives of this course are to<br>• To provide the students an overview of the profession of Civil Engineering.<br>• To give the students an illustration of the Civil Engineering, properties of various building material, basic requirements of a building and explain the building construction aspects. | | | | |
| Class work | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the basic concepts and terminology related to civil engineering, masonry, stones, timber, paints, and varnishes. | Level 1: Remember |
| CO2 | Explain the functions and importance of various building components such as roofs, floors, doors, windows, cavity walls, and foundations. | Level 2: Understand |
| CO3 | Apply appropriate construction methods and materials for specific building components like masonry work, damp-proofing, and fire protection based on site conditions. | Level 3: Apply |
| CO4 | Analyze the environmental, social, and economic impact of civil engineering practices and select sustainable materials and green building solutions. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

### Module 1: Masonry Construction

Introduction and history to masonry construction, and terminology, Classification and properties of bricks: traditional and fly ash bricks, hollow bricks, AAC blocks, Bonds in brickwork, Laying and curing practices, Defects in masonry, Stone masonry: types, structural applications, finishes, Composite masonry and applications, Glass block masonry: uses. Introduction to green building concept.

### Module 2: Stones and Tiles

Stones: Classification, requirements of good structural stone, quarrying, blasting, dressing of stones and seasoning of stone; Tiles: Manufacturing of tiles: ceramic, vitrified, and cement-based, Use of terracotta and faience in modern construction.

## Unit-II

### Module 3: Timber, paints and varnishes

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, Plywood and fiber boards, Important Indian timbers; Basic constituents of paints, types of paints, constituents of varnishes, characteristics and types of varnishes.

**Module 4: Roofs and Floors**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc. Floor structures, ground, basement and upper floors, various types of floorings. Doors and Windows: Locations, sizes, types of doors and windows including UPVC, fixtures and fasteners for doors and windows.

**Unit-III**

**Module 5: Cavity, Partition Walls and Foundations**

Cavity walls and its position, advantages of cavity wall, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall. Types of foundations, sub-surface investigation, Foundation in water logged areas, Masonry wall foundation, Introduction to deep foundations.

**Module 6: Stairs & Stair cases**

Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators.

**Unit-IV**

**Module 7: Damp-Proofing, Water-Proofing and Fire protection**

Dampness and its causes, prevention of dampness, materials used, Damp-proofing treatment in buildings; Water proofing: water- proofing treatment of roofs including Latest Materials; Fire protection: Fire resisting construction, fire protection requirements for buildings.

**Module 8: Sound insulation and Acoustics**

Classification, measurement and transmission of sound, sound insulation of buildings, Acoustical materials and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other emerging materials including properties and uses.

**Suggested Readings:**

- Building Construction By Sushil Kumar, Standard Pub., N. Delhi
- Building Material By Rangawala
- Construction Engineering By Y.S. Sane
- Building Construction By Gurcharan Singh, Standard Pub., N. Delhi

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Basics of Civil Engineering | https://youtu.be/CsKddkqgwVk?si=6EFtfcMai-Q30sMm&t=97 |
| Unit-II | Seasoning of timber | https://youtu.be/tjYDnrMSHX0?si=b03FVrA0Gv3o_I-f |
| Unit-III | Types of doors and windows | https://youtu.be/VqvcWrgpT0g?si=aHaAZpTW2M4JQhZl |
| Unit-IV | Damp-Proofing | https://youtu.be/rkO9eqvFG-4?si=4xBa38PhH8fdQWza |

HOD AS

| Course code | **ESC-ME-101B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course title | **Basics of Mechanical Engineering** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | Semester-I/II |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To introduce the fundamental concepts of mechanical engineering.<br>• To provide knowledge of thermodynamics, heat engines, and energy systems.<br>• To familiarize with manufacturing processes, machine tools, and workshop practices.<br>• To offer insights into fluid mechanics, hydraulic systems, and their practical utilities. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to:

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Define the fundamental concepts of mechanical engineering. | Level 1: Remember |
| CO2 | Explain the principles of machine tools, thermal, fluid, and mechanical systems. | Level 2: Understand |
| CO3 | Apply engineering concepts to solve problem related to mechanical systems. | Level 3: Apply |
| CO4 | Analyze the behavior and performance of mechanical elements in practical scenarios. | Level 4: Analyze |

**Note**: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit -I

**Introduction to Commonly used Machine Tools in a Workshop:** Construction details and working of Lathe, Shaper, Planer, Milling, Drilling and Grinding.

**Introduction to Manufacturing Systems:** Fundamentals of Numerical Control (NC). Advantage of NC systems, Classifications of NC, Comparison of NC and CNC.

## Unit -II

**Thermodynamics:** Introduction to Thermodynamics, Types of Systems, Thermodynamic Equilibrium, Properties, State, Path, Process and Cycle, Elementary introduction to Zeroth, First and Second laws of thermodynamics, Heat and Work Interactions for various non-flow and flow processes.

**Refrigeration & Air conditioning:** Concept of Heat Engine, Heat Pump & Refrigerator, Unit and Rating of refrigeration machines, Coefficient of performance, simple refrigeration vapour compression cycle, Psychrometric charts and its usage.

## Unit -III

**Steam Generator:** Classification of boiler, introduction to fire tube and water tube with simple sketches, comparison between water tube & fire tube boiler, explain with sketches Lancashire, Cochran, babcock & wilcox boilers, Boiler mountings - functions with sketches of stop valve, safety valve, water level indicator, pressure gauge, Fusible plug, Boiler accessories - function with sketches of feed pump, economizer, super heater, air preheater.

**Hydraulic Turbines & Pumps:** Introduction, Classification, Construction details and working of Pelton, Francis and Kaplan turbines, Construction details and working of Reciprocating and Centrifugal pumps.

## Unit -IV

**Power Transmission Methods and Devices:** Introduction to Power transmission, Belt, Rope, Chain and Gear drive, Types and functioning of clutches.

**Stresses and Strains:** Mechanical properties of materials, concept & types of stresses and strains, poison's ratio, Hook's law, stress-strain diagrams, Elastic constants & their relationships. stresses and strains in simple and compound bars under axial loading.

**Suggested Readings**

- Elements of Mechanical Engineering- R.K. Rajput Laxmi Pub., Delhi.
- Elements of Mechanical Engineering- D.S. Kumar, S.K. Kataria and Sons
- Engineering Thermodynamics - P.K. Nag TMH, New Delhi.
- Refrigeration & Air conditioning- Arora & Domkundwar, Dhanpat rai & Co. Pvt. Ltd.
- Workshop Technology Volt. I & II – Hazra & Chowdhury, Asian Book Comp., New Delhi.
- Process and Materials of Manufacture- Lindberg, R.A. Prentice Hall of India, New Delhi.
- Principles of Manufacturing Materials and Processes- Campbell, J.S. - McGraw Hill.

**Useful Video links**

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Machine Tools in a Workshop | https://archive.nptel.ac.in/courses/112/105/112105233/ |
| | NC and CNC | https://archive.nptel.ac.in/courses/112/105/112105211/ |
| Unit-II | Basic thermodynamics | https://archive.nptel.ac.in/courses/112/103/112103316/ |
| | Refrigeration & Air conditioning: | https://archive.nptel.ac.in/courses/112/105/112105129/ |
| Unit-III | Boilers mountings & accessories | https://archive.nptel.ac.in/courses/112/107/112107216/ |
| | Hydraulic Turbines & Pumps | https://archive.nptel.ac.in/courses/112/104/112104117/ |
| Unit-IV | Power Transmission Devices | https://nptel.ac.in/courses/116102012 |
| | Basics of strength of materials | https://archive.nptel.ac.in/courses/112/107/112107147/ |



| Course Code | **ESC-FTS-101B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Fundamentals of Fire and Safety Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- I/II** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To provide foundational knowledge of fire science, fire behavior, safety management and safety audit.<br>• To develop understanding of emergency preparedness, fire prevention measures, building codes related to fire safety, safety provisions and safety training.<br>• To familiarize learners with various fire protection systems and technologies essential for minimizing fire and safety-related risks.<br>• To train students in the application of firefighting techniques, Safety systems and procedures across various industries and environments. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 3 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic terminology of fire and safety. | Level 1: Remember |
| **CO2** | Explain the fundamental concepts of Fire and Safety Engineering. | Level 2: Understand |
| **CO3** | Apply fire and safety engineering knowledge to deal with the real life scenarios related to fire and safety. | Level 3: Apply |
| **CO4** | Analyze the effectiveness of fire safety strategies, emergency response plans, firefighting operations, safety training, and fire audit safety management system in diverse scenarios and industries. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Fire Engineering Science:** Fire, Elements of fire, Classification of fire, Flash point, Fire point, Causes of fire, Phases of fire, Physical properties of matter, Temperature, Heat, Heat transmission, Thermal expansion, Hydraulics, Specific heat, Latent heat, Combustion, Types of combustion, Smoke, Electricity.
**Buildings:** Classification of buildings based on occupancy (as per latest National Building Code of India).

## Unit-II

**Fire Prevention:** Elements of Construction, Elements of Structure, Fixed Installations–Fire doors, Smoke Ceiling, Compartmentation, Pressurization, Fire Safety Practice, Fire Safety Management.

**Fire Protection:** Fire Alarm and Detection Systems, Fire Extinguishers, Fire Hose Reels, Fire Hose Cabinets, Fire Hydrants, Fire Pumps, etc., Fire Sprinkler Systems, Fire Suppression Systems, Kitchen Fire Safety, General Requirements and Guidelines for the Installation of Fire Detection and Alarm System in the Buildings.

## Unit-III

**Accident:** Introduction, Types of accidents, Causes of accidents, Principle of accident prevention, Accident investigation, and process of investigation, Onsite and offsite emergency response plan, and cost of accident, Emergency Evacuation, Process of Emergency Evacuation, Evacuation Plan, Means of Escape.

**Safety:** Introduction to safety, Need for integration of health and environment safety, Safety and productivity, Points for consideration of safety, General instructions for safety, Personal safety, Personal protective equipment, Objectives of safety management, Principles of safety management, Responsibilities of management, Plant manager, Engineers, individuals, Line supervisors, Safety managers, Workers and trade unions in the field of safety, Contractor, government, Social organization, Safety committee, Role of safety committee, advantages.

## Unit-IV

**Safety Education and Training**: Elements of training cycle, Objectives of training, Training methods, Types of training, Behavior oriented training, Communication, purpose, barrier to communication, causes of preventable injuries, Death off the job.
Safety Audit: Safety audits, Types of audit, Audit goals, Responsibilities of audit team, Audit procedure, Safety in design, engineered safety.

**Suggested Readings:**


- Manual of Firemanship by HMSO
- Fire Safety in Buildings by V K Jain, New Age publishers, New Delhi
- Principles of Fire Safety Engineering by A. K. Das, PHI Publishers.
- Fundamentals of Fire Safety in Building Design by Dr. Than Singh Sharma, Aayush Publications, New Delhi
- Handbook of Fire Technology by R.S.Gupta, Orient Longman Pvt. Ltd., Kolkata
- Manual of Fire Safety by N. Sesha Prakash, CBS Publishers & Distributors Pvt. Ltd.
- National Building Code (NBC) Part-4 Life and Safety (Latest Edition)- Bureau of Indian Standards
- Fundamentals of Industrial Safety & Health by K.U.Mistry, Siddharth Prakashan.
- Industrial Safety Health and Environment management Systems by Jain and Rao, Khanna Publishers
- Safety Management by R.K. Mishra- AITBS Publishers.
- Safety Management in Industry by N.V. Krishnan, Jaico Publishing House, 1997
- Industrial Safety by Ronald P. Blake, Prentice Hall, New Delhi, 1973
- Occupational Safety and Health by David L. Goetsch, Prentice Hall
- Modern Accident Investigation and Analysis by Ted S. Ferry, John Wiley & Sons

**Useful Video Links**

| Unit No. | Topic | Link | Source |
|---|---|---|---|
| Unit-I | Basics of Fire-Part 1 | https://youtu.be/eLeZ2zc2hgI?si=VeWVsuhIkwRf-XYd | NPTEL (IIT Madras) |
| | Basics of Fire-Part 2 | https://youtu.be/NzIbiOAJONc?si=7H_mIiQm18vvULrd | NPTEL (IIT Madras) |
| | Combustion | https://youtu.be/n6HAyxdup_U?si=IMSS2Ye7w01SQQNz | NPTEL (IIT Delhi) |
| Unit-II | Safety practices for Fire protection | https://youtu.be/-XRu7BSouvY?si=ogFdjHXtUbAbHWly | NPTEL (IIT Madras) |
| | Fire safety: Internal planning, Detection and Suppression | https://youtu.be/e3Orj5XDj2M?si=YghWp5QRE9ECcIKA | NPTEL (IIT Madras) |
| | Sprinklers I | https://youtu.be/ZKsqIPM810M?si=5uIMn1w6so-tb7oU | NPTEL (IIT Roorkee) |
| | Sprinklers II | https://youtu.be/Z82ypLX2gn8?si=bdPqswwPWQ-DB613 | NPTEL (IIT Roorkee) |
| Unit-III | Accident, Accident Investigation | https://youtu.be/VhuZ6M7a8N8?si=AJ0gXnTGKOd9KPFK | NPTEL (IIT Kharagpur) |
| | Emergency Scene Management (ESM) | https://youtu.be/uibCRbELVbA?si=z9JrmlCfMjKvDR4g | NPTEL ( IIT Kanpur ) |
| | Safety Engineering & Accident causing mechanisms | https://youtu.be/91YpCY-1Fy0?si=4L5f1y_NiOLGSm-4 | NPTEL (IIT Kharagpur) |
| | Personal Protective Equipment | https://youtu.be/eLnv6Eb2Pq0?si=cbAkgLUqZ9QEJoWQ | NPTEL (IIT Delhi) |
| | Safety Committee Meeting | https://youtu.be/N12BEnI1hCY?si=TdR-4HO58IZsM5mp | NPTEL- IITC |
| Unit-IV | Safety Education | https://youtu.be/v-eltsixu4I?si=2T9UetPJdllhk7YN | NPTEL (IIT Kharagpur) |
| | Safety Audit | https://youtu.be/HuYIDi0QQm8?si=y_vJEkJHAVaP81WS | NPTEL (IIT Kharagpur) |



| | | | | | |
|---|---|---|---|---|---|
| Course code | **ESC-CSE-101B** | | | | |
| Category | Engineering Science Courses | | | | |
| Course title | **Basics of Computer Science and Engineering** | | | | |
| **Scheme and Credits** | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 0 | 0 | 3 | |
| **Course Objectives:** | The objectives of this course are<br>• To provide insight about the fundamentals of logic design, number systems, and basic data structures with their operations.<br>• To explore foundational knowledge of database management systems and computer networking principles, architectures, and devices.<br>• To explain software development methodologies and operating system functions, types, and real-world applications.<br>• To develop awareness of cybersecurity threats, preventive practices, and analyze emerging trends and ethical issues in modern computing. | | | | |
| Class work | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of logic design, data structures, database systems, computer networks, operating systems, software engineering, cyber security, and current computing trends. | Level 1: Remember |
| **CO2** | Explain the working principles, classifications, and roles of key computing components and technologies such as data models, SDLC models, OS types, and network topologies. | Level 2: Understand |
| **CO3** | Apply logical reasoning, data structure operations, and networking principles to basic problem-solving scenarios in computing and software environments. | Level 3: Apply |
| **CO4** | Analyze cyber security threats and emerging computing technologies to identify their components, interactions, and implications for system security and societal impact. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Logic Design:** Logic gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Number Systems (Decimal, Binary, Octal, Hexadecimal), Conversion between number systems.

**Data Structures:** Introduction to data structure, Operations on data structures (insertion, deletion, traversal), Types (linear, non-linear).

## Unit-II

**Database Management System:** Introduction, Definition, Applications, Advantages, Data abstraction, Database Vs File Systems, Data Models (Relational, Hierarchical, Object Oriented, Network, Entity-Relationship Model).

**Computer Network:** Introduction, Types of networks (LAN, WAN, MAN, Internet), Basic networking concepts (IP addresses, DNS, WWW, ISP, Email), Network devices and components (Routers, Switches, Modems), Network topologies (Bus, Star, Ring, Tree, Mesh, Hybrid).

## Unit-III

**Software Engineering:** Introduction to Software Development Life Cycle, SDLC Models (Waterfall, Spiral and Prototype model), Requirements Analysis and Specification.

**Operating System:** Introduction to Operating system, Functions of an OS, Types of OS (Batch, Multiprogramming, Multi-Processing, Multi-Tasking, Time-Sharing, Distributed, Network, Real-Time Operating System), Popular operating systems (Windows, Mac OS, Linux).

## Unit-IV

**Cybersecurity Fundamentals:** Introduction to cybersecurity, Common threats (Viruses, Malware, Trojans, Ransomware, Spyware, Adware, Phishing), Basic security practices (Password management, Firewalls, IDS), Authentication Vs Authorization.

**Current Trends in Computing:** Emerging technologies (AI, Machine Learning, Blockchain, IoT, Cloud Computing, Big Data, Generative AI), Impact of technology on society, Ethical considerations in computing.

**Suggested Readings:**


- Fundamental of Computers and Programming with C, by A.K.Sharma, Dhanpat Rai Publications, New Delhi.
- Digital Logic and Computer Design by M. Morris Mano.
- Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan.
- Data Communications and Networking by Behrouz A. Forouzan, McGraw-Hill.
- Software Engineering: A Practitioner's Approach by Roger S. Pressman, Bruce R. Maxim, McGraw-Hill Education.
- Operating System Principles by Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Wiley India Pvt. Limited.
- The Fourth Industrial Revolution by Klaus Schwab.
- Modern Digital Electronics by R. P. Jain, McGraw Hill
- Computer Networks by Tanenbaum, Pearson.
- Operating Systems by William Stallings, Pearson Education
- Fundamentals of Database System, by Elmasri Ramez and Navathe Shamkant, Pearson Education

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Logic Gates & Number System | https://archive.nptel.ac.in/courses/108/105/108105113/ |
| | Data Structures | https://youtu.be/zWg7U0OEAoE |
| Unit-II | Database Management System | https://onlinecourses.nptel.ac.in/noc22_cs91/preview |
| | Computer Network | https://archive.nptel.ac.in/courses/106/105/106105183/ |
| Unit-III | Software Engineering | https://archive.nptel.ac.in/courses/106/105/106105182/ |
| | Operating System | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| Unit-IV | Cyber Security Fundamentals | https://archive.nptel.ac.in/courses/106/106/106106129/ |
| | Introduction to Artificial Intelligence | https://archive.nptel.ac.in/courses/106/102/106102220/ |
| | Big Data Computing | https://archive.nptel.ac.in/courses/106/104/106104189/ |
| | Cloud Computing | https://archive.nptel.ac.in/courses/106/105/106105167/ |



| Course Code | **ESC-DS-101B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Basics of Data Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• Introduce the core concepts, evolution, and applications of data science along with the role of Python in data analysis.<br>• Explain statistical techniques for descriptive data analysis, including measures of central tendency, dispersion, distribution, and correlation.<br>• Develop the ability to perform data wrangling tasks such as data cleaning, organization, enrichment, and validation for preparing data for analysis.<br>• Enable students to visualize data effectively using Python libraries and select appropriate visualization methods for different types of datasets. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total Marks | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define the fundamental concepts and terminologies of data science, including data types, data preprocessing, statistical measures, and visualization techniques. | Level 1: Remember |
| **CO2** | Explain the data science process, roles of data scientists, statistical principles, data wrangling steps, and the importance of visualization tools. | Level 2: Understand |
| **CO3** | Apply data preprocessing, statistical methods, and Python-based Visualization techniques to analyze and interpret real-world datasets. | Level 3: Apply |
| **CO4** | Analyze datasets to identify patterns, trends, and correlations using statistical and visualization methods, and assess the effectiveness of predictive models and recommender systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

### Unit-I

**Introduction to Data Science:** Evolution of Data Science, Applications of Data Science in various fields, Need of Python for data analysis, Data scientist roles and responsibilities, Types of Data, Data objects and attributes types, Data science process, Data Pre-processing, Trend & predictive mining, Recommender systems.

### Unit-II

**Descriptive Data Analysis:** Central tendency (mean, mode, median), Dispersion (range, variance, and standard deviation), shape of the distribution of datasets, Normal distribution, Covariance, correlation, importance of correlation, Correlation metric.

## Unit-III

**Data Wrangling:** Introduction of Data Wrangling, Data Wrangling process, steps-Discover, Organization, Cleaning, Data enrichment, Validation, Publishing, Use cases of data wrangling, Advantages of Data Wrangling.

## Unit-IV

**Data Visualization:** Importance of Data Visualization, Basic Visualization tools, Specialization Visualization tools, Information dashboards, python packages-matplotlib, seaborn, Types of plots-line, bar, histogram, pie, scatter, Distribution plots, selecting best plot according to data.

### Suggested Readings


- Data Science for Dummies by Lillian Pierson, 2nd edition, John Wiley & Sons, 2017.
- Beginners Guide to Data Visualization: How to Understand, Design, and Optimize Over 40 Different Charts by Elizabeth Clarke, Kenneth M Fornari, 2022.
- The Art of Data Science by Roger D. Peng, Elizabeth Matsui, illustrated, 2016.
- Data Science for Beginners by Andrew Park, 2021.
- Data Wrangling: Concepts, Applications and Tools by M. Niranjan Murthy, Kavita Sheoran, 2023.
- Fundamentals of Data Visualization by Claus O. Wilke, 2019.


### Useful Video links

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Data Science | https://youtu.be/MTjOuCbdBCo |
| | Data Preprocessing | https://youtu.be/lOh2x-UACaU?list=PLShJJCRzJWxhz7SfG4hpaBD5bKOloWx9J |
| Unit-II | Descriptive Data Analysis | https://youtu.be/jnuYqmeYiWY?si=uhtB3Zxr5u4R6KVT |
| | Covariance and correlations | https://youtu.be/ZZsVkC0PIkc?si=px-Qs-WZB9w2x6We |
| Unit-III | Data Wrangling | https://youtu.be/eI9Ze4kOkC8?si=lUJ6k_Y1KxhME6Ax |
| Unit-IV | Data Visualisation | https://youtu.be/eFByJkA3ti4?si=AxQPVKmI_P8yfFPa |

| Course Code | **ESC-AI-101B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Basics of Artificial Intelligence** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To introduce the fundamental concepts, history, types, and applications of Artificial Intelligence, including intelligent agents and expert systems.<br>• To develop understanding of AI problem-solving methods, including search strategies and knowledge representation techniques.<br>• To familiarize students with the basics of machine learning, its types, and its role within AI systems and applications.<br>• To explore ethical considerations in AI and examine real-world applications across various domains such as healthcare, finance, and security. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 45 Marks | | | | |
| Total Marks | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skill Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall foundational concepts, terminology, and components of Artificial Intelligence including problem-solving methods, knowledge representation, machine learning types, and real-world applications. | Level 1: Remember |
| CO2 | Explain search strategies, knowledge representation techniques, and machine learning models, and describe their role in AI systems. | Level 2:Understand |
| CO3 | Apply appropriate search algorithms and machine learning techniques to solve real-world AI problems. | Level 3: Apply |
| CO4 | Analyze the ethical issues, biases, and societal impacts of AI technologies and evaluate the effectiveness of AI applications across various domains. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 9 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to AI**: Definition, History, Applications, Intelligent agents, AI problem-solving techniques, AI vs. Human Intelligence, Types of AI (Narrow, General, Super AI), Intelligent agents and environments, Introduction to Expert Systems, Components of an expert system (knowledge base, inference engine, user interface), Examples: MYCIN, DENDRAL, Rule-based systems (if-then rules).

## Unit-II

**Search Strategies:** Problem formulation, Search tree and state space, Uninformed search (BFS, DFS), Informed search (A*, Best-First Search), Heuristic search, Constraint satisfaction problems.

**Knowledge Representation & Reasoning:** Propositional Logic, First-Order Predicate Logic, Logic-based representation, Semantic networks, Frames and Scripts, Ontologies.

### Unit-III

**Machine Learning in AI:** Machine Learning basics, Types of ML: Supervised and Unsupervised, Machine Learning vs. Traditional Programming, Applications of Machine Learning, Decision trees, Neural networks, Reinforcement learning, Introduction to Neural Networks and Deep Learning basics.

### Unit-IV

**AI Ethics & Applications:** Introduction to AI Ethics, Need for ethics in AI systems, ethical frameworks, Bias in AI, Data bias and algorithmic bias, Mitigating bias in AI systems, Case studies (e.g., biased hiring tools, facial recognition). AI in Healthcare, Finance, and Autonomous Systems, AI in Cyber security, AI in Law and Order, AI in Business and Marketing.

**Suggested Readings:**

- Artificial Intelligence: A Modern Approach – Stuart Russell & Peter Norvig, Pearson.
- Introduction to AI – Patrick Henry Winston, MIT Press.
- Deep Learning – Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press.
- Artificial Intelligence: Foundations of Computational Agents – David Poole, Alan Mackworth.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to AI | https://www.youtube.com/watch?v=GHpchgLoDvI&list=PLp6ek2hDcoNB_YJCruBFjhF79f5ZHyBuz |
| | Expert Systems | https://www.youtube.com/watch?v=nE5c5w4aizU |
| Unit-II | Uninformed search | https://www.youtube.com/watch?v=ayP0KCeBK_U |
| | Semantic networks | https://www.youtube.com/watch?v=dU9WsMglBSM&t=317s |
| Unit-III | Machine Learning | https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77 |
| | Neural networks | https://www.youtube.com/watch?v=xbYgKoG4x2g&list=PL53BE265CE4A6C056 |
| Unit-IV | Bias in AI | https://www.youtube.com/watch?v=Y0m136XU65o |
| | Cyber security | https://www.youtube.com/watch?v=OYsY5B9pqYU&list=PLyqSpQzTE6M-jkJEzbS5oHJUp2GWPsq6e |

HOD AS

| Course Code | **LC-CSE-102B** | | | | |
|---|---|---|---|---|---|
| Category | Engineering Science Courses | | | | |
| Course Title | **Programming for Problem Solving Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To perform arithmetic calculations like addition and type conversions.<br>• To solve problems with loops, decision-making, and mathematical computations.<br>• To apply advanced concepts like arrays, pointers, structures, and recursion for data handling.<br>• To develop modular programs using file handling, sorting, and searching techniques. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| **CO1** | Describe the usage of Turbo C IDE and basic C programming techniques. | Level 2: Understand |
| **CO2** | Apply Turbo C IDE, arithmetic operators, control statements, and functions for basic programming tasks. | Level 3: Apply |
| **CO3** | Implement arrays, strings, recursion, pointers, structures, unions, and file handling for efficient data manipulation. | Level 3: Apply |
| **CO4** | Analyze the applicability of control statement and iteration statements to implement linear search and bubble sorting. | Level 4:Analyze |

**List of Experiments:**

| **Sr. No.** | **Content** |
|---|---|
| 1 | Study Turbo C IDE Programming Environment. |
| 2 | Write a C program to perform the addition of two numbers using arithmetic operators and variables, along with type conversion. |
| 3 | Write a C program to find the roots of a quadratic equation using mathematical library functions. |
| 4 | Write a C program using if-else to find the largest of three numbers. |
| 5 | Write a C program using switch-case to create an arithmetic calculator. |
| 6 | Write a C program using for loop to generate the Fibonacci series for n terms. |
| 7 | Write a C program using do-while loop to find the sum of the first 5 natural numbers. |
| 8 | Write a C program using 1-D array to read and write elements in an array. |
| 9 | Write a C program using a 2-D array to implement the addition of two matrices. |
| 10 | Write a C program to implement various string functions using the concept of strings. |
| 11 | Write a C program using Call by Value to swap two numbers. |

| | |
|---|---|
| 12 | Write a C program using recursion to find the factorial of a number. |
| 13 | Write a C program using pointers to get the memory address of an element. |
| 14 | Write a C program using structures to read and write basic information of a student. |
| 15 | Write a C program using union to read and write basic information of a student. |
| 16 | Write a C program using file handling to read and write data into a text file. |
| 17 | Write a C program to implement linear search using control and iteration statements. |
| 18 | Write a C program to implement bubble sort using control and iteration statements. |

**Virtual Lab Links:**

| **Experiment Name** | **Virtual Lab Links** |
|---|---|
| Introduction of Turbo C IDE and Programming Environment. | https://www.youtube.com/watch?v=oyEjuHlOd58 |
| Apply the concept of mathematical library functions to find roots of a quadratic equation | https://www.youtube.com/watch?v=3QiItmIWmOM&list=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP&index=2 |
| Apply the concept of switch case to create arithmetic calculator. | https://www.youtube.com/watch?v=HHuaYKKoMR4 |
| Apply the concept of 2-D array to implement the addition of two matrices. | https://www.youtube.com/watch?v=ukA_X29Wy6c |
| Apply the concept of structure to read and write basic information of a student. | https://www.youtube.com/watch?v=cCnYT5TSHSA&list=PLeCxvb23g7hrw27XlekHtfygUTQ0TmFfP&index=14 |
| Apply the concept of file handling to read and write data into a text file. | https://www.youtube.com/watch?v=AHkkRS_VsRg |

**Note:** At least 10 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| Course Code | **LC-ENG-102B** | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Sciences including Management Courses | | | | |
| Course Title | **Language Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To develop the ability to communicate effectively in social and professional contexts.<br>• To improve the Pronunciation and Phonemic knowledge of the students. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Practical Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Explain the spoken language in various contexts and enhance overall comprehension skills. | Level 2: Understand |
| CO2 | Describe the International Phonetic Alphabet and improve clarity and pronunciation. | Level 2: Understand |
| CO3 | Apply their knowledge and skills to excel in Group Discussions, Debates, Extempore, Speeches and Presentations. | Level 3: Apply |
| CO4 | Apply the communication strategies effectively in social and professional settings for impactful interactions. | Level 3: Apply |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1 | Listening Comprehension |
| 2 | Recognition of Phonemes in the International Phonetic Alphabet |
| 3 | Self- Introduction and Introducing Others |
| 4 | Conversational Skills and Dialogues in Everyday Situations. |
| 5 | Workplace Communication |
| 6 | Telephonic Communication |
| 7 | Speeches for Special Occasions (Welcome Speeches, Introduction Speeches, Felicitation Speeches and Farewell Speeches) |
| 8 | Group Discussions |
| 9 | Debates |
| 10 | Presentation Skills |

**Suggested Readings:**

- Communicative English for Engineers and Professionals by Nitin Bhatnagar and Mamta Bhatnagar, Pearson Education, 2013.
- Practical English Usage by Michael Swan, 3rd Edition OUP,1995.
- Practical Course in Spoken English, J. K. Gangal, PHILearning, 2015.
- Communication Skills for Professionals by Nira Konar, PHI Learning, 2009.
- Spoken English by R.K. Bansal and J.B. Harrison, Orient Longman, 1983.
- Communication Skills for Engineers and Scientists, Sangeeta Sharma and Binod Mishra, PHI Learning, 2015.

**Useful Video links:**

| Topics | Links |
|---|---|
| Listening Comprehension | https://www.youtube.com/watch?v=Q5WwWn7PD6o&list=PLLy_2i UCG87CQhELCy tvXh0E_y-bOO1_q&index=7<br>https://www.youtube.com/watch?v=jiPxwFVA9lE&list=PLLy_2iUC G87CQhELCytv<br>Xh0E_y-bOO1_q&index=8 |
| Phonemes and Allophones | https://www.youtube.com/watch?v=fAfI-UkMoVA |
| Self- Introduction and Introduction of others | https://www.youtube.com/watch?v=QgjkjsqAzvo<br>https://www.youtube.com/watch?v=TwZ7LgrPwR0 |
| Conversation and Dialogues in Everyday Situations | https://www.youtube.com/watch?v=H6n3iNh4XLI |
| Workplace Communication | https://www.youtube.com/watch?v=B53VM3FKag0&list=PLzf4HHls |
| | QFwIQUeZq_yk EVB6qZrTRnJZn&index=16<br>https://www.youtube.com/watch?v=PAISeBhtYqI&list=PLzf4HHlsQ FwIQUeZq_ykE VB6qZrTRnJZn&index<br>https://www.youtube.com/watch?v=j4tCTRrYC1Q |
| Telephonic Communication | https://www.youtube.com/watch?v=xROJzUo5Apc |
| Speeches, Debates and Oral Presentation | https://www.youtube.com/watch?v=xG23Ufhkizs&list=PLLy_2iUCG8 7CQhELCytvX h0E_y-bOO1_q&index=47<br>https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQ |
| | FwIQUeZq_yk EVB6qZrTRnJZn&index=17 |
| Group Discussion | https://www.youtube.com/watch?v=1DVO_f2gk1A&list=PLLy_2iU |
| | CG87CQhELCytv Xh0E_y-bOO1_q&index=42<br>https://www.youtube.com/watch?v=R6RyBAZe94w&list=PLLy_2i UCG87CQhELCyt vXh0E_y-bOO1_q&index=43<br>https://www.youtube.com/watch?v=UcEq_RsCyxY&list=PLbMVog Vj5nJSZB8BV29_<br>sPwwkzMTYXpaH&index |
| Presentation Skills | https://www.youtube.com/watch?v=nK2NgiAp4VU&list=PLzf4HHlsQ |
| | FwIQUeZq_yk EVB6qZrTRnJZn&index=17 |

| Course Code | **LC-DT-101B** | | | | |
|---|---|---|---|---|---|
| Category | Humanities and Social Sciences including Management courses | | | | |
| Course Title | **Design Thinking** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are to<br>• Develop an understanding of Design Thinking, its need, objectives, and stages, along with creative thinking and problem-solving processes.<br>• Apply Design Thinking in engineering product design, including prototyping, testing, and alignment with customer expectations<br>• Explore individual differences through discussions and activities that foster acceptance, appreciation, and collaboration in design.<br>• Assess market strategies for production, costs, business models, and sustainability to optimize product success. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the key concepts of Design Thinking, including its necessity, objectives, and various stages in the creative problem-solving process. | Level 1: Remember |
| **CO2** | Understand Design Thinking and its product design stages, including prototyping and testing, while fostering appreciation for individual differences. | Level 2: Understand |
| **CO3** | Apply Design Thinking to solve customer challenges, enhance user experience, and refine products through Rapid Prototyping and testing. | Level 3: Apply |
| **CO4** | Analyze market strategies for production, costs, business models, and sustainable design, assessing their impact on product success and future trends. | Level 4: Analyze |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1. | Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concept and Brainstorming, Stages of Design Thinking Process- Empathize, Define, Ideate, Prototype, Test. |
| 2. | Understanding Creative Thinking Process, Understanding Problem Solving, Testing Creative Problem Solving. |

| | |
|---|---|
| 3. | Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment- Engineering Product Design. |
| 4. | What is Prototype? Why Prototype, Rapid Prototype Development process, Testing, Sample. |
| 5. | Understanding Individual differences and Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of individual differences. |
| 6. | Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of customer Expectations with Product Design. |
| 7. | Feedback loop, Focus on User Experience, Address "ergonomic challenges, user focused design, rapid prototyping and testing, final product, Final Presentation-"Solving Practical Engineering Problem through Innovative Product Design & Creative Solution". |
| 8. | Conduct survey and identify the problem either individual or group and frame the problem statement. |
| 9. | Implementation & Market Integration- Design for Production, Cost considerations, Business Models. |
| 10. | Reflection & Future Trends- Evolution of Design Thinking, Sustainable Design, Career Pathways |

**Note:** At least 8 experiments are to be performed by the students. Faculty members can add 2-3 extra experiment if they feel useful to add.



| Course Code | **MC-101B** | | | | |
|---|---|---|---|---|---|
| Category | Mandatory Non-Credit Courses- Audit Courses | | | | |
| Course Title | **Yoga and Sports** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | - | |
| Course Objectives | The objective of this course are<br>• To make the students understand the importance of sound health and fitness principles as they relate to better health.<br>• To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.<br>• To create a safe, progressive, methodical and efficient activity-based plan to enhance improvement and minimize risk of injury.<br>• To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health. | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the key concepts and terminologies of Physical Education | Level 1: Remember |
| **CO2** | Describe the importance of physical fitness, wellness, lifestyle changes, and the concept of positive lifestyle for improving health. | Level 2: Understand |
| **CO3** | Apply physical fitness, wellness, yoga techniques, first aid techniques and sports psychology strategies to manage emotions, stress, anxiety, sports injuries and enhance performance. | Level 3: Apply |
| **CO4** | Analyze the psychological aspects such as motivation, emotions, and stress to understand their impact on sports performance and athlete behavior. | Level 4: Analyze |

## Unit-I

**Introduction to Physical Education:** Meaning & definition of Physical Education, Aims & Objectives of Physical Education, Changing trends in Physical Education, Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga.

**Awards:** Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhayanchand Award, Rajiv Gandhi Khel Ratna Award etc.)

## Unit-II

**Physical Fitness, Wellness and Lifestyle:** Meaning & Importance of Physical Fitness & Wellness, Components of Physical fitness, Components of Health related fitness, Components of wellness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle.

**Yoga and Asana:** Meaning & Importance of Yoga, Elements of Yoga, Introduction - Asanas,

Pranayama, Meditation & Yogic Kriyas, Yoga for concentration, Relaxation Techniques for improving concentration - Yog-nidra, Asanas as preventive measures, Sukhasana, Tadasana, Padmasana, Shashankasana, Vajrasana, Pavan Muktasana, Ardha Chakrasana, Bhujangasana, Shavasana, Hastasana, Trikonasana, Ardh Matsyendrasana, Vakrasana, Shalabhasana, Paschimottasana, Chakrasana, Gomukhasana, Parvatasana, Matsyasana.

**Unit-III**

**Psychology & Sports:** Definition & Importance of Psychology in Physical Edu. and Sports, differentiate between growth & development, Adolescent problems & their Management.
**Emotion:** Concept, Type & Controlling of emotions, Meaning, Concept & Types of Aggressions in Sports, Psychological benefits of exercise, Anxiety & Fear and its effects on Sports Performance, Motivation, its type & techniques, Understanding Stress & Coping Strategies.

**Unit-IV**

**Sports / Games:** Following subtopics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc. History of the Game/Sport, Latest General Rules of the Game/Sport, Specifications of Play Fields and Related Sports Equipment, Important Tournaments and Venues, Sports Personalities, Proper Sports Gear and its Importance.
**Sports Medicine:** First Aid – Definition, Aims & Objectives, Sports injuries: Classification, Causes & Prevention, Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries.

**Note:**
***The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.***



| Course Code | **MC-102B** | | | | |
|---|---|---|---|---|---|
| Category | Mandatory Non-Credit Courses – Audit Course | | | | |
| Course Title | **Fire Ground Operation-I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** (For B.Tech Fire Tech & Safety Engineering Students) |
| | 0 | 0 | 2 | - | |
| Course Objectives | The objectives of this course are<br>• To instill discipline and professionalism by teaching ground decorum, proper communication with superiors, and adherence to dress codes.<br>• To provide a strong foundation in drill techniques, including the principles, history, and practical execution of various formations and movements.<br>• To equip trainees with practical firefighting skills, focusing on the use of fire safety equipment such as fire extinguishers, hoses, and breathing apparatus.<br>• To foster teamwork and leadership through group drills, enhancing coordination, following instructions, and executing synchronized movements. | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall key concepts of ground decorum, basic drill movements, fire extinguisher procedures, and firefighting equipment. | Level 1: Remember |
| CO2 | Explain the principles, history, and instructional methods of drills, along with the purpose of various firefighting tools and equipment. | Level 2: Understand |
| CO3 | Demonstrate proper interaction with senior officers, faculty members, and peers, as well as execute basic drill movements such as saluting and quick march. | Level 3: Apply |
| CO4 | Analyze the sequence and coordination required for complex drill movements such as forming file from single file or changing direction by wheeling. | Level 4: Analyze |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| 1 | Introduction to ground decorum, talking with senior officers, faculty members, ground instructors and seniors, dress code. |
| 2 | To study the aim, principle, instruction method and history of drill. |
| 3 | To perform the positions of attention, stand at ease, stand easy, sizing, right dress, dismiss, step forward/backward march and side step. |
| 4 | To perform the dressing, open and close order march, forming up in three ranks, numbering, proving, sizing, dismissing and falling out. |
| 5 | To perform the position of march and pace, turning by numbers, mark time, the halt, marching in squad, quick march and the halt (on the move). |

| | |
|---|---|
| 6 | To perform the position of right (or left)- turn, changing direction by wheeling and changing steps on the march, forming file from single file and forming single file from file. |
| 7 | To study the tricks of parade inspection, how and whom to salute and perform the position of saluting. |
| 8 | To perform saluting at the halt, saluting on the march, marching off in single file, reforming three ranks. |
| 9 | To perform the fire extinguisher drill. |
| 10 | Introduction to the basic concept of Hose, Hydrant, Ladder, Knots & Lines, Pump, Foam, B. A set. |

***The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.***



| Course Code | **BSC-MAT-102B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Mathematics-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop a comprehensive understanding of probability theory, discrete and continuous distributions, and statistical methods for analyzing data.<br>• To equip students with the skills to apply probability distributions, statistical analysis, and tests of significance in practical scenarios.<br>• To foster the ability to model real-world problems using probability and statistical techniques, including hypothesis testing and regression analysis. | | | | |
| Course Pre-requisite | Mathematics upto 12th Standard and Engineering Mathematics-I | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts, definitions, and theorems related to probability, random variables, distributions, and statistical measures. | Level 1: Remember |
| **CO2** | Explain the core concepts such as probability theorems, properties of distributions, and statistical methods for data analysis. | Level 2: Understand |
| **CO3** | Apply probability theory and statistical techniques to solve problems in real-world scenarios. | Level 3: Apply |
| **CO4** | Analyze statistical data and probability distributions to identify relationships between variables, evaluate assumptions, and interpret the implications of test results. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Basic Statistics:** Definition, Scope and Application of Statistics, Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis.

**Correlation and Regression:** Rank Correlation, Curve Fitting by the Method of Least Squares - Fitting of Straight lines, Second Degree Parabolas and more General Curves.

## Unit-II

**Basic Probability & Discrete Probability Distributions:** Random Experiment, Sample Space, Events and its Types, Various Definitions of Probability, Addition Theorem, Multiplication Theorem, Conditional Probability, Bayes' Theorem.

**Random Variables:** Random Variables, Discrete Random Variable, Probability Mass Function, Expectation, Variance and Moments of Discrete Random Variables.

**Discrete Probability Distributions:** Bernoulli, Binomial and Poisson along with their Properties and Limiting/Approximation Cases.

## Unit-III

**Continuous Random Variables:** Continuous Random Variables and their Properties, Distribution Functions, Probability Density Function, Expectation, Variance, Moments of Continuous Random Variables, Two Dimensional Random Variables- Joint, Marginal and Conditional Distributions of Random Variables.

**Continuous Probability Distributions:** Uniform, Normal and Exponential along with their Properties and Limiting/Approximation Cases.

## Unit-IV

**Applied Statistics:** Test of Significance: Large Sample Test for Single Proportion, Difference of Proportions, Single Mean, Difference of Means, and Difference of Standard Deviations.

**Small Samples:** Test for Single Mean, Difference of Means and Correlation Coefficients; Test for Ratio of Variances, Chi-Square Test for Goodness of Fit and Independence of Attributes.

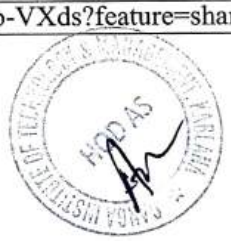
**Suggested Readings:**


- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- Advanced Engineering Mathematics by H.K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Mathematical Statistics by P. Mukhopadhyay, Books and Allied Private Limited, Kolkata.
- Fundamentals of Mathematical Statistics by S.C. Gupta, and V. K. Kapoor, S. Chand & Sons, New Delhi.
- Business Statistics by T.R. Jain and S.C. Aggarwal, VK Global Publications Pvt. Ltd.
- R. E. Walpole, R. H. Myers, S. L. Myers, and K. E. Ye, Probability and Statistics for Engineers and Scientists, 9th edition. Pearson.




**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit I** | Measures of Central Tendency | https://youtu.be/XaHFNhHfXwQ?si=oir6QOmcf8ZQLpKa |
| | Correlation | https://youtu.be/TWd42yUBZkk?si=V6exIcI1CtbRwBEg |
| | Regression | https://youtu.be/_pbAib0He0Y?si=cG_TU71Js3Pq7jvq |
| **Unit II** | Introduction of Probability | https://youtu.be/60vHy2lA4o4 |
| | Random Variables | https://youtu.be/2CP3m3EgL1Q |
| | Discrete Random variable & Probability Distribution | https://youtu.be/Sv9UYnp9tbs?si=eHqwSJETA5SO3NFI |
| **Unit III** | Continuous Probability distribution | https://youtu.be/o2LB3KQME3U?si=NWaP0TY_K8tPaAfu |
| | Bivariate Probability distribution | https://youtu.be/h-8hJN74O7g?si=K53Y3COL4g_qrWi- |
| | Probability distributions | https://youtu.be/Hw8KHNgRaOE |
| **Unit IV** | Testing ofHypothesis & Levels of significance | https://youtu.be/14PQawp_rjk |
| | Large Sample Test | https://auece.digimat.in/nptel/courses/video/111105090/L72.html |
| | Chi-Square Test | https://youtu.be/SlCsNb-VXds?feature=shared |



| Course Code | **BSC-MAT-103B** | | | | |
|---|---|---|---|---|---|
| Category | Basic Science Courses | | | | |
| Course Title | **Engineering Mathematics-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To develop an understanding of multivariable integral calculus, vector calculus, Fourier series, Fourier transform and complex analysis.<br>• To familiarize with the applications of engineering mathematics in engineering domain that would enhance their analytical thinking skills. | | | | |
| Course Pre-requisite | Mathematics upto 12th Standard and Engineering Mathematics-I | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of multivariable integrals, vector calculus, Fourier series, Fourier transform and complex analysis. | Level 1: Remember |
| **CO2** | Explain the principles and applications of multivariable integrals, vector calculus, Fourier series, Fourier transform and functions of complex variables. | Level 2: Understand |
| **CO3** | Solve the problems using techniques of integrals, vector calculus, Fourier series expansions, Fourier transform and complex analysis. | Level 3: Apply |
| **CO4** | Analyze complex mathematical problems associated with multivariable integrals, vector calculus, Fourier series and transform and complex function theory. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts (preferably 2 from each unit/section) of 1.5 marks each and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Multivariable Integral Calculus:** Evaluation of definite and improper integrals, double integrals, Evaluation of double integrals (Cartesian and polar coordinates), Change of order of integration, Change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Applications of double integral to find area enclosed by plane curves, Triple integrals, Applications of triple integrals, Beta and Gamma functions.

## Unit-II

**Vector Calculus:** Differentiation of vectors, scalar and vector point functions, Gradient of a scalar point function, Directional derivative, Curl and divergence, Statement of Green's, Stoke's and Gauss divergence theorems, Verification and evaluation of vector integrals using these theorems.

## Unit-III

**Fourier Series and Fourier Transforms**: Euler's formulae, Dirichlet's conditions, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem, Fourier transform of Dirac-delta function.

## Unit-IV

**Functions of Complex Variable**–Differentiability and Analyticity, Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations, Harmonic functions, Integration of complex functions, Cauchy-integral theorem and formula (without proof), Taylor's series, Laurent's series, Zeros of analytic functions, Singularities, Residues, Cauchy-Residue theorem (without proof).

**Suggested Readings:**


- Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publishing Company Limited.
- Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers.
- Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons.
- Advanced Engineering Mathematics by H.K. Dass, S. Chand.
- A textbook of Engineering Mathematics by N. P. Bali and Manish Goyal, Laxmi Publications.
- Engineering Mathematics for first year by T. Veerarajan, Tata McGraw-Hill Publishing Company Limited.
- Engineering Mathematics- Calculus, Differential Equations and Linear Algebra by P. Sivaramakrishna Das, C. Vijayakumari, Pearson Education.


**Useful Video links:**

| Unit No. | Topic | Link |
|---|---|---|
| Unit-I | Multiple Integrals | https://youtu.be/mIeeVrv447s?si=ZxrHvWcK3RQTaOyp |
| | Change of order of integration | https://youtu.be/4rc3w1sGoNU?si=GmMACWg459ppFGyn |
| | Change of variables | https://youtu.be/wtY5fx6VMGQ?si=bSR0rySP3bql6Ngh |
| Unit-II | Vector Differentiation | https://youtu.be/Qj0KM9Uh7xw?si=9gLE1lLBgoYnyi8v |
| | Gradient of a scalar field and Directional derivative | https://youtu.be/JTJXHcLrxgM?si=kuqQlxeT4Y0N9Xeo |
| | Gradient, Divergence and Curl | https://youtu.be/v_sTlDeCUdU?si=yf6yzC0hazmWzYEh |
| | Line integral | https://youtu.be/yCqLvRiVtng?si=iqbOrl9Bq28F9HIL |
| | Applications of Line integrals | https://youtu.be/mMBSb_dtkYU?si=rtFe1esglErwBr3b |
| | Green's Theorem | https://youtu.be/34aX-fNMS-c?si=v1hj0iSsVQ2ypsJp |
| | Divergence Theorem of Gauss | https://youtu.be/DtqTXJ5X3xo?si=J5KIjrjWImlSylNH |
| | Stoke's Theorem | https://youtu.be/q-fgRrPayJY?si=MI5sFHwamcF8gApa |
| Unit-III | Fourier series | https://youtu.be/ygOjw0_Kh8k?si=eSrcBHLRFtk4NemO |
| | Examples on Fourier series of a Periodic Signal | https://youtu.be/yQQH-3eftIE?si=ZdvDoXAk3UC8TSrQ |
| Unit-IV | Introduction to Complex Numbers | https://www.youtube.com/watch?v=gFjlBKW8aZU |
| | Analytic functions of a complex variable | https://youtu.be/b5VUnapu-qs?si=odZ34Xpop2x-xcob https://www.youtube.com/watch?v=q01b-lV6y5Q |
| | Calculus of residues (Part I) | https://youtu.be/o77UV7YrWyw?si=9T5nTIJ3krNNYKx4 |
| | Calculus of residues (Part II) | https://youtu.be/Aq6K0lmv3Qw?si=rWyCeSJMlEVpimr6 |

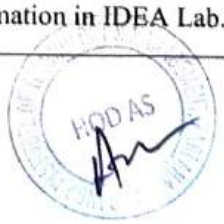
| Course Code | **MC-103B** | | | | |
|---|---|---|---|---|---|
| Category | Mandatory Non-Credit Course – Audit Course | | | | |
| Course Title | **IDEA Lab Workshop** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I/II** |
| | 0 | 0 | 2 | - | |
| Course Objectives | The objectives of this course are to<br>• Develop proficiency in using hand tools and power tools by understanding their applications, handling techniques, and safety measures for effective prototyping and machining.<br>• Gain foundational knowledge of Intellectual Property Rights (IPR) and patents to access and utilize patent information in the IDEA Lab for innovation and design purposes.<br>• Apply subtractive manufacturing processes and basic joining techniques to fabricate prototypes, assemble components, and machine 3D geometry on soft materials.<br>• Integrate embedded systems and electronics into projects by designing circuits, programming microcontrollers like Arduino and Raspberry Pi, and implementing functional hardware enclosures using machining or 3D printing. | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the functions, applications, and safety measures of various hand tools and power tools used in prototyping and machining. | Level 1: Remember |
| **CO2** | Understand the importance of Intellectual Property Rights (IPR) and patents, demonstrating the ability to access and utilize patent information for innovation in the IDEA Lab. | Level 2: Understand |
| **CO3** | Apply subtractive manufacturing processes and basic joining techniques to fabricate prototypes and machine 3D geometry on soft materials with precision. | Level 3: Apply |
| **CO4** | Analyze the integration of embedded systems and electronics by designing circuits, programming microcontrollers, and developing functional hardware enclosures through machining or 3D printing. | Level 4: Analyze |

**List of Experiments:**

| Sr. No. | Contents |
|---|---|
| 1. | Introduction to basic hand tools - Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading, Adhesives. |
| 2. | Basics of IPR and patents accessing and utilizing patent information in IDEA Lab. |



| | |
|---|---|
| 3. | Prototyping using subtractive cutting processes. |
| 4. | Machining of 3D geometry on soft material such as soft wood or modelling wax. |
| 5. | Basic welding, brazing and other joining techniques for assembly |
| 6. | Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools, various types of drill bits. |
| 7. | Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit. |
| 8. | Arduino and Raspberry Pi programming and use. |
| 9. | Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure. |
| 10. | Implementation and Documentation of Mini Project (Report and Video) |

***The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.***



| Course Code | **MC-104B** | | | | |
|---|---|---|---|---|---|
| Category | Mandatory Non-Credit Courses – Audit Course | | | | |
| Course Title | **Fire Ground Operation-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 0 | 0 | 2 | - | |
| Course Objectives | The objectives of this course are to<br>• Develop comprehensive physical fitness and mental resilience<br>• Understand firefighting techniques and equipment handling<br>• Learn teamwork, communication and rescue operations<br>• Ensure safety and protection through personal protective equipment (PPE) and breathing apparatus | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall key terms, classifications, and features related to physical fitness, yoga, firefighting equipment and personal protective equipments. | Level 1: Remember |
| CO2 | Explain the principles and purpose of fitness monitoring, squad drills, extinguishers, hose drills, hydrants, knots, and foam types. | Level 2 :Understand |
| CO3 | Solve basic and advanced tasks such as operating and refilling portable extinguishers, executing hose drills and practicing knots and lacing techniques. | Level 3: Apply |
| CO4 | Analyze the suitability of different hoses and ladders for specific scenarios, and assess fitness data to provide feedback. | Level 4: Analyze |

**List of Experiments:**

| Sr. No | Contents |
|---|---|
| 1 | **Physical Exercise:** Monitoring Levels of Fitness, Pulse, Blood Pressure, Body fat |
| 2 | **Yoga & Mediation** |
| 3 | **Squad Drill:** Clarification, Correction of faults, Inspection, Handling a squad, Questions, Communication drill and mutual drill |
| 4 | **Extinguishers:** Operation of portable extinguishers, Refilling of portable extinguishers, Inspection requirement of portable extinguishers |
| 5 | **Hose & Hose Fitting:** Types, (Delivery Hose, Suction Hose, Hose Reel-Hose), Hose binding/patching g/washing, Hose drill: Lifting, Lowering, Carrying, Laying, Connect, Disconnect, Removal of kinks, Under - running, Roll |
| 6 | **Hydrant:** Types of Hydrants, Hydrant Installation (underground and pillar post) |
| 7 | **Ladder:** Types of ladders: Hook ladder, Roof ladder, 35 ft Aluminum extension ladder, 45 ft Aluminum extension ladder, Truss - type and non-truss –type |
| 8 | **Knots:** Introduction, Types of ropes, Rope construction, Types of knots, Types of lacing, (Round lasing, diagonal lasing, Figure of eight lasing, Square lasing), Types of lacing, knot practice (Over hand, figure of eight, Reef, Chair knot) |

| | |
|---|---|
| 9 | **Pump:** Types of pumps |
| 10 | **Foam:** Introduction, Part identification and specification: FB -2, FB -10, FB - 5X, FB -10X, MFG- 5A, MFG -10A |
| 11 | **B. A set:** Construction features, uses |
| 12 | **P.P.E:** Introduction |

***The evaluation of students will be conducted by the concerned instructor(s) or an examiner appointed by the Director/Controller of Examination/Head of Department at the end of the semester. Based on their performance, students will be awarded grades as follows: A (Excellent), B (Good), C (Satisfactory), and F (Not Satisfactory). A student who receives an 'F' grade is required to repeat the course.***

## DEPARTMENT OF MANAGEMENT

## GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

**Minutes of 2nd meeting of Board of Studies of Department of Management held on 27.5.2025**

The 2nd meeting of Board of Studies (BOS) of Department of Management was held on 27.05.2025 at 01:00 P.M in the Board Room of Ganga Institute of Technology and Management, Kablana.

The following members were present for the BOS meeting:

| S. No. | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Dr Punam Devi | HoD & Professor, MGMT, GITAM, Kablana | Chairperson |
| 2 | Dr. Pardeep Ahlawat | Subject Expert (Professor, IMSAR, MDU, Rohtak), University Nominee | Member |
| 3 | Dr. Sanjay Bhayana | Subject Expert (Professor, NIFTEM, Sonipat), Outside Parent University | Member |
| 4 | Dr. Dipika | Professor, MGMT, GITAM Kablana | Member |
| 5 | Dr. Payush | Professor, MGMT, GITAM Kablana | Member |
| 6 | Dr. Bhawana Yadav | Associate Professor, MGMT, GITAM Kablana | Member |
| 7 | Dr. Manisha | Associate Professor, MGMT, GITAM Kablana | Member |
| 8 | Dr. Anju | Assistant Professor, MGMT, GITAM Kablana | Member |
| 9 | Mr. Ajay Kumar | Assistant Professor, MGMT, GITAM Kablana | Member |
| 10 | Ms. Preeti Sharma | Assistant Professor, MGMT, GITAM Kablana | Member |
| 11 | Mr. Sachin Gupta | Assistant Professor, MGMT, GITAM Kablana | Member |
| 12 | Mr. Umesh Bhardwaj | Assistant Professor, MGMT, GITAM Kablana | Member |
| 13 | Ms. Shalu | Assistant Professor, MGMT, GITAM Kablana | Member |
| 14 | Ms. Manju | Assistant Professor, MGMT, GITAM Kablana | Member |
| 15 | Ms. Divya | Assistant Professor, MGMT, GITAM Kablana | Member |
| 16 | Ms. Bhumika Samal | Assistant Professor, MGMT, GITAM Kablana | Member |
| 17 | Ms. Sangeeta Gupta | Assistant Professor, MGMT, GITAM Kablana | Member |
| 18 | Ms. Asha | Assistant Professor, MGMT, GITAM Kablana | Member |
| 19 | Mr. Joginder Singh Grewal | Assistant Professor, MGMT, GITAM Kablana | Member |
| 20 | Mr. Gourav | Assistant Professor, MGMT, GITAM Kablana | Member |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

GANGA INSTITUTE OF TECHNOLOGY & MANAGEMENT, KABLANA ★ HOD MGMT

**Agenda wise Discussions and Resolutions**

**Item No. 2.1**
Confirmation of the minutes of 1st meeting of the Board of Studies of Department of Management held on 30.12.2024

**The minutes of 1st meeting of the Board of Studies of Department of Management held on 30.12.2024 (Annexure-I Page No. 1 to 3 already circulated) be confirmed.**

**Item No. 2.2**
Follow up action report of the decisions taken in the 1st meeting of Board of Studies held on 30.12.2024

**The follow up action report of the decisions taken in the 1st meeting of Board of Studies held on 30.12.2024 be noted.**

| Items | Particulars | Follow-up Actions |
|---|---|---|
| 2 | Review of the Syllabus Prescribed for 1st year under autonomous status | • The mission, Vision and Program Outcomes included in the scheme of Examinations<br>• Case studies are included in the syllabus is implemented<br>• The objectives are listed numerically<br>• Approved Scheme of Examinations and Syllabus of the BBA and MBA programs |
| 3 | Panel of examination | Approved panel of examiners for the MBA and BBA Programs |

**Item No. 2.3**
Changes in the credit Structure of the MBA Program

The members of the BOS were of the view that there should be a category of Discipline Elective courses included in the credit structure of the MBA program for specialization.

| Existing credit structure of the MBA Program for 2024-25 | | | | |
|---|---|---|---|---|
| Sr. No. | Category | Only Course Work<br>Breakup of Credits | Course Work with Research | Only Research work |
| 1 | Discipline Specific Courses | 80 | 60 | 40 |
| 2 | Skill Enhancement Course/ Vocational Course/ Internship/ Project Work/ Thesis | 16 | 36 | 56 |
| Total Credits | | 96 | 96 | 96 |

| Amended credit structure of the MBA Program w.e.f. 2025-26 | | | | |
|---|---|---|---|---|
| Sr. No. | Category | Only Course Work<br>Breakup of Credits | Course Work with Research | Only Research work |
| 1 | Discipline Specific Courses | 48 | 44 | 40 |
| 2 | Discipline Elective Courses | 32 | 16 | - |
| 3 | Skill Enhancement Course/ Vocational Course/ Internship/ Project Work/ Thesis | 16 | 36 | 56 |
| Total Credits | | 96 | 96 | 96 |

**Resolved that changes in the credit structure of the MBA Program be approved and these changes are recommended to the Academic Council for approval.**

**Item No. 2.4**
Scheme of Examinations and Syllabus of BBA 1st Semester (B-Scheme) and BBA 3rd Semester (A-Scheme) BBA 3rd Semester from A.Y. 2025-26.

**Resolved that the Scheme of Examinations and Syllabus of of BBA 1st Semester (B-Scheme) and BBA 3rd Semester (A-Scheme) from A.Y. 2025- 26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure II Pages 4-68).**

**Item No. 2.5**
Scheme of Examinations and Syllabus of MBA 3rd Semester from A.Y. 2025-26.

**Resolved that Scheme of Examinations and Syllabus of MBA 3rd Semester from A.Y. 2025-26 be approved and further resolved that the Scheme of Examinations and Syllabus of the above is recommended to the Academic Council for approval (Annexure III Pages 69-181).**

**Item No. 2.6**
Panel of Examiners for Theory and Practical Examinations of BBA and MBA programs from A.Y. 2025-26.

**The panel of examiners for Theory and Practical Examinations of BBA and MBA programs from A.Y. 2025-26 is reviewed and approved. The same is to be sent to the Controller of Examinations of the Institute for the Information (Annexure IV Pages 182-191).**

**Item No. 2.7**
Any other item with the permission of the chair

With the permission of the chair the following item was discussed

2.7.1 Syllabus of Fundamentals of Management and Organisational Behaviour, Economics for Engineers and Universal Human Values-II for all B.Tech programs from the A.Y. 2025-26

**Resolved that the syllabus of Fundamentals of Management and Organizational Behaviour, Economics for Engineers and Universal Human Values-II for all B.Tech programs, from A.Y. 2025–26 is approved and further resolved that the same is recommended to the Academic Council for approval (Annexure V Pages 192-197).**

The meeting concluded with the thanks to the Chair.

**Chairperson**
**Board of Studies**
**Deptt. of Management**

**Endst No.** GITAM/BOSMGMT/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the members of Board of Studies
- All HODs




**Chairperson**
**Board of Studies**
**Deptt. of Management**

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

**An Autonomous Institute (UGC)**

**Approved by AICTE, New Delhi and Affiliated to MDU, Rohtak**

**NAAC 'A' GRADE**

GITAM

## SCHEME AND SYLLABI

## OF

## 3-4 YEAR

## BACHELOR OF BUSINESS

## ADMINISTRATION PROGRAM

## (BBA)

## WITH EFFECT FROM THE

## SESSION 2025-26

# Scheme of Studies and Examination
## BBA – 1st Semester (GITAM)
## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per Week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Formative Assessment | Summative Assessment | Practical /Viva- Voce | Total |
| 1 | Core Courses | DSC-BBA-101B | Business Organization | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 |
| 2 | Core Courses | DSC-BBA-103B | Basics of Accounting | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 |
| 3 | Core Courses | DSC-BBA-105B | Basics of Economics | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 |
| 4 | Multidisciplinary Courses | Refer Table No.- I | ..... | 2 | 0 | 0 | 2 | 2 | 50 | 50 | - | 100 |
| 5 | Ability Enhancement Courses | AEC-101B | General English-I | 1 | 1 | 0 | 2 | 2 | 65 | 35 | - | 100 |
| 6 | Additional Courses | Refer Table No.- II | **(Additional Course)** Foreign Language (To be decided by the Institute/College at them level) (1-1-0) OR Any Course of Similar Credits on Any Foreign Languages from SWAYAM portal | - | - | - | - | No credit | - | - | - | - |
| 7 | Skill Enhancement Courses | SEC-101B | Computer Fundamentals and Office Automation Tools | 1 | 0 | 0 | 1 | 1 | 15 | 35 | - | 50 |
| | | LC-SEC-103B | Computer Fundamentals and Office Automation Tools Lab | 0 | 0 | 1 | 2 | 1 | 35 | - | 15 | 50 |
| 8 | Value Added Courses | VAC-113B | Environmental Studies | 2 | 0 | 0 | 2 | 2 | 65 | 35 | - | 100 |
| **Total Credits** | | | | | | | | **20** | | | | **700** |

Note:
1. The duration of all the end-term theory examinations shall be 3 hours.
2. The Criteria for awarding the formative assessment of 30 marks throughout the Program shall be as under:
   a) Sessional Examination: 15 marks.
   b) Assignments/ Presentations/ Seminars and Class Participation: 10 marks
   c) Attendance: 5 marks
   (Less than 65% - 0 marks; Upto 70% - 2 marks; Upto 75% - 3 marks; Upto 80% - 4 marks; Above 80% - 5 marks)



TECHNOLOGY & MA... HOD/MGMT ...GANGA INS... ...SALAVA

3. The panel of examiners for end-semester theory examinations shall be prepared and approved by the BOS, comprising internal and external examiners based on their expertise, specialization, and area of interest.

4. The formative assessment criteria for **Multi-Disciplinary Course** in Semester I will be as follows:

| | |
|---|---|
| Sessional Test | 20 Marks |
| Assignment/ Case Study/ Mini Project | 15 Marks |
| Quiz/ Group Discussion/ Debate | 10 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

5. The formative assessment criteria for **Ability-Enhancement Course** in Semester I will be as follows:

| | |
|---|---|
| Sessional Test | 30 Marks |
| Peer Discussion/ Debate/ Extempore Speech | 10 Marks |
| Role Play | 05 Marks |
| Assignment/Essay/ Article/ Report Writing | 15 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

6. The formative assessment criteria for **Value Added Course** in Semester I will be as follows:

| | |
|---|---|
| Sessional Test | 30 Marks |
| Class Assignment/ Case Study/ Mini Project | 15 Marks |
| Quiz/ Seminar/ Group Discussion/ Debate | 15 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

7. The formative assessment criteria for **Skill-Enhancement Course** in Semester I will be as follows:

| **Skill-Enhancement Course (Theory)** | |
|---|---|
| Sessional Test | 10 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |
| **Skill-Enhancement Course (Lab)** | |
| Lab Work (Practical File)/ Field Work (Report)/ Portfolio | 15 Marks |
| Assignment/ Seminar/ Presentation | 15 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

8. An '**Additional Course**' is a non-credit course that is undertaken for learning purposes only. If completed, the '**Additional Course**' may be recorded and will be assessed on a **Grading** basis.

| Marks (%) | Letter Grade | Grade Point |
|---|---|---|
| >90 | O(Outstanding) | 10 |
| >75 to 90 | A+(Excellent) | 9 |
| > 65 to 75 | A (Very good) | 8 |
| >55 to 65 | B+(Good) | 7 |
| > 50 to 55 | B (Above average) | 6 |
| > 40 to 50 | C(Average) | 5 |
| 40 | P (Pass) | 4 |
| Less than 40 | F(Fail) | 0 |
| - | Ab (Absent) | 0 |

## Semester-I

### Table No. I (Multidisciplinary Courses)

| S. NO. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | Multidisciplinary Courses | MDC-BBA-101B | Foundations of Management |
| 2 | Multidisciplinary Courses | MDC-ASH-103B | Introductory Mathematics |
| 3 | Multidisciplinary Courses | MDC-105B | Indian Vision for Human Society |
| 4 | Multidisciplinary Courses | MDC-107B | Indian Culture and Civilization |
| 5 | Multidisciplinary Courses | MDC-109B | Indian Science, Engineering and Technology |
| 6 | Multidisciplinary Courses | MDC-111B | Indian Town Planning and Architecture |
| 7 | Multidisciplinary Courses | MDC-113B | Indian Health, Wellness and Psychology |

### Table No. II Additional Course

| S. No. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | **Additional Courses** | AEC-103B | French |

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| Course Code | DSC-BBA-101B | | | | |
|---|---|---|---|---|---|
| Category | Core Courses | | | | |
| Course Title | **Business Organization** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand business concepts, scope, objectives, SWOT analysis, and the role of technology.<br>2. To explore business organizations including sole proprietorships, partnerships, companies, and franchising.<br>3. To understand entrepreneurship, focusing on opportunities, business setup, and government support for start-ups.<br>4. To learn about the government-business interface, including the stock exchange, mergers, acquisitions, and trade associations. | | | | |
| Formative Assessment | 30 Marks | | | | |
| Summative Assessment | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** fundamental concepts of business organizations. | Level-1 Remember |
| CO2 | **Explain** various forms of business organizations and government policies. | Level-2 Understand |
| CO3 | **Apply** business methods and principles in decision making. | Level-3 Apply |
| CO4 | **Analyze** the methods and principles of organization to solve business problems. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 marks (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Overview Of Business:** Concept, Nature and Scope, Business as a System, Business Objectives, Business Environment Interface, SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats), Distinction Between Business Commerce and Trade (Definitions, Functions and Differences), Role of Technology in Business. |
| **Unit-II** | **Forms Of Business Organization:** Sole Proprietorship, Partnership (Types of Partnerships and their Features), Joint Stock Company, Cooperative Societies (Principles and Types), Multinational Corporations (Characteristics and Impact on Global Business), Emerging Trends in Business Structures, Concept of Franchising as a Business Model. |
| **Unit-III** | **Entrepreneurship:** Concept and Nature of Entrepreneurship, Entrepreneurial Opportunities in the Contemporary Business Environment, Process of Setting up a Business Enterprise, Choice of a Suitable Form of Business Organization, Government Policies and Support for Start-Ups, Feasibility and Preparation Business Plan. |

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| | |
|---|---|
| **Unit-IV** | **Government and Business Interface:** Stock Exchange in India (Role and Function), Business Combinations, Concept and Causes of Mergers and Acquisitions.<br>**Chambers of Commerce and Industries in India:** Overview of FICCI, CII, Role of Trade Associations and their Influence on Policy Making. |

**Suggested Readings:**

- Business Organization and Management by Basu C, McGraw Hill Education
- Business Organization and Management by T. N Chhabra, Sun India Publications
- The Practice of Management by Peter F. Drucker, Harper & Row, New York
- Business Organization and Management by V. K Kaul, Pearson Education
- Essentials of Management by B. P Singh and A. K Singh, Excel Books Pvt. Ltd

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Overview of Business | https://onlinecourses.swayam2.ac.in/nou21_mg03/preview |
| **Unit-II** | Forms of Business Organization | https://onlinecourses.swayam2.ac.in/nou21_mg03/preview |
| **Unit-III** | Introduction to Entrepreneurship | https://www.youtube.com/watch?v=ICYqc5_mJ5g&t=74s |
| **Unit-IV** | Government and Business Interface | https://youtu.be/2jDYW2xd98s?si=RBl7MPPYyRmLb3Zm |



| Course Code | DSC-BBA-103B | | | | |
|---|---|---|---|---|---|
| Category | Core Courses | | | | |
| Course Title | **Basics of Accounting** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand basic accounting principles including recording transactions and preparing financial accounts.<br>2. To learn depreciation accounting and computerized accounting using Tally software.<br>3. To understand corporate financing through shares and debentures, including issues and redemption methods.<br>4. To understand the preparation of final accounts for a company as per statutory requirements. | | | | |
| Formative Assessment | 30 Marks | | | | |
| Summative Assessment | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** the fundamental concepts of a financial accounting system and application in organizations. | Level-1 Remember |
| CO2 | **Describe** the concepts of accounting system. | Level-2 Understand |
| CO3 | **Apply** financial and accounting techniques to solve business problems. | Level-3 Apply |
| CO4 | **Determine** the financial information & provisions to make decisions in the real world. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 marks (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** Meaning, Advantages and Limitations of Accounting, Branches of Accounting, Users of Financial Accounting Information, Recording of Business Transaction (Including GST Transactions), Ledger, Trial Balance, Preparation of Financial Accounts with Adjustments (Trading Account, Profit and Loss Account, Balance Sheet). |
| **Unit-II** | **Accounting Principles and Computerized Accounting System:** Depreciation Accounting, Concept, Purpose, Advantages and Methods (Straight Line Method and Written Down Method), Bank Reconciliation Statement, Computerized Accounts by Using Tally Software. |
| **Unit-III** | **Corporate Financing Through Shares and Debentures:** Meaning, Issue of Share, Forfeiture and Surrender of Shares, Issue of Debentures, Methods of Redemption of Debentures (Redemption at Maturity, Redemption by Lump Sum, Redemption by Conversion in to Equity Shares, Redemption by Installments). |

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| | |
|---|---|
| **Unit-IV** | **Final Accounts of a Company and Statutory Provisions:** Statutory Provision Regarding Preparation of Final Accounts of Company, Preparation of Profit and Loss Account and Balance Sheet of Company as per the Requirement of Schedule V1 of the Companies Act, Acquisition of Business and Profit Prior to Incorporation. |

**Suggested Readings:**

- Accounting Text and Cases by R. N. Anthony, D. Hawkins, K. A Merchant, McGraw-Hill Education India
- Accounting and Finance for Non-finance Managers by J.K. Batra, Sage Textbook
- Essentials of Financial Accounting by A. K. Bhattacharyya, PHI Learning
- Financial Accounting: A Managerial Perspective by R.Narayana swamy, PHI Learning
- Financial Accounting by B. K. Goyal, H. N.Tiwari, Taxmann Publication, New Delhi

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction | https://youtu.be/B1uFFttAA6o?feature=shared |
| **Unit-II** | Accounting Principles | http://sdnbvc.digimat.in/nptel/courses/video/110106050/L03.html |
| **Unit-III** | Corporate Financing through Shares and Debentures | https://youtu.be/4JKG5ZZ9T94 |
| **Unit-IV** | Final Accounts of a Company and Statutory Provisions | http://sdnbvc.digimat.in/nptel/courses/video/110106147/L54.html |



| Course Code | DSC-BBA-105B | | | | |
|---|---|---|---|---|---|
| Category | Core Courses | | | | |
| Course Title | **Basics of Economics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of microeconomics, including resources, economic problems, and the production possibility curve.<br>2. To understand demand and supply analysis, focusing on elasticity and factors affecting demand and supply.<br>3. To understand consumer behavior through utility and indifference curve analysis, and their impact on equilibrium.<br>4. To understand cost and revenue analysis in different market structures, including perfect competition, monopoly, and non-price competition. | | | | |
| Formative Assessment | 30 Marks | | | | |
| Summative Assessment | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** the fundamental concepts of business economics. | Level-1 Remember |
| CO2 | **Interpret** the theories of consumption and production. | Level-2 Understand |
| CO3 | **Apply** the theories and laws of micro economics to solve business problems. | Level-3 Apply |
| CO4 | **Analyze** the process of decision making by consumers and producers. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 mark (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question is compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction:** Meaning, Nature and Scope of Microeconomics, Concept of Resources, Meaning and Types of Economy, Difference Between Micro and Macro Economics, Central Problems of An Economy (What, How and For Whom to Produce), Production Possibility Curve, Meaning, Assumptions and its Properties, Shifting of Curve and Opportunity Cost, Characteristics of Various Economic Resources, Factors of Production. |
| Unit-II | **Demand and Supply Analysis:** Law of Demand, (Market Demand, Determinants of Demand, Demand Schedule), Demand Curve, Types of Goods, (Normal Goods, Inferior Goods, Substitute Goods, Complimentary Goods, Giffen Goods), Price Elasticity of Demand, Factors Affecting Price Elasticity of Demand, Methods to Measure Price Elasticity of Demand, Law of Supply, Determinants of Supply, Elasticity of Supply. |
| Unit-III | **Consumer Behavior (Utility Analysis):** Meaning of Utility, Marginal Utility, Law of Diminishing Marginal Utility, Law of Equi-Marginal Utility, Conditions of Consumer's Equilibrium.<br>**Consumer Behavior (Indifference Curve Analysis):** Assumptions, Properties of Indifference Curve, Consumer Equilibrium, Short Run and Long Run Production Functions, Law of Variable Proportions, Law of Return to Scale, Factors Affecting the Location of Firms |



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| | |
|---|---|
| Unit-IV | **Cost and Revenue:** Total Cost, Total Fixed Cost, Total Variable Cost, Average Cost, Average Fixed Cost, Average Variable Cost, Meaning and Relationship of Total Revenue and Marginal Revenue, Market and Forms of Market, Equilibrium of the Firm and Industry, Perfect Competition, Monopoly, Monopolistic Competition, Discriminating Monopoly, Aspects of Non-Price Competition. |

**Suggested Readings:**


- Modern Microeconomics by A. Kout soyiannis, Macmillan Press, London
- Microeconomics Theory and Applications, by A. Sen, Oxford University Press
- Microeconomic Analysis by H. Varian, W.W. Norton, New York
- Economic Theory and Operations Analysis by W.J. Baumol, Prentice Hall of India, New Delhi
- Barriers to New Competition by J. Bain, Harvard University Press, Harvard
- Microeconomic Theory A Mathematical Approach by J.M. Henderson & R.E. Quandt, McGraw Hill


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Introduction | https://youtu.be/vzz2E7fU7Kk?feature=shared |
| Unit-II | Demand and Supply Analysis | https://youtu.be/6MGjlbn7kQ0 |
| Unit-III | Consumer Behavior | https://youtu.be/CG46N6R-bwo?feature=shared |
| Unit-IV | Cost and Revenue | https://youtu.be/svespJwNQNo |



| Course Code | AEC-101B | | | | |
|---|---|---|---|---|---|
| Category | Ability Enhancement Courses | | | | |
| Course Title | General English-I | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-I |
| | 1 | 1 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To build a strong foundation in basic English grammar, including parts of speech, subject-verb agreement, and determiners.<br>2. To understand the communication process, barriers, and types of communication, while developing strategies for effective interaction.<br>3. To develop listening, speaking, and reading skills, focusing on active listening, public speaking, and voice modulation.<br>4. To gain proficiency in writing notices, memos, circulars, and business letters with correct structure and layout. | | | | |
| Formative Assessment | 65 Marks | | | | |
| Summative Assessment | 35 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the basics of English grammar and communication for effective interactions. | Level-1 Remember |
| CO2 | **Describe** the parts of speech, communication barriers, listening strategies and frame technical documents. | Level-2 Understand |
| CO3 | **Apply** grammar rules, communication principles and skills in personal and professional contexts. | Level-3 Apply |
| CO4 | **Apply** the knowledge of grammar and LSRW skills to communicate effectively. | Level-3 Apply |

**Note:**

1. Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Basics of English Grammar:** Parts of Speech, Conjunction, Prepositions, Articles, Subject-Verb Agreement and Noun-Pronoun Agreement, Determiners. |
| Unit-II | **Basics of Communication**: Definition, Nature, Importance of Communication, Communication Process, Barriers to Effective Communication and Overcoming Strategies, Types of Communication, Communication Networks. |
| Unit-III | **Enhancing LSRW Skills**: Listening Skills, Cognitive Process of Listening, Types of Listening, Active Listening Techniques, Barriers to Effective Listening, Speaking Skills, Public Speaking, Voice Modulation, Reading Skills. |
| Unit-IV | **Technical Writing:** Notices, Memo, Circulars, Structure and Layout of Business Letters, Structure, Layout and Types of Letters. |



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**Suggested Readings:**

- Business Communication Process and Product by Mary Ellen Guffey and Dana Loewy, Cengage Learning
- Effective Communication Skill by John Nielsen, NTC/Contemporary Publishing Company
- Public Speaking for Success by Dale Carnegie, Per Capita Publishing
- Word Power Made Easy by Norman Lewis, Goyal Publishers & Distributors Pvt Ltd.
- English Grammar in Use by Raymond Murphy, Cambridge University Press

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Basics of English Grammar | https://youtu.be/3oIAICs8N9I?si=B |
| Unit-II | Basics of Communication | https://youtu.be/J3oVY0O4PYk?si=3a5hO-SUga5H-ZDQ |
| Unit-III | Enhancing LSRW Skills | https://youtu.be/yyUiEp5ny_Y?si=o0VkCYDW4EP4v3PD |
| Unit-IV | Technical Writing | https://www.youtube.com/watch?v=BO7j-X87rM8 |



| Course Code | SEC-101B | | | | |
|---|---|---|---|---|---|
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Computer Fundamentals and Office Automation Tool** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 1 | 0 | 0 | 1 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of computers, types, hardware, software, memory, and applications in business, education, and healthcare.<br>2. To understand document creation and editing in MS Word including advanced features like auto-text, mail merge, and formatting tools.<br>3. To develop skills in using MS Excel by creating and editing worksheets, applying formulas, functions, and creating charts for data analysis.<br>4. To understand presentation software for creating, editing slides, and using animations and advanced features. | | | | |
| Formative Assessment | 15 Marks | | | | |
| Summative Assessment | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** basic terms of computer fundamentals and MS Office. | Level-1 Remember |
| CO2 | **Explain** fundamental concepts and applications of computer along with MS Office. | Level-2 Understand |
| CO3 | **Demonstrate** computer fundamentals to operate hardware, software and manage memory system. | Level-3 Apply |
| CO4 | **Apply** MS office tools for documentation, data analysis and engaging presentations. | Level-3 Apply |

**Note:** Note: Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 07 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Computer Fundamental:** Introduction of Computer with Block Diagram, Advantages, Limitations and Applications of a Computer in Business, Education and Healthcare Field in Computer, Generations of Computer, Types of Computers, Hardware, Software, Memory (Primary Memory, Secondary Memory and Cache Memory), Computer Virus and Antivirus. |
| **Unit-II** | **Documentation using MS-Word:** Creating and Editing a Document, Formatting Document, Auto-Text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word, Mail Merge. |
| **Unit-III** | **Electronic Spread Sheet:** Introduction to MS-Excel, Creating and Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts. |
| **Unit-IV** | **Virtual Presentation Software:** Presentations, Creating Manipulating and Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering Art Objects, Working with Animation, |



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| | |
|---|---|
| | Adding a Slide to Presentation, navigating through a Presentation, Slide-Sorter, Slide-Show, Editing Slides. |

**Suggested Readings:**

- Fundamentals of Computers by V. Rajaraman, PHI
- Computer Fundamentals by P. K. Sinha, BPB Publication
- Learn Microsoft Office by Russell A. Stultz, BPB Publication
- Computer Course Windows 7 and Office 2010, by Ravi Kant Taxali, McGraw Hill Education
- Computer Applications in Management by Saxena, Vikas Publication
- Computer Fundamentals by B. Ram, New Age Publications

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Computer Fundamental | https://youtu.be/tas2eUavhREsi=t98GCs7srmiPQkny |
| Unit-II | Mail merge | https://www.youtube.com/watch?v=M69x9RSPHX0 |
| Unit-III | Electronic Spread Sheet | https://www.youtube.com/watch?app=desktop&si=2IOn7z5e2HvxxE7a&v=3q2eeVLLOd8&feature=youtu.be |
| Unit-IV | Virtual Presentation Software | https://youtu.be/1GZ3OeOcaVA?si=UBz8q5lS3C0XVVio |



| Course code | LC-SEC-103B | | | | |
|---|---|---|---|---|---|
| Category | Skill Enhancement Courses | | | | |
| Course title | **Computer Fundamentals and Office Automation Tools Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 0 | 0 | 1 | **1** | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals concepts of computer and use the computer in business.<br>2. To demonstrate the ease to work with MS Office.<br>3. To develop skills in Microsoft Excel for creating time tables, analyzing student marks, and using charts for data visualization.<br>4. To explore Microsoft Access and its features for managing databases and understanding its applications in data handling. | | | | |
| Formative Assessment | 35 Marks | | | | |
| Practical/Viva- Voce | 15 Marks | | | | |
| Total Marks | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Course Outcomes | RBT Level |
|---|---|---|
| CO1 | **Apply** the functionality of MS Word, Power Point, MS Excel and MS Access. | Level-3 Apply |
| CO2 | **Analyze** various tools of MS Office. | Level-4 Analyze |
| CO3 | **Evaluate** the MS Office tool in documentation, presentations and data management. | Level-5 Evaluate |
| CO4 | **Prepare** structured documents, presentations and data sets using MS Office tools. | Level-6 Design |

**List of Practical's**

| S. No. | Description |
|---|---|
| 1 | To study about MS-Office and its applications |
| 2 | Introduction of Microsoft Word and its features. |
| 3 | How to insert a flowchart in MS-Word. |
| 4 | To prepare curriculum vitae (CV) in MS-Word of a graduate with the specification. |
| 5 | How to use mail-merge in MS-Word. |
| 6 | To study about Microsoft Power Point and its features |
| 7 | To study about Microsoft Excel and its features |
| 8 | To prepare time-table using MS-Excel |
| 9 | Analyze the marks of the students of a class using various chart (Line, XY, Bar and Pie) with the help of MS-Excel. |
| 10 | To study about MS-Access and its features. |



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**Suggested Readings:**

- Fundamentals of Computers by V. Rajaraman, PHI.
- Computer Fundamentals by P.K. Sinha, BPB Publication.
- Learn Microsoft Office by Stultz, A. Russell, BPB Publication.
- Computer Course windows 7 and Office 2010, Taxali, Ravi Kant, McGraw Hill Education.

**Useful Video Links:**

| Topics | Links |
|---|---|
| Computer Fundamental | https://youtu.be/tas2eUavhREsi=t98GCs7srmiPQkny |
| Documentation using MS-word | https://youtu.be/1GZ3OeOcaVA?si=UBz8q5lS3C0XVVio |
| Electronic Spread Sheet | https://enine.digimat.in/nptel/courses/video/110105033/L13.html |
| Virtual Presentation Software | https://youtu.be/1GZ3OeOcaVA?si=UBz8q5lS3C0XVVio |



| Course Code | VAC-113B | | | | |
|---|---|---|---|---|---|
| Category | Value Added Courses | | | | |
| Course Title | **Environmental Studies** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>1. To understand the basics of environmental studies, ecosystems, and sustainability.<br>2. To explore renewable and non-renewable resources, their issues, and conservation strategies.<br>3. To understand biodiversity, its value, threats, and conservation methods.<br>4. To understand pollution, climate change, and solutions for environmental disasters. | | | | |
| Formative Assessment | 65Marks | | | | |
| Summative Assessment | 35 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** key environmental concepts and principles. | Level-1 Remember |
| CO2 | **Describe** the environment, sustainability, natural resources, biodiversity, pollution and disaster. | Level-2 Understand |
| CO3 | **Apply** environmental knowledge to propose solutions for sustainable practice, conversation of natural resources, pollution control and disaster management. | Level-3 Apply |
| CO4 | **Analyze** the structure and function of ecosystem, effect of human activities on natural resources, types of biodiversity and role of individual in environment pollution. | Level-3 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 07 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total; first question is compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Environmental Studies:** Multidisciplinary Nature of Environmental Studies, Scope and Importance, Concept of Sustainability and Sustainable Development, Ecosystem, Introduction, Characteristic and Features, Structure and Function of the following Ecosystem- Forest Ecosystem, Aquatic Ecosystems (Ponds, Lakes, Rivers, Oceans). |
| **Unit-II** | **Renewable and Non-renewable resources:** Natural Resources and Associated Problems, Forest Resources – (Use and Over-Exploitation, Deforestation, Timber Extraction, Mining, Dams and their Effects on Forest and Tribal People), Water Resources – (Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams Benefits and Problems), Land Resources – (Land as a Resource, Land Degradation, Role of an Individual in Conservation of Natural Resources). |



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| | |
|---|---|
| **Unit-III** | **Biodiversity and its Conservation**: Introduction, Genetic, Species and Ecosystem Diversity, Biogeographically Classification of India, Value of Biodiversity, Consumptive Use, Productive Use, Social Use, Ethical Use, Threats to Biodiversity, Habitat Loss, Poaching of Wildlife, Man Wildlife Conflicts,<br>**Conservation of Biodiversity:** Benefits and Name of the Methods of in-Situ and Ex-Situ Conservation of Biodiversity. |
| **Unit-IV** | **Environmental Pollution**: Definition, Causes, Effects and Control Measures of (Air Pollution and Water Pollution), Role of an Individual in Prevention of Pollution, **Disaster Management:** Meaning, Reason and Solutions of Floods, Earthquake, Cyclone and Landslides, Meaning of Climate Change, Reasons and Solution to Greenhouse Gases, Acid Rain and Global Warming. |

**Suggested Readings:**

- Text Book of Environmental Studies by D. K. Asthana, S. Chand Publishing.
- Fundamentals of Environmental Studies by M. Basu, S. Xavier, Cambridge University Press.
- Environment, edited by R. N. Basu, University of Calcutta, Kolkata.
- Environmental Science by T. O. Miller Jr., Wadsworth Publishing Co.
- Environmental Management by K. D. Wagner, W.B. Saunders Co., Philadelphia

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Multidisciplinary nature of environmental Studies | https://nptel.ac.in/courses/122102006 |
| **Unit-II** | Renewable and non-renewable resources | https://archive.nptel.ac.in/courses/121/106/121106014 |
| **Unit-III** | Biodiversity and its conservation | https://nptel.ac.in/courses/129105008 |
| **Unit-IV** | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |



| Course Code | AEC-103B | | | | |
|---|---|---|---|---|---|
| Category | Additional Courses | | | | |
| Course Title | **French** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 1 | 1 | - | **2** | |
| Course Objectives | The objectives of this course are<br>1. To understand foundational language skills necessary for basic communication, including introducing themselves and others, describing places, and talking about their surroundings.<br>2. To focus on enhancing students' ability to express personal likes, interests, and other simple ideas, ensuring their ability to engage in basic communicative transactions.<br>3. To achieve a partial A1 level by the end of the semester according to the Common European Framework, which will enable them to handle simple communication in everyday situations. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** key concepts related to reading, listening, speaking, and writing in English, focusing on everyday communication. | Level-1 Remember |
| CO2 | **Explain** basic communication techniques for understanding texts, listening to simple conversations, and expressing oneself in writing. | Level-2 Understand |
| CO3 | **Apply** reading skills to use simple texts (e.g., notices, short passages, emails) and extract relevant information to answer questions or complete given tasks. | Level-3 Apply |
| CO4 | **Apply** listening skills to understand simple conversations or audio messages and respond appropriately by completing activities such as answering questions or writing brief personal messages. | Level-3 Apply |

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Reading:** Reading Simple Texts Related to One's Immediate Environment such as Notices, Posters, Catalogs, Fliers, Personal Messages or Emails and Answering Questions on them. |
| **Unit-II** | **Listening:** Understanding familiar Words and very Basic Phrases about Oneself, One's Family, and Immediate Concrete Surroundings, such as Very Brief Announcements in Public Spaces, Short, Simple Formal/Informal Conversation, Questions and Instructions When Speakers are Speaking at a Slower Pace. |
| **Unit-III** | **Writing:** Guided Writing will Include activities such as, Filling a Form, Writing Simple Phrases (Postcards, Messages, Invitations etc) on everyday Topics. |
| **Unit-IV** | **Speaking:**<br>**Monologue**: Describing and Presenting oneself, One's Immediate Environment and the People S/He Knows Using Simple Phrases and Sentences.<br>**Dialogue:** Taking part in a Conversation and Interaction in a Simple way provided the other Person |



| | |
|---|---|
| | is Prepared to Repeat or to Rephrase more Slowly and help Formulate what S/he is trying to say asking simple Questions on familiar Topics or Matters related to one's Immediate Environment. Making simple Purchases in Shops or Obtaining Services that one Requires. |

**Suggested Readings:**


- Kizirian, V. M, Daill, E., Berthet, A., Hugot, C., Waendendries, M. Alter Ego + 1. Paris : Hachette.
- Berthet, A., Daill, E., Hugot, C., Waendendries, M. Alter Ego+ 1 ,Cahier d'activités. Paris : Hachette.
- Hachette, Y., Mérieux, R. Latitudes 1, (Livre de l'élève & Cahier d'exercices). Paris : Didier.
- Cocton, M-N., Dupleix, D., Heu, E., Kasazian, E., Ripaud, D.Saison 1, (Livre de l'élève & Cahier d'exercices). Paris: Didier.
- Denyer, M., Garmendia, A., Lions-Olivieri, M-L. Version Originale 1, Livre de l'élève. Paris : Editions Maisons des Langues.
- Magne, M., Lions-Olivieri, M-L. Version Originale 1, Cahier d'exercices. Paris : Editions Maisons des Langues.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | French Absolute Beginners Guide | https://www.youtube.com/watch?v=Sk6YQynZ1h8 |
| | Learn how to read in French | https://www.youtube.com/watch?v=sSCEoAWw0q4 |
| Unit-II | French Listening Practice - 50 Everyday French Sentences | https://www.youtube.com/watch?v=Aofb0XEJIks |
| Unit-III | Learn how to write French with me | https://www.youtube.com/watch?v=9iUiei9YMCk |
| Unit-IV | Slow and Easy French Conversation Practice | https://www.youtube.com/watch?v=ReVCwcHwnZI |



| Course Code | MDC-BBA-101B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Foundations of Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand the nature, process, functions, and challenges of management, including managerial skills and roles at various levels.<br>2. To learn about the nature and process of planning, types of plans, strategies, and the decision-making process.<br>3. To understand organizing, structure, and delegation within an organization.<br>4. To understand types and techniques of control like budgetary, financial, and quality control. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** a strong foundation to the students on fundamentals of management. | Level-1 Remember |
| CO2 | **Explain** their knowledge of functional areas of management and provide an understanding of various management theories and their applications. | Level-2 Understand |
| CO3 | **Apply** organizational principles to develop effective structures, allocate responsibilities, and manage decision-making. | Level-3 Apply |
| CO4 | **Analyze** various control techniques and assess their effectiveness in monitoring and improving organizational performance. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units, Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Overview of Management:** Concept, Nature, Process, Managerial levels (Technical, Conceptual, Interpersonal), Skills, Functions and Role of Managers, Challenges of Management. |
| **Unit-II** | **Planning:** Nature and Purpose of Planning, Planning Process, Types of Plans, Management By Objectives (MBO), Strategies, Types of Strategies (Corporate Strategy, Business Strategy, Differentiation Strategy, Retrenchment Strategy, Growth Strategy),<br>**Decision Making:** Types of Decision, Decision Making Process, Rational Decision Making. |
| **Unit-III** | **Organizing:** Meaning, Nature and Purpose of Organizing, Organization Structure, Departmentation, Span of Control, Centralization and Decentralization, Delegation of Authority and Responsibility. |



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|---|---|
| **Unit-IV** | **Controlling:** Meaning, Nature and Scope of Control, Types of Control, Control Process, Control Techniques (Budgetary Control, Financial Control, Quality Control, Inventory Control, Statistical Control, Production Control), Cost Control, Effective Control System. |

**Suggested Readings:**

- Management Theory and Practice by C. B. Gupta, Sultan Chand and Sons
- Essentials of Management by Koontz and Wechrich, Tata McGraw-Hill
- Management: Concepts and Strategies by J. S. Chandan, Vikas Publishing House, New Delhi
- Management by Robbins and Coulter, Prentice Hall of India, New Delhi
- Developing Communication Skills by Krishna Mohan and Meera Banerji, Macmillan India Ltd., New Delhi
- Management and Organisational Behaviour by Wendy Blaoisi, Curtis W. Cook, and Phillip L. Hunsaker, McGraw Hill

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Management | https://youtu.be/TtbImDfUt4c?feature=shared |
| **Unit-II** | Decision Making | https://youtu.be/B96-Gpn56sU?feature=shared |
| **Unit-III** | Delegation of Authority | https://youtu.be/GlLXV7JLVnk?feature=shared |
| **Unit-IV** | Controlling: Issues, Types, Techniques and Importance | https://youtu.be/v7XmhnenEGs?feature=shared |



| Course Code | MDC-ASH-103B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Introductory Mathematics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand the types, representation, and operations on sets, along with the basic laws of indices.<br>2. To explore matrix operations and determinants in solving linear equations.<br>3. To understand arithmetic and geometric progressions, their sums, and applications, along with some special sequences.<br>4. To understand permutation, combination, and the binomial theorem for solving problems. | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the definitions and properties of sets, indices, matrices, determinants, sequences, series, permutations, combinations, and binomial theorem. | Level-1 Remember |
| CO2 | **Explain** the operations on sets, matrix algebra, determinants, sequences, series, and the application of permutation, combinationa and bionmial theoram principles. | Level-2 Understand |
| CO3 | **Apply** the set theory, matrix operations, determinants, sequence and series calculations, and permutation and combination techniques to solve practical problems. | Level-3 Apply |
| CO4 | **Analyze** the results from set operations, matrix methods, sequences, series, permutations, and combinations to analyze their practical applications and implications. | Level-4 Analyze |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Theory of Sets:** Meaning and Types of Sets, Representation of Sets, Venn Diagram, Operation on Sets, Union, Intersection and Complements of Sets, Cardinality of Finite Set, Practical Applications of Set Theory, Ordered Pairs, Cartesian Product of Two Sets.<br>**Indices:** Introduction, Law of Indices |



| | |
|---|---|
| **Unit-II** | **Algebra of Matrices:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication, Multiplication of Matrices and Its Properties.<br>**Determinants:** Introduction, Minors, Co-Factors, Properties of Determinants, Applications of Determinants in Finding Solution of Linear Equations.<br>**Matrices (Continued):** Transpose of Matrix, Symmetric and Skew-Symmetric Matrices, Singular and Non-Singular Matrices and Joint of Matrix, Inverse of Matrix, Solution of System of Linear and Homogeneous Linear Equations by using Matrix Method. |
| **Unit-III** | **Sequence and Series:** Sequence, Series and Progression, Arithmetical Progression and Its Representation, Sum of N Terms of an A.P, Arithmetic Mean, Geometrical Progression and Sum of G.P, Geometric Mean, Application of A.P and G.P, Some Special Sequences. |
| **Unit-IV** | **Permutation and Combination:** Factorial Notation, Permutation, Circular Permutation, Combination, Practical Problem on Combinations.<br>**Binomial Theorem:** Introduction, General term, Middle term, Absolute term, Coefficient of any Power of x. |

**Suggested Readings:**

- Business Mathematics by Sancheti, D.C., A.M. Malhotra, V.K. Kapoor, Sultan Chand & Sons
- Business Mathematics by Zameerudin, Qazi, S.K. Bhambri, Vikas Publishing House Pvt. Ltd
- Text Book of Business Mathematics by R. Jaya Prakash, Ashish Publishing House
- Business Mathematics by Janardan Dinodia, Dr. Dalip Kumar, Jeevan sons Publications

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to set theory | https://youtube.com/playlist?list=PLEHGYFbPuuMEMCD-8hwgnsZS0xKd8ydie&si=wr6io6TNmtN9CNsa |
| **Unit-II** | Arithmetic Progression | https://youtube.com/playlist?list=PLaAhQ2ofZZRD6WKjeCFg890_07QXWNT6i&si=udeAM9Kq_4CZwK_K |
| **Unit-III** | Sequence and Series | https://youtube.com/playlist?list=PLVFqK_9GOGXm-Ia53f-yONR8XhwGknj9Z&si=YXFrCI3YdJnjYAez |
| **Unit-IV** | Permutation and Combination | https://youtu.be/iyIq1YSSA5E?si=Qukhh4uhRDgADByC |



| Course Code | MDC-105B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Vision for Human Society** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>1. To help the learner to understand the concept of "vasudhaiva kutumbkam" and its realization process as a base for the development of vision for a humane society<br>2. To help to identify the universality in humans and its coexistence in existence<br>3. To introduce the sense of responsibility, duties and participation of individual for establishment of fearless society.<br>4. To understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the holistic development of physical, mental and spiritual wellbeing of one and all, at the level of individual, society, nation and ultimately the whole world. | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Remember** core concepts related to human existence, consciousness, and social harmony. | Level-1 Remember |
| CO2 | **Understand** the aims of human life and the ethical foundations of individual and societal well-being | Level-2 Understand |
| CO3 | **Apply** philosophical and ethical principles to personal conduct and social interactions. | Level-3 Apply |
| CO4 | **Apply** integrated knowledge to promote harmony, balance, and purposeful living in society. | Level-3 Apply |

**Note:**

Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **The world view & Vision of Human Society:** The concept of non-duality of Prakriti (Jad) and Purush (Chetana), human as coexistence of Jad & Chetan, Pancha-mahabhutas, the root of sorrow and suffering, freedom from sorrow, salvation, eternal peace truth (vyaharika satya), ultimate truth. The acceptance of various systems of philosophy for realization of truth and complementariness in society in ancient Indian system. |
| **Unit-II** | **Aspiration and Purpouse of Individual and Human Society:** Aims of Human life; at individual level and societal level. At societal level; Four purusarthas Dharma, Artha, Kama, Moksha. Individual level; Abhyudaya (progress), Nihsreyasa (perfection) Pravrtti , Nivrtti. Dharma; Dharma sutras (Gautama, apastamba, baudhayana, vasistha). Dharma-Shastra; (manusmriti, naradamrti, visnusmrti, yajnavalkya smriti) sociology, different stages of life like studenthood householdership, |



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|---|---|
| | retirement and renunciation, rites and duties, judicial matters, and personal laws (Aachara Vyavahara, Prayaschitta). Artha; Kautliya Arthashastra, Kamandakiya Nitisara, Brihaspati Sutra, Sukra Niti, Moksha: Human liberation (Ignorance to Knowledge) |
| **Unit-III** | **Program for Ensuring Human Purpose: at Individual and Societal level –I:** Fundamental concept of Nitishastra: Satyanishtha Aur Abhiruchi (Ethics, Integrity & aptitude). The true nature of self; Shiksha Valli, Bhrigu Valli (concept of Atman-Brahman (self, soul). The true constitution of Human: Ananda Valli (Annamaya Kosha, Pranamaya Kosha, Manomaya Kosha, Vijnanamaya Kosha, Anandamaya Kosha). The four states of consciousness (Waking state, Dreaming state, Deep Sleep State, Turiya the fourth state), Consciousness (seven limbs and nineteen mouths), Prajna, Awarness. The Life Force *Prana (*Praana-Apaana-Vyaana-Udaana- Samaana)<br>**Program for Ensurimg Human Purpose: at Individual and Societal level – II:** Differentiating *Vidya* and *Avidya*, human bondages, Higher and Lower Knowledge (Para Vidhya & Apara Vidhya). Concept of Sattva, Rajas, Tamas and need of balancing the same, Patanjali yog sutra; Yama, Niyama, Asanas, pranayams, pratyahara, dharna, dhyana, Samadhi, Sixteen category of padartha, pramans (pratyaksh, anuman, upaman, shabda). Saadhana chatushtayam (viveka, vairagya, mumukshatavam, shadsampathi (sama, dama, uparama, titiksha, shradha, samadhana), Understanding Nitya karma, Naimittika Karma, Kamya karma, prayaschitta karma, Nishidha Karma. Meditation and Progressive meditation (Narada's education), Ativadin to selfknowledge, Jyan yog, Karma yog, sanyas yog in aspect to harmonious practice in society |
| **Unit-IV** | **Practices for Ensuring Human Purpose – III:** Practice in philosophy, architecture, grammar, mathematics, astronomy, metrics, sociology, economy and polity, ethics, geography, logic, military science, weaponry, agriculture, mining, trade and commerce, metallurgy, shipbuilding, medicine, poetics, biology and veterinary science. |

**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Maharaj swami chidatmanjee, Ancient Indian Society, Anmol publication pt ltd, indi
- S. C. Manerjee, Society in Ancient India: Evolution Since the Vedic Times Based on Sanskrit, Pali, Pakrit and Other Classical Sources: No. 1 (Reconstructing Indian History and Culture), DK printing, India
- Rao, N. 1970. *The Four Values in Indian Philosophy and Culture*. Mysore: University of Mysore.
- Chakraborti, K. 2001. Religious Process: The Puranas and the Making of Regional Tradition, Delhi, OUP.
- Kuhn, T. 1970. The Structure of Scientific Revolutions, (2nd ed.). University of Chicago Press, USA.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Indian Philosophy | https://www.youtube.com/watch?v=ddJg3gzYEb8 |
| **Unit-II** | Indian Philosophy (Orthodox & Heterodox Systems) | https://www.nptelprep.in/courses/109106059/videos |
| **Unit-III** | Indian Knowledge Systems | https://www.youtube.com/playlist?list=PLRfu94TCePTtVPR-kC4RpIGIwo7-ViCGP |
| **Unit-IV** | Philosophy & Consciousness (Sankhya/Yoga Focus) | https://archive.nptel.ac.in/courses/109/106/109106059/ |

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| Course Code | **MDC-107B** | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Culture and Civilization** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>5. To introduce fundamentals of Ancient Indian Educations to understand the pattern and purpose of studying vedas, vedangas, upangas, upveda, purana & Itihasa<br>6. To help students to trace, identify and develop the ancient knowledge systems.<br>7. To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the holistic development of physical, mental and spiritual wellbeing<br>8. To build in the learners a deep-rooted pride in Indian knowledge, committed to universal human right, well-being and sustainable development. | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Remember** core ideas and texts of Indian knowledge traditions. | Level-1 Remember |
| CO2 | **Understand** philosophical and scientific foundations of knowledge systems. | Level-2 Understand |
| CO3 | **Apply** traditional concepts to interpret science, language, and culture. | Level-3 Apply |
| CO4 | **Apply** integrated knowledge to real-life and managerial contexts. | Level-3 Apply |

**Note:**
Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to IKS:** Caturdaśa Vidyāsthānam, 64 Kalas, Shilpa Śāstra, Four Vedas, Vedāṅga, Indian Philosophical Systems, Vedic Schools of Philosophy ( Sāṃkhya and Yoga, Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta), Non-Vedic schools of Philosophical Systems (Cārvāka, Buddhist, Jain), Puranas (Maha-puranas, Upa-Puranas and Sthala-Puranas), Itihasa (Ramayana, Mahabharata), Niti Sastras, Subhasitas |
| **Unit-II** | **Foundation concept for Science & Technology:** Linguistics & Phonetics in Sanskrit (panini's), Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (Bhūta Saṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach |



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| | |
|---|---|
| | to physical reality, constituents of the physical reality, Pramāṇa, Saṃśaya |
| **Unit-III** | **Indian Mathematics & Astronomy in IKS:** Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of $\pi\pi$, Trigonometry, Algebra, Chandah Sastra of Pingala, Indian Astronomy, celestial coordinate system, Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System Astronomical Instruments (Yantras) Jantar Mantar or Raja Jai Singh Sawal. |
| **Unit-IV** | **Indian Science & Technology in IKS:** Indian S & T Heritage, sixty-four art forms and occupational skills (64 Kalas) Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Town & Planning Architecture in India, Temple Architecture, Vastu Sastra,<br>**Humanities & Social Sciences in IKS:** Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water in wellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System Body-Mind-Intellect- Consciousness Complex. Governance, Public Administration & Management reference to Ramayana, Artha Sastra, Kauṭilyan State |

**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.
- Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
- SK Das, The education system of Ancient hindus, Gyan publication house, India
- BL Gupta, Value and distribution system in india, Gyan publication house, India
- Reshmi ramdhoni, Ancient Indian Culture and Civilisation, star publication, 2018
- Supriya Lakshmi Mishra, Culture and History of Ancient India (With Special Reference of Sudras), 2020.
- Gambirananda, Swami, Tr. *Upanishads with the Commentary of Sankarachrya.* Kolkata: Advaita Ashrama publication Department, 2002.
- Ranganathananda, Swami. *The Massage of the Upanishads.* Bombay: Bharathya Vidya Bhaven, 1985.
- Om Prakash, Religion and Society in Ancient India, Bhariya Vidhya Prakashan, 1985


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Indian Knowledge Systems (Philosophy & Culture) | https://www.youtube.com/watch?v=5f0phlOdYvU |
| **Unit-II** | Ayurveda & Traditional Medicine in Indian Knowledge Systems | https://www.youtube.com/watch?v=xORzinU4oC8 |
| **Unit-III** | Indian Contributions to Mathematics (Ancient Mathematics & Systems) | https://www.youtube.com/watch?v=T0gCkyKVQUg |
| **Unit-IV** | Indian Astronomy & Calendar Systems | https://www.youtube.com/watch?v=JpZBaHsQ2Ws |



| Course Code | MDC-109B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | Indian Science, Engineering and Technology | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-I |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To familiarize learners with major sequential development in Indian science, engineering and technology.<br>2. To review & strengthen the ancient discovery and research in physics, chemistry, maths, metallurgy, astronomy, architecture, textile, transport, agriculture and Ayurveda etc.<br>3. To help students to trace, identify and develop the ancient knowledge systems to make meaningful contribution to development of science today<br>4. To help to understand the apparently rational, verifiable and universal solution from ancient Indian knowledge system for the scientific, technological and holistic development of physical, mental and spiritual wellbeing. | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** key ideas, historical contributions of traditional knowledge systems. | Level-1 Remember |
| CO2 | **Understand** the principles, cultural knowledge creation and practice. | Level-2 Understand |
| CO3 | **Apply** traditional scientific concepts to explain natural phenomena, health, and technology. | Level-3 Apply |
| CO4 | **Apply** integrated knowledge to relate traditional practices with contemporary life and sustainability. | Level-3 Apply |

**Note:**
Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Indian Traditional Knowledge; Science and Practices:** Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & co evolution. Traditional agricultural practices, Traditional water-harvesting practices, Traditional Livestock and veterinary Sciences Traditional Houses & villages, Traditional Forecasting, Traditional Ayurveda & plant-based medicine, Traditional writing Technology |
| Unit-II | **Ancient Indian Science (Physics, Chemistry, Maths):** Physics in India: Vaisheshika darshan atomic theory & law of motion, theory of panchmahabhoota, Brihath Shathaka (divisions of the time, unit of distance), bhaskarachaya (theory of gravity, surya siddhanta & sidhanta shriomani ), Lilavati (gurutvakashan Shakti). Chemistry in India Vatsyayana, Nagarjuna, Khanda, Al-Biruni, Vagbhaṭa – building of the ras-shala (laboratory), working arrangements of ras-shala, material and equipment, Yaśodhara Bhaṭṭa-process of distillation, apparatus, saranasamskara, saranataila |



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|---|---|
| | Mathematics in India: Baudhayana's Sulba sutras, Aryabhaṭa, Bhaskaracharya- I, Severus Sebokht, Syria, Brahmagupta, Bhaskaracharya-II, Jyeṣṭhadeva. |
| **Unit-III** | **Ancient Indian Science (metallurgy, Astronomy, Architecture):** Metallurgy in India: Suvarna (gold) and its different types, prosperities, Rajata(silver), Tamra(copper), Loha(iron), Vanga(tin), Naga / sisa (lead), Pittala(brass), Astronomy in India Vedang Jyotish, Aryabhata Siddhanta, Mahabhas kriya, Laghubhas kriya, vatesvarasiddhanta, Sisyadhivrddhida, Grahashyay, Goladhyaya, Karabakutuhala (Aryabhaṭa, Varahamihira, Brahmagupta, Vaṭesvara, Bhaskara, Paramesvara, NilakaṇṭhaSomayaji, Jyeṣṭhadeva, ŚankaraVarman). Architecture in India: Nagara (northern style), Vesara (mixed style), and Dravida (southern style), Indian vernacular architecture, Temple sytle, cave architecture, rock cut architecture, kalinga architecture, chandels architecture, Rajput architecture, jain architecture, sikh architecture, Maratha architecture Indo-Islamic architectural, Indo-Saracenic revival architecture, Greco Buddhist style. |
| **Unit-IV** | **Ancient Indian Science (Textile, Agriculture, Transport):** Textile Technology in India: Cotton (natural cellulose fiber), silk, wool (natural protein fibers), bast and leaf fibres, mridhu dhautadhu pitam baram (meaning a practice of fumigating the fabric with incence smoke before use as a part of the finishing process), Sita dhautavasanayugala (bleached white–a finishing process); suchhastah, sutradharah (needle and thread – tools for stitching). dyeing, washing spinning and weaving technology, Agriculture in India: Krishi suktas, Krishi parashara, Brihat samhita, Types of crops, Manures, Types of land- deva matruka, Nadi matruka, use of animals in warfare, animal husbandry, Animals for medicines. Ancient transport in India<br>**Ancient Indian Science (Ayurveda & Yoga):** Ayurveda for Life, Health and Well-being: Introduction to Ayurveda: understanding Human body and Pancha maha Bhuta, the communication between body & mind, health regimen for wellbeing, introduction to yoga (raja yoga, astang yoga, Gyan yoga), understanding of Indian psychological concept, consciousness, tri dosha & tri guna. |

**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatva Bodh of Shankaracharya, Central Chinmay mission trust, Bombay, 1995.
- SK Das, The education system of Ancient Hindus, Gyan publication house, India
- R P Kulkarni, Glimpse of Indian Engineering and Technology (Ancient & Medieval period, Munshi ram Manohar Lal Publishers Pvt. Ltd. 2018
- AK Pathak, Science and Technology in India, Anshika Prakashan pratapgarh, 2016
- PB Sharma, S. Narain, Doctors Scientists and Engineers of Ancient India, Kalpaz Publications 2017
- Anonyms, History of Science in India- Volume-I Part-I (Physics, Mathematics and Statistics), the national academy of science, India & the Ramkrishna mission institute of culture, 2014
- Dharmpal, Indian science and technology in the eighteen century, rashtrottahana sahitya, 1983
- S Biswal, B L ray, Vedic Science and technology, DK Print world, 2009
- A.K Bag, History of technology in Indian (Set 3 vol), Indian Nation Science Academy, 1997.
- AR Vasudev Murty, Science and Technology in Ancient India as Reflected in the Mahabharata, Sanskrit Bharati, 2019


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Indian Traditional Knowledge & Research Culture | https://archive.nptel.ac.in/courses/121/106/121106003/? |
| Unit-II | Ancient Indian Science (Physics, Chemistry, Maths) | https://www.youtube.com/watch?v=T0gCkyKVQUg |
| Unit-III | Ancient Indian Science (Metallurgy, Astronomy, Architecture) | https://www.youtube.com/watch?v=r5KTrbJlKAA |



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| Course Code | MDC-111B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Town Planning and Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>1. To develop the knowledge and analysis on the understanding of eco-friendly, robust and scientific planning and architecture system of ancient India.<br>2. To understand the importance of functional, aesthetic, psychological, culture and socio religious concept of ancient India architecture.<br>3. To help the learners to trace, identify and develop the approach, process and material used in town and planning, construction and architecture.<br>4. To understand the various eco-friendly technology accepted in ancient civilization | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the concepts related to human settlements and architectural traditions. | Level-1 Remember |
| CO2 | **Understand** how culture, environment, and human needs influence-built forms. | Level-2 Understand |
| CO3 | **Apply** principles of form, space, materials in architectural examples. | Level-3 Apply |
| CO4 | **Apply** analytical understanding to compare regional and period-based architectural practices. | Level-3 Apply |

**Note:**
Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **The Introduction to ancient Architecture:** Introduction to relationship between Man, Nature, Culture and city forms. Study of determinants (Natural and man-made) influencing location, growth & pattern of human settlements including types of settlements growth (Organic and planned) and settlement forms. Architecture as satisfying human needs: functional, aesthetic and psychological outline of components and aspects of architectural form-site, structure, skin, materials, services, use, circulation, expression, character, experience. Understanding of the causative forces - the cultures, history, socio religious practices and institution, political and economic conditions, issues of land, climate and technology, Historical and Primitive Architecture. |

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|---|---|
| **Unit-II** | **Ancient Architecture as Expression of Art & Design:** Relationship between Art and Design with man, space and environment. Expression in Art and Architecture – concept of space, sense of enclosure openness, robustness, dynamism, spatial geometry, Eco-friendliness. Architecture through use of elements of visual arts such as point, line, plane, form, space, colour, texture, light, solids and voids, shadow and shade etc. Understanding of effect of scale, proportions, order, material effects such as textures, patterns, light, sound, temperature etc in architectural spaces.<br>Allied visual and performing arts and its relationship to build environments using colour theory, symbolism, glass painting, scriptural writing, clay moulding, stone carving. Important Indian architecture as per elements space & form **Form:** specific geometry form (sphere, cube, pyramid, cylinder and cone and its sections as well as their derivatives) **Space:** build form space, open space, Internal and External space, Continuous spaces Centralized, Linear, Radial Clustered, Grid space Different type of Materials used for construction in Ancient Indian architecture. **Clay products:** Classification of bricks, Fire Brick, Fly Ash Bricks, Tiles, Terracotta, Earthenware, Porcelain, Stoneware. **Stones:** Uses of Stones, Qualities of Good Building Stones, Dressing, Common Building Stones of India. **Glass:** Different glass Forms and their Suitability, **Timber**: Different Forms and their Suitability **Metals:** Ferrous & Nonferrous Metals and Alloys, and, their Suitability, limitations, precautions **Paints and Varnishes:** Different types and their Suitability, limitations, precautions |
| **Unit-III** | **Ancient Architecture Principle & Planning:** Design: Principles of designing – Composition of Plan. Inception and development of the early Hindu temple form with reference to Vedic and Buddhist planning principles and design elements; Development of regional styles and manifestations thereof; Evolution of temple complexes and temple towns; Planning: Residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Vastu shastra and its importance in building interrelationship with human, nature and cosmos Town Planning: Town plans of Harappa, Mohenjo-Daro, Pataliputra, Delhi. Vastu shastra and its application in city layout. |
| **Unit-IV** | **Ancient Architecture-I:** The settlement planning pattern, elements, associated forms, typical Vedic village, towns (Dandaka, Nandya vartha etc.), typology of Shelters and civic buildings of ancient architecture in reference to following civilization: Indus Valley, Aryan/Vedic Civilisation, Buddhist Architecture, Indo Aryan & Dravidian Architecture. Role of Shilpa sastras and Artha shastra in settlement planning. Important architecture: Great baths, Development of fortification, walled towns, structures developed e.g.: Stupas, Viharas, Chaityas, Stambhas, Torana, sacred railing etc. Study of worshipping places with especial reference to Indo Aryan / Nagara style & Dravidian style (Chola, Chalukya, Pallava, Satavahana, Hoysala, Vijayanagar etc.), design of shikharas & gopuram, rock-cut and structural examples of temples.<br>**Ancient Architecture-II:** Evolution of Hindu Temples in different period: Gupta, Aihole, Badami, Pattadakkal, Mahabalipuram, Indo Aryan Style in Orrisa, Khajuraho, Gujarah, Rajasthan. Dravidian Style in Chola, Chalukyan, Pandya, Pallava, Hoysala Style, Revival of Hindu architecture of South India at Vijaynagara and Madurai Tradition Indian villages & House: Regional house construction, interior & importance e.g. Rajasthani house, bhungas of Kutch, nalukettu of Kerala, Ikra of assam, manduva logili or illu of Andra Pradesh, Wadas of Maharashtra, Mud houses of Madhya Pradesh, kathkuni of Himachal Pradesh, khanjaghara of orisha, Taq and dhajji diwari of Kashmir etc. Scientific achievements though ancient architect: Jantar Mantar, Musical Pillars of Vitthal temple, Sundial of Konark temple, construction of eight shiva temple in straight line from Kedarnath to Rameshwaram at longitude 79oE 41'54, Veerbhadra temple with 70 hanging pillars, Ellora caves excavating the mountain, Jaipur plan pink city etc. |

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**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatva Bodh of Shankaracharya, Central Chinmay mission trust, Bombay, 1995.
- Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
- Dr. V. Ganapati Sthapati, Building Architecture of Sthapatya Veda
- Binode Behari Dutt, Town planning in ancient India, Life Span Publishers & Distributors
- NR Dave, A Study of The Hindu Science of Architecture and its Practice with Special Reference to Raja Vallabha, Bharti Vaidya Bhavan, 2011
- M W Meister, South India Lower Dravida Desa - Encyclopaedia of Indian Temple Architecture (Set of 2 Books)- An Old and Rare Books, American Institute of Indian Studies, 1999
- D N Shukla Civil Architecture in Ancient India (Part-I) Meharchand Lakshmi Das publication, 2016.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Early Architecture & Human Settlements | https://www.youtube.com/watch?v=zq8t_XnJhTQ |
| Unit-II | Buddhist, Early Temple & Built Forms | https://www.youtube.com/watch?v=zq8t_XnJhTQ |
| Unit-III | Temple Evolution & Material/Spatial Concepts | https://www.youtube.com/watch?v=7Bx9UYSIIDk |
| Unit-IV | Historical Examples & Site Planning | https://www.nptelprep.in/courses/124106009/videos? |



| Course Code | MDC-113B | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Health, Wellness and Psychology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>1. To Understand the fundamental principles of Indian health systems such as Ayurveda and yoga which are useful in maintaining the health of a healthy person<br>2. Understand traditional way of cleansing the body regularly, strengthening body with Yogic exercises, maintaining the internal balance to prevent diseases<br>3. To Understand our unique Mind Body Constitution and choosing the right lifestyle suitable to maintain the internal balance.<br>4. Understanding mind and its dynamics through knowledge of Ayurveda and Yoga and using the knowledge to maintain harmony between body and mind to achieve perfect mental health. | | | | |
| Formative Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall fundamental concepts related to human constitution, health maintenance, and mind–body interrelationships. | Level-1 Remember |
| CO2 | Explain how internal balance, lifestyle practices, and mental factors influence overall wellbeing and immunity. | Level-2 Understand |
| CO3 | Apply principles of daily and seasonal routines, diet, and self-care practices to promote physical and mental health | Level-3 Apply |
| CO4 | Apply integrative mind–body principles to enhance resilience, self-awareness, and holistic health in everyday life. | Level-3 Apply |

**Note:**
Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Understanding human body:** Introduction to Ayurveda, the Knowledge of Life, Health and treatment aspects in Ayurveda, Influence of Pancha maha Bhuta on Internal environment of Human being, understanding composition of Human body through the concept of Dosha Dhatu Mala, Understanding Prakruthi, the Mind – Body Constitution. |
| Unit-II | **Understanding the communication between body & Mind:** Establishing communication between body and mind by understanding the language of body. Understanding the concept of Agni, Koshta, Sara and Ojas and their relevance in enhancing our immunity to protect from various infections. Looking at the world through the lenses of Dravya, Guna and Karma Applying the principle of Samanya and Visesha in every aspect of life to achieve perfect health. |



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|---|---|
| **Unit-III** | **Introduction to Health Regimen:** Understanding Swastha vritta, the healthy regimen to maintain state of wellbeing Dinacharya, the Daily regimen including Daily detoxification, exercise, Intake of Food, Water, Air and Sunlight, work and ergonomics, Rest and sleep hygiene. Ritu charya, the seasonal regimen, Sadvritta and the concept of social wellbeing, understanding trividha upastambhas, three pillars to health, Concept of Shadrasa in choosing appropriate nourishment to the body and mind. |
| **Unit-IV** | **Introduction to Yoga:** Definition, Meaning and objectives of Yoga, Relevance of yoga in modern age. Brief Introduction of Hatha yoga, Raja yoga, Karma yoga, Gyana Yoga, Bhakti yoga Understanding eight steps of Ashtanga yoga, Understanding Shatkriyas, the six cleansing procedures of Yoga<br>**Introduction to Indian Psychology:** Concept of Manas in Ayurveda and understanding Mind Body harmony, Triguna based Psychology in Ayurveda and Yoga, Influence of Tri dosha on Mind, Mind body intellect and consciousness complex, Understanding Consciousness and solution to issues within Human Mind. |

**Suggested Readings:**


- The Charaka Samhita
- The Susruta Samhita
- Teh Ashtanga Hridaya
- Dr Deepak Chopra, Perfect Health--Revised and Updated: The Complete Mind Body Guide, Harmony publication, 2001
- Vasant lad, Ayurveda, the Science of Self-healing: A Practical Guide: Science of Self- healing, lotus press, 1984
- The Hatha yoga pradipika
- The Patanjali yoga sutras
- The Gheranda Samhita
- BKS Iyengar, Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority, Thronson Publication, 2006
- Swamy Satyananda Saraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, 2002


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Introductory Concepts & Roots of the Tradition | https://www.youtube.com/watch?reload=9&v=16-q-V9lG5w&embeds_referring_euri=https%3A%2F%m%2F |
| Unit-II | Human Body, Constitution & Balance | https://www.youtube.com/watch?v=ty9ZfluxOFk&embeds_referring_euri |
| Unit-III | Healthy Living & Well-Being (Daily/Seasonal Regimen) | https://www.youtube.com/watch?v=9AJseqmcrfQ |



**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)**

**An Autonomous Institute (UGC)**

**Approved by AICTE, New Delhi and Affiliated to MDU, Rohtak**

**NAAC 'A' GRADE**

# SCHEME AND SYLLABI

# OF

# 3-4 YEAR

# BACHELOR OF BUSINESS ADMINISTRATION PROGRAM

# (BBA)

# WITH EFFECT FROM THE SESSION 2024-25

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR (HR.), DELHI-NCR

## Scheme of Studies and Examination

## BBA – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical | Total | |
| 1 | Discipline Specific Course-Major Course | DSC-BBA-201A | Cost and Management Accounting | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 2 | Discipline Specific Course-Major Course | DSC-BBA-203A | Corporate Governance | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 3 | Discipline Specific Course-Major Course | DSC-BBA-207A | Business Policy and Strategy | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 4 | Discipline Relevant Course-Minor | Refer Table No.-IX | ---------- | 3 | 1 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 5 | Multidisciplinary Courses | Refer Table No.-X | ---------- | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| 6 | Ability Enhancement Course | Refer Table No.-XI | ---------- | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| 7 | Skill Enhancement Course | SEC-201A | Business Etiquettes | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| | | LC-SEC-203A | Business Etiquettes Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| **Total Credits** | | | | | | | | **24** | | | | **600** | |



## Semester-III

Table No. IX (Discipline Relevant Course-Minor)

| S. No. | Category | Course Code | Course Title |
|---|---|---|---|
| 1 | Discipline Relevant Course- Minor | MIC-BBA-205A | Disaster Management |

Table No. X (Multidisciplinary Courses)

| S. No. | Category | Course Code | Course Title | Offered By |
|---|---|---|---|---|
| 1 | Multidisciplinary Courses | MDC-BBA-201A | Corporate Social Responsibility | Department of Business Studies |
| 2 | | MDC-BBA-203A | Finance for Non-Finance Managers | Department of Business Studies |
| 3 | | MDC-BBA-205A | Group Dynamic and Leadership | Department of Business Studies |
| 4 | | MDC-BCA-207A | Web Technology | Department of Computer Application |
| 5 | | MDC-BCA-209A | Graphic Designing | Department of Computer Application |
| 6 | | MDC-BCA-211A | Multimedia Systems | Department of Computer Application |

Table No. XI (Ability Enhancement Course)

| S. No. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | Ability Enhancement Course | AEC-201A | General English-II |
| 2 | | AEC-203A | German |

| Course Code | DSC-BBA-201A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Specific Course - Major Course | | | | |
| Course Title | **Cost and Management Accounting** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are:<br>1. To understand the fundamental principles and terminology of cost and management accounting.<br>2. To understand the procedures related to material control, labor cost management, overheads, and budgeting.<br>3. To understand the application of various costing methods and marginal costing techniques in business decisions.<br>4. To understand how to analyze financial statements and accounting reports for evaluating organizational performance. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** fundamental concepts of cost and management accounting. | Level-1 Remember |
| CO2 | **Explain** material control, labor cost, overheads, and budgeting processes. | Level-2 Understand |
| CO3 | **Apply** costing methods and marginal costing for decision-making. | Level-3 Apply |
| CO4 | **Analyze** costing methods, cost control techniques, and management accounting tools to interpret financial data and support decision-making in organizations. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 marks (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** - Objective, elements of cost, cost sheet, importance of cost accounting, types of costing, installation of costing system, difference between cost accounting and financial accounting.<br>**Material Control:** - Meaning and objectives of material control, material purchase procedure, fixation of inventory levels – Reorder level, EOQ, Minimum level, Maximum level, Danger level and Methods of Valuing Material Issues. |
| **Unit-II** | **Labor Cost Control:** - its importance, methods of Time Keeping and Time Booking; Treatment and Control of Labor Turnover, Idle Time, Overtime,<br>**Systems of Wage Payment:** – Time Wage System, Piece Wage System and Balance or Debt Method;<br>**Overhead:** – classification, allocation and apportionment of overhead including machine hour rate.<br>**Methods of Costing:** – Job, Batch and Contract Costing, Process Costing Fundamental, Process Losses & Gains. |

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|---|---|
| **Unit-III** | **Management Accounting:** - Meaning, nature, scope, objective and functions; marginal costing and profit planning, practical application of marginal costing techniques;<br>**Responsibility Accounting:** - types of responsibility centers, performance evaluation criteria, responsibility reporting;<br>**Budgeting:** – role of budgets and budgeting in organizations, budgeting process, operational and financial budgeting. |
| **Unit-IV** | **Financial Statements:** - Nature and types of Financial Statements; techniques of financial statement analysis, ratio analysis, fund flow and cash flow analysis, techniques in performance measurement;<br>**Management accounting information** for activity and process decisions; basic capital budgeting techniques. |

**Suggested Readings:**

- Advance Cost Accounting by Jain & Narang, Kalyani Publishers, New Delhi.
- Cost Accounting by S.N. Mittal, S.Chand
- Cost Accounting by B.K Bhar. Academic Publisher
- Principles and Practice of Cost Accounting by N.K. Prasad, Book Syndicate Private

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Fundamentals of Financial Management | https://onlinecourses.nptel.ac.in/noc24_mg114/preview?utm_source=chatgpt.com |
| **Unit-II** | Systems of Wage Payment, Methods of Costing, Overhead | https://onlinecourses.nptel.ac.in/noc24_mg114/preview?utm_source=chatgpt.com |
| | Treatment and Control of Labor Turnover, Idle Time, and Overtime | https://archive.nptel.ac.in/courses/110/101/110101003/?utm_source=chatgpt.com |
| **Unit-III** | Management Accounting, Responsibility Accounting, Budgeting | https://onlinecourses.nptel.ac.in/noc24_mg99/preview?utm_source=chatgpt.com |
| **Unit-IV** | Financial Statement Analysis and Reporting | https://onlinecourses.nptel.ac.in/noc25_mg24/preview |



| Course Code | DSC-BBA- 203A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Specific -Major Course | | | | |
| Course Title | **Corporate Governance** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are following:<br>1. To Understand the Core Principles and Frameworks of Corporate Governance.<br>2. To understand the Ethical, Social, and Legal Dimensions of Corporate Governance.<br>3. To understand the Role of Key Governance Actors and Their Interactions.<br>4. To understand Corporate Governance Failures and Their Reforms. | | | | |
| Assessment | 30Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

Course Outcomes: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Discuss** the Principles and Frameworks of Corporate Governance. | Level-1 Remember |
| CO2 | **Explain** Governance Principles to Real-World Scenarios. | Level-2 Understand |
| CO3 | **Apply** corporate governance principles and models to board roles, stakeholder participation, ethical decisions, and legal governance practices. | Level-3 Apply |
| CO4 | **Analyze** corporate governance principles, board roles, ethics, CSR, stakeholder participation, and legal frameworks to address governance challenges. | Level-4 Analyze |

Note:

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 marks (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Corporate Governance**: Definition of Corporate Governance, Evolution of Corporate Governance, Importance of Corporate Governance, Principles of Corporate Governance, Corporate Governance Models, Corporate Governance Frameworks. |
| **Unit-II** | **The Role and Structure of Corporate Governance** : Composition, functions, and responsibilities Of The Board of Directors ,Role of Independent Directors, rights, powers and participation of stakeholders in governance, relations in Management and Governance, Governance in Public vs. Private Companies |
| **Unit-III** | **Ethical Issues and Corporate Social Responsibility (CSR)**: Ethical Decision-Making in Corporate Governance, Definition, importance, and frameworks in CSR, Sustainability and Governance, conflict in interests, Stakeholder vs. Shareholder Model. |



| | |
|---|---|
| **Unit-IV** | **Corporate Governance and Legal Frameworks:** Global Corporate Governance Regulations, Indian Corporate Governance Regulations, LODR- Listing Obligations and Disclosure Requirements The Role of Regulators and Auditors, Corporate Governance Failures, Trends and Developments in corporate governance. |

**Suggested Readings:**

- Corporate Governance by Kenneth A. Kim & John R. Nofsinger, Pearson College Div
- Corporate Governance: Principles, Policies, and Practices by Bob Tricker, Oxford University Press
- Corporate Governance Theory and Practice by Sandeep Goel,wiley
- Corporate Governance by Aruna Jha andAnju Bhatia, Taxmann Publications Private Limited
- Corporate Governance Practices in India by Sanjay Bhayana, Regal Publication

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Corporate Governance | https://archive.nptel.ac.in/courses/110/105/110105138/ |
| **Unit-II** | Conflicts and elements of Corporate Governance | https://archive.nptel.ac.in/courses/110/105/110105138/ |
| **Unit-III** | Areas of Corporate Governance | https://archive.nptel.ac.in/courses/110/105/110105138/ |
| **Unit-IV** | Conclusion of Corporate Governance | https://archive.nptel.ac.in/courses/110/105/110105138/ |



| Course Code | DSC-BBA-207A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Specific Course-Major Course | | | | |
| Course Title | **Business Policy and Strategy** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the foundational concepts, processes, and significance of business policy and strategic management.<br>2. To understand various strategy types and their application at the corporate, business, and functional levels.<br>3. To understand the implementation aspects of strategy, including structural, behavioral, and functional dimensions.<br>4. To understand techniques for evaluating and controlling strategies, including McKinsey's 7S Framework. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** the framework of business policy and strategic management, including strategic intent, environmental and organizational appraisal, types of strategies, implementation methods, evaluation, and control techniques. | Level-1 Remember |
| CO2 | **Explain** the framework of strategic management, including strategic intent, environmental and organizational appraisal, strategy types, implementation, and control. | Level-2 Understand |
| CO3 | **Apply** strategic tools and models such as SWOT, PEST, Porter's Five Forces, BCG Matrix, GE 9-cell Matrix, McKinsey's 7s Framework to formulate strategies, implement them through resource and structural planning, and evaluate their effectiveness using control techniques. | Level-3 Apply |
| CO4 | **Analyze** the internal and external evironment, strategic alternatives at corporate, business, and functional levels, as well as implementation challenges related to structure, culture, leadership, and ethics, and apply strategic control systems. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 2 marks each from all units and remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Business Policy and Strategic Management:** Definition, Concept, Objective and Significance, The levels at which strategy operates, Characteristics of Strategic Management, An Overview: Strategic Management Process, Concept of Strategic Decision Making. Defining strategic intent: Vision, Mission, Business definition, Goals, and Objectives.<br>**Environment Appraisal:** Concept and Environmental Sector; PEST Analysis, Organizational Appraisal: Concepts and Capability Factors; Porter's Value Chain Model, Framework for developing Strategic Advantage, SWOT Analysis as a Tool for assessing Organizational Capabilities and Environment Opportunities. |



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|---|---|
| **Unit-II** | **Type of Strategies:** Corporate Level (Concept of Grand Strategies), Business Level, and Functional Level, Guidelines for Crafting Successful Business Strategies. Strategy Analysis and Choice: Corporate Level Strategy Analysis: BCG Matrix and GE 9 cell Matrix, Business Level Strategy Analysis: Life Cycle Analysis, Porter's Five Forces of Industry Analysis, Blue Ocean Canvas in Today's Industries, Concept of Strategic Decision Making, Subjective Factors in Strategic Choice, and Process of Strategic Choice. |
| **Unit-III** | **Strategy Implementation:** Interrelation Between Strategy Formulation and Implementation, Aspects of Strategy Implementation, An overview of Project, Procedural Implementation, Resource Allocation, Structural Implementation: An overview of: Structural Consideration, Structure for Strategies, Behavioural Implementation: An overview of: Leadership, Corporate Culture, Corporate Politics and Use of Power, Personal Values and Business Ethics, Functional /Operational Implementation: An overview of: Functional Strategies. |
| **Unit-IV** | **Strategy Evaluation and Control:** An Overview of Strategic Evaluation and Control, Strategic Control and Operational Control, Techniques for Strategic Evaluation and Control, Role of Organizational Systems in Evaluation, McKinsey's 7s Framework |

**Suggested Readings:**


- Business Policy and Strategic Management by Azhar Kazmi, Tata McGraw-Hill, New Delhi.
- Strategic Management and Business Policy by Wheelen and Hunger, Pearson Education.
- Strategic Management by Chandrasekharan, Oxford University Press.
- Crafting and Executing Strategy: The Quest for Competitive Advantage by A. Thompson Jr., A. J. Strickland III, and J. E. Gamble, Tata McGraw-Hill.
- Strategic Management: Concepts and Cases by Fred R. David, Pearson Education.
- Strategic Management: Competitiveness and Globalization by M. A. Hitt, R. D. Ireland, and R. E. Hoskisson, Thomson Asia Pvt. Ltd.
- Strategic Management: Strategy Formulation and Implementation by J. A. Pearce II and R. B. Robinson Jr., AITBS Publishers and Distributors, Delhi.
- Management Policy and Strategic Management: Concepts, Skills and Practices by R. M. Srivastava, Himalayan Publishing House.
- Managing in a Time of Great Change by Peter F. Drucker, Truman Talley Books / Plume, Penguin Group.


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Strategic Management Process | https://nptel.ac.in/courses/110108047 |
| | Environment Appraisal | https://nptel.ac.in/courses/110107509 |
| Unit-II | Corporate Level and Business Level Strategies | https://nptel.ac.in/courses/110105161 |
| Unit-III | Strategy Implementation | https://nptel.ac.in/courses/122105024 |
| | Case Study | https://nptel.ac.in/courses/122105024 |
| Unit-IV | McKinsey's 7s Framework | https://nptel.ac.in/courses/110108161 |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | MIC-BBA-205A | | | | |
| Category | Discipline Relevant Course-Minor | | | | |
| Course Title | **Disaster Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the concepts of disasters, hazards, risks, and vulnerabilities.<br>2. To understand various natural and man-made disasters and their impacts.<br>3. To understand disaster management strategies including planning, response, and recovery.<br>4. To understand the relationship between development, climate change, and disaster risk reduction. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** key concepts of disasters, man-made disaster, disaster management, and their link to development and vulnerability. | Level-1 Remember |
| CO2 | **Explain** the concepts of disasters, man-made disaster, disaster management processes, and their links to development and climate change adaptation. | Level-2 Understand |
| CO3 | **Apply** concepts of natural and man-made disasters, disaster management strategies, disaster responses, and the inter-relationship between disasters and development. | Level-3 Apply |
| CO4 | **Analyze** disaster causes and management strategies, and interpret their impact on development, climate adaptation, and indigenous knowledge integration. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 2 marks (each) from all units. Remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Disaster**: Meaning and Nature, Concept of Hazard, Risk and Vulnerability, Types of Disaster: Natural Disaster, Flood, Cyclone, Earthquakes, And Landslides etc. |
| **Unit-II** | **Man-made Disaster:** Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc. |
| **Unit-III** | **Disaster Management;** (Concept & significance), Planning, Coordination, leadership and control, Pre-Disaster Preparation, Handling Disaster, Post-disaster – Damage and Needs Assessment. |



| | |
|---|---|
| **Unit-IV** | **Inter-relationship between Disasters and Development:** Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources |

**Suggested Readings:**

- Disasters in India: Studies of Grim Reality by Anu Kapur & others, Rawat Publishers.
- Disaster Management Act 2005 by Govt. of India.
- National Disaster Management Policy 2009 by Govt. of India.
- Disaster Management by Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
- Disaster Science and Management by Tushar Bhattacharya, 1st Edition; McGraw-Hill Education (India) Private Limited.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Concept of Hazard | https://nptel.ac.in/courses/10510-4183 |
| Unit-II | Man-made Disaster | https://avcce.digimat.in/nptel/courses/video/105104183/L06.html |
| Unit-III | Post-disaster | https://archive.nptel.ac.in/courses/124/107/124107010/ |
| Unit-IV | Climate Change Adaptation. | http://digimat.in/nptel/courses/video/126103022/L59.html |



| Course Code | MDC-BBA-201A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | Corporate Social Responsibility | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand the core concepts, evolution, and strategic value of CSR in business.<br>2. To understand how to design and integrate CSR strategies aligned with organizational goals.<br>3. To understand impactful CSR initiatives that drive environmental, social, and ethical outcomes.<br>4. To understand global CSR reporting frameworks and effective stakeholder communication. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** fundamental concepts and significance of responsible business practices. | Level-1 Remember |
| CO2 | **Explain** CSR strategy, Best Practices, stakeholder roles, and CSR Reporting. | Level-2 Understand |
| CO3 | **Demonstrate** the application of socially and environmentally responsible actions in business contexts. | Level-3 Apply |
| CO4 | **Analyze** CSR concepts, strategies, initiatives, and reporting practices to examine their integration, impact, and alignment within organizational and regulatory contexts. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Corporate Social Responsibility:** Definition and Concept of Corporate Social Responsibility (CSR), Historical Evolution of CSR, Importance and Benefits of CSR for Businesses, Legal and Regulatory Framework for CSR. |
| Unit-II | **CSR Strategy and Implementation in Organisation:** Developing a CSR Strategy: Setting Goals and Objectives, Stakeholder Engagement and Management in CSR, Integration of CSR into Business Operations, Corporate Governance and Ethics in CSR |
| Unit-III | **CSR Initiatives and Best Practices:** Environmental Sustainability Initiatives (e.g., Sustainable sourcing, Renewable energy adoption), Social Impact Initiatives (e.g., Community development programs, Employee volunteering), Ethical Business Practices (e.g., Fair labour practices, Anti-corruption measures), Corporate Philanthropy and Charitable Giving |

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|---|---|
| **Unit-IV** | **CSR Reporting and Accountability:** Transparency and Disclosure in CSR Reporting, Global Reporting Initiatives (GRI) Standards, Assurance and Verification of CSR Reports, Stakeholder Communication an Engagement through CSR Reporting |

**Suggested Readings:**

- Corporate Social Responsibility: Indian Perspectives" by Sanjay K. Agarwal, SAGE publication, Delhi
- Corporate Social Responsibility in India by Nayan Mitra, René Schmidpeter, Springer International Publishing
- Corporate Social Responsibility and Sustainable Development by Hitesh Arora, Jitendra K. Das, Shallini Taneja, Taylor & Francis
- Business Ethics and Corporate Governance" by A.C. Fernando, Pearson Education

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Corporate Social Responsibility | nptel.ac.in/courses/110105081 |
| **Unit-II** | Stakeholders and CSR | https://archive.nptel.ac.in/courses/110/105/110105081/ |
| **Unit-III** | Social impact initiatives | https://nptel.ac.in/csr?utm |
| **Unit-IV** | Reporting Initiatives (GRI) Standards | https://archive.nptel.ac.in/courses/110/105/110105159/ |



| Course Code | MDC-BBA-203A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | Finance for Non-Finance Managers | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand the role and objectives of financial management and key financial decisions with their risk-return trade-offs.<br>2. To understand the time value of money and apply compounding and discounting techniques.<br>3. To understand capital budgeting and evaluate investment projects using standard appraisal methods.<br>4. To understand financing, dividend, and working capital decisions and the factors influencing them. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Discuss** the financial management fundamental concepts and its application. | Level-1 Remember |
| CO2 | **Describe** the concepts of financial management to prepare and manage financial system. | Level-2 Understand |
| CO3 | **Apply** financial management techniques to solve business problems | Level-3 Apply |
| CO4 | **Analyze** financial information to make decisions in the real world. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Finance:** Introduction to Financial Management: Concept and Importance of Finance Function, Objectives of Financial Management, Financial Decisions and their Risk-Return Trade-off. Time Value of Money, Concept and Rationale, Compounding & Discounting to obtain Future and Present values. Sources of Finance. |
| Unit-II | **Investment Decisions:** Concept and Importance of Capital Budgeting, Objectives and Problems in Capital Budgeting, Types of Investment Projects, Capital Budgeting Process. Investment Evaluation Techniques: Pay Back Period, Discounted Payback Period, Net Present Value, Profitability Index, Internal Rate of Return. |
| Unit-III | **Financing Decisions:** Capital Structure: Concept, Factors affecting Capital Structure, Capital Structure Theories: Net Income Approach, Net Operating Income Approach, Traditional Approach and MM approach. |

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|---|---|
| **Unit-IV** | **Dividend Decisions and Working Capital Management:** Dividend Decisions: Concept, Types of Dividends, Factors determining the Dividend policy.<br>**Working Capital Management:** Concept and need for Working Capital, Types of Working Capital and factors affecting Working Capital requirements. |

**Suggested Readings:**

- Fundamentals of Financial Management: with Excel application supplement by Surender Singh and Rajeev Kaur, Mayur Paperbacks.
- Financial Management by I.M.Pandey, Vikas Publishing House Pvt. Ltd.
- Finance for Non-finance Managers by B.K. Bhargav, Jaiko Publishing House.
- Finance Sense: Finance For Non-Finance executives by P. Chandra, Tata McGraw Hill.
- Basic Financial Management by Vanita Tripathi, Taxmann Publication
- Finance For Non-Finance Managers by Gabriel Hawawini, Claude Viallet, Cengage Delmar Learning India Pvt Ltd.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Fundamentals of Financial Management | nptel.ac.in/courses/110107144 |
| Unit-II | Capital Budgeting | https://onlinecourses.nptel.ac.in/noc25_mg138/ |
| Unit-III | Capital Structure | https://onlinecourses.nptel.ac.in/noc20_mg31/ |
| Unit-IV | Working Capital Management | https://onlinecourses.nptel.ac.in/noc19_mg40/ |



| Course Code | MDC-BBA-205A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Group Dynamic and Leadership** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand group types, functions, development stages, and reasons for group membership.<br>2. To understand key group processes like conformity, deviance, cohesiveness, social loafing, and competition.<br>3. To understand organizational communication processes, barriers, and strategies for effective communication.<br>4. To understand power, politics, conflict, negotiation, and leadership theories, styles, and effectiveness in organizations. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the fundamental concepts, types, and functions of groups, group processes, and organizational communication. | Level-1 Remember |
| CO2 | **Explain** the dynamics of group behavior, communication processes, leadership, and the influence of power and politics in organizations. | Level-2 Understand |
| CO3 | **Apply** concepts of group dynamics, communication processes, power and conflict management, and leadership styles to improve organizational effectiveness. | Level-3 Apply |
| CO4 | **Analyze** the impact of group dynamics, power structures, and leadership styles on organizational effectiveness and communication. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Groups**: Groups and types of groups, their functions, stages of group development, reasons of joining groups.<br>**Group Processes**: Conformity, deviance, cohesiveness, social loafing and facilitation, cooperation and competition. |
| Unit-II | **Organizational communication**: Functions of communication, Communication Process; Direction of communication; Informal communication network; Electronic communication; Barriers to effective communication; Enhancing communication effectiveness. |
| Unit-III | **Power and Politics in Organizations**: Classifications of Power, Power Tactics, Sources of power, Causes and consequences of Political Behavior, Managing organizational Politics.<br>**Conflict and Negotiation**: Nature of conflict in organizations; Types of Conflicts, Conflict process; |



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|---|---|
| | Negotiation : Process, Bargaining strategies. |
| **Unit-IV** | **Leadership**- Leader v/s manager- Leadership styles, Concepts, Theories and Styles: Trait, Behavioral and situational; Transactional and Transformational Leaderships, Leadership effectiveness, effective leadership communication. |

**Suggested Readings:**

- Organizational Behavior by S.P. Robbins, T.A. Judge & N.Vohra, Pearson Education.
- Understanding organizational behavior by U.Pareek, Oxford: Oxford University Press.
- Culture and organizational behavior by J.B.P Sinha, SAGE: New Delhi.
- Organizational Behavior by F Luthans , McGraw-Hill Companies.
- Behavior in Organizations by J. Greenberg & R. Baron, Pearson-Prentice Hall.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Groups | nptel.ac.in/courses/109107199 |
| **Unit-II** | Organizational Communication | https://archive.nptel.ac.in/courses/110/105/110105052/ |
| **Unit-III** | Power and Politics in Organisation | https://archive.nptel.ac.in/courses/110/105/110105033/ |
| **Unit-IV** | Leadership Style | https://dituniversity.digimat.in/nptel/courses/video/122105021/L03.html |



| Course Code | MDC-BCA-207A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Web Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of the Internet, World Wide Web, web browsers, servers, protocols, and search techniques.<br>2. To understand the process of web publishing, including site planning, domain selection, hosting, and using tools like FrontPage and DHTML.<br>3. To understand the basics of HTML for web development, including text formatting, linking, layout design, and page structuring.<br>4. To understand the use of images, lists, tables, forms, and the features of DHTML such as CSSP and JSASS for interactive web design. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** fundamental concepts of the Internet, World Wide Web, web browsers, web servers, protocols like HTTP and TCP/IP, and search engine functionalities. | Level 1: Remember |
| CO2 | **Explain** the process of web publishing, including domain registration, hosting, web development phases, and the role of markup languages like HTML and DHTML. | Level 2: Understand |
| CO3 | **Apply** HTML and DHTML to develop basic web pages by using tags for formatting, linking, layout creation, form handling, and incorporating multimedia. | Level 3: Apply |
| CO4 | **Analyze** and structure web content using CSS and DHTML elements to enhance interactivity, layout control, and presentation logic for user-friendly web interfaces.. | Level 4: Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Internet and World Wide Web:** Introduction to Internet and World Wide Web; Evolution and History of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol, Overview of TCP/IP and its services; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools. |
| Unit-II | **Web Publishing:** Hosting your Site; Internet Service Provider; Web terminologies, Phases of Planning and designing your Web Site; Steps for developing your Site; Choosing the contents; Home Page; Domain Names, Front page views, adding pictures, Links, Backgrounds, Relating Front Page to DHTML. Creating a Website and the Markup Languages (HTML, DHTML). |



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|---|---|
| **Unit-III** | **Web Development:** Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Text styles; Text Structuring; Text colors and Background; Formatting text; Page layouts. |
| **Unit-IV** | Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes;<br>**DHTML:** Dynamic HTML, Features of DHTML, CSSP (cascading style sheet positioning) and JSASS (JavaScript assisted style sheet), Layers of Netscape, The ID attributes, DHTML events. |

**Suggested Readings:**

- Web Design: The Complete Reference by Thomas A. Powell, Tata McGraw-Hill
- HTML Beginners Guide by Wendy Willard,Tata McGraw-Hill.
- Internet and World Wide : How to Program Web by Deitel and Goldberg, PHI.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Internet | https://archive.nptel.ac.in/courses/106/105/106105084/ |
| | TCP/IP | https://archive.nptel.ac.in/courses/106/105/106105084/ |
| **Unit-II** | Introduction to HTML | https://archive.nptel.ac.in/courses/106/105/106105084/ |
| **Unit-III** | HTML Forms | https://archive.nptel.ac.in/courses/106/105/106105084/ |
| **Unit-IV** | JavaScript | https://archive.nptel.ac.in/courses/106/105/106105084/ |



| Course Code | MDC-BCA-209A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Graphic Designing** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand the basics of computer graphics systems, display devices, and input hardware.<br>2. To understand 2-D transformations and viewing techniques using matrix representations.<br>3. To understand 2-D and 3-D object representation using polygons and spline curves.<br>4. To understand 3-D transformations, viewing pipelines, and projection methods. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** fundamental concepts of computer graphics systems, input/output devices, and graphics primitives.. | Level 1: Remember |
| CO2 | **Explain** 2D geometrical transformations, viewing pipelines, and coordinate transformations in graphical systems. | Level 2: Understand |
| CO3 | **Apply** mathematical and graphical techniques to perform transformations and construct curves and surfaces in 2D and 3D space. | Level 3: Apply |
| CO4 | **Analyze** and distinguish different 3D object representations, projection transformations, and clipping methods in viewing pipelines. | Level 4: Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Graphics Primitives:** Introduction to computer graphics, Basics of Graphics systems, Application areas of Computer Graphics, overview of graphics systems, video-display devices, and raster-scan systems, random scan systems, graphics monitors and workstations and input devices. |
| Unit-II | **2-D Geometrical Transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.<br>**2-D Viewing:** The viewing pipeline, viewing coordinate reference frame, window to view- port coordinate transformation, viewing functions. |
| Unit-III | **3-D Object Representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves. |

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| **Unit-IV** | **3-D Geometric Transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations.<br>**3-D Viewing:** Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping. |

**Suggested Readings:**

- Computer Graphics by Donald Hearn and M. Pauline Baker, PHI Publications.
- Theory & Problem of Computer Gaphics by Plastock, Schaum Series

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Computer Graphics | https://nptel.ac.in/courses/106/102/106102065/# |
| | Video Display Devices | https://nptel.ac.in/courses/106/102/106102065/# |
| Unit-II | 2D Transformations | https://nptel.ac.in/courses/106/102/106102065/# |
| Unit-III | Polygon Surfaces and 3D Object Representation | https://nptel.ac.in/courses/106/102/106102065/# |
| Unit-IV | 3D Geometric Transformations | https://nptel.ac.in/courses/106/102/106102065/# |



| Course Code | MDC-BCA-211A | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Multimedia Systems** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand multimedia fundamentals, components, applications, and tools including text, hypermedia, and design techniques.<br>2. To learn image fundamentals, color models, formats, and basic digital image processing techniques for multimedia use.<br>3. To understand audio and video integration, formats, and editing tools used in multimedia development projects.<br>4. To gain practical skills to plan, design, cost, and execute complete multimedia projects using appropriate software. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the fundamental concepts of multimedia systems including text, images, sound, and video along with their tools, formats, and features | Level 1: Remember |
| CO2 | **Explain** the structure and characteristics of multimedia components such as text design, image processing, audio integration, and video creation in digital environments. | Level 2: Understand |
| CO3 | **Apply** multimedia design techniques to integrate text, images, audio, and video using appropriate models, formats, and tools. | Level 3: Apply |
| CO4 | **Analyze** the process of multimedia project development including planning, design, production, cost estimation, and required software and skill sets. | Level 4: Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Multimedia:** Brief outline about Multimedia, features, uses, applications, multimedia software tools, Text: Introduction about Fonts and Faces - Using Text in Multimedia – various techniques used in Text and Design Tools - Hypermedia and Hypertext. |
| Unit-II | **Images:** Fundamentals of Still Images – Color Models and Representation – Image File Formats and Compression Techniques.<br>**Digital Image Processing:** Concepts of Image Enhancement, Restoration, and Filtering – Image Masking Techniques – Visual Effects in Digital Media – Understanding Image Layers and Their Functionalities |
| Unit-III | **Sound:** brief outline about sound, adding sound to multimedia animations– Action-Scripts. System sounds, making midi audio, digital audio file formats, midi versus digital audio - adding sound to multimedia project.<br>**Video:** using video - how video works - short note on analog video - digital video - obtaining video clips – shooting and editing video. Video and Digital Movie Tools |



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|---|---|
| **Unit-IV** | **Multimedia Project Development:** Making of multimedia project, Stages of multimedia, Types of multimedia software, multimedia skills, planning and costing designing and producing of Multimedia. |

**Suggested Readings:**

- Multimedia Systems by Ralf Steinmetz &KlaraNahrstedt – Pearson Education
- Fundamentals of Multimedia by Ze-Nian Li & Mark S. Drew – Pearson India
- Multimedia: Making It Work by Tay Vaughan – McGraw Hill Education
- Digital Image Processing by Rafael C. Gonzalez & Richard E. Woods – Pearson Education
- Multimedia and Virtual Reality by Vikas Gupta – Dreamtech Press
- Principles of Multimedia by Ranjan Parekh – Tata McGraw Hill

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Multimedia | https://nptel.ac.in/courses/117105083 |
| **Unit-II** | Images and Digital Image Processing | https://archive.nptel.ac.in/courses/117/105/117105135/ |
| **Unit-III** | Sound and Video in Multimedia | https://archive.nptel.ac.in/noc/courses/noc16/SEM2/noc16-ec12/ |
| **Unit-IV** | Multimedia Project Development | https://nptel.ac.in/courses/105106149 |



| Course Code | AEC-201A | | | | |
|---|---|---|---|---|---|
| Category | Ability Enhancement Course | | | | |
| Course Title | General English-II | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand the role of stress, intonation, and phonetic transcription in effective spoken English.<br>2. To understand the structure and usage of clauses and verb forms including tenses, modals, and non-finites.<br>3. To understand the mechanics of writing, barriers to effective writing, and strategies to overcome them.<br>4. To understand various forms of writing including paragraphs, dialogues, letters, emails, and blogs. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Identify** stress patterns, intonation types, verb forms, clauses, and modals, tense and writing formats. | Level-1 Remember |
| CO2 | **Describe** the role of stress, intonation, grammar, and writing mechanics in effective communication. | Level-2 Understand |
| CO3 | **Apply** stress, intonation, grammar, and writing strategies to produce clear spoken and written English. | Level-3 Apply |
| CO4 | **Analyze** effective spoken and written texts using accurate stress, intonation, grammar, and structure. | Level- 4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction of Stress**: Role of stress , primary stress and secondary stress (marking primary stress on commonly used words) Transcription (of commonly used multisyllabic words)<br>**Phonetics and Intonation**: Intonation – concept and uses of rising tone, falling tone, rising-falling tone, falling-rising tone |
| Unit-II | **Grammar- Clauses and Verbs**: Clauses: Noun, Adjective, Adverbial and Conditional Verbs: Finite/Non-Finite, Infinitive, Gerund, Participles, Modals, Tense |
| Unit-III | **Writing Skills and Mechanics**: Introduction to Writing Skills and Mechanics of Writing Barriers to Effective Writing and Steps to overcome them. |
| Unit-IV | **Practical Writing Applications**: Paragraph Writing : Descriptive, Argumentative, Expository Dialogue Writing , Letter Writing , Email Writing, Resume writing and Blog Writing |

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**Suggested Readings:**

- English for Ability Enhancement by Orient Blackswan.
- English Phonetics for Indian Students by T.Balasubramanian, Macmillan India Limited
- Better Spoken English by Shreesh Chaudhary, Vikas Publishing House Pvt Ltd
- Speak Better Write Better English by Lewis, Norman, Goyal Publishers & Distributors Pvt. Ltd.
- Oxford Advanced Learner's Dictionary, Oxford University Press
- Practical English Usage by Swan, Michael, Oxford University Press
- A Practical English Grammar by A.J.Thomson and A. V. Martinet. Oxford University Press

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Stress and Intonation | https://archive.nptel.ac.in/courses/109/106/109106094/ |
| Unit-II | Modals | https://auece.digimat.in/nptel/courses/video/109106201/L24.html |
| Unit-III | Introduction to Writing Skills | https://archive.nptel.ac.in/courses/109/107/109107172/ |
| Unit-IV | Paragraph Writing | https://archive.nptel.ac.in/courses/109/106/109106094/ |



| Course Code | AEC-203A | | | | |
|---|---|---|---|---|---|
| Category | Ability Enhancement Course | | | | |
| Course Title | German | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand basic self-introduction and sentence formation using correct grammar.<br>2. To understand everyday vocabulary and grammar for daily activities and social interactions.<br>3. To understand communication in cultural contexts using appropriate cases and prepositions.<br>4. To understand practical language for work, health, and travel using advanced grammar forms. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Identify** basic grammar and vocabulary for everyday topics like self-introduction, hobbies, and time. | Level-1 Remember |
| | **Describe** daily life, places, food, and activities using correct grammar. | Level-2 Understand |
| CO3 | **Use** grammar structures like dative, perfect tense, and prepositions in practical contexts. | Level-3 Apply |
| CO4 | **Interpret** cultural and social topics using modal verbs, imperative, and perfect tense. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Basic Communication and Grammar**: Introducing oneself and others; Grammar: W-questions, personal pronouns, simple sentence, verb conjugation<br>Hobbies, the week, numbers, the alphabet, months, seasons /Grammar : articles , plural, the verbs to have and to be |
| Unit-II | **Daily Life and Social Interaction:** In the city / naming places and buildings, means of transport, basic directions<br>Food, drink, family / groceries and meals<br>Everyday life, telling time, making appointments |
| Unit-III | **Culture, Communication, and Living Spaces-** Leisure activity, celebrations / Grammar: separable verbs, the accusative, past tense of to have and to be Contacts, writing letters / Grammar: dative My apartment, rooms, furniture, colours / Grammar: changing prepositions. |



| | |
|---|---|
| Unit-IV | **Culture and Communication-** Professions / Grammar: perfect tens Clothe/ Grammar: perfect tense and dative Health and the body / Grammar: the imperative and modal verbs Holiday and weather. |

**Suggested Readings:**

- Textbook + Workbook + Glossar by Netzwerk Deutsch alsFremdsprache A1
- TangramAktuell A1/1,2 by Rosa-Maria Dallapiazza et al,
- Grundkurs Lehrbuch by Becker, Braunert und Schlenker, Unternehmen Deutsch

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Basic Communication and Grammar | nptel.ac.in/courses/109106166 |
| Unit-II | Daily Life and Social Interaction | nptel.ac.in/courses/109106166 |
| Unit-III | Culture, Communication, and Living Spaces | nptel.ac.in/courses/109106166 |
| Unit-IV | Culture and Communication | nptel.ac.in/courses/109106166 |



| Course Code | SEC-201A | | | | |
|---|---|---|---|---|---|
| Category | Skill Enhancement Course | | | | |
| Course Title | **Business Etiquettes** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand key principles of business etiquette and professional conduct.<br>2. To understand workplace courtesy and resolve ethical issues effectively.<br>3. To understand proper telephone, email, and disability etiquette.<br>4. To understand cultural awareness and professional appearance. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** basic business etiquette and professional conduct. | Level-1 Remember |
| CO2 | **Explain** workplace ethics and cultural sensitivity. | Level-2 Understand |
| CO3 | **Demonstrate** proper etiquette in communication and interactions. | Level-3 Apply |
| CO4 | **Analyze** workplace scenarios to resolve conflicts and uphold ethics. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will have 7 short questions of 1 marks (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Business Etiquette:** Introduction- ABCs of etiquette- meeting and greeting scenarios- principles of exceptional work behavior- role of good manners in business - professional conduct and personal spacing. |
| **Unit-II** | **Workplace Courtesy and Business Ethics:** Workplace Courtesy- Practicing common courtesy and manners in a workplace-Etiquette at formal gatherings- Professional qualities expected from an employer's perspective - Hierarchy and Protocol. Ethical issues - preventing sexual harassment-conflict resolution strategies - Choosing appropriate gift in the business environment - real life workplace scenarios - company policy for business etiquette |
| **Unit-III** | **Professional Communication and Etiquette in the Workplace:** Telephone Etiquette, email etiquette and Disability Etiquette Mastering the telephone courtesy, handling rude or impatient clients -internet usage in the workplace, email etiquette, online chat etiquette guidelines -Basic disability Etiquette practices |
| **Unit-IV** | **Diversity and Cultural Awareness at Workplace Impact of diversity** - Cultural Sensitivity - Taboos and Practices - Inter - Cultural Communication, Business Attire and Professionalism Business style and professional image- dress code guidelines for appropriate business attire-grooming for success. |



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**Suggested Readings:**

- Indian Business Etiquette by Raghu Palat, Jaico Publishers
- At Ease with Etiquette by Nina Kochhar, Health Harmony
- The Book of Etiquette and Manners by Nimeran Sahukar and Prem P. Bhalla, Pustak Mahi Publishers
- Corporate Grooming and Etiquette by Sarvesh Gulati, Rupa Publications
- The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success by Barbara Pachter, McGraw Hill Education

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | Business Etiquette – Basic | https://archive.nptel.ac.in/courses/110/105/110105079/ |
| Unit-II | Workplace Courtesy and Business Ethics | https://archive.nptel.ac.in/courses/110/105/110105138/ |
| Unit-III | Telephone Etiquette, email etiquette | https://archive.nptel.ac.in/courses/109/107/109107121/ |
| | online chat etiquette guidelines | https://archive.nptel.ac.in/courses/109/104/109104031/?utm_source=chatgpt.com |
| Unit-IV | Diversity and Cultural Awareness | https://onlinecourses.nptel.ac.in/noc25_hs41/preview |
| | Cultural Communication | https://onlinecourses-archive.nptel.ac.in/noc19_hs05/preview |
| | Business Attire | https://archive.nptel.ac.in/courses/109/105/109105110/ |



| Course code | LC-SEC-203A | | | | |
|---|---|---|---|---|---|
| Category | Skill Enhancement Course | | | | |
| Course title | **Business Etiquettes Lab** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>1. To understand professional greetings, workplace behavior, and personal spacing through role-play.<br>2. To understand workplace courtesy, ethics, and conflict resolution in real-life scenarios.<br>3. To understand proper telephone, email, and disability etiquette in business settings.<br>4. To understand cultural awareness, dress code understanding, and professional grooming. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Exam | 15 Marks | | | | |
| Total Marks | 25 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Course Outcomes | RBT Level |
|---|---|---|
| CO1 | **Apply** business etiquette in professional and digital settings | **Level-3 Apply** |
| CO2 | **Analyze** workplace situations to choose appropriate professional behavior. | **Level-4 Analyze** |
| CO3 | **Evaluate** ethical and cultural practices in business environments. | **Level-5 Evaluate** |
| CO4 | **Create** professional documents and presentations using proper etiquette. | **Level-6 Create** |

**List of Practical's**

| S. No. | Description |
|---|---|
| 1 | To conduct a quiz on the ABCs of etiquette, including meeting and greeting scenarios, and principles of professional behavior in a business setting. |
| 2 | To conduct exercises where students practice common workplace courtesy and manners, including etiquette at formal gatherings and understanding hierarchical protocols. |
| 3 | To conduct role-play scenarios where students face ethical issues like preventing sexual harassment and resolving conflicts in a professional environment. |
| 4 | To conduct exercises in telephone etiquette, including handling impatient or rude clients, while mastering the nuances of internet and online chat etiquette. |
| 5 | To conduct a series of exercises where students practice email etiquette, including writing professional emails and managing internet usage in the workplace. |
| 6 | To conduct a session to introduce basic disability etiquette practices, including understanding challenges faced by people with disabilities in the workplace. |
| 7 | To organize an interactive workshop focused on the impact of diversity and cultural sensitivity in the workplace, covering taboos, cultural practices, and communication styles. |
| 8 | To engage in a group discussion about the importance of business attire, grooming for success, and professional image in the workplace. |



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|---|---|
| 9 | To engage students in role-play exercises simulating business meetings, where they demonstrate good business etiquette, including professional greetings and appropriate conduct. |
| 10 | To organize a mock networking event or speed networking session, where students interact with peers and professionals from diverse backgrounds. |

**Suggested Readings:**

- Indian Business Etiquette by Raghu Palat, Jaico Publishers, 2008
- At Ease with Etiquette by Nina Kochhar, Health Harmony, 2011
- The Book of Etiquette and Manners by Nimeran Sahukar and Prem P. Bhalla, Pustak Mahi Publishers, 2004
- Corporate Grooming and Etiquette by Sarvesh Gulati, Rupa Publications, 2012
- The Essentials of Business Etiquette: How to Greet, Eat, and Tweet Your Way to Success by Barbara Pachter, McGraw Hill Education, 2013

**Useful Video Links:**

| Topics | Links |
|---|---|
| Effective Business Communication | https://onlinecourses.nptel.ac.in/noc21_mg98/preview |
| Business Manners | https://onlinecourses.nptel.ac.in/noc21_mg99/preview |
| International Business Communication | https://archive.nptel.ac.in/courses/110/105/110105052/ |
| Soft Skills for Business Negotiations and Marketing Strategies | https://onlinecourses.nptel.ac.in/noc22_mg105/preview |



# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA (JHAJJAR)

**An Autonomous Institute (UGC)**

**Approved by AICTE, New Delhi and Affiliated to MDU, Rohtak**

**NAAC 'A' GRADE**

GITAM

## SCHEME AND SYLLABI

## OF

## 2-YEAR

## MASTERS OF BUSINESS

## ADMINISTRATION PROGRAM

## (MBA)

## WITH EFFECT FROM THE ACADEMIC SESSION

## 2024-25

# Scheme of Examination

## MBA – 3rd Semester

## *w.e.f.* 2025-26

**(STUDENT SHOULD SELECT ANY ONE OPTION FOR THE SECOND YEAR OF 2 YEAR PG PROGRAM)**

**Option 1: (Only Course Work)**

**Second year of 2-Year MBA Program (NHEQF Level 6.5): Third Semester**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical /Viva Voce | Total | |
| 1 | Discipline Specific Course | DSC-MBA-201A | Strategic Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 2 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 3 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 4 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 5 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 6 | Skill Enhance ment Course-3 | SEC-MBA-205A | Digital Marketing | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| | | LC-MBA-207A | Digital Marketing Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| | Internship-3 | INT-MBA-209A | Summer Internship Report | - | - | - | - | 4 | 50 | - | 50 | 100 | 3 |
| | Project Work-1 | PR-MBA-211A | Project Work | - | - | - | - | 4 | 50 | - | 50 | 100 | 3 |
| | | **TOTAL CREDIT** | | | | | | **24** | | | | **600** | |

**Note:**

1. Students are required to choose any two courses from any two specialization areas offered under a dual specialization scheme from the given three groups, selecting not more than one specialization from one Group. A minimum of **one third** students are required to offer any specialization area from any two groups. The specialization area opted for in the 3rd Semester would remain the same in the 4th semester also.

| Group A | Course Code | Group B | Course Code | Group C | Course Code |
|---|---|---|---|---|---|
| Human Resource Management | DEC-HR | Marketing | DEC-MKT | Finance | DEC-FIN |
| Business Analytics | DEC-BA | Public Policy | DEC-PP | International Business | DEC-IB |
| Information Technology | DEC-IT | Agri-Business | DEC-AGB | Operations Management | DEC-OM |



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2. Each student in the course of Digital Marketing will be given assignments such as developing an online business model/digital marketing strategies/employing digital marketing tactics for business expansion, etc. and the same will be evaluated by an external examiner from academia based on his/her expertise/specialization/area of interest recommended by the BOS of Department of Management Studies (GITAM) for practicum/viva-voce examination and one internal examiner recommended by the HOD department of Management Studies.
3. The students are required to choose either SEC-3 or Internship-3 or Project Work-1.
4. In case of Project Work, the topic of the Research Project to be submitted for evaluation in the third Semester shall be submitted by the student along with a brief synopsis after finalization within first month of the Semester in consultation with the faculty member allotted as Research Supervisor by the HOD department of Management Studies.



## Table-I
## Elective Courses for MBA 3rd Semester

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical/Viva Voce | Total | |
| 1 | Discipline Elective Course-Marketing | DEC-MKT-MBA-211A | Consumer Behavior | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 2 | Discipline Elective Course-Marketing | DEC-MKT-MBA-213A | Social Media Marketing | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 3 | Discipline Elective Course-Marketing | DEC-MKT-MBA-215A | Retail Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 4 | Discipline Elective Course-Marketing | DEC-MKT-MBA-217A | Service Marketing | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 5 | Discipline Elective Course-Marketing | DEC-MKT-MBA-219A | Marketing Research and Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 6 | Discipline Elective Course-Finance | DEC-FIN-MBA-221A | Indian Financial System and Financial Services | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 7 | Discipline Elective Course-Finance | DEC-FIN-MBA-223A | Project Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 8 | Discipline Elective Course-Finance | DEC-FIN-MBA-225A | Business Taxation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 9 | Discipline Elective Course-Finance | DEC-FIN-MBA-227A | Behavioral Finance | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 10 | Discipline Elective Course-Finance | DEC-FIN-MBA-229A | Insurance and Risk Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 11 | Discipline Elective Course-HR | DEC-HR-MBA-231A | Compensation Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 12 | Discipline Elective Course-HR | DEC-HR-MBA-233A | Management of Industrial Relations | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 13 | Discipline Elective Course-HR | DEC-HR-MBA-235A | Cross Cultural Human Resource Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | Discipline Elective Course-HR | DEC-HR-MBA-237A | Indian Labour Legislation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 15 | Discipline Elective Course-HR | DEC-HR-MBA-239A | Human Resource Metrics and Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 16 | Discipline Elective Course-IT | DEC-IT-MBA-241A | E-Commerce and Applications | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 17 | Discipline Elective Course-IT | DEC-IT-MBA-243A | Multimedia and Web Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 18 | Discipline Elective Course-IT | DEC-IT-MBA-245A | Advanced Database Management System | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 19 | Discipline Elective Course-IT | DEC-IT-MBA-247A | AI Applications in Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 20 | Discipline Elective Course-IT | DEC-IT-MBA-249A | Information Security and Cyber Laws | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 21 | Discipline Elective Course-IB | DEC-IB-MBA-251A | International Trade Theory and Practices | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 22 | Discipline Elective Course-IB | DEC-IB-MBA-253A | Export Import Procedure and Documentation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 23 | Discipline Elective Course-IB | DEC-IB-MBA-255A | Foreign Exchange Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 24 | Discipline Elective Course-IB | DEC-IB-MBA-257A | International Business Environment | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 25 | Discipline Elective Course-IB | DEC-IB-MBA-259A | International Business Negotiation and Economic Blocks | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 26 | Discipline Elective Course-AGB | DEC-AGB-MBA-261A | Agri-Business Environment and Policy | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 27 | Discipline Elective Course-AGB | DEC-AGB-MBA-263A | Agri-Business Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 28 | Discipline Elective Course-AGB | DEC-AGB-MBA-265A | Agri-Business Entrepreneurship | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 29 | Discipline Elective Course-AGB | DEC-AGB-MBA-267A | Agricultural Economics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 30 | Discipline Elective Course-AGB | DEC-AGB-MBA-269A | Agri-Business Finance | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 31 | Discipline Elective Course-OM | DEC-OM-MBA-271A | Technology and Innovation Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 32 | Discipline Elective Course-OM | DEC-OM-MBA-273A | Supply Chain and Logistics Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 33 | Discipline Elective Course-OM | DEC-OM-MBA-275A | Operations Research | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 34 | Discipline Elective Course-OM | DEC-OM-MBA-277A | R&D Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | Discipline Elective Course-OM | DEC-OM-MBA-279A | Purchasing and Material Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 36 | Discipline Elective Course-BA | DEC-BA-MBA-281A | Basics of Business Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 37 | Discipline Elective Course-BA | DEC-BA-MBA-283A | Applied Multivariate Analysis | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 38 | Discipline Elective Course-BA | DEC-BA-MBA-285A | Information Economics and its Applications | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 39 | Discipline Elective Course-BA | DEC-BA-MBA-287A | Business Data Mining | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 40 | Discipline Elective Course-BA | DEC-BA-MBA-289A | Data Analytics Using R | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 41 | Discipline Elective Course-PP | DEC-PP-MBA-291A | Public Policy Formulation and Evaluation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 42 | Discipline Elective Course-PP | DEC-PP-MBA-293A | Sustainable Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 43 | Discipline Elective Course-PP | DEC-PP-MBA-295A | Rural Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 44 | Discipline Elective Course-PP | DEC-PP-MBA-297A | Social Campaign Promotion | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 45 | Discipline Elective Course-PP | DEC-PP-MBA-299A | Indian Social and Political System | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



# Scheme of Examination
## MBA – 3rd Semester
## *w.e.f.* 2025-26

**Option 2: (Coursework and Research)**

**Second year of 2-Year MBA Program (NHEQF Level 6.5): Third Semester**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical/Viva Voce | Total | |
| 1 | Discipline Specific Course | DSC-MBA-201A | Strategic Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 2 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 3 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 4 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 5 | Discipline Elective Course | Refer Table No.-1 | | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 6 | Skill Enhancement Course-3 | SEC-MBA-205A | Digital Marketing | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| | | LC-MBA-207A | Digital Marketing Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| | Internship-3 | INT-MBA-209A | Summer Internship Report | - | - | - | - | 4 | 50 | - | 50 | 100 | 3 |
| | Project Work-1 | PR-MBA-211A | Project Work | - | - | - | - | 4 | 50 | - | 50 | 100 | 3 |
| | | **TOTAL CREDIT** | | | | | | **24** | | | | **600** | |

**Note:**

1. Students are required to choose any two courses from any two specialization areas offered under a dual specialization scheme from the given three groups, selecting not more than one specialization from one Group. A minimum of **one third** students are required to offer any specialization area from any two groups. The specialization area opted for in the 3rd Semester would remain the same in the 4th semester also.

| Group A | Course Code | Group B | Course Code | Group C | Course Code |
|---|---|---|---|---|---|
| Human Resource Management | DEC-HR | Marketing | DEC-MKT | Finance | DEC-FIN |
| Business Analytics | DEC-BA | Public Policy | DEC-PP | International Business | DEC-IB |
| Information Technology | DEC-IT | Agri-Business | DEC-AGB | Operations Management | DEC-OM |



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2. Each student in the courses of Digital Marketing will be given assignments such as developing an online business model/digital marketing strategies/employing digital marketing tactics for business expansion, etc. and the same will be evaluated by an external examiner from academia based on his/her expertise/specialization/area of interest recommended by the BOS of Department of Management Studies (GITAM) for practicum/viva-voce examination and one internal examiner recommended by the HOD department of Management Studies.
3. The students are required to choose either SEC-3 or Internship-3 or Project Work-1.
4. In case of Project Work, the topic of the Research Project to be submitted for evaluation in the third Semester shall be submitted by the student along with a brief synopsis after finalization within first month of the Semester in consultation with the faculty member allotted as Research Supervisor by the HOD department of Management Studies.



## Table-I
## Elective Courses for MBA 3rd Semester

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical /Viva Voce | Total | |
| 1 | Discipline Elective Course-Marketing | DEC-MKT-MBA-211A | Consumer Behavior | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 2 | Discipline Elective Course-Marketing | DEC-MKT-MBA-213A | Social Media Marketing | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 3 | Discipline Elective Course-Marketing | DEC-MKT-MBA-215A | Retail Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 4 | Discipline Elective Course-Marketing | DEC-MKT-MBA-217A | Service Marketing | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 5 | Discipline Elective Course-Marketing | DEC-MKT-MBA-219A | Marketing Research and Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 6 | Discipline Elective Course-Finance | DEC-FIN-MBA-221A | Indian Financial System and Financial Services | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 7 | Discipline Elective Course-Finance | DEC-FIN-MBA-223A | Project Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 8 | Discipline Elective Course-Finance | DEC-FIN-MBA-225A | Business Taxation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 9 | Discipline Elective Course-Finance | DEC-FIN-MBA-227A | Behavioral Finance | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 10 | Discipline Elective Course-Finance | DEC-FIN-MBA-229A | Insurance and Risk Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 11 | Discipline Elective Course-HR | DEC-HR-MBA-231A | Compensation Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 12 | Discipline Elective Course-HR | DEC-HR-MBA-233A | Management of Industrial Relations | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 13 | Discipline Elective Course-HR | DEC-HR-MBA-235A | Cross Cultural Human Resource Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 14 | Discipline Elective Course-HR | DEC-HR-MBA-237A | Indian Labour Legislation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | Discipline Elective Course-HR | DEC-HR-MBA-239A | Human Resource Metrics and Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 16 | Discipline Elective Course-IT | DEC-IT-MBA-241A | E-Commerce and Applications | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 17 | Discipline Elective Course-IT | DEC-IT-MBA-243A | Multimedia and Web Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 18 | Discipline Elective Course-IT | DEC-IT-MBA-245A | Advanced Database Management System | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 19 | Discipline Elective Course-IT | DEC-IT-MBA-247A | AI Applications in Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 20 | Discipline Elective Course-IT | DEC-IT-MBA-249A | Information Security and Cyber Laws | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 21 | Discipline Elective Course-IB | DEC-IB-MBA-251A | International Trade Theory and Practices | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 22 | Discipline Elective Course-IB | DEC-IB-MBA-253A | Export Import Procedure and Documentation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 23 | Discipline Elective Course-IB | DEC-IB-MBA-255A | Foreign Exchange Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 24 | Discipline Elective Course-IB | DEC-IB-MBA-257A | International Business Environment | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 25 | Discipline Elective Course-IB | DEC-IB-MBA-259A | International Business Negotiation and Economic Blocks | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 26 | Discipline Elective Course-AGB | DEC-AGB-MBA-261A | Agri-Business Environment and Policy | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 27 | Discipline Elective Course-AGB | DEC-AGB-MBA-263A | Agri-Business Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 28 | Discipline Elective Course-AGB | DEC-AGB-MBA-265A | Agri-Business Entrepreneurship | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 29 | Discipline Elective Course-AGB | DEC-AGB-MBA-267A | Agricultural Economics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 30 | Discipline Elective Course-AGB | DEC-AGB-MBA-269A | Agri-Business Finance | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 31 | Discipline Elective Course-OM | DEC-OM-MBA-271A | Technology and Innovation Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 32 | Discipline Elective Course-OM | DEC-OM-MBA-273A | Supply Chain and Logistics Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 33 | Discipline Elective Course-OM | DEC-OM-MBA-275A | Operations Research | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 34 | Discipline Elective Course-OM | DEC-OM-MBA-277A | R&D Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 35 | Discipline Elective Course-OM | DEC-OM-MBA-279A | Purchasing and Material Management | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



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| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 36 | Discipline Elective Course-BA | DEC-BA-MBA-281A | Basics of Business Analytics | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 37 | Discipline Elective Course-BA | DEC-BA-MBA-283A | Applied Multivariate Analysis | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 38 | Discipline Elective Course-BA | DEC-BA-MBA-285A | Information Economics and its Applications | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 39 | Discipline Elective Course-BA | DEC-BA-MBA-287A | Business Data Mining | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 40 | Discipline Elective Course-BA | DEC-BA-MBA-289A | Data Analytics Using R | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 41 | Discipline Elective Course-PP | DEC-PP-MBA-291A | Public Policy Formulation and Evaluation | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 42 | Discipline Elective Course-PP | DEC-PP-MBA-293A | Sustainable Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 43 | Discipline Elective Course-PP | DEC-PP-MBA-295A | Rural Development | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 44 | Discipline Elective Course-PP | DEC-PP-MBA-297A | Social Campaign Promotion | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |
| 45 | Discipline Elective Course-PP | DEC-PP-MBA-299A | Indian Social and Political System | 3 | 1 | 0 | 4 | 4 | 40 | 60 | - | 100 | 3 |



# Scheme of Examination
## MBA – 3rd Semester
## *w.e.f.* 2025-26

**Option 3: (Only research work) only the students who have completed 3 years Bachelor's Programme)**

**Second year of 2-Year MBA Program (NHEQF Level 6.5): Third Semester**

| Sr. No. | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in H |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Examination | Practical/ Viva Voce | Total | |
| 1 | Skill Enhancement Course-3 | SEC-MBA-205A | Digital Marketing | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| | | LC-MBA-207A | Digital Marketing | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| 2 | Internship-3 | INT-MBA-209A | Summer Internship Report | - | - | - | - | 4 | 50 | - | 50 | 100 | 3 |
| 3 | Research Thesis/Project-1 | RT-MBA-201A | Research Thesis/Project | - | - | - | - | 20 | 200 | 200 | 100 | 500 | 3 |
| | | TOTAL CREDIT | | | | | | 24 | | | | 600 | |

## Note:

1. Students completing the program successfully shall be awarded a 2-year PG Degree in Business Administration upon securing 88 credits.
2. Each student in the courses of Digital Marketing will be given assignments such as developing an online business model/digital marketing strategies/ employing digital marketing tactics for business expansion, etc. and the same will be evaluated by an external examiner from academia based on his/her expertise/specialization/area of interest recommended by the BOS of Department of Management Studies (GITAM )for practicum/viva-voce examination and one internal examiner recommended by the Director GITAM.
3. Students who opted for option 3 should submit a project report/synopsis of at least 50 pages comprising of literature survey, identification of research problem, plan of work, methodology as well as practical work (if any) at the end of the third semester and the same will be evaluated by internal and external examiners.
4. The viva voce in respect of the Research Thesis/Project shall be conducted by a Board of Examiners, consisting of one internal faculty member to be appointed by the Director and two external examiners from the Industry and Academic field (ordinarily not below the rank of Associate Professor and/or any professional working at a senior position from industry) out of the panel recommended by the BOS of Department of Management Studies of GITAM. (two members shall form the quorum).



| Course Code | DSC-MBA-201A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Specific Course | | | | |
| Course Title | Strategic Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the foundational concepts, processes, and significance of business policy and strategic management.<br>2. To understand various strategy types and their application at the corporate, business, and functional levels.<br>3. To understand the implementation aspects of strategy, including structural, behavioral, and functional dimensions.<br>4. To understand techniques for evaluating and controlling strategies, including McKinsey's 7S Framework. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the framework of strategic management, including strategic intent, environmental and organizational appraisal, types of strategies, implementation methods, evaluation, and control techniques. | Level-2 Understand |
| CO2 | **Apply** strategic tools and models such as SWOT, PEST, Porter's Five Forces, BCG Matrix, GE 9-cell Matrix, McKinsey's 7s Framework to formulate strategies, implement them through resource and structural planning, and evaluate their effectiveness using control techniques. | Level-3 Apply |
| CO3 | **Analyze** the internal and external environment, strategic alternatives at corporate, business, and functional levels, as well as implementation challenges related to structure, culture, leadership, and ethics, and apply strategic control systems. | Level-4 Analyze |
| CO4 | **Evaluate** strategic decisions using integrated frameworks by aligning vision, mission, goals, and strategic choices with organizational capabilities, external dynamics, implementation realities, and performance control systems. | Level-5 Evaluate |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Business Policy and Strategic Management:** Definition, Concept, Objective and Significance, The levels at which strategy operates, Characteristics of Strategic Management, An Overview: Strategic Management Process, Concept of Strategic Decision Making. Defining strategic intent: Vision, Mission, Business definition, Goals, and Objectives.<br>**Environment Appraisal:** Concept and Environmental Sector; PEST Analysis, Organizational Appraisal: Concepts and Capability Factors; Porter's Value Chain Model, Framework for developing Strategic Advantage, SWOT Analysis as a Tool for assessing Organizational Capabilities and Environment Opportunities, Strategic Agility in a VUCA World (Volatile, Uncertain, Complex, Ambiguous). |



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|---|---|
| **Unit-II** | **Type of Strategies:** Corporate Level (Concept of Grand Strategies), Business Level, and Functional Level, Guidelines for Crafting Successful Business Strategies. Strategy Analysis and Choice: Corporate Level Strategy Analysis: BCG Matrix and GE 9 cell Matrix, Business Level Strategy Analysis: Life Cycle Analysis, Porter's Five Forces of Industry Analysis, Blue Ocean Canvas in Today's Industries, Concept of Strategic Decision Making, Subjective Factors in Strategic Choice, and Process of Strategic Choice; Role of AI in enhancing strategic planning and competitive analysis. |
| **Unit-III** | **Strategy Implementation:** Interrelation Between Strategy Formulation and Implementation, Aspects of Strategy Implementation, An overview of Project, Procedural Implementation, Resource Allocation, Structural Implementation: An overview of: Structural Consideration, Structure for Strategies, Behavioural Implementation: An overview of: Leadership, Corporate Culture, Corporate Politics and Use of Power, Personal Values and Business Ethics, Functional /Operational Implementation: An overview of: Functional Strategies. |
| **Unit-IV** | **Strategy Evaluation and Control:** An Overview of Strategic Evaluation and Control, Strategic Control and Operational Control, Techniques for Strategic Evaluation and Control, Role of Organizational Systems in Evaluation, McKinsey's 7s Framework |

**Suggested Readings:**


- Business Policy and Strategic Management by Azhar Kazmi, Tata McGraw-Hill, New Delhi.
- Strategic Management and Business Policy by Wheelen and Hunger, Pearson Education.
- Strategic Management by Chandrasekharan, Oxford University Press.
- Crafting and Executing Strategy: The Quest for Competitive Advantage by A. Thompson Jr., A. J. Strickland III, and J. E. Gamble, Tata McGraw-Hill.
- Strategic Management: Concepts and Cases by Fred R. David, Pearson Education.
- Strategic Management: Competitiveness and Globalization by M. A. Hitt, R. D. Ireland, and R. E. Hoskisson, Thomson Asia Pvt. Ltd.
- Strategic Management: Strategy Formulation and Implementation by J. A. Pearce II and R. B. Robinson Jr., AITBS Publishers and Distributors, Delhi.
- Management Policy and Strategic Management: Concepts, Skills and Practices by R. M. Srivastava, Himalayan Publishing House.
- Managing in a Time of Great Change by Peter F. Drucker, Truman Talley Books / Plume, Penguin Group.


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Strategic Management Process | https://nptel.ac.in/courses/110108047 |
| | Environment Appraisal | https://nptel.ac.in/courses/110107509 |
| Unit-II | Corporate Level and Business Level Strategies | https://nptel.ac.in/courses/110105161 |
| Unit-III | Strategy Implementation | https://nptel.ac.in/courses/122105024 |
| | Case Study | https://nptel.ac.in/courses/122105024 |
| Unit-IV | McKinsey's 7s Framework | https://nptel.ac.in/courses/110108161 |



| Course Code | DEC-MKT-MBA-211A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Marketing | | | | |
| Course Title | Consumer Behavior | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the consumer behavior and the factors that influence individual and group decision-making in marketing contexts.<br>2. To understand the psychological, cultural, social, and personal aspects of consumer behavior.<br>3. To understand the consumer research methods, decision-making models, motivational drivers.<br>4. To understand the effective marketing strategies and enhancing customer satisfaction and loyalty in both domestic and global markets. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts, influences, and models of consumer behavior in marketing contexts. | Level-2 Understand |
| CO2 | **Apply** consumer behavior theories to real-world purchase situations and marketing strategies. | Level-3 Apply |
| CO3 | **Examine** the impact of branding, retailing, and advertising on consumer loyalty and opinion. | Level-3 Apply |
| CO4 | **Analyze** the influence of psychological, social, and cultural factors on consumer decision-making and their impact on buying behavior. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Consumer Behavior** and consumer research; importance of consumer Behavior; evolution of consumer Behavior; methods of studying consumer Behavior; customer centric organizations; market analysis; market segmentation, marketing mix strategies; value of brands in marketing strategy; customer loyalty and retention strategy; global marketing strategy; global marketing strategy; global advertising effectiveness; consumer decision process model; variables affecting the decision process; types of decision process; factors influencing the extent of problem solving; pre-purchase processes; need recognition; internal and external search; pre-purchase evaluation |

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|---|---|
| **Unit-II** | **Different types of purchase situations**; retailing and the purchase process, determinants of retail success or failure; point -of-purchase materials; consumer logistics; location based retailing; direct marketing consumption Behaviors; consumption experiences; importance of customer satisfaction; factors affecting satisfaction level; demographics and consumer Behavior; economic resources and consumer Behavior; personality and consumer Behavior; personal values; lifestyle motivational conflict and need priorities; motivational intensity; motivating consumer |
| **Unit-III** | **Importance of consumer knowledge**; types of consumer knowledge; sources of consumer knowledge; benefits of understanding consumer knowledge; consumer beliefs; consumer feelings; consumer attitudes; consumer intentions; culture and its effect on consumer Behavior; changing values and its effect on consumer Behavior; changing values and its effect on marketing; determinants of social class; social class and consumer Behavior; importance of families and households on consumer Behavior; role Behavior and its influence on the decision process; family life cycles; changing roles of women; children and household consumer Behavior |
| **Unit-IV** | **Group and personal influences on individuals**; reference group and its influence on individuals; transmission of influence through dyadic exchanges; word of mouth and opinion leaders in advertising and marketing strategy; diffusion of innovations; diffusion process; reaching the consumer; gaining consumer's attention; shaping consumer's opinion; opinions change; product's and advertising's role in shaping consumer opinion; cognitive learning; retrieval of information; company's role in helping consumers to remember, Consumer Protection Act 1986 and 2019: objectives, key provisions, and implications for marketers and consumers. |

**Suggested Readings:**

- Consumer Behavior by Schiffman Leon and Ramesh Kumar, Pearson Education
- Consumer Behavior: A Digital Native by Jagdish Sheth, Pearson Education.
- Consumer Behavior by Blackwell, Roger, Miniard, Paul and Engel, James Thomson Learning, New Delhi
- Consumer Behavior by Loudon, David J., Dellabitta and Albert Tata, McGraw Hill, New Delhi.
- Consumer Behavior – Buying, Having and Being by Soloman and Michael R, Pearson Education
- Consumer Behavior in Indian Perspective by Rakesh Nair, Himalaya Publishing House, New Delhi

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Consumer Behavior and Consumer Research | https://onlinecourses.nptel.ac.in/noc22_mg47/preview?utm_source |
| | Consumer decision process model | https://kristujayanti.digimat.in/nptel/courses/video/110105074/L32.html |
| **Unit-II** | Personality and Consumer Behavior | https://kongunadu.digimat.in/nptel/courses/video/110105074/L11.html |
| **Unit-III** | Importance of consumer knowledge | https://www.shiksha.com/online-courses/consumer-buying-behaviour-by-nptel-course-nptel44 |
| **Unit-IV** | Group and personal influences on individuals | https://onlinecourses.nptel.ac.in/noc24_mg45/preview |



| Course Code | DEC-MKT-MBA-213A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Marketing | | | | |
| Course Title | **Social Media Marketing** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the role of social media in marketing, advertising and public relations.<br>2. To understand the optimal use of various social media platforms for social media marketing.<br>3. To understand the importance of social media for developing an effective marketing plan.<br>4. To understand recent trends and challenges in Social Media marketing. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the concepts, tools, platforms, and trends of social media and online marketing, including SEO, content marketing, and communication strategies. | Level-2 Understand |
| CO2 | **Apply** social media marketing and digital communication strategies to formulate integrated online marketing plans and platform-specific campaigns. | Level-3 Apply |
| CO3 | **Examine** the evolving social media and digital strategies that influence customer engagement, marketing communication, and brand positioning. | Level-3 Apply |
| CO4 | **Analyze** the relationship between social media tools, online platforms, and digital marketing outcomes using appropriate metrics and insights. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Social Media Marketing-** Concept and Importance. Social Media Platforms- Online communities and Forums; Blogs and Microblogs, Social Networks, other contemporary social media platforms: Goals, Role in Marketing and Use as listening tools. Trends in SMM. Social Media Influencers, Social Marketing : Concept and Importance, Difference in Social media marketing and social marketing. |
| Unit-II | **SMM Plan- Setting Goals,** Determining Strategies, Identifying Target Market, Selecting Tools, Selecting Platforms, Implementation: Measuring Effectiveness - Conversion rate, amplification rate, applause rate: on page and on post level. |

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|---|---|
| **Unit-III** | **Online Marketing Planning and Setup:** Online marketing communications and channel mix, Online marketing planning development, Understanding digital media planning terminology, Digital media planning stages, Designing the communication mix, Marketing communications from mass market to mass customized, Steps to creating marketing communications strategy, Understanding marketing operations set-up. |
| **Unit-IV** | **Search Engine Optimisation (SEO)** Introduction, Understanding SEO, User Insights, Benefits and Challenges, Content Marketing, Traditional Media vs Social Media, recent trends and challenges in Social Media marketing. |

**Suggested Readings:**

- Marketing Management in India by Keller, K. L and Kotler, P, Pearson Education.
- Marketing Management by Mamoria C.B and Bhatacahrya A., Kitab Mahal, Delhi
- Digital Marketing by Mathur,V. and Arora S., PHI Learning
- Social Media Marketing by Tracy L Tuten and Michael R Solomon, Sage Publications Ltd
- Digital Marketing by Mathur,V. and Arora S., PHI Learning
- Digital Marketing by Ahuja V, Oxford University Press.
- The Digital Marketing Handbook: Deliver Powerful Digital Campaigns by Simon Kingsnorth, Kogan Page.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Social Media Marketing- Concept and Importance | https://onlinecourses.nptel.ac.in/noc25_mg45/preview |
| **Unit-I** | Trends in Social Media Marketing | https://onlinecourses.nptel.ac.in/noc24_mg25/preview |
| **Unit-II** | Identifying Target Market | http://www.digimat.in/nptel/courses/video/110104068/L01.html |
| **Unit-III** | Online Marketing Planning | http://www.digimat.in/nptel/courses/video/110107158/L24.html |
| **Unit-III** | Understanding marketing operations set-up | https://onlinecourses.nptel.ac.in/noc25_mg26/preview |
| **Unit-IV** | Recent trends and challenges in Social Media marketing. | https://srmuniv.digimat.in/nptel/courses/video/110104055/L13.html |



| Course Code | DEC-MKT-MBA-215A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Marketing | | | | |
| Course Title | Retail Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the comprehensive knowledge of the retail industry, including its evolution, structure, and operational strategies.<br>2. To understand the consumer behavior, retail formats, and the application of retail mix elements.<br>3. To understand the retail location planning, store design, merchandise management, pricing, and promotional strategies.<br>4. To understand the role of technology, supply chain integration, and contemporary developments such as e-retailing and foreign direct investment (FDI) in retail, preparing students for diverse careers in the retail sector. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts, formats, functions, and trends in retailing, including consumer behavior, retail mix, merchandise planning, and retail technology. | Level-1 Understand |
| CO2 | **Use** retail management principles to plan store formats, manage merchandise, and optimize retail site selection and consumer experience. | Level-3 Apply |
| CO3 | **Apply** technological innovations, supply chain practices, and retail formats to influence competitive advantage and customer engagement. | Level-3 Apply |
| CO4 | **Analyze** the interrelationship between retail location, merchandising strategies, and consumer behavior in achieving retail success. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Retail-** Evolution of Retail, Organised vs. Unorganised retailing, Retail Mix, theories of retail development, Types of Retailers; Careers in Retailing; understanding Consumers. |
| Unit-II | **Retail Locations-** Planned and Unplanned, Retail Site Location- Site Characteristics, Trade Area Characteristics, Location and Site Evaluation; Store Layout and Design; Space Management; Visual Merchandising; Atmospherics |

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|---|---|
| **Unit-III** | **Managing Merchandise** - Merchandise Planning, Process, Forecasting Sales, Developing Assortment Plans, National Brands and Private Labels; Sales force automation Retail Pricing-Setting Retail Prices, Price Adjustments, Pricing Strategies; Retail Communication Mix. |
| **Unit-IV** | **Information and Supply Chain Management-** Information Flows, Logistics, Distribution Centre. Contemporary issues in Retail- Significance of retail as an industry, Retail scenario at International and National Level, Technology in Retailing, Multi-channel Retailing, E-Retailing: Future of e-retailing, Challenges for traditional retail and e-retail, FDI in Retail. |

**Suggested Readings:**

- Retailing Management Text and Cases by Pradhan, S.,McGraw Hill Education, New Delhi.
- Retail Management; A Strategic Approach by Berman, Barry and Evans Joel, Pearson Education.
- Retailing Management by Micheal Levy, Barton Weitz and Ajay Pandit, Tata McGraw Hill, New Delhi.
- Retail Management by Gibson G.Vedamani, Pearson Education.
- Retailing: Environment and Operations, by Newman, Andrew, J. and Cullen, Peter, Vikas Publishing House, New Delhi
- Retail Marketing Management by Gilbert and David, Pearson Education.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Retail | https://onlinecourses.nptel.ac.in/noc22_mg51/preview |
| | Theories of retail development | http://digimat.in/nptel/courses/video/110107167/L07.html |
| **Unit-II** | Retail Site Location | https://onlinecourses.nptel.ac.in/noc23_mg100/preview |
| **Unit-III** | Forecasting Sales | http://digimat.in/nptel/courses/video/110107163/L09.html |
| | Pricing Strategies | https://onlinecourses.nptel.ac.in/noc23_mg100/preview |
| **Unit-IV** | FDI in Retail | https://onlinecourses.nptel.ac.in/noc20_mg10/preview |



| Course Code | DEC-MKT-MBA-217A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Marketing | | | | |
| Course Title | **Service Marketing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the unique characteristics and challenges of marketing in service-based industries.<br>2. To understand the service concepts, consumer behavior, and service marketing strategies.<br>3. To understand the effective service innovation, blueprinting, customer relationship management, and service recovery.<br>4. To understand the effective role of employees, technology, and intermediaries in service delivery. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the key concepts, frameworks, and characteristics of services marketing, including customer behavior, service classification, design, and delivery challenges. | Level-2 Understand |
| CO2 | **Apply** services marketing principles to implement customer expectations, develop service strategies, and manage service experiences across industries. | Level-3 Apply |
| CO3 | **Demonstrate** the extent to which strategic planning in services—covering innovation, communication, pricing, and recovery—impacts service quality and customer satisfaction. | Level-3 Apply |
| CO4 | **Analyze** the interrelationship between service design, customer experience, and service performance in achieving service excellence. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Services: Service and Technology**, Goods versus Services, Service Marketing Mix, Gap model of Services, important service industries-Hospitality and Tourism, Transportation, Telecom, Banking and Insurance, Education and Entertainment, Healthcare.<br>Service classification and challenges in Service Business. |



| | |
|---|---|
| **Unit-II** | **Focus on the Customer:** Consumer Behaviour in Services, Customer Expectation of Services, and Customer perception of services. Elements in an effective services marketing research programme, Building customer relationship, Relationship development strategies, Reasons of Service failure, Service recovery and strategies |
| **Unit-III** | **Aligning Service design and standards:** Challenges of Services Innovation and design, new service development process Service Blueprinting, Customer-defined service standards and its types, Physical evidence and types of services cape, Strategic roles of services cape |
| **Unit-IV** | **Delivering and performing services:** Employees role in service delivery, Customers role in service delivery, AI driven support system, Delivering services through intermediaries and electronic channels, Strategies for matching capacity and demand, Key service communication challenges, Approaches to pricing services, Financial and Economic impact of services. |

**Suggested Readings:**

- Services Marketing by Lovelock, C., Wirtz, J.and Chatterjee J., Pearson Education.
- Service Marketing by Zeithaml,V., Bitner, M.J., Gremler, D.D. and Pandit A., McGraw Hill publication.
- Essentials of Services Marketing by Gopal Das, Pearson Education.
- Service marketing: Indian Context by Srinivasan, PHI publication.
- Handbook of Service Marketing and Management by Swartz and T. Iqcobucci D., Sage Publication.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Service Marketing | http://digimat.in/nptel/courses/video/110105078/L02.html |
| Unit-II | Consumer Behaviour in Services marketing | http://digimat.in/nptel/courses/video/110107142/L04.html |
| | Building customer relationship | https://onlinecourses.nptel.ac.in/noc22_mg93/preview |
| Unit-III | New service development process | https://onlinecourses.swayam2.ac.in/imb19_mg01/preview |
| Unit-IV | Customers role in service delivery | http://digimat.in/nptel/courses/video/110107434/L35.html |



| Course Code | DEC-MKT-MBA-219A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Marketing | | | | |
| Course Title | **Marketing Research and Analytics** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the marketing research, its design, and application of research methodology to Marketing issues.<br>2. To understand and impart knowledge on the concepts of measurement and scaling.<br>3. To understand the role of marketing research methodology in different business contexts.<br>4. To understand the concept of Report Preparation and Presentation. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the purpose, scope, and ethical considerations of marketing research and its role in informed marketing decision-making. | Level-2 Understand |
| CO2 | **Apply** marketing research techniques to formulate research problems, design effective studies, and collect relevant data using appropriate sampling and data collection methods. | Level-3 Apply |
| CO3 | **Use** the marketing research process to determine its impact on marketing Decisions | Level-3 Apply |
| CO4 | **Analyze** sampling techniques, data collection methods, and statistical tools to interpret research findings and improve marketing decision-making. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Marketing Research:** Meaning and Scope of Marketing Research, Factors that Influence Marketing Research, Scope of Marketing Research, Limitations of Marketing Research, Marketing Research Process, Role of Marketing Research in Marketing Decision-making, International Marketing Research, Marketing Research in social media, Mobile Marketing Research, Ethics in Marketing Research, Use of Information Technology in Marketing Research. |
| Unit-II | **Marketing Research Design:** The Process of Defining the Problem and Developing an Approach, Defining a Marketing Research Problem, Exploratory, Descriptive, Casual Research Design, Marketing Research Proposal |

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|---|---|
| **Unit-III** | **Sampling and Data Collection:** Sampling Design Process, Classification of Sampling Techniques, Probability and Non-Probability Sampling Techniques, Internet Sampling, Sampling Distribution, Sample Size Determination, Non-Response Issues in Sampling. Sources of Data Collection, Methods of Data Collection. |
| **Unit-IV** | **Analysis and Presentation of Data:** Data Preparation, Data Preparation Process, Statistically Adjusting Data, Frequency Distribution, Cross Tabulation, Hypothesis Testing, BiVariate Analysis, Correlation, Regression, Multivariate Analysis, Discriminant, Logit Analysis, Factor Analysis, Cluster Analysis. Report Writing, Report Preparation and Presentation |

**Suggested Readings:**

- R for Marketing Research and Analytics by Chris Chapman and Elea McDonnell Feit, Springer International Publishing.
- Marketing Analytics by V. Kumar, Robert P. Leone, David A. Aaker, and George S. Day John, Hill Publishing.
- Marketing Research: Delivering Customer Insight by Alan Wilson, Pearson Publishing.
- Marketing Research by R.C. Agarwal and Dr. N.S. Kothari, SBPD Publishing House.
- Marketing Research –Measurement & Method by Donald S. Tull, Del I. Hawkins, PHI Private Limited.
- Marketing Research by Naresh Malhotra and Satyabhushan Dash, Pearson Publishing.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Meaning and Scope of Marketing Research | https://onlinecourses.nptel.ac.in/noc24_mg137/preview |
| | Ethics in Marketing Research | https://onlinecourses.swayam2.ac.in/ugc19_ge04/preview |
| **Unit-II** | Marketing Research Design | https://onlinecourses.nptel.ac.in/noc24_mg134/preview |
| **Unit-III** | Sampling and Data Collection | https://onlinecourses.nptel.ac.in/noc20_mm11/preview |
| | Methods of Data Collection | https://onlinecourses.nptel.ac.in/noc24_mm09/preview |
| **Unit-IV** | Hypothesis Testing | https://nptel.ac.in/courses/103106120 |



| Course Code | DEC-FIN-MBA-221A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Finance | | | | |
| Course Title | **Indian Financial System and Financial Services** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the financial system and its reforms.<br>2. To understand money markets, capital markets, and SEBI.<br>3. To understand the roles of key financial institutions.<br>4. To understand financial inclusion and microfinance. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the structure and components of the Indian financial system. | Level-2 Understand |
| CO2 | **Demonstrate** the regulatory framework and policies governing the Indian financial system. | Level-3 Apply |
| CO3 | **Apply** Indian financial system concepts to real-world roles of institutions, markets, and regulators. | Level-3 Apply |
| CO4 | **Analyze** the mechanisms & regulations of the Indian financial system and market in a real world scenario. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Financial System** – Meaning, components, and functions, Reforms in Indian Financial System – Key developments and regulatory changes, Money Market – Structure, functions, and key segments (Call money, Treasury bills, Commercial papers, etc. |
| **Unit-II** | **Capital Market**- New issue market; Stock Exchange and its functions; trading in stock exchange; NSE; OTCEI; depositories and custodians; Role and Functions of SEBI; New Financial Instruments. |
| **Unit-III** | **Commercial Banks** – Functions, role in credit and deposit mobilization, Regional Rural Banks (RRBs) – Objectives, rural credit role, Development Banks – SIDBI, NABARD, IDBI; functions and development role, Non-Banking Financial Companies (NBFCs) – Types, role, differences from banks, EXIM Bank – Functions, role in foreign trade finance, Reserve Bank of India (RBI) – Functions, monetary policy, regulatory role.<br>**Banking Operations and Instruments**: Negotiable Instruments: Types, features, legal framework (NI Act. 1981), and role in financial Transactions. |



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|---|---|
| **Unit-IV** | **LICI (Life Insurance Corporation of India)** – Role in life insurance and long-term finance, UTI (Unit Trust of India) – Functions and contribution to capital markets, SIDBI (Small Industries Development Bank of India) – Support for MSMEs, NABARD (National Bank for Agriculture and Rural Development) – Role in rural and agricultural finance, Micro Finance – Concept, institutions, and role in poverty alleviation, Financial Inclusion – Meaning, need, and government initiatives. |

**Suggested Readings:**

- Management of Banking and Financial Services by Suresh, P. and Paul, J., Pearson Education.
- Indian Financial System by Khan, M.Y., Tata McGraw Hill.
- Financial Markets, Institutions and Financial Services by Clifford, *G.*, PHI Learning.
- Management of Financial Services by Khan, M.Y., McGraw-Hill.
- Emerging Scenario of Financial Services by Gordan, E. and K. Natrajan, Himalaya Publishing House.
- Financial Institutions and Market by Khan, M.Y., McGraw-Hill.
- Financial Institutions and Market by Bhole, L.M., McGraw-Hill.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Financial System | https://onlinecourses.nptel.ac.in/noc20_mg10/preview |
| **Unit-II** | Capital Market, SEBI | https://onlinecourses.nptel.ac.in/noc24_mg20/preview?utm_source=chatgpt.com |
| **Unit-III** | Commercial Banks | https://onlinecourses.nptel.ac.in/noc25_mg22/preview?utm_source=chatgpt.com |
| **Unit-IV** | LIC; UTI; SIDBI; NABARD | https://onlinecourses.nptel.ac.in/noc24_mg20/preview?utm_source=chatgpt.com |
| | Micro Finance, Financial Inclusion | https://onlinecourses.nptel.ac.in/noc22_mg20/preview |



| Course Code | DEC-FIN-MBA-223A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Finance | | | | |
| Course Title | **Project Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand capital investment and budgeting phases.<br>2. To understand and evaluate project opportunities.<br>3. To understand financial and risk appraisal techniques.<br>4. To understand project financing and management basics. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts of project management. | Level-2 Understand |
| CO2 | **Apply** capital budgeting techniques to determine project feasibility. | Level-3 Apply |
| CO3 | **Apply** project analysis tools to examine key factors influencing investment decisions. | Level-3 Apply |
| CO4 | **Analyze** financial and social aspects to support strategic decision-making. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Capital Investment-** need, types, phases of capital budgeting, Generation and Screening of Project Ideas- corporate appraisal, monitoring the environment and identifying investment opportunities, scouting the project ideas and project rating, Market and Demand Analysis, Technical Analysis. |
| **Unit-II** | **Financial Estimates and Investment Appraisal Criteria-** Estimation of investment, revenue and production cost, working capital requirement, Evaluation techniques of capital investment decisions. Project Portfolio Management (PPM) |
| **Unit-III** | **Project Risk Analysis-** types of Risk, Risk adjusted discount rate method, certainty equivalent coefficient method, sensitivity analysis, decision tree analysis. Weighted average cost of capital (WACC) and its relevance in financial decision making, financing of projects, Project Appraisal by Financial institutions. |
| **Unit-IV** | **Social Cost Benefit Analysis (SCBA):** Rationale for SCBA, UNIDO Approach. Project Management and Review: Forms of project Organization, project planning and control, human aspect of project management, Behavioral Project Management, pre-requisite for successful project implementation. |

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**Suggested Readings:**

- Project Planning: Analysis, Selection, Implementation and Review by Prasanna Chandra, TMH (Tata McGraw-Hill)
- Project Management by Pradeep Pai, Pearson Education
- Project Management and Appraisal by Khatua, Oxford University Press
- Project Management for Business and Technology: Principles and Practice by Nicholas, Pearson Education
- Practical Project Management by R.G. Ghattas and S.L. McKee, Pearson Education Asia
- Project Management by P.K. Pinto, Pearson Education
- Project Management by K. Nagarajan, New Age International Publishers.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Project Management basic | https://onlinecourses.nptel.ac.in/noc24_mg01/preview |
| Unit-II | Financial Estimates and Investment Appraisal Criteria | https://onlinecourses.nptel.ac.in/noc21_mg93/preview |
| Unit-III | Project Risk Analysis | https://archive.nptel.ac.in/courses/110/104/110104073/ |
| Unit-IV | Social Cost Benefit Analysis (SCBA), UNIDO Approach of SCBA | https://onlinecourses.nptel.ac.in/noc22_ce59/preview?utm_source=chatgpt.com |
| | Project Management | https://onlinecourses.nptel.ac.in/noc23_mg124/preview?utm_source=chatgpt.com |



| Course Code | DEC-FIN-MBA-225A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Finance | | | | |
| Course Title | **Business Taxation** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand core concepts of Income Tax and GST.<br>2. To understand income under various heads and apply deductions.<br>3. To understand tax assessment, TDS, and advance tax provisions.<br>4. To understand tax planning from tax avoidance and evasion. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts of Tax in India. | Level-2 Understand |
| CO2 | **Apply** provisions of tax to compute the total income and tax liability of individuals and companies. | Level-3 Apply |
| CO3 | **Apply** tax concepts and structure to examine tax implications of individual and business transactions. | Level-3 Apply |
| CO4 | **Analyze** tax provisions to identify the implications of tax planning, tax avoidance, and tax evasion. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Basic Concepts of Income Tax, Residential status and tax incidence, Incomes exempt from tax, Computation of Income under the head Salary and House Property. |
| **Unit-II** | Computation of Income under the head Business and Profession, Capital Gains, Income from Other Sources, Clubbing of income, Set off and Carry forward of Losses. |
| **Unit-III** | General Deductions, Assessment of Individual and Company, Provision with regard to TDS and advance tax, Basic understanding of tax planning and its distinction from tax avoidance and tax evasion, Taxation of Startups and Angel Investment. |
| **Unit-IV** | GST: Rationale for GST; features of GST law in India, structure of GST (SGST, CGST, UTGST and IGST); rates of GST, models of GST, GST Council. |

**Suggested Readings:**

- Direct Taxes Law and Practice by Vinod K. Singhania and Kapil Singhania, Taxmann Publications Pvt. Ltd., New Delhi (67th edition, 2022).

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- Income Tax Law and Practice by V. P. Gaur et al., Kalyani Publishers, Ludhiana (50th edition, 2022).
- Direct Tax Laws and International Taxation by T. N. Manoharan, Snow White Publications Pvt. Ltd., Mumbai (2022).
- Problems and Solutions in Income Tax by S. P. Mehrotra and S. P. Goyal, Sahitya Bhavan Publications, Agra (2022).
- Practical Income Tax by V. P. Gaur et al., Kalyani Publishers, Ludhiana (37th edition, 2022).

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Basic Concepts of Income Tax | https://onlinecourses.swayam2.ac.in/cec24_cm09/preview |
| Unit-II | Computation of Income | https://onlinecourses.swayam2.ac.in/cec25_cm01/preview?utm_source=chatgpt.com |
| Unit-III | General Deductions | https://onlinecourses.swayam2.ac.in/cec24_cm07/preview |
| Unit-IV | GST | https://onlinecourses.nptel.ac.in/noc24_mg138/preview |



| Course Code | DEC-FIN-MBA-227A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Finance | | | | |
| Course Title | **Behavioral Finance** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the evolution of behavioral finance.<br>2. To understand cognitive biases and their impact on decision-making.<br>3. To understand behavioral finance applications in markets and investments.<br>4. To understand investor behavior and corporate finance decisions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts in behavioral finance and market inefficiencies. | Level-2 Understand |
| CO2 | **Apply** behavioral finance concepts to real-world scenarios in both individual and corporate finance contexts. | Level-3 Apply |
| CO3 | **Apply** behavioral finance principles to examine decision-making in financial markets. | Level-3 Apply |
| CO4 | **Analyze** the impact of behavioral finance on financial decision-making and market behavior in real-world scenarios. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Behavioral Finance**-Overview, History of Behavioral Finance; From standard finance to behavioral finance- Are financial markets efficient?, Limits to arbitrage- Fundamental Risk, Noise Trader Risk, Implementation cost, evidence of limits to arbitrage |
| **Unit-II** | **Cognitive Biases, Beliefs, and Heuristics-Prospect Theory**: Loss Aversion, Framing, and Ambiguity Aversion, Heuristics and Biases: Representativeness, Availability, Anchoring, Overconfidence, OptimismMental Accounting, Self-Control, and Regret Avoidance, Endowment Effect, Disposition Effect, Herd Behavior, and Hindsight Bias |
| **Unit-III** | **Investor Behavior and Application in Financial Markets-** Aggregate Stock Market: Equity Premium Puzzle, Volatility Puzzle,The Cross Section of Average Returns: Size Premium, Momentum, and Long-Term Reversals,Investor Behavior: Insufficient Diversification, Naïve Diversification, Excessive Trading, and Buying/Selling Decisions |

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|---|---|
| **Unit-IV** | **Behavioral Applications in Corporate Finance**-Security Issuance, Capital Structure, and Investment Decisions, Managerial Irrationality in Corporate Finance |

**Suggested Readings:**

- Behavioral Finance by William Forbes, Wiley (2009).
- Behavioral Finance: Psychology, Decision-Making and Markets by L. F. Ackert and R. Deaves, South-Western College Publication.
- Investor Behavior: The Psychology of Financial Planning and Investing by H. K. Baker and V. Ricciardi, Wiley (2018).
- Personal Finance (11th ed.) by Jack Kapoor, Les Dlabay, and R. J. Hughes, McGraw Hill.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Behavioral Finance,Cognitive Biases, Beliefs, and Heuristics | https://onlinecourses.nptel.ac.in/noc20_mg33/preview |
| **Unit -IV** | Investor Behavior and Application in Financial Markets,Behavioral Applications in Corporate Finance | https://onlinecourses.nptel.ac.in/noc22_mg20/preview |



| Course Code | DEC-FIN-MBA-229A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-Finance | | | | |
| Course Title | **Insurance and Risk Management** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand basic concepts and types of insurance.<br>2. To understand insurance regulations and institutions.<br>3. To understand insurance products, premiums, and claims processes.<br>4. To Understand risk management and its processes. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the fundamental and regulatory framework of the insurance sector. | Level-2 Understand |
| CO2 | **Apply** insurance principles and regulations to current insurance products in today's market. | Level-3 Apply |
| CO3 | **Apply** risk management techniques in insurance operations. | Level-3 Apply |
| CO4 | **Analyze** insurance strategies and their impact on pricing and wealth. in real world scenario. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Insurance**-Concept, Nature, Classification-Life and Non-life, Functions, Importance and Principles of Insurance; IRDA Act 1999 - Organization, guidelines for life and Non-life insurance. |
| **Unit-II** | **Life Insurance** -Concept; Public and Pvt. Sector companies in India - their products, schemes and plans; LIC Act 1956-An overview. **General Insurance** - Concept, Types; Public and Pvt. Sector companies in India – their products, schemes and plans. Motor Insurance and Health Insurance in India. |
| **Unit-III** | **Bases and mechanism for Insurance Premium calculation;** Distribution channel in Insurance-Introduction, Individual Agents-Appointment, functions, code of conduct and remuneration; Claims settlement in Life Insurance and General Insurance. |
| **Unit-IV** | **Risk and its Management:** Objectives of Risk Management, Risk Identification and Measurement, Risk Pooling Arrangements and Diversifications, Process of Risk Management. Risk Management and Shareholder's Wealth. Risk Pricing. Process of Risk Control, Loss Prevention, Techniques of Risk Retention and Reduction, Behavioral Economics in Risk Management. |

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**Suggested Readings:**

- Insurance Theory and Practice by Nalini Prave Tripathy, Prabir Pal, TMH (Tata McGraw-Hill)
- Principles of Risk Management and Insurance by George E. Rejda, Pearson Education
- Insurance Management by K.P. Singh, B.S. Bodla, M.C. Garg, Deep and Deep Publications, Delhi
- Insurance by M.N. Mishra, Vikas Publication
- Risk Management and Insurance by Harrington and Mehaus, Tata McGraw-Hill
- Principles of Risk Management and Insurance by George Rejda, Pearson Education

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Fundamental of Insurance | https://onlinecourses.swayam2.ac.in/cec24_mg17/preview |
| Unit-II | Life Insurance, General Insurance, Motor Insurance and Health Insurance | https://onlinecourses.swayam2.ac.in/cec24_mg17/preview |
| Unit-III | Bases and mechanism for Insurance Premium calculation | https://archive.nptel.ac.in/courses/111/104/111104089/?utm_source=chatgpt.com |
| Unit-IV | Risk and its Management | https://archive.nptel.ac.in/courses/110/107/110107128/ |



| Course Code | DEC-HR-MBA-231A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-HR | | | | |
| Course Title | **Compensation Management** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the role of compensation in organizations through economic and behavioral theories, strategic approaches, and motivational aspects.<br>2. To understand how to ensure fairness in compensation by evaluating jobs, analyzing industry pay differences, and designing comprehensive pay structures.<br>3. To understand the unique compensation needs of special employee groups, including executives, professionals, and international employees.<br>4. To understand the legal and institutional framework governing compensation systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts and principles related to compensation systems. | Level-2 Understand |
| CO2 | **Apply** key principles to structure and modify reward management systems and assess their effectiveness within organizational contexts. | Level-3 Apply |
| CO3 | **Apply** knowledge of strategic compensation to examine employer approaches in managing legally required benefits. | Level-3 Apply |
| CO4 | **Analyze** compensation-related issues affecting human resource practices and organizational performance. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Compensation:** concept, objectives, financial and non-financial compensation system, economic and behavioural theories related to compensation; strategic perspectives of compensation; compensation as motivational tool; compensation policy, International Compensation- concept, objectives and methods. |



| | |
|---|---|
| **Unit-II** | **Internal and external equities in the compensation system:** determining the worth of jobs; understanding inter and intra-industry compensation differentials, designing pay structure and administering compensation packages; understanding different components of compensation packages like fringe benefits, incentives and retirement plans; pay for performance plans. |
| **Unit-III** | **Compensation of special groups:** Corporate Directors, Chief Executives, Senior Managers; components of executive compensation package; compensation of professionals and knowledge workers, R&D staff, sales compensation plan, international compensation. |
| **Unit-IV** | **Statutory provisions governing different components of reward systems:** working of different institutions related to reward systems like wage boards, pay commissions, role of trade unions in compensation management; tax planning. |

**Suggested Readings:**

- Compensation by Milkovich, George T and Newman J.M., Tata McGraw Hill.
- Compensation Management by Henderson, R.O., Pearson Education.
- Strategic Compensation by Martocchio, J.J., Pearson Education.
- Reward Management by Armstrong, M and Murlis H, Kogan Page, UK.
- Compensation Reward Management by Singh, B.D., Excel Books, New Delhi.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Performance and Reward Management | https://nptel.ac.in/courses/110105137 |
| Unit-II | Employee benefits and pension schemes | https://srmuniv.digimat.in/nptel/courses/video/110105137/L49.html |
| Unit-III | Sales Force Management: Compensation | https://terna.digimat.in/nptel/courses/video/110105122/L28.html |
| Unit-IV | Taxes and financial planning | http://digimat.in/nptel/courses/video/110105144/L27.html |



| Course Code | DEC-HR-MBA-233A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-HR | | | | |
| Course Title | **Management of Industrial Relations** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the foundational concepts, evolution, and key aspects of industrial relations and trade unions, including their role in relation to the state.<br>2. To understand the processes and structures of collective bargaining, participative management, and grievance handling for effective industrial relations.<br>3. To understand major labour laws in India and the mechanisms for resolving industrial disputes and promoting fair labour practices.<br>4. To understand global trends and international practices in industrial relations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the concept of industrial relation at the micro and macro levels. | Level-2 Understand |
| CO2 | **Apply** knowledge of industrial relations institutions to illustrate their role in shaping labor-management outcomes in workplace scenarios. | Level-3 Apply |
| CO3 | **Examine** industrial relation problems based on research and assessment of current practices. | Level-3 Apply |
| CO4 | **Analyze** current and emerging trends in industrial relations in the real world. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Industrial relations:** concepts, evolution, significance, perspectives and organization; Anatomy of industrial relations; industrial relations and the state; Trade unions :concept, significance, types, approaches and objectives, Problems of trade unions in India and recommendations of national commission on labour for strengthening of trade unions. |
| **Unit-II** | **Collective bargaining:** concept, importance and process of bargaining; participative management: Forms of workers' participative management in India; tripartite and bipartite bodies; standing orders and grievance procedure; code of discipline. |

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|---|---|
| **Unit-III** | **Industrial relations Acts:** Trade union act-1948, Industrial Disputes Act-1947, Industrial disputes: conciliation, arbitration, adjudication, recent trends in industrial disputes-lay off, termination, retrenchment, closures; Payment of wages act-1936, Minimum wages act-1948. |
| **Unit-IV** | **Modern and international scenario of industrial relations:** Industrial relations and technological change; Industrial relations and HRD; ILO and industrial relations; legal framework of Industrial relations; industrial relations systems in India, UK, USA and Japan. |

**Suggested Readings:**

- Industrial Relations, Trade Union and Labor Legislation by PRN Sinha and I.B Sinha, Pearson Education.
- Human Resource planning by Bhattacharya Dipak Kumar, Excel Books.
- Human Resource Planning: Approaches, Needs, Assessment and Priorities in Manpower Planning, by Srivastava, M.P.,Manak Publications, Pvt. Limited, New Delhi.
- Strategic Human Resource Planning by Belcourt, Monica & J. McBey, Kenneth, Cengage Learning India.
- Human Resource Planning by Srivastava, M.P. Institute of Applied Manpower Research, New Delhi.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Trade Union Act, 1926 | https://kongunadu.digimat.in/nptel/courses/video/110103506/L09.html |
| **Unit-II** | Collective bargaining | http://www.digimat.in/nptel/courses/video/110103506/L15.html |
| **Unit-III** | Industrial disputes | https://tkiet.digimat.in/nptel/courses/video/110103506/L11.html |
| **Unit-IV** | Labour Welfare and Industrial Relations | http://kcl.digimat.in/nptel/courses/video/110103506/L19.html |



| Course Code | DEC-IIR-MBA-235A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-HR | | | | |
| Course Title | **Cross Cultural Human Resource Management** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand key HR concepts and the impact of cultural differences in global organizations.<br>2. To understand models of cultural diversity and their effect on cross-cultural communication.<br>3. To understand global HR practices like staffing, training, performance, and compensation in MNCs.<br>4. To understand international labor standards, CSR, repatriation, and emerging global HRM trends. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the value of culture in human resource management. | Level-2 Understand |
| CO2 | **Determine** the ways and mechanisms to manage cross cultural barriers. | Level-3 Apply |
| CO3 | **Examine** the HR challenges like performance appraisal system and change & development. | Level-3 Apply |
| CO4 | **Analyze** the role of legislation and regulations in International labour standards. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** Concept, objectives and significance, managing human resources in the global business environment; human and cultural variables in global organizations; workforce diversity and managerial Implications; role of values in dealing with cultural diversity. |
| **Unit-II** | **Approaches to Manage Cultural Diversity**: achieve global model for cultural differences, Halls and Halls cross cultural classification and Hofstede six key dimensions, cross cultural differences in communications. |
| **Unit-III** | **GHRM**: The Contingency Matrix approach to GHRM. Global staffing and staff flow practices. Global organization structures, Training & development of global employees, Performance management in MNCs, Global compensation practices, MNCs and industrial relations trends. |
| **Unit-IV** | **Labour legislation:** International Labour Standards. International transfer and repatriation strategies, Corporate Social Responsibility in Global Scenario. Emerging global HRM practices. |

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**Suggested Readings:**

- International HRM by Gupta, S.C. Macmillan India
- International HRM by Ray and French, University Press
- Transnational Management: Text, Cases and Readings in Cross Border Management by Bartlett, Cand Ghoshal, S.,Chicago, Irwin
- The Global Challenge- framework for international human resource management by Evans, Pucik and Barsoux, Tata McGraw-Hill Irwin.
- International Human Resource Management by Dowling, Peter J and Welch, Denice E., Cengage Learning
- International Human Resource Management by Aswathappa, K, McGraw Hill
- International Human Resource Management by Tayeb, Monir H., Oxford University Press
- International Human resource Management by Rao, P.L., Excel Books

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Workforce Diversity | http://www.digimat.in/nptel/courses/video/110103433/L07.html |
| Unit-II | Cross Cultural Communication | https://kristujayanti.digimat.in/nptel/courses/video/109104031/L36.html |
| Unit-III | Training and development of global employees | http://kcl.digimat.in/nptel/courses/video/109105192/L09.html |
| Unit-IV | Corporate Social Responsibility | https://kongunadu.digimat.in/nptel/courses/video/110105081/L07.html |



| Course Code | DEC-HR-MBA-237A | | | | |
|---|---|---|---|---|---|
| Category | Discipline elective course-HR | | | | |
| Course Title | **Indian Labour Legislation** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of labour laws and the factors influencing their development.<br>2. To understand industrial jurisprudence and the enforcement of labour laws in India.<br>3. To understand major labour laws and their practical applications.<br>4. To understand contemporary labour law reforms and stakeholder views.<br>5. To understand gender justice in labour laws and key judicial rulings. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the relevance of labour laws. | Level-2 Understand |
| CO2 | **Apply** appropriate mechanisms to resolve industrial disputes. | Level-3 Apply |
| CO3 | **Demonstrate** the rights of labour. | Level-3 Apply |
| CO4 | **Analyze** the relevance of regulations in protecting and promoting labour rights. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction Labour Legislations:** Nature, Objectives, Need, Classification/Types of Labour Legislation; Principles of Modern Labour Legislation; Factors Influencing Labour Legislations; Indian Constitution and Labour Legislation. |
| **Unit-II** | **Jurisprudence:** Meaning and scope of Industrial Jurisprudence, Principles of Industrial Adjudication, Challenges and problems in Labour Laws, Approaches to Labour Laws enforcement in India. |
| **Unit-III** | **The Regulative & Protective Labour Legislations:** The Trade Unions Act, 1926; The Industrial Disputes Act, 1947, The Industrial Employment (Standing Orders) Act, 1946, The Factories Act, 1948. |
| **Unit-IV** | **Contemporary Issues:** Need of Labour Law Reforms, New proposed Labour Codes; Govt , trade unions , employer and employees perspective in new framework of Labour Laws and labour reforms. Gender Justice: Constitutional Aspects, Legal Aspects. |

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**Suggested Readings:**

- Industrial and Labour Laws by S. C. Srivastav, Vikas Publishing Houses.
- Industrial Law by Malik, P.L., Eastern Book Company, Lucknow.
- Labour and Industrial Relations Law by Goswami, V.G., Central Law Agency, Allahabad.
- Industrial Jurisprudence by Sharma, A.M., Himala Pub. House, New Delhi.
- Labour and Industrial Laws by Mishra P.N., Central Law Publishing, Allahabad.
- Industrial Relations and Labour Legislations by Sinha, P.R.N., Oxford and IBH Publishing Co., New Delhi.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | New Labour Codes of India | https://onlinecourses.nptel.ac.in/noc22_lw05/preview |
| Unit-III | Labour Welfare and Industrial Relations | https://onlinecourses.nptel.ac.in/noc24_mg104/preview |
| Unit-IV | Gender Justice and Workplace Security | https://onlinecourses.nptel.ac.in/noc19_hs57/preview |



| Course Code | DEC-HR-MBA-239A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-HR | | | | |
| Course Title | **Human Resource Metrics and Analytics** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the evolution, types, and applications of HR analytics and HRIS, along with key HR metrics and data management techniques.<br>2. To understand practical aspects of e-HRM systems, HRIS implementation, data security, and basic statistical tools for HR analysis using Excel.<br>3. To understand analytical methods for HR benchmarking, forecasting, compensation analysis, and ROI-based decision-making.<br>4. To understand the strategic role of HR analytics, including data modeling, managing resistance, and using new data sources for workforce insights. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts of HR Metrics and Analytics. | Level-2 Understand |
| CO2 | **Examine** HR-related problems and make data-driven decisions based on evidence rather than opinion. | Level-3 Apply |
| CO3 | **Applying** HR metrics and analytics techniques that help in improving workplace practices. | Level-3 Apply |
| CO4 | **Analyze** HR information system and analytics to support effective real-world decision-making. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **HR Metrics and Analytics:** Concept, components, need, evolution and significance; Types and Measures - HR Productivity Metrics and Human Capital Metrics. HR Analytics Maturity Model, CEO/ Managers - HR expectations on Analytics, understanding HR indicators, metrics and data, Data collection, tracking, entry. Relational databases and HR systems. |
| Unit-II | **E-HRM and Statistical analysis for HR:** Evolution of HRIS, Planning and implementing a new HRIS, Security and privacy considerations, Statistical analysis for HR (regression analysis, measures of central tendency) Graphs, tables, spreadsheets, data manipulation (using Excel). |

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| | |
|---|---|
| **Unit-III** | **Benchmarking HR metrics:** concept, types and challenges, Staffing- supply and demand forecasting, Total compensation analyses, Cost justification-return on investment; Communicating recommendations. |
| **Unit-IV** | **Workforce Analytics in HR:** Perspective of analytics in HR, Translator role, resistance to workforce analytics, emerging data sources, workforce analytics function, modelling in HR: descriptive and indicative models for employee retention and turnover. |

**Suggested Readings:**

- The HR Scorecard: Linking people, strategy, and performance by Becker B.E., Huafelid M.A. and Ulrich D, Harvard Business Review Press.
- The Power of People by Nigel Guenole, Jonathan Ferrar, Sheri Feinzig, Pearson Education.
- Applying Advanced Analytics to HR Management Decisions by Sesil, 1e, Pearson Education.
- Winning on HR Analytics by Soundararajan, Sage Publication.
- HR Analytics: Understanding Theory and Applications by Bhattacharya, Sage Publication.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | HR Analytics | https://nptel.ac.in/courses/110107492 |
| **Unit-II** | HR Data Preparation & Development of HR metrics | http://digimat.in/nptel/courses/video/110107492/L02.html |
| **Unit-III** | Concept, importance, process and methods of Staffing and HRM | https://srmuniv.digimat.in/nptel/courses/video/110105146/L31.html |
| **Unit-IV** | Employee Development Analytics | https://terna.digimat.in/nptel/courses/video/110107492/L38.html |



| Course Code | DEC-IT-MBA-241A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course- IT | | | | |
| E-Commerce and Applications | **E-Commerce and Applications** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the basic framework and infrastructure of E-Commerce and EDI<br>2. To understand E-Commerce models and customer relationship technologies in retailing.<br>3. To understand E-Commerce applications in manufacturing, publishing, and banking.<br>4. To understand the role of intranets in corporate finance and HR systems. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the fundamental concepts of E-Commerce, including its framework, network infrastructure, and EDI standards | Level-1 Remember |
| CO2 | Explain the role of intranets in managing customer assets, and describe the challenges in online retailing and banking | Level-2 Understand |
| CO3 | Apply E-Commerce technologies to design solutions for manufacturing, publishing, and logistics processes | Level-3 Apply |
| CO4 | Analyze the components and functionalities of financial information systems and evaluate their impact on corporate finance | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Technology and Infrastructure for E-Commerce:** Framework of E-commerce; Network Infrastructure for E Commerce – Market Forces Influencing I-way, Network Access Equipment, Public Policy Issues Shaping the I way; EDI - Applications in Business, Legal, Security and Privacy Issues of EDI; Components of EDI Standards, ASC X12 and EDIFACT. Mobile Commerce, Social Commerce. |

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| | |
|---|---|
| **Unit-II** | **E-Commerce and Retailing**: Changing Retail Industry Dynamics, Mercantile Models from the Consumer's Perspective, Management Challenges in Online Retailing, Dynamic Pricing and Revenue Models,<br>Intranets and Customer Asset Management: Basics of Customer Asset Management, Online Sales Force, Online Customer Service and Support, Technology and Marketing Strategy. |
| **Unit-III** | **Intranets and Manufacturing:** Integrated Logistics, Agile Manufacturing, Emerging Business Requirements, Manufacturing Information Systems, Intranet-based Manufacturing, and Logistics Management. E-Commerce and Online Publishing: Why Online Publishing, Online Publishing approaches, Advertising and Online Publishing. **E-Commerce and Banking:** Changing Dynamics in the Banking Industry, Home Banking Implementation Approaches, and Management Issues in Online Banking. |
| **Unit-IV** | **Intranets and Corporate Finance:** An Introduction, Financial Systems, Financial Intranets, Software Modules in Financial Information Systems, Human Resource Management Systems, Size/Structure of Financial Software Market. |

**Suggested Readings:**

- Kalakota and Whinston, Electronic Commerce: A Manager's Guide, Pearson Education.
- Greenstien and Vasarhelyi, Electronic Commerce: Security, Risk Management and Control, Tata McGraw Hill.
- Dave Chaffey, E-Business and E- Commerce Management, Strategy, Implementation and Practice, Pearson Education.

**Useful Video Links:**

| Unit no. | Topics | Links |
|---|---|---|
| **Unit-I** | E-Commerce | https://www.youtube.com/watch?v=BGEQCn6EEDA&list=PLYuTvKb3AO_4u8C5dfBnZUk-zRUw95xpU |
| **Unit-II** | Challenges in Online Retailing | https://www.youtube.com/watch?v=X0DA_Xj9z_Q |
| **Unit-III** | Logistics Management | https://www.youtube.com/watch?v=GnHZneVfXMU |
| **Unit-IV** | Financial Systems | https://www.youtube.com/watch?v=p1KD-Y1e2Hg |



| Course Code | DEC-IT-MBA-243A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-IT | | | | |
| Course Title | **Multimedia and Web Development** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the basics of multimedia systems and video technologies.<br>2. To understand compression techniques and multimedia standards.<br>3. To understand multimedia file formats and application design.<br>4. To understand web design concepts and HTML elements. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the basic concepts, components, and tools of multimedia systems and video technologies | Level-1 Remember |
| CO2 | **Explain** the need for data compression and distinguish between various compression techniques and multimedia standards. | Level-2 Understand |
| CO3 | **Apply** knowledge of multimedia formats and system components to design basic multimedia applications and distributed multimedia systems | Level-3 Apply |
| CO4 | **Analyze** the structure and design of websites using web development processes, navigation techniques, and HTML components | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Multimedia**: Multimedia devices, components of multimedia systems, authoring tools, creating multimedia, video-capturing, video on demand, Hypertext vs. Hypermedia, Virtual Reality, Familiar and face of font, bitmap fonts |
| **Unit-II** | **Data compression :** Need for data compression, non-lossy and lossy compressions for images, color, gray scale and still-video image, video image, and audio compression JPEG standard, MPEG standard, DVI Technology, MIDI, brief survey of speech recognition and generation, Basic Image Processing (use Photoshop). |
| **Unit-III** | **Data and file format standards, Multimedia applications design:** Application classes, types of multimedia systems; Distributed multimedia systems: Components, distributed multimedia databases, Animation: cell animation, computer animation, morphing. Introduction to authoring tools |

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|---|---|
| **Unit-IV** | **Introduction to Web design:** Web development process, site types and architectures, navigation theory and practice. Introduction to Page: Page sizes, page types, web design tools; introduction to text: Fonts and text layout, formatting tags, text design issues for the web.<br>**HTML:** Structure of HTML document; HTML Tags, inserting images, creating links, tables, forms, and frames ,Introduction to WML and its application |

**Suggested Readings:**

- Buford, Multimedia Systems, Pearson Education,
- Vaughan, Multimedia Making IT Work, Tata McGraw Hill,
- Villamil and Molina, Multimedia: An Introduction, PHI
- Shuman, Multimedia in Action, Vikas Publishing House
- Senclair, Multimedia on the PC, BPB Publications
- Rosch, Multimedia Bible, SAMS Publishing
- Powell, Web Design: The Complete Reference, Tata McGraw Hill

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Multimedia Services | https://www.youtube.com/watch?v=fAJzLuce_ms |
| **Unit-II** | Data compression | https://www.youtube.com/watch?v=5wRPin4oxCo |
| **Unit-III** | Multimedia Application | https://www.youtube.com/watch?v=davcYvCJ63w |
| **Unit-IV** | HTML | https://www.youtube.com/watch?v=QEtWL4IWlL4 |



| Course Code | DEC-IT-MBA-245A | | | | |
|---|---|---|---|---|---|
| Discipline Elective Courses | Discipline Elective Course-IT | | | | |
| Course Title | **Advanced Database Management System** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand basic database concepts like entities, relationships, and constraints.<br>2. To understand normalization techniques and relational design theory.<br>3. To understand object-oriented, parallel, and distributed database systems.<br>4. To understand web-based, XML, and advanced data models for modern applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall and define fundamental database concepts such as entities, attributes, relationships, keys, constraints, and data abstraction | Level-1 Remember |
| CO2 | Explain normalization techniques and the theoretical foundations of database design to identify and eliminate redundancy. | Level-2 Understand |
| CO3 | Apply object-oriented and distributed database concepts to design and implement data models in real-world scenarios | Level-3 Apply |
| CO4 | Analyze web-based, semi-structured, and advanced database models to assess their suitability for specialized applications like GIS and mobile environments. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Database Design:** Entities, Attributes, Entity Sets, Relationships, Key Constraints, Participation Constraints, Weak Entities, UML Class Diagrams, Subclasses, Superclasses, Inheritance, Specialization, Generalization, Constraints and Characteristics of Specialization and Generalization Hierarchies, Modelling of UNION Types Using Categories, Representing Specialization and Generalization In UML Class Diagrams, Data Abstraction, Knowledge Representation and Ontology Concepts. |



| | |
|---|---|
| **Unit-II** | **Databases Design Theory:** Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Reasoning About FD's, FIRST, SECOND, THIRD Normal Form, BCNF, Fourth Normal Form, Lossless Join Decomposition, Dependency Preserving Decomposition, Schema Refinement in Database Design, Multi Valued Dependencies. |
| **Unit-III** | **Object- Oriented, Parallel and Distributed Databases:** Overview of Object-Oriented Concepts, Object Identity,Object Structure, Type Constructor, Encapsulation of Operations, Methods and Persistence; Architectures for Parallel Databases, Parallel Query Evaluation, Parallelizing Individual Operations, Sorting Joins, Distributed Database Concepts, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in Distributed Databases, Concurrency Control and Recovery in Distributed Databases. |
| **Unit-IV** | **Databases on the Web and Semi-Structured Data:** Web interface, XML, structure of XML data, querying XML data, storage of XML data, XML applications, semi-structured data model, indexes for text data. Enhanced Data Models for Advanced Applications: Active database concepts, temporal database concepts, spatial databases: concept and architecture, deductive databases and query processing, mobile databases,Geographic Information Systems (GIS). |

**Suggested Readings:**

- Elmasri and Navathe, Fundamentals of Database Systems, 6th Edition, Wesley
- Ramakrishnan and Gehrke, Database Management Systems, 3rd edition, McGraw-Hill
- Korth, Silberschatz, Sudarshan, Database System Concepts, 5th edition
- Rob and Coronel, Database Systems: Design, Implementation and Management,
- Date and Longman, Introduction to Database Systems. Subramanian V. S., Principles of Multimedia Database Systems, Elsevier Publishers
- Shio Kumar Singh, Database Systems: Concepts, Design and Applications, 2nd edition, Pearson Publishing.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Entity Sets, Relationships | https://www.youtube.com/watch?v=9wPWupdoXGM&list=PLyqSpQzTE6M-xymXgqewlzcC3U4cdRoSu&index=5 |
| **Unit-II** | Normalisation | https://www.youtube.com/watch?v=i-Ntc-noQ6c |
| **Unit-III** | Distributed Databases | https://www.youtube.com/watch?v=dlBVWMdGhqw&list=PLUJ7JmcrTifBROWODSG8wgvl20XgBuE-N |
| **Unit-IV** | Spatial databases | https://www.youtube.com/watch?v=NFUfC5Qpa8s |



| Course Code | DEC-IT-MBA-247A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course- IT | | | | |
| E-Commerce and Applications | **AI Application in Management** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>• To understand the basics and evolution of AI in business.<br>• To understand AI applications in marketing and customer engagement.<br>• To understand AI's role in human resource management.<br>• To understand AI use in finance and risk management. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the definitions, history, and types of Artificial Intelligence and its core technologies. | Level-1 Remember |
| CO2 | Explain the role of key enablers like Big Data, Cloud Computing, and IoT in the development of AI in business. | Level-2 Understand |
| CO3 | Apply knowledge of AI technologies to analyze how AI can transform business models and strategic management. | Level-3 Apply |
| CO4 | Analyze different types of AI and evaluate their potential impacts on business strategy and operations. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Definition and Scope of Artificial Intelligence in Business – History and Evolution of AI Technologies – Types of AI: Narrow AI, General AI, and Super AI – Core technologies: Machine Learning, Deep Learning, Natural Language Processing (NLP), Robotics, and Expert Systems – Key Enablers: Big Data, Cloud Computing, IoT – AI in Strategic Management – Business model transformation using AI. |
| **Unit-II** | Customer segmentation and targeting using AI – Consumer behavior prediction – Personalization and recommendation engines – AI-powered content generation and A/B testing – Chatbots and conversational AI for customer engagement – Campaign optimization using AI tools – Case Studies: Amazon, Netflix, Spotify. |
| **Unit-III** | AI in talent acquisition: Resume screening, job matching – AI-driven on boarding and engagement – Predictive analytics in workforce planning and attrition – Performance evaluation and productivity analysis – Sentiment analysis – Virtual assistants for HR – Ethical and legal implications of AI in HR – Case Studies: HireVue, Pymetrics, LinkedIn Talent Insights |

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|---|---|
| Unit-IV | Fraud detection using AI – Algorithmic and high-frequency trading – Credit scoring and risk assessment – Financial forecasting using predictive models – Chatbots in banking – Robo-advisors in wealth management – Applications in budgeting and planning. Case Studies: PayPal. |

**Suggested Readings:**

- Artificial Intelligence in Business: Creating Value with Machine Learning by Rajendra Akerkar, Springer
- Prediction Machines: The Simple Economics of Artificial Intelligence by Ajay Agrawal, Joshua Gans, Avi Goldfarb, Harvard Business Review Press
- Machine Learning Yearning by Andrew Ng, Self-published
- Data Science for Business by Foster Provost and Tom Fawcett, O'Reilly Media

**Useful Video Links:**

| Unit no. | Topics | Links |
|---|---|---|
| Unit-I | Artificial Intelligence | https://www.youtube.com/watch?v=GHpchgLoDvI&list=PLp6ek2hDcoNB_YJCruBFjhF79f5ZHyBuz |
| Unit-II | Artificial Intelligence and Chatbot Integration in Services | https://www.youtube.com/watch?v=Dxkww5aegLc |
| Unit-III | Talent acquisition | https://www.youtube.com/watch?v=wc_J2lIyDG8&list=PLLy_2iUCG87Cs2lx7OgbBDyzIL2YkzRLo |
| Unit-IV | Fraud detection of Financial data | https://www.youtube.com/watch?v=8RgVP0J1ilM |



| Course Code | DEC-IT-MBA-249A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course- IT | | | | |
| E-Commerce and Applications | **Information Security and Cyber Laws** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>• To understand the basic concepts and principles of information security.<br>• To understand security mechanisms like authentication, cryptography, and firewalls<br>• To understand operational, human, and physical aspects of system security.<br>• To understand legal issues and cyber laws related to information technology. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the fundamental concepts of information security, including confidentiality, integrity, availability, and basic security threats. | Level-1 Remember |
| CO2 | Explain the principles of authentication, access control, cryptography, firewalls, and malware detection in the context of securing systems. | Level-2 Understand |
| CO3 | Apply security mechanisms such as cryptographic techniques, intrusion detection, and security policies to secure information and network systems. | Level-3 Apply |
| CO4 | Analyze legal issues and cybercrimes such as hacking, defamation, piracy, and cybersquatting, and assess the impact of IT laws and cyber regulations. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | Overview of basic concepts of security: Confidentiality, Integrity and Availability; Security threats, Information security principles, operational and human issues in information and network security; Security policies: types, development and management. |
| **Unit-II** | Authentication, Access control mechanism, Physical security control, Operations security, Cryptography: basic concepts, symmetric and asymmetric cryptography; Key management, Firewalls, Intrusion detection, malware detection. |
| **Unit-III** | Legal Issues in information and communication technology, cyber-crime and IT Act 2000, Legal resources against Hacking, Cyber fraud, defamation and abuse, pornography and other IT offences; Contracts in cyber world and Jurisdiction |

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|---|---|
| **Unit-IV** | Cyber squatting, legal and other innovative moves against cyber squatting, Copyright and protection of contents; Software piracy; E-Commerce Taxation, Protection of Cyber consumers in India |

**Suggested Readings:**

- Information Security: Principles and Practices by Mark Merkow and James Breithaupt, Pearson Education
- Cyber Law Simplified byVivek Sood, Tata McGraw Hill, New Delhi
- Introduction to Computer Security by Matt Bishop, 1/e, Pearson Education.

**Useful Video Links:**

| Unit no. | Topics | Links |
|---|---|---|
| **Unit-I** | Basic concepts of security | https://www.youtube.com/watch?v=3JblSrRT8XE |
| **Unit-II** | Access control mechanism | https://www.youtube.com/watch?v=aT2gDFkf2BU |
| **Unit-III** | Legal Issues in information and communication technology | https://www.youtube.com/watch?v=SSijgMgjZzg |
| **Unit-IV** | Copyright and protection of contents | https://www.youtube.com/watch?v=z6vXUZmF9P4 |



| Course Code | DEC-IB-MBA-251A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course - IB | | | | |
| Course Title | **International Trade Theory and Practices** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the concept of International Business environment<br>2. To understand the models & theories of international trade<br>3. To understand the concept of country risk analysis and responsibilities of International trade.<br>4. To understand the economic crisis of developing countries. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** international trade theories, trade policies, economic integration, digital trade, and India's evolving role and strategies in the global trade environment. | Level-2 Understand |
| CO2 | **Apply** concepts of trade barriers, regional agreements, export promotion schemes, and digital tools to examine and enhance India's foreign trade operations. | Level-3 Apply |
| CO3 | **Analyze** the effects of globalization, protectionism, WTO regulations, and geopolitical factors on international trade dynamics and India's trade competitiveness. | Level-4 Analyze |
| CO4 | **Analyze** India's trade policy framework, incentives, and sustainability initiatives to recommend strategic improvements for boosting export performance and global integration. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Evolution and importance of international trade in the global economy;** Trade as a driver of globalization and digital integration;Classical and modern trade theories: Comparative advantage, Heckscher-Ohlin, Strategic Trade Theory, Porter's Diamond; Global Value Chains (GVCs) and India's positioning;Gains from trade, terms of trade concepts, and trade equilibrium; Digital trade and cross-border e-commerce |

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|---|---|
| **Unit-II** | **Free trade vs. protectionism**: Tariffs, quotas, non-tariff barriers; Countervailing duties, anti-dumping, and WTO dispute mechanisms; Impact of trade wars and geopolitical trade shifts (e.g., US-China, EU regulations);Forms and levels of economic integration: FTA, customs union, common market; Impact of regional groupings (e.g., RCEP, IPEF, EU, USMCA) on Indian exports; Bilateral and plurilateral trade agreements: Opportunities and challenges |
| **Unit-III** | **Components of international trade policy;** Export promotion strategies (DGFT, EPCs, PLI scheme); Digital tools for export promotion: ICEGATE, e-Sanchit, Trade Analytics; Assessing export potential using trade intelligence platforms; Role of SEZs, FTZs, and trade facilitation infrastructure; Sustainable trade practices and ESG compliance in exports; Role of digital expos, virtual fairs, and international marketplaces |
| **Unit-IV** | **Trends in India's foreign trade post-liberalization;** India's strategic trade policy: Make in India, Atmanirbhar Bharat, PLI; Major export-import schemes and incentives; WTO and its impact on Indian trade policy: TRIPS, agriculture, e-commerce; India's role in global trade reform and multilateral negotiations; Assessment of India's trade policy in the context of sustainability and competitiveness |

**Suggested Readings:**


- International Trade: Theory and Policy by Paul R. Krugman,Pearson Education
- Export-Import Procedure and Documentation by Jain. S. Khushpat, Jain.V. Apexa, Himalaya Publishing House.
- "Anti-dumping and Countervailing Measures" by B Gupta, R.K,Sage Publications, New Delhi.
- "International Trade", Verma by M.L, Commonwealth Publishers, Delhi.
- "International Marketing Management" by Varsheny R.L. and B. Bhattacharya , Sultan Chand and Sons, Delhi


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Evolution of International Trade | https://onlinecourses.nptel.ac.in/noc23_hs149/preview |
| **Unit-II** | Regional Economic Groupings and Trade Barriers | https://onlinecourses.nptel.ac.in/noc23_hs149/preview |
| **Unit-III** | FDI and MNCs | https://onlinecourses.nptel.ac.in/noc25_mg31/preview |

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| Course Code | DEC-IB-MBA-253A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course - IB | | | | |
| Course Title | **Export Import procedure and Documentation** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of international trade.<br>2. To understand the practical knowledge of export documentation and procedures.<br>3. To understand export incentives and policy assistance.<br>4. To understand the methods of international payments and export finance. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the procedural frameworks, trade barriers, and digital initiatives governing international trade documentation, classification systems, and government policies in export-import operations. | Level 2 Understand |
| CO2 | **Apply** knowledge of international trade documents, export-import procedures, payment methods, customs clearance, and insurance practices to effectively manage global trade transactions. | Level 3 Apply |
| CO3 | **Apply** regulatory frameworks, including FEMA, UCPDC guidelines, export finance mechanisms, and institutional support to ensure compliance and optimize export-import financial operations. | Level 3 Apply |
| CO4 | **Analyze** export promotion schemes, institutional roles, and emerging digital trade platforms to enhance India's international trade competitiveness and infrastructure. | Level 4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.



| Unit No. | Contents |
|---|---|
| Unit-I | **Significance of Procedures and Documentation in International Trade:** procedure and Documentation as Trade Barriers.WTO Provisions, Digitalization of trade documentation (e.g., e-BRC, e-SANCHIT in India).,Recent Government of India initiatives like "Trade Infrastructure for Export Scheme (TIES)". Aligned Document System (ADS), Official machinery for Trade Procedure and Documentation; ITC (HS) classification System; Role of ICC, INCOTERMS; Nature of Export / Trading Houses, EDI and Documentation. |
| Unit-II | **Main Export and Import Documents**; Export Order Processing; export contract; Export Price Quotations; Shipping and Custom Clearance of Export and Import Cargo; Central Excise clearance; Role of Forwarding agents; Cargo Insurance and Claim Procedure. |
| Unit-III | **Methods of Payments in International Trade;** Documentary Collection of Export Bills; UCPDC Guidelines; Realisation of Export Proceeds; FEMA- Origin and Objectives, Main Provision of FEMA. Pre Shipment and Post Shipment Finance. Role of EXIM Bank and ECGC in India. |
| Unit-IV | **Major Export Promotion Schemes in India**- EPCG, Duty Exemption Scheme; RoDTEP (Remission of Duties and Taxes on Exported Products); Facility for Deemed Exports; Export Promoting Institutions (EOU's/ EPZs/ SEZ's) – Role of Export Promotion Councils, Commodity Boards and ITPO.;E-Commerce exports and digital platforms like Amazon Global Selling, eBay, ONDC. |

**Suggested Readings:**

- Export-Import Procedure and Documentation by Jain. S. Khushpat, Jain.V. Apexa, Himalaya Pub. House.
- "Export Management" by Kapoor,D.C, Vikas Publishing House Pvt. Ltd., New Delhi.
- Export: What Where and How, Delhi by Paras Ram ,Anupam Publication.
- Handbook of Procedures by Ministry of Commerce, Government of India, New Delhi.
- Export Procedures and Documentations by M.D.Jitendra, Rajat Publications, Delhi
- Export Import Procedure and Documentation Manual by NABHI.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Preliminaries for Export | https://archive.nptel.ac.in/courses/110/107/110107145/ |
| Unit-II | Export Documentation and Export Procedures | https://nptel.ac.in/courses/110107112 |
| Unit-III | Policy Assistance and Incentives | https://archive.nptel.ac.in/courses/110/107/110107145/ |
| Unit-IV | Methods of Payments and Export Finance | https://archive.nptel.ac.in/courses/110/107/110107145/ |

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| Course Code | DEC-IB-MBA-255A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course - IB | | | | |
| Course Title | Foreign Exchange Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the nature of foreign exchange<br>2. To understand the factors influencing exchange rate fluctuations.<br>3. To understand the structure and functioning of foreign exchange markets<br>4. To understand foreign exchange risk management tools | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the fundamental concepts, macroeconomic frameworks, and evolving trends in foreign exchange markets. | Level-2 Understand |
| CO2 | **Apply** economic theories and models in exchange rate determination and foreign exchange market dynamics. | Level-3 Apply |
| CO3 | **Demonstrate** techniques of hedging, pricing, and managing risk in international financial transactions. | Level-3 Apply |
| CO4 | **Analyze** the structure, instruments, and digital evolution of foreign exchange markets for strategic decision-making. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Nature of foreign exchange:** sources of demand for and supply of foreign exchange-the balance of payments (bop) framework; nominal, real and effective exchange rates; determination of rate of exchange, monetary portfolio balance, purchasing power parity approaches; overvalued and undervalued currencies; exchange rate systems; Role of Cryptocurrency and Blockchain in FX Markets ;Impact of Central Bank Digital Currencies (CBDCs) on Foreign Exchange Markets; Impact of Global Macroeconomic Shocks (e.g., COVID-19, Geopolitical conflicts) on Exchange Rate Determination; Behavioral Finance aspects in Exchange Rate Movements. |
| Unit-II | **General factors of exchange rate fluctuations**; the Dornbusch Sticky -price theory of exchange rate volatility; exchange rate overshooting and the J-curve effect; central banking intervention for exchange rate stability; effect of depreciation on trade balance. |

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|---|---|
| **Unit-III** | **Nature functions and participants of foreign exchange market;** spot and forward markets; forward premium; forwards in hedging and arbitrage; methods of quoting exchange rates; cross rates of exchange; arbitrage operations; bid -ask spreads; the Interest Rate Parity Theorem; the Expectation Theory; International Fisher Effect. |
| **Unit-IV** | **Currency futures, options and determination of their market value, over-the-counter options;** Fisher Black's Optional-Pricing model; currency and interest rate swaps; credit risk of swaps, Euro currency market and its instruments; measuring foreign exchange risk and exposure; basic techniques of exposure management; foreign exchange regulation in India, |

**Suggested Readings:**

- Global Financial Markets by Giddy I.A.N.,AITBS, New Delhi
- International Finance by D. Levi Maurice, Prentice Hall of India, New Delhi
- Multinational Business Finance by David K. Eiteman, Pearson Education Roth Paul, Mastering Foreign Exchange and Money Markets , Pitman, London
- International Financial Management by Apte P.G,Tata McGraw Hill, New Delhi

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Nature of Foreign Exchange & Exchange Rate Determination | https://archive.nptel.ac.in/courses/110/105/110105057/ |
| **Unit-II** | Exchange Rate Fluctuations & Macroeconomic Impacts | https://archive.nptel.ac.in/courses/109/107/109107173/ |
| **Unit-III** | Foreign Exchange Market Operations & Theories | https://archive.nptel.ac.in/courses/110/105/110105121/ |
| **Unit-IV** | Currency Derivatives & Risk Management | https://archive.nptel.ac.in/courses/110/107/110107128/ |



| Course Code | DEC-IB-MBA-257A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course - IB | | | | |
| Course Title | **International Business Environment** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the nature, scope, and importance of international business<br>2. To understand the socio-cultural environment in global markets<br>3. To understand the international economic, political, and legal environments<br>4. To understand the role of technology in international business | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts and environments of international business, including globalization trends, cultural diversity, investment theories, and technology dynamics. | Level 2 – Understand |
| CO2 | **Apply** international business frameworks to examine global entry strategies, market operations, and responses to economic, legal, and technological factors. | Level 3 – Apply |
| CO3 | **Analyze** the interplay of cultural, economic, political, legal, and technological forces shaping international business decisions and risks. | Level 4 – Analyze |
| CO4 | **Analyze** the global business strategies in light of digitalization, geopolitical shifts, regulatory changes, and Industry 4.0 advancements. | Level 4 – Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to International Business**: Importance, nature and scope of International business; Modes of entry into International Business; Globalization 5.0 & De-globalization Trends Internationalization process and managerial implications.<br>**Socio-Cultural environment**: significance, religion, language, education, attitudes, culture, customs and practices, cross cultural literacy, managing cultural diversity- dealing with cultural differences, social responsibility of business. ; Digital Internationalization of Firms -Role of digital platforms in entering global markets (e.g., Amazon Global, Shopify). |



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|---|---|
| **Unit-II** | **International Economic Environment**: International economic analysis indicators; Economic factors affecting international business operations- economic freedom, economic systems, economic indicators; Assessing economic development, performance and potential;<br>**Regional economic integration**: Effects of integration, major regional trading groups in Asia and America. International Investment Theory - Theory of capital movements, Market imperfections, Internationalization, Appropriability, Location specific advantage. |
| **Unit-III** | **Political and Legal environment**: Political environment: Individualism Vs. collectivism, political ideology, political risk; Legal environment: Types of Legal systems, trends in legal system, implications for managers, legal issues in international business.; Geopolitical Risk Management- Tools like risk mapping and scenario analysis for unstable regions (e.g., war zones, trade tensions). |
| **Unit-IV** | **Technological environment**: Impact of technology on society, economy, industry; Need to spend on R and D, implication of technology on MNCs, environmental factors contributing for rise of technology, Nature of technology transfer, stages in transfer process, international technological issues; .Industry 4.0 and Global Supply Chains (Role of AI, IoT, and blockchain in cross-border operations.) |

**Suggested Readings:**

- International Business by Daniels J.D. and H. LEE Radesbaugh, Pearson Education.
- International Business"by Aswathappa, K, Tata McGraw Hill publications, New Delhi.
- International Business Law and its Environment by Richard M. Schaffer etal, Thomson 2002.
- International Business by Michael Zinkata et al,John. J Wild, et al, Global Business, The Dryden Press 1988., Pearson Education

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Intercultural Communication | https://nptelvideos.com/course.php?id=667 |
| Unit-III | International Business Environment ( full course) | https://archive.nptel.ac.in/courses/110/107/110107145/ |



| Course Code | DEC-IB-MBA-259A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-IB | | | | |
| Course Title | **International Business Negotiation and Economic Blocks** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the concepts, structure, and environment of global business negotiations.<br>2. To understand the impact of national and corporate cultures on negotiation styles and outcomes.<br>3. To understand skills for planning and executing each stage of the global negotiation process.<br>4. To understand communication and strategic negotiation abilities using modern tools and techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the foundational concepts, cultural dimensions, strategic processes, and technological tools that influence global business negotiations in both physical and digital contexts. | Level-2 Understand |
| CO2 | **Apply** negotiation frameworks, cultural insights, and strategic tools to manage real-world negotiation scenarios, including cross-cultural and digitally mediated contexts. | Level-3 Apply |
| CO3 | **Analyze** the interplay of power, communication dynamics, culture, and negotiation strategy for decision-making in global negotiations. | Level-4 Analyze |
| CO4 | **Analyze** negotiation effectiveness and sustainability by integrating global negotiation models, dispute resolution mechanisms, and emerging technological tools. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Foundations of Global Business Negotiation:** Nature and scope of global negotiations; Key terms: BATNA, ZOPA, Trust-building, Ethical Dilemmas; Negotiation process architecture and phases; Understanding global negotiation volatility: Political, economic, and regulatory instability; Assessing negotiation readiness: Stakeholders, leverage, goals |



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| | |
|---|---|
| **Unit-II** | **Culture and Behavioral Dynamics in Negotiation:** Cultural intelligence in cross-border negotiations; National negotiation traits (US, Japan, China, India, EU, Middle East);Hofstede's cultural dimensions and Trompenaars' model; Role of gender and corporate culture;Hybrid and virtual cultural impacts on negotiation behavior; Selecting and adapting negotiation styles |
| **Unit-III** | **Strategic Negotiation Process and Conflict Management:** Pre-negotiation planning: goal setting, stakeholder mapping; Negotiation strategies: integrative vs distributive; Building momentum, anchoring, first offers; Managing complex/multi-party negotiations; Dispute resolution: Mediation, arbitration, conciliation; Post-agreement follow-up, renegotiation, and sustainability |
| **Unit-IV** | **Tools, Technology, and Power in Negotiation**: Communication skills: Verbal, non-verbal, written, visual; Deadlock management and breaking impasses; Negotiation power dynamics and persuasion techniques; Digital negotiation platforms (Zoom, Teams, Miro, CRMs) ;AI-enabled tools and simulations in negotiation; Trends in online, remote, and hybrid negotiations |

**Suggested Readings:**

- Global Business Negotiations: A Practical Guide by Subhash Jain & Claude Cellich, South Western Educational Publishing
- International Business Negotiation by Pervez. N. Ghauri & JeanClaude Usunier, Pergamon
- Communicating in Global Business Negotiation: A geocentric approach by Rudd & Lawson, Sage
- Creative solutions to Global Business Negotiations by Claude Cellich & Subhash Jain, Business Expert Press

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit -1** | Negotiation Mastery: Strategies for Conflict and Collaboration | https://elearn.nptel.ac.in/shop/iit-workshops/completed/negotiation-mastery-strategies-for-conflict-and-collaboration/ |
| **Unit- 2** | Soft Skills for Business Negotiations and Marketing Strategies, | https://onlinecourses.nptel.ac.in/noc20_mg39/preview |
| **Unit- 3** | Negotiation and Conflict Management | https://onlinecourses.swayam2.ac.in/cec22_hs30/preview |
| **Unit- 4** | Negotiation Mastery: Strategies for Conflict and Collaboration | https://elearn.nptel.ac.in/shop/iit-workshops/completed/negotiation-mastery-strategies-for-conflict-and-collaboration/ |



| Course Code | DEC-AGB-MBA-261A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-AGB | | | | |
| Course Title | **Agri-Business Environment and Policy** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the role of agriculture in the Indian economy and its contribution to sustainable economic development<br>2. To understand challenges and policy reforms in farm production, supply chains, marketing, and finance.<br>3. To understand the impact of globalization and economic reforms on Indian agriculture and agribusiness.<br>4. To understand agribusiness concepts, systems, and emerging trends in production, processing, and exports. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the basic concepts of Indian agri business environment | Level-2 Understand |
| CO2 | **Apply** strategic approaches to enhance efficiency and sustainability in agri business operations. | Level-3 Apply |
| CO3 | **Apply** technological solutions to enhance decision-making in agri business environments. | Level-3 Apply |
| CO4 | **Outline** the key drivers of change in the agri business environment. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Role of agriculture in the Indian economy**, challenges in economic growth and sustainable agriculture, Problems and policy changes relating to farm supplies, farm production, Agro processing, agricultural marketing, agricultural finance in the country. |
| **Unit-II** | **Impact of globalization on agribusiness sector**, Structure of agriculture, Linkages among sub-sectors of the agribusiness sector, Economic reforms and Indian agriculture. |
| **Unit-III** | **Agribusiness-** concepts and approach, evaluation of systems, Emerging trends in production, processing, marketing and exports, Policy controls and regulations relating to the industrial sector with specific reference to agro-industries, role of IT in Agribusiness. |
| **Unit-IV** | **Agribusiness policies**-concept and formulation, new dimensions in Agri-business environment and policy. Agricultural price and marketing policies, distribution system and other policies. |

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**Suggested Readings:**

- Economics Environment of Business by Adhikary, M, S. Chand and Sons publ.
- Essentials of Business Enviornment by Aswathappa, K, Himalya Publ.
- Business Environment by Saleem Shaikh, Pearson Education.
- Business Environment by Francis Cherunilam, Himalaya Publ.
- Economic Analysis and Business Policy by Kulkarni. B. D.
- Financing Agri-Business by Shete, N. B.
- Agrarian crisis and farmer suicides by Deshpande, R.S. and Arora, S., Sage Publications, Delhi

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Sustainable agriculture | https://archive.nptel.ac.in/courses/126/105/126105014/ |
| Unit-II | Economic reforms and Indian agriculture. | https://onlinecourses.nptel.ac.in/noc24_ec04/preview |
| Unit-III | Role of IT in agribusiness | https://archive.nptel.ac.in/courses/126/104/126104006/ |
| Unit-IV | Agricultural Marketing - Indian Agriculture, Indian Economy | https://edurev.in/v/115747/Agricultural-Marketing-Indian-agriculture--Indian- |



| Course Code | DEC-AGB-MBA-263A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-AGB | | | | |
| Course Title | Agri- Business Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester- III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the nature, scope, and characteristics of Agri business and farm management.<br>2. To understand economic principles to solve farm management problems and improve decision-making.<br>3. To understand the farm planning, budgeting, and accounting tools for agri business analysis.<br>4. To understand the strategies to manage risk and uncertainty in agri business decisions. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the fundamental concepts Agri business management | Level-2 Understand |
| CO2 | **Apply** economic principles to solve Agri management problems | Level-3 Apply |
| CO3 | **Apply** management concepts to solve practical problems in agricultural business settings. | Level-3 Apply |
| CO4 | **Analyze** agri business strategies and make decisions in the real world. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to agri business management:** Nature, scope and characteristics business management, Role of farm business management, Farm management decisions; farm management problems, Principles of farm management decisions |
| Unit-II | **Fundamental Economic Principles of Production and Cost:** Principle of variable proportion and cost principle, Principle of factor substitution, Law of equi-marginal returns, opportunity cost principle. |
| Unit-III | **Tools of farm management and farm business analysis:** Farm planning and budgeting, Farm records and accounts, types and problems in farm records and accounts, net worth statement, farm efficiency measures, Role of IT in farm management and problem-solving. |
| Unit-IV | **Management of farm resources:** land, labor, capital, farm machinery, farm building, Risk and uncertainty in farming, Sources of uncertainty in farming, Management strategy to counteract uncertainty, Decision making process in farm business management under risks and uncertainty. |



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**Suggested Readings:**

- Farm Management Economics by Heady, E. O and Jensen, H., Prentice Hall.
- Fundamentals of Farm Business Management, Johl, S. S and Kapoor, T. R., Kalyani Publ.
- Economics of Farm Management in India, Kahlon, A. S and Singh, K., Allied Publ.
- Farm Management and Agricultural Marketing, Panda, S. C., Kalyani Publ.
- Farm Management, Dhondyal. S. P.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Nature, scope and characteristics business management | https://onlinecourses.nptel.ac.in/noc22_mg42/preview |
| **Unit-I** | Law of equi-marginal returns | http://www.digimat.in/nptel/courses/video/110101149/L25.html |
| **Unit-III** | Basics of Farm Business Planning and Financial Readiness | https://www.canr.msu.edu/videos/basic-of-farm-business-planning-and-financial-readiness |
| **Unit-III** | Farm machinery | http://www.digimat.in/nptel/courses/video/126105009/L01.html |



| Course Code | DSC-AGB-MBA-265A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-AGB | | | | |
| Course Title | **Agri-Business Entrepreneurship** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester- III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the concepts and theories of agripreneurship and enterprise development.<br>2. To understand the entrepreneurial traits and decision-making strategies to identify and develop agribusiness opportunities.<br>3. To understand the entrepreneurial process, business environment, and feasibility of agricultural ventures.<br>4. To understand Agri business plans with growth strategies and IT integration in agripreneurship.. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the concepts, process, and strategies of entrepreneurship in agribusiness | Level-2 Understand |
| CO2 | **Apply** strategic and financial planning techniques for sustainable enterprise growth. | Level-3 Apply |
| CO3 | **Apply** critical thinking to develop structured approaches for entrepreneurial decision-making and problem-solving. | Level-3 Apply |
| CO4 | **Analyze** factors influencing agribusiness entrepreneurship | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Agripreneurship** – Concept, characteristics, Approaches, Theories, Need for enterprises development. Traits/Qualities of entrepreneur, Entrepreneur behavior, skills; Entrepreneurship, Strategies for making decisions, Classification of Entrepreneurs, Entrepreneur vs. Professional Managers. |
| **Unit-II** | **Entrepreneurial Process and Structure**, Barriers to Enterprise, Sources of Innovative Opportunities, Marketing Research; Business Environment – Micro Environment, Macro Environment, Venture Feasibility – Technical, Marketing, Financial Feasibility, starting new business or buying firms. Entrepreneurship in the Agricultural Sector. start-ups, SHGs, FPO, cooperatives. |

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|---|---|
| Unit-III | **Business strategy**: concept - long term and short-term focus; Business organization; Sources of Finance, Venture capital financing - concept, purpose and schemes, Capital Markets, Government Policies and Regulations for Agribusiness. |
| Unit-IV | **Business Plan:** Sources of Product, Pre-Feasibility Study, Criteria for selection of product, Ownership and Capital, Growth Strategies in business – Market penetration, Market expansion, Product Expansion, Diversification, Acquisition, Steps in Product launch, IT in Agripreneurship. |

**Suggested Readings:**


- Agri-Business and Entrepreneurship Development by Dandekar, V. M. and Sharma, V. K., Manglam Publications, New Delhi.
- Entrepreneurship Development and Small Business Enterprises by P. Charantimath, Pearson Education.
- Entrepreneurship Development, Project formulation, Appraisal and Financing for Small Industry by Desai, V., 2006, Himalaya Publications, New Delhi.
- Entrepreneurship by Hisrich, R. D. and Peters, M. P., Tata McGraw Hill.
- Patterns of Entrepreneurship Management by Kaplan, J. M. and Warren, A. C., John Wiley and Sons; 4th revised edition.
- Fundamentals of Entrepreneurship Management by Nandan, H., Prentice Hall.


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| Unit-I | Traits/Qualities of entrepreneur, | https://archive.nptel.ac.in/courses/127/105/127105007/ |
| Unit-II | Barriers to Enterprise, Sources of Innovative Opportunities, | https://archive.nptel.ac.in/courses/110/107/110107094/ |
| Unit-III | Capital Markets | https://drmcet.digimat.in/nptel/courses/video/110105035/L23.html |
| Unit-IV | Growth Strategies in business | http://www.digimat.in/nptel/courses/video/110106164/L51.html |



| Course Code | DEC-AGB-MBA-267A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-AGB | | | | |
| Course Title | **Agricultural Economics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester- III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the meaning, concepts, scope, and importance of agricultural economics.<br>2. To understand the structure and role of Indian agriculture in the national economy and factors affecting productivity.<br>3. To understand the evolution, objectives, and components of Indian agricultural policy and land reforms.<br>4. To understand various agricultural development programs and the role of institutions like NABARD and APEDA | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the meaning, scope, and importance of agricultural economics in the Indian context. | Level-2 Understand |
| CO2 | **Apply** economic principles to solve agri business problems | Level-3 Apply |
| CO3 | **Apply** economic theories and tools to determine agricultural productivity and market trends. | Level-3 Apply |
| CO4 | **Analyze** the structure, policy, reforms and productivity patterns of Indian agriculture. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Agricultural Economics**: Meaning, concepts, definitions, scope and importance of Agricultural economics, Basics of economic principles; Theory of consumer behaviour, and its applications- Demand analysis; Demand function; Demand elasticity; Demand forecasting; |
| **Unit-II** | **Structure & Dynamics of Indian Agricultural**: Place of agriculture in National economy, Special characteristics of agriculture in Indian economy, Pattern of agricultural holdings, Agricultural productivity: Trends, causes and consequences of low productivity in India, Green revolution: Strategy in development of Indian agriculture. |

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|---|---|
| **Unit-III** | **Indian Agricultural Policy:** Meaning, types and importance, Evolution of agricultural policy, Famine Commission Report, Royal Commission on Agriculture: Recommendations, Land Reform Policy, Nature and objectives of land reforms, Major agricultural input policies including seed, fertilizer, pesticides, credit and irrigation, |
| **Unit-IV** | **Indian Agricultural Reforms:** National Rural Employment Assurance Programme & other recent Agricultural Development Programs Role of NABARD & Other agricultural credit societies, Current Agricultural Export Policies for different commodities, Role of APEDA, National Rural Employment Assurance Programme & other recent Agricultural Development Programs. |

**Suggested Readings:**


- Indian Agriculture: Problems, Progress and Prospects by Agrawal, A.N, Vikas Publishing House Pvt. Ltd., Delhi.
- Agricultural Problems of India by Mamoria, C.B, Kitab Mahal, Allahabad
- Natural Resources Conservation and Ecological Approach by Owen Oliver, MacMillan Co, Third Avenue.
- Agricultural Problems of India by Bansil, P.C, Vikas Publishing House Pvt. Ltd., Delhi.
- Agricultural Policy in India by Jain, S.C, Allied Publishers Pvt. Ltd.
- Agricultural Policy in wealthy Countries by James P.G, Ague and Robertson Publishers, Sydeny.
- Agricultural Policy in India by Karla, O.P, Bombay Popular Prakashan, Mumbai.
- Text Book of Animal Husbandry by Banerjee, G.C, Oxford and IBH Publishers, New Delhi.
- Animal Husbandry in India by Mahanta, K.C.


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Agricultural Economics | https://onlinecourses.swayam2.ac.in/nou25_hs28/preview |
| **Unit-II** | Place of agriculture in National economy, | https://archive.nptel.ac.in/noc/courses/noc19/SEM2/noc19-ag04/ |
| **Unit-III** | Agriculture and irrigation | https://archive.nptel.ac.in/courses/126/105/126105010/ |
| **Unit-IV** | Indian Agricultural Reforms | https://onlinecourses.nptel.ac.in/noc24_ec04/preview |



| Course Code | DEC-AGB-MBA-269A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-AGB | | | | |
| Course Title | Agri- Business Finance | | | | |
| Scheme and Credits | L | T | P | Credits | Semester- III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand Planning and managing cash inflows and outflows to ensure liquidity in agribusiness operations.<br>2. To understand the minimum return required to justify investment decisions in agriculture-related projects.<br>3. To understand the interest calculated on both the principal and accumulated interest, crucial for loan and investment evaluation.<br>4. To understand investment decisions and capital structure using capital budgeting and cost of capital techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the fundamental concepts of agri-business finance | Level-2 Understand |
| CO2 | **Apply** the concepts of financial management and accounting systems to prepare and manage agribusiness finance. | Level-3 Apply |
| CO3 | **Apply** financial and accounting techniques to solve the agribusiness problems | Level-3 Apply |
| CO4 | **Analyze** financial information to make decisions in the agribusiness. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Agribusiness Finance:** Agribusiness Finance; Agribusiness producers; Flow of fund in the economy; Importance of finance to agribusiness; Domestic trends in agribusiness finance; International trends. Agribusiness loans: Legal issues, terms, interest rates; Promissory Note; Parties to loan Transactions; Security Agreement; Mortgages versus deeds of trust; other loan terminology; life cycle of loan; default and foreclosure; determinants of interest rates. |
| Unit-II | **Time value of money**; loan calculations and analysis; compound interest; the process of discounting; annuities; present value of an annuity; basic loan calculations; building an amortization schedule; loan balance; refinance analysis; cash budgeting. Capital budgeting and leasing; cost of capital; capital budgeting techniques other considerations regarding capital budgeting; lease and leasing. |

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| | |
|---|---|
| **Unit-III** | **Financial statements;** Generally accepted accounting principles and the farm financial standard council; the income statement, owner's equity, balance sheet; accrual adjusted income statement, statement of cash flows.<br>**Financial statement analysis;** ratios analysis; common-size statement and horizontal analysis; risk in agribusiness; sources of business risk in agriculture; risk management in agriculture. |
| **Unit-IV** | **Agriculture lending industry:** commercial banks and farm credit system; other agribusiness lenders; venders/ trade credit; life insurance financing, Agri-Fintech Integration, Value Chain Financing, and Climate-Resilient Credit Models. |

**Suggested Readings:**

- Fundamental of agribusiness finance by Battles Ralph, W. Robert, C. Thompson, Wiley.
- Agri-Business and finance management by Parveen kumar verma, K.N.S. banafar, jaya publishing.
- Economic development in the agro- finance sector by Dr. Partha Sarathi Banerjee, Notion press.
- Accounting for agriculture by Hayden Van Der, Reactive publishing.
- State of agriculture finance in India by N Srinivasan, SAGE publication.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Agricultural finance | https://unacademy.com/lesson/agricultural-finance/SRCYUG24 |
| **Unit-II** | Time value of money: concepts and calculation | https://kristujayanti.digimat.in/nptel/courses/video/109107115/L01.html |
| **Unit-III** | Balance Sheet | https://archive.nptel.ac.in/courses/110/101/110101131/ |
| **Unit-IV** | Credit Analysis | https://drmcet.digimat.in/nptel/courses/video/112107260/L26.html |



| Course Code | DEC-OM-MBA-271A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-OM | | | | |
| Course Title | **Technology and Innovation Management** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the strategic role of technology in operations and business competitiveness.<br>2. To understand the processes of technology forecasting, acquisition, transfer, and commercialization.<br>3. To understand tools for managing innovation, R&D, and intellectual property in organizations.<br>4. To understand technology management practices in real-world business and manufacturing contexts. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** key concepts of technology management and their role in business strategy. | Level-2 Understand |
| CO2 | **Apply** innovation and forecasting tools to support decision-making in dynamic environments. | Level-3 Apply |
| CO3 | **Examine** how digital tools contribute to innovation in business contexts. | Level-3 Apply |
| CO4 | **Evaluate** strategies for adopting and integrating new technologies to enhance organizational performance. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Technology and Innovation-** Understanding technology and innovation in the business context, Types of Innovation: Product, process, and organizational innovations, Technology Life Cycle: Stages from introduction to obsolescence, Strategic Alignment: Integrating technology strategy with business objectives. |
| **Unit-II** | **Technology Forecasting and Acquisition-Forecasting Methods**: Expert opinion, trend analysis, and Delphi method, Acquisition Strategies: Make-or-buy decisions and sourcing technologies, R&D Management: Managing research and development for innovation, Absorption and Assimilation: Integrating new technologies into existing operations. |
| **Unit-III** | **Innovation Management-Innovation Models**: Open innovation and closed innovation, Managing the Innovation Process: Stages from idea generation to commercialization, Barriers to Innovation: |

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|---|---|
| | Identifying and overcoming obstacles, Role of Government and Agencies: Support in fostering innovation. |
| **Unit-IV** | **Intellectual Property and Digital Transformation-Intellectual Property Rights (IPR)**: Patents, copyrights, and trademarks, Digital Technologies: Impact of AI, IoT, and Industry 4.0 on innovation, Sustainability and Ethics: Integrating sustainable practices and ethical considerations, Global Perspectives: Understanding international trends and regulations. |

**Suggested Readings:**

- Management of Technology: The Key to Competitiveness and Wealth Creation by Tarek Khalil, McGraw Hill Education.
- Managing Technology and Innovation for Competitive Advantage by V.K. Narayanan, Pearson Education.
- Technology and Innovation Management by Sanjiva Shankar Dubey, PHI Learning.
- Strategic Management of Technology and Innovation by Burgelman, Christensen & Wheelwright, McGraw-Hill.
- Technology Management by G.P. Gupta, McGraw Hill India.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Technology and Innovation | https://onlinecourses.nptel.ac.in/noc22_de05/preview?utm_source=chatgpt.com |
| **Unit-II** | Technology Forecasting and Acquisition-Forecasting Methods | https://archive.nptel.ac.in/courses/109/105/109105176/?utm_source=chatgpt.com |
| **Unit-III** | Innovation Management-Innovation Models | https://onlinecourses.nptel.ac.in/noc21_mg63/preview?utm_source=chatgpt.com |
| **Unit-IV** | Intellectual Property and Digital Transformation | https://archive.nptel.ac.in/courses/109/105/109105176/?utm_source=chatgpt.com |



| Course Code | DEC-OM-MBA-273A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Specific Course-OM | | | | |
| Course Title | Supply Chain and Logistics Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the foundational principles of supply chain management and logistics.<br>2. To understand strategic network design and the role of transportation systems in supply chains.<br>3. To understand effective methods for inventory control and vendor management.<br>4. To understand the impact of information technology and decision-support systems on modern supply chains. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts and components of supply chain management, including design, logistics, purchasing, inventory, decision-support systems, and recent trends. | Level-2 Understand |
| CO2 | **Apply** principles of supply chain design, logistics, and transportation for effective distribution networks and improved supply chain operations. | Level-3 Apply |
| CO3 | **Apply** inventory management techniques, purchasing strategies, and decision-support tools to improve supply chain efficiency and respond to current trends like IT integration and outsourcing. | Level-3 Apply |
| CO4 | **Analyze** supply chain components and processes to examine their impact on efficiency and competitiveness. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Understanding the Supply Chain:** Define Supply Chain, Objective of a Supply Chain, Importance of Supply Chain Decisions, Decision Phases in a Supply Chain, Process View of a Supply Chain, Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope, logistics as integral part of SCM, components of logistics, supply chain analytics &AI |



| | |
|---|---|
| **Unit-II** | **Designing the supply chain network:** Role of distribution, factors influencing distribution, design options, e business and its impact , distribution networks in practice, network design in the supply chain, role of network, factors affecting the network design decisions, modelling for supply chain, designing and planning transportation networks: Role of transportation, modes and their performance, transportation infrastructure and policies design options and their trade-offs, tailored transportation. |
| **Unit-III** | **Purchasing and Vendor management:** Centralized and decentralized purchasing, functions of purchase department and purchase policies, single vendor concept, management of stores, accounting for materials. Inventory Management: Concept, various costs associated with inventory, various EOQ models, buffer stock (trade-off between stock out / working capital cost),lead time reduction, reorder point / re-order level fixation, exercises , ABC, SDE / VED Analysis, Just-In-Time and Kanban System of Inventory management. |
| **Unit-IV** | **Decision-support systems for supply chain management:** Introduction, the challenges of modelling structure of decision support systems, input data, analytical tools, presentation tools, supply chain decision: support systems. Recent Issues in SCM: Role of Computer / IT in Supply Chain Management, CRM vs. SCM, Benchmarking concept, Features and Implementation, Outsourcing-basic concept, Value Addition in SCM-concept of demand chain management |

**Suggested Readings:**

- Supply Chain Management Strategy, Planning and Operation by Chopra, S., Peter Meindl, Kalra, D.V., Pearson Education
- Supply Chain Management by Shah, J., Pearson Education
- Supply Chain Management by Sharma, Oxford University Press
- Supply Chain Logistics Management by Donald J. Bowersox, David J. Closs, M. Bixby Cooper, TMH
- Supply Chain Management by Sahay, B.S., Macmillan
- A Text Book of Logistics and Supply Chain Management by Agarwal, D.K., Macmillan
- Logistics and Supply Chain Management by Raghuram, G., Macmillan

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Logistic and supply chain management | https://onlinecourses.nptel.ac.in/noc24_hs128/ |
| **Unit-II** | Supply chain digitization and network | https://onlinecourses.nptel.ac.in/noc24_mg59/ |
| **Unit-III** | Supply chain and vendor management | https://www.coursera.org/specializations/supply-chain-management |
| **Unit-IV** | Supply chain analytics and decision support system | https://www.coursera.org/articles/supply-chain-analytics |

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| Course Code | DEC-OM-MBA-275A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-OM | | | | |
| Course Title | **Operations Research** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>1. To understand key Operations Research concepts for managerial decision-making.<br>2. To understand methods for solving linear programming, transportation, and assignment problems.<br>3. To understand project management using PERT/CPM and decision-making under uncertainty.<br>4. To understand applications of game theory, queuing theory, and simulation in business problem-solving. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the concepts and applications of Operations Research tools for effective managerial decision-making. | Level-2 Understand |
| CO2 | **Apply** appropriate Operations Research techniques such as linear programming, transportation, and assignment models to examine business and industrial problems. | Level-3 Apply |
| CO3 | **Apply** project management techniques like decision theory, game theory, queuing models, and simulation techniques to support managerial decision-making. | Level-3 Apply |
| CO4 | **Analyze** Operations Research techniques to improve managerial decision-making across functional areas. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Operations Research:** Meaning, origin, scope and role in managerial decision making. Linear programming: Meaning, scope and limitations. Formulation of industrial and business problem as linear programming problems. Solution of linear programming problems by graphical and simplex methods. Degeneracy and duality in linear programming problems. |



| | |
|---|---|
| **Unit-II** | **Transportation Problems:** Balanced and unbalanced cases, Initial basic feasible solution of transportation problems by N/W method, least cost entry method and Vogel's approximation method. Optimal solution of transportation problem by MODI and STEPING STONE method. Degeneracy in transportation problem. Assignment problems including traveling salesman's problem. Special cases in assignment problems: unbalanced problems, maximization objective and multiple optimal solutions. |
| **Unit-III** | **Decision theory:** decision making under uncertainty and risk, Bayesian analysis, decision trees. PERT/CPM: Difference between PERT and CPM, network construction, calculating EST, EFT, LST, LFT and floats, probability considerations in PERT, time -cost trade-off. |
| **Unit-IV** | **Game theory:** meaning and types of games, types of strategies. Solution of games with saddle point and graphical method. Principle of dominance. Concept of Auction Theory<br>**Queuing theory:** concept, assumptions and applications. Steady state solution of MM1 and MMK models. Poisson distributed arrivals and exponentially distributed service time models. Simulation: meaning, process, advantages, limitations and applications |

**Suggested Readings:**

- Operations Research by Paneerselvam, PHI, New Delhi.
- Operations Research: An Introduction by Taha, Pearson Education.
- Quantitative Techniques in Management by Vohra, N.D., Tata McGraw Hill Publishing Company Ltd., New Delhi.
- Operations Research by Kapoor, V.K., Sultan Chand and Sons, New Delhi.
- Operations Research: Theory and Applications by Sharma, J.K., Macmillan India Ltd., New Delhi.
- Operations Research by Kalavathy, Vikas Publishing House, New Delhi.
- Operation Research by Natarajan, A.M., Pearson Education.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Linear Programming method for solving games | https://archive.nptel.ac.in/courses/111/107/111107128/ |
| **Unit-II** | Decision theory PERT,CPM | https://nptel.ac.in/courses/112107238 |
| **Unit-III** | Transportation problem | https://nptel.ac.in/courses/111107128 |
| **Unit-IV** | Theorems of Game Theory, Solution of Mixed Strategy Games | https://archive.nptel.ac.in/courses/112/106/112106131/ |



| Course Code | DEC-OM-MBA-277A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-OM | | | | |
| Course Title | R&D Management | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of emerging technologies and the process of environmental analysis in Research and Development (R&D).<br>2. To understand the operational and financial structures that define R&D environments.<br>3. To understand the application of procurement, material, and contract management policies in R&D settings.<br>4. To understand and develop analytical skills for managing test facilities and utilizing collaborative development tools effectively. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts and practices for managing R&D environments, resources, and technology. | Level-2 Understand |
| CO2 | **Apply** project management and resource allocation to prepare proposals and manage budgets and procurement. | Level-3 Apply |
| CO3 | **Apply** technology scanning and material management to optimize the use of instruments and test facilities. | Level-3 Apply |
| CO4 | **Analyze** R&D environment and processes to examine strategies for effective project execution and collaboration. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Survey of Emerging Technologies** - Environment Analysis; Project Proposals; R and D Management: Management of knowledge workers. Legal Framework for R&D Projects: Government policies, ethics, and compliance in research, Intellectual Property Management in R&D: Protecting inventions and innovations developed during projects. |
| Unit-II | **R and D environment;** Management of High value Instruments Test Facilities, Workshops etc., Identification of partners/contractors for R&D Projects; R and D Budget. |

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|---|---|
| **Unit-III** | **Technology Scanning:** Procurement Procedure; Material Management Policy; Discard Policies and Procedure; Contract Management; Procurement and Utilization of Capital Equipment; Test Equipment. |
| **Unit-IV** | **Test Facilities;** Sharing of resources with other Institution, Sponsored Resources; Development Tools. |

**Suggested Readings:**

- The Science of Managing Organised Technology by Marvin J. Cetron and Joel D. Goldhar (eds.), Gordon and Research, Science Publications.
- Management of Research and Development Organizations; Managing the Unmanageable by R. K. Jain and H. C. Triandis, Wiley.
- The Management of Research, Development and Design in Industry by Tom McLeod, Gower.
- Project Management: A Managerial Approach by Jack R. Meredith and Samuel J. Mantel, Wiley.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Survey of Emerging Technologies | https://onlinecourses.nptel.ac.in/noc23_ge36/ |
| **Unit-II** | R and D Projects | https://onlinecourses.nptel.ac.in/noc24_hs01/ |
| **Unit-III** | Technology Scanning | https://nptel.ac.in/courses/110/105/110105091 |
| **Unit-IV** | Development Tools. | https://onlinecourses.nptel.ac.in/noc24_ar07/ |



| Course Code | DEC-OM-MBA-279A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-OM | | | | |
| Course Title | **Purchasing and Material Management** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 3 | 1 | 0 | 4 | |
| 1. Course Objectives | The objectives of this course are<br>1. To understand its role, scope, and interrelationship with other departments.<br>2. To understand legal aspects, public and international purchasing procedures.<br>3. To understand material planning systems (MRP, JIT) and cost reduction techniques.<br>4. To understand capital equipment purchasing, supplier evaluation, and material storage/distribution. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** key concepts of material management. | Level-2 Understand |
| CO2 | **Apply** various materials management tools and techniques to optimize business operations. | Level-3 Apply |
| CO3 | **Examine** the impact of strategic purchasing decisions on overall business performance. | Level-3 Apply |
| CO4 | **Evaluate** material management strategies to optimize business operations overall organizational success. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Purchasing and Materials Management**-Definition, objectives, scope, and nature of materials management, Structure of materials management and its relationship with other departments, Legal aspects of purchasing and public purchasing procedures, International purchasing procedures and documentation, Material Logistics: Overview of warehousing, material handling, and transportation |
| Unit-II | **Material Planning and Quantity Determination:** Determination and description of material quantity; material planning in Push and Pull systems. Production Planning Tools: Material Requirements Planning (MRP); Just-in-Time (JIT) systems. |



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|---|---|
| **Unit-III** | **Material Quality Management and Cost Reduction**-Incoming quality inspection and vendor process capability, Cost Reduction Techniques: Standardization, simplification, value analysis, and value engineering, Strategic Purchasing Decisions: Make-or-buy decisions and vendor selection |
| **Unit-IV** | **Capital Equipment, Stores Management, and Distribution**-Capital Equipment and Stores Management: Purchasing capital equipment and evaluating suppliers' efficiency, Material Storage and Distribution: Stores layout, material handling, packaging, and distribution systems |

**Suggested Readings:**

- Materials Management: An Integrated Approach by Gopalakrishnan, P. & Sundaresan, M., Prentice Hall of India, New Delhi.
- Procurement Principles and Management by Baily, P., Farmer, D., Crocker, B., Jessop, D., & Jones, D., Pearson Education.
- Purchasing and Supply Management by Dobler, Donald W. & Burt, David N., Tata McGraw-Hill Publishing Company Ltd., New Delhi.
- Introduction to Materials Management by Arnold, J. R. Tony, Chapman, Stephen N., & Clive M. Lloyd, Pearson Education.
- Materials Management: Procedures, Text and Cases by Datta, A. K., PHI Learning Pvt. Ltd., New Delhi.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Inventory and Materials Management | https://onlinecourses.nptel.ac.in/noc24_mg106/preview?utm_source=chatgpt.com |
| **Unit-II** | Material Planning and Quantity Determination | https://onlinecourses.nptel.ac.in/noc22_mg74/preview?utm_source=chatgpt.com |
| **Unit-III** | Material Quality Management and Cost Reduction | https://onlinecourses.nptel.ac.in/noc25_mg74/preview |
| **Unit-IV** | Capital Equipment, Stores Management, and Distribution | https://onlinecourses.nptel.ac.in/noc25_mg42/preview |



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|---|---|---|---|---|---|
| Course Code | **DEC-BA-MBA-281A** | | | | |
| Category | Discipline Elective Course | | | | |
| Course Title | **Basics of Business Analytics** | | | | |
| Scheme and Credits | **L** | **T** | **P** | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamentals of business analytics, including its types, characteristics, and relationship with business intelligence.<br>2. To understand the business analytics process and its integration with the decision-making process in organizations.<br>3. To understand the applicability of business analytics across diverse functional areas and public sector organizations.<br>4. To understand the roles, skills, and responsibilities of key analytics professionals like statisticians, data scientists, and data engineers. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts, types, and processes of business analytics and their applications across industries. | Level-2 Understand |
| CO2 | **Apply** descriptive, predictive, and prescriptive analytics methods to solve business problems and support decisions. | Level-3 Apply |
| CO3 | **Analyze** business scenarios by interpreting analytical data to gain insights and determine their influence on competitive advantage. | Level-4 Analyze |
| CO4 | **Analyze** analytics tools, technologies, and career roles in the context of evolving industry demands. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Business analytics:** Introduction, types of analytics, characteristics of analytics, business analytics, and business intelligence; business analytics process and its relationship with decision making process; Advantage of business analytics: informed decisions, developing distinct capability, creating competitive advantage, key attributes of analytical competitors. |



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| **Unit-II** | **Analytical methods and models:** Descriptive analytics-overview of its tools and techniques, role in business analytics process and its importance in business decision making; Predictive analytics- nature and type of modelling, basics of data mining and machine learning environment, role in business analytics process and its importance in strategic decision making; Prescriptive analytics: basics of its tools and modelling, role in business analytics process, data driven decision making. |
| **Unit-III** | **Business analytics in action:** Applicability and importance of business analytics in different areas- financial analytics, human resource analytics, marketing analytics, healthcare analytics, supply chain analytics, sport analytics and analytics for Government and non-profit organization, business strategy and analytics integration. |
| **Unit-IV** | **Developing analytics:** Statistician, data scientist and data engineer and their key features, skills required for analytics, big data and its analyst, important analytics software, major companies providing analytical solutions, job opportunities in business analytics, Data visualisation |

**Suggested Readings:**

- Business Intelligence: A Managerial Perspective on Analytics by Ramesh Sharda, Dursun Delen and Efraim Turban, Pearson Education
- Data Visualization: A Practical Introduction by Kieran Healy, Princeton University Press
- Business Analytics by Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, Pearson Education
- Business analytics Data analysis and Decision Making by S. Christian Albright and Wayne L. Winston, Cengage Learning India Pvt. Ltd.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Business Analytics | https://nptel.ac.in/courses/110105089 |
| **Unit-II** | Descriptive Analytics | https://nptel.ac.in/courses/110105089 |
| | Data Mining | https://nptel.ac.in/courses/110105089 |
| **Unit-III** | Supply Chain Analytics | https://onlinecourses.nptel.ac.in/noc23_mg16/preview |
| **Unit-IV** | Data Visualisation | https://nptel.ac.in/courses/110105089 |



| Course Code | DEC-BA-MBA-283A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-BA | | | | |
| Course Title | **Applied Multivariate Analysis** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamental concepts of univariate and multivariate statistics<br>2. To understand multivariate probability distributions, particularly the Multinomial and Multivariate Normal distributions, and their applications in real-world data modeling.<br>3. To understand the comprehensive knowledge of multivariate data visualization and reduction techniques<br>4. To understand the statistical inference techniques, including estimation, hypothesis testing, and model adequacy tests in both univariate and multivariate contexts. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** fundamental concepts of univariate and multivariate statistical models. | Level-2 Understand |
| CO2 | **Apply** estimation procedures, hypothesis testing frameworks, and descriptive statistics to examine both univariate and multivariate data using appropriate statistical methods. | Level-3 Apply |
| CO3 | **Analyze** univariate and multivariate data using descriptive and inferential statistics, including model adequacy for regression, ANOVA, MANOVA, PCA, and factor analysis. | Level-4 Analyze |
| CO4 | **Evaluate** univariate and multivariate estimation, hypothesis testing, inferential statistics, and advanced multivariate models using software tools. | Level-5 Evaluate |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Multivariate:** Basic concepts of multivariate statistical modeling, Basic concepts of multivariate distributions, Multinomial and multivariate normal distributions, Principal component analysis and other multivariate data visualization techniques, Profile analysis. |



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| **Unit-II** | **Basics of univariate statistics:** Univariate descriptive statistics, Sampling distribution, Estimation, Hypothesis testing. |
| **Unit-III** | **Basic of multivariate statistics:** Multivariate descriptive statistics, Multivariate normal distribution, Multivariate Inferential statistics |
| **Unit-IV** | **Multivariate models:** Analysis of variance (ANOVA), Multivariate analysis of variance (MANOVA), Multiple linear regression (MLR): Introduction, Sampling distribution of regression coefficients, Model adequacy tests, Test of assumptions, Model diagnostics, Multivariate linear regression (MvLR): Introduction, Estimation, Model adequacy tests, Regression modeling using SPSS, Principle component analysis (PCA): Introduction, Model adequacy and interpretation, Factor analysis (FA): Introduction, Estimation and model adequacy testing, Rotation of FA, factor scores, Cluster analysis (CA), Introduction to structural equation modeling (SEM), Correspondence analysis |

**Suggested Readings:**

- Research Methodology: Concepts and Cases by Chawla Deepak and Neena Sondhi, Vikas Publishing House.
- Methods of Multivariate Analysis by Alvin C. Rencher, Wiley Series in Probability and Statistics
- Multivariate Data Analysis by Joseph F. Hair, Rolph E. Anderson and Willian C. Black, Pearson Education
- Introduction to multivariate Analysis by C. Chatfied, Springer

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Multivariate Statistical Model | nptel.ac.in/courses/110105060 |
| **Unit-II** | Univariate descriptive statistics | nptel.ac.in/courses/110105060 |
| **Unit-III** | Multivariate descriptive statistics | nptel.ac.in/courses/110105060 |
| | Factor Analysis : Model Adequacy, rotation, factor scores and case study | nptel.ac.in/courses/110105060 |
| **Unit-IV** | Multivariate analysis of variance (MANOVA) | nptel.ac.in/courses/110105060 |



| Course Code | DSC-BA-MBA-285A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-BA | | | | |
| Course Title | **Information Economics and its Applications** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand core concepts of information asymmetry, including moral hazard, adverse selection, and monopolistic screening.<br>2. To understand game theory to analyze signaling, screening, and equilibrium outcomes under asymmetric information.<br>3. To understand information-related issues in insurance and labor markets using economic models.<br>4. To understand the mechanism design principles, like the revelation principle and truthful implementation. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** key concepts of information economics, such as moral hazard, adverse selection, signaling, and screening across different market settings. | Level-2 Understand |
| CO2 | **Apply** theoretical models from microeconomics and game theory to real-world problems involving imperfect information in insurance, labor, and credit markets. | Level-3 Apply |
| CO3 | **Examine** the principles of contract theory, game theory, and mechanism design in the context of asymmetric information. | Level-3 Apply |
| CO4 | **Analyze** strategic interactions and outcomes in auctions, bargaining, and screening mechanisms using tools from contract theory and mechanism design. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Information Economics; The Principal Agent:** Hidden actions (Moral hazard) problem, hidden information problems, monopolistic screening. Microeconomic Theory (MWG),The Theory of Contracts. |
| **Unit-II** | **Adverse Selection:** Concept, lemons problem, probable solutions, game theoretic approach Signalling: Separating and Pooling equilibrium,Insurance market, cheap talk. Job Market Signaling |

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| **Unit-III** | **Screening:** Second degree price discrimination, Game Theory. Screening in Competitive Insurance Market, Monopoly screening in insurance .Market Equilibrium in Competitive Insurance Markets |
| **Unit-IV** | **Introduction to Mechanism design:** Basic concepts, revelation principle, truthful implementation. Applications of mechanism design to bargaining and auctions: Bidding behaviour in the four standard auctions: First price sealed bid, second price sealed bid, Dutch auction, English auction. Revenue equivalence theorem; Applications to Finance: Credit market rationing. |

**Suggested Readings:**

- Microeconomic Theory by Andreu Mas-Colell, Michael D. Whinston, Jerry R. Green, Oxford University Press
- Contract Theory by Patrick Bolton and Mathias Dewatripont, The MIT Press
- The Theory of Industrial Organization by Jean Tirole,The MIT Press
- The Economics of Contracts: A Primer by Bernard Salanié, MIT Press
- Game Theory for Applied Economists by Robert Gibbons, Princeton University Press

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Microeconomics: Theory & Application | https://onlinecourses.nptel.ac.in/noc20_hs01/preview |
| | Managerial Economics | https://archive.nptel.ac.in/noc/courses/noc20/SEM2/noc20-mg67 |
| **Unit-II** | Introduction to Game Theory and Mechanism Design | https://archive.nptel.ac.in/courses/106/101/106101237/ |
| | Strategy: An Introduction to Game Theory | https://archive.nptel.ac.in/courses/110/104/110104063/ |
| **Unit-III** | Financial Institutions and Markets | https://archive.nptel.ac.in/courses/110/105/110105121/ |
| **Unit-IV** | Introduction to Game Theory and Mechanism Design | https://onlinecourses.nptel.ac.in/noc23_cs117/preview |



| Course Code | DEC-BA-MBA-287A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-BA | | | | |
| Course Title | **Business Data Mining** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the fundamental concepts and architecture of data warehousing.<br>2. To understand the basic processes, functionalities, and applications of data mining.<br>3. To understand the integration of data mining systems with data warehouses.<br>4. To understand various data mining methods and techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the fundamental concepts, components, and techniques of data warehousing and data mining for effective data analysis and knowledge discovery. | Level-2 Understand |
| CO2 | **Apply** data warehousing and mining techniques for data extraction, preprocessing, analysis, and decision support. | Level-3 Apply |
| CO3 | **Analyze** data warehousing and data mining techniques to reveal relationships, patterns, and structures within large datasets for effective knowledge discovery and decision support. | Level-4 Analyze |
| CO4 | **Evaluate** data warehousing and data mining frameworks, methodologies, and techniques for their effectiveness in extracting insights and supporting data-driven decision-making. | Level-5 Evaluate |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Data Warehousing**-Concept of data warehousing, Data warehousing components, Building a data warehouse, Mapping the data warehouse to a multiprocessor architecture, DBMS schemas for decision support, Data extraction, cleanup, and transformation tools, Metadata.<br>**Introduction to Data Mining**-Definition and importance, Types of data, Data mining functionalities, Interestingness of patterns, Classification of data mining systems, Data mining task primitives |
| **Unit-II** | **Integration and Preprocessing**-Integration of Data Mining and Data Warehousing, Issues and Challenges, Data Preprocessing: Techniques and importance of data preprocessing |



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|---|---|
| **Unit-III** | **Mining Patterns, Associations, and Correlations-**Mining Frequent Patterns: Introduction and methods, Association Rule Mining: Mining various kinds of association rules ,Correlation analysis, Constraint-based association mining |
| **Unit-IV** | **Classification and Prediction-**Classification Techniques: Basic concepts, Decision tree induction, Bayesian classification, Rule-based classification, Prediction Methods: Overview and applications |

**Suggested Readings:**

- Data Mining Methods and Models by Daniel T. Larose , Wiley-Interscience.
- Insight into Data Mining Theory and Practice by K.P. Soman, Shyam Diwakar, and V. Aja , Prentice Hall of India.
- Introduction to Data Mining by Pang-Ning Tan, Michael Steinbach, and Vipin Kumar ,Pearson Education.
- Introduction to Data Mining with Case Studies by G.K. Gupta Prentice Hall of India.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to data warehousing | https://www.coursera.org/articles/management |
| **Unit-II** | Integrated data mining with data warehousing | https://archive.nptel.ac.in/courses/106/105/106105174/ |
| **Unit-III** | Data processing | https://onlinecourses.nptel.ac.in/noc21_cs06/ |
| **Unit-IV** | Classification | https://onlinecourses.nptel.ac.in/noc21_mg08/ |



| Course Code | DEC-BA-MBA-289A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course BA | | | | |
| Course Title | **Data Analytics Using R** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are<br>1. To understand the basics and foundational concepts of R programming.<br>2. To understand and analyze data using R tools and techniques.<br>3. To understand clustering operations on datasets using R.<br>4. To understand parallel computing techniques in R for efficient data processing. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the core concepts of R, statistical modeling, advanced data analysis techniques, and specialized applications for data handling and interpretation. | Level-2 Understand |
| CO2 | **Apply** R programming techniques for data handling, statistical modeling, advanced analysis, and specialized applications such as text mining and risk assessment. | Level-3 Apply |
| CO3 | **Analyze** data using R through statistical models, advanced analytical methods, and specialized techniques for complex and high-dimensional data challenges. | Level-4 Analyze |
| CO4 | **Evaluate** the effectiveness of R-based data handling, statistical models, advanced analysis techniques, and specialized applications for complex data-driven problems. | Level-5 Evaluate |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to R and Data Handling-**Introduction to R, Getting Started with R, Loading and Handling Data in R, Exploring Data in R, R console, RStudio, and basic functions, Using R packages and libraries, Vectors, lists, and arrays in R |
| **Unit-II** | **Statistical Modeling and Classification-**Linear Regression using R,Logistic Regression, Decision Tree, Types of statistical models: descriptive, inferential, predictive, and prescriptive, The process of building statistical models: assumptions, fitting, validation, and evaluation |
| **Unit-III** | **Advanced Data Analysis Techniques-**Time Series in R,Clustering, Association Rules, Data analysis methods and their importance in complex data problems, Challenges in analyzing large and high-dimensional datasets |

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| **Unit-IV** | **Specialized Applications in R-Text Mining, Parallel Computing with R, Key libraries and packages for specialized applications in R ,Value at Risk (VaR) and risk assessment using R** |

**Suggested Readings:**

- Data Analytics Using R by Seema Acharya, McGraw Hill Education.
- Data Analysis and Graphics Using R by Maindonald & Braun, Cambridge University Press.
- Head First Data Analysis by Michael Milton, O'Reilly Media.
- R Programming for Beginners by Rakshit, McGraw Hill Education.
- Hands-On Programming with R by Garrett Grolemund, O'Reilly Media.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to R | https://archive.nptel.ac.in/courses/111/104/111104160/ |
| **Unit-II** | Linear Regression using R | https://archive.nptel.ac.in/courses/110/107/110107092/ |
| **Unit-III** | Clustering | https://archive.nptel.ac.in/courses/110/107/110107095/ |
| **Unit-IV** | Text Mining | https://archive.nptel.ac.in/courses/110/107/110107095/ |
| | Parallel computing with R | https://onlinecourses.nptel.ac.in/noc24_mg113/preview |



| Course Code | DEC-PP-MBA-291A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-PP | | | | |
| Course Title | **Public Policy Formulation and Evaluation** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are as following:<br>1. To develop a foundational understanding of public policy.<br>2. To equip students with analytical tools and frameworks.<br>3. To enhance decision-making and strategic thinking skills.<br>4. To foster the ability to work collaboratively on policy analysis and recommendations. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

Course Outcomes: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key concepts, stages, and institutional frameworks involved in public policy formulation, implementation, and evaluation, particularly within the Indian governance context. | Level-2 Understand |
| CO2 | **Explain** the interrelationships among various stakeholders, policy tools, and processes, and interpret how political, economic, and social factors influence policy decisions and outcomes in India. | Level-3 Apply |
| CO3 | **Apply** policy analysis models and evaluation techniques to real-world public policies, using data-driven approaches to assess their effectiveness, efficiency, and impact. | Level-3 Apply |
| CO4 | **Illustrate** the difference between successful and unsuccessful policy interventions with an example. | Level-4 Analyze |

Note:

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Public Policy**: Concept and Nature of Public Policy, Policy Cycle: Stages and Stakeholders, Types of Public Policies (Economic, Social and Regulatory), Role of Government, Civil Society, and Private Sector, Policy-Making Institutions in India: Legislature, Executive, and Judiciary. |
| Unit-II | **Policy Formulation and Design** : Agenda Setting and Problem Identification, Policy Analysis and Alternatives, Role of Data and Evidence in Policy Design, Political, Economic, and Ethical Considerations, Tools and Techniques of Policy Formulation (Cost-Benefit, SWOT and PESTLE) |

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|---|---|
| **Unit-III** | **Policy Implementation**: Implementation Frameworks and Challenges, Role of Bureaucracy, Central and State Governments, Inter-Governmental Coordination, Public-Private Partnerships (PPPs) and NGO Involvement, Monitoring Mechanisms. |
| **Unit-IV** | **Policy Evaluation and Impact Assessment** : Evaluation Models: Formative, Summative, Ex-ante, Ex-post, Key Performance Indicators (KPIs), Social Cost-Benefit Analysis, Tools for Policy Evaluation: Logic Models, RCTs (Randomized Control Trials), Surveys, Feedback Mechanism for Policy Review and Redesign. |

**Suggested Readings:**

- Public Policy: An Introduction to the Theory and Practice of Policy Analysis – Wayne Parsons
- The Oxford Handbook of Public Policy" – Moran, Rein, and Goodin
- Indian Public Policy Reports – NITI Aayog Publications
- Government Policy Documents and White Papers (available online)

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Public policy and administration | https://nptel.ac.in/courses/129106411 |
| **Unit-II** | Principles of state policy | https://nptel.ac.in/courses/129106411 |
| **Unit-III** | Legislative interpretation | https://nptel.ac.in/courses/129106411 |
| **Unit- IV** | Administrative tribunal | https://nptel.ac.in/courses/129106411 |



| Course Code | DEC-PP-MBA-293A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-PP | | | | |
| Course Title | **Sustainable Development** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are as following:<br>1. To introduce the concept, importance, and dimensions of sustainable development.<br>2. To analyze the role of businesses in promoting sustainability.<br>3. To develop an understanding of global and national policies for sustainable development.<br>4. To enable students to evaluate sustainability practices and design strategies in business contexts. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

Course Outcomes: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the key principles, goals, and dimensions of sustainable development. | L2-Understand |
| CO2 | **Demonstrate** sustainable development frameworks and assessment tools. | L-3 Apply |
| CO3 | **Determine** sustainability strategies for different business models. | L-3 Apply |
| CO4 | **Illustrate** the global sustainability initiatives and governance mechanisms with examples. | L-4 Analyze |

Note:

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction to Sustainable Development: Definition and evolution,** three pillars of sustainability, Sustainable Development Goals (SDGs), Indicators and measurement of sustainability, Ecological footprint and carbon footprint. |
| **Unit-II** | **Environmental and Social Dimensions of Sustainability:** Natural resource management: water, energy, forests, and biodiversity, Climate change: causes, consequences, mitigation, and adaptation, Pollution control and waste management, Social inclusion, gender equality, and poverty alleviation, Health, education, and sustainable livelihoods. |
| **Unit-III** | **Business and Sustainability:** Corporate Social Responsibility (CSR) and sustainability, Triple Bottom Line (TBL) approach, Sustainable business models and strategies, Environmental, Social, and Governance (ESG) criteria, Green marketing, green finance, and green supply chains. |

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|---|---|
| **Unit-IV** | **Policy, Governance and Global Perspectives:** National policies and institutional frameworks for SD in India, Global agreements: UNFCCC, Kyoto Protocol, Paris Agreement, Role of international organizations: UNDP, UNEP, World Bank, WTO, Public-Private Partnerships (PPP) for sustainable development, Challenges and barriers to implementation of SD, Future trends: circular economy, carbon neutrality, SD in digital economy |

**Suggested Readings:**


- What is Sustainable Development? by Kates, R. W., Parris, T. M., & Leiserowitz, A. A. , journal Environment: Science and Policy for Sustainable Development by Taylor & Francis
- The Age of Sustainable Development by Sachs, Jeffrey D. , Columbia University Press
- Economic Development by Todaro, Michael & Smith, Stephen , Pearson Publishers
- Sustainable Development: Issues and Challenges by Kumar, S. & Choudhury, A. , Gullybaba Publishing House


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Sustainable Development | https://archive.nptel.ac.in/courses/110/101/110101153/ |
| **Unit-II** | Evolution of Sustainable Development | https://archive.nptel.ac.in/courses/110/101/110101153/ |
| **Unit-III** | Relevance of Sustainable Development | https://archive.nptel.ac.in/courses/110/101/110101153/ |
| **Unit-IV** | Sustainable Development and environment | https://archive.nptel.ac.in/courses/110/101/110101153/ |



| Course Code | DEC-PP-MBA-295A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-PP | | | | |
| Course Title | **Rural Development** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>1. To provide a conceptual understanding of rural development, its scope, and strategic approaches.<br>2. To examine the roles and functions of institutions at national, state, and local levels in rural development.<br>3. To analyze economic and sectoral issues affecting rural areas and explore modern development strategies.<br>4. To introduce students to rural development information systems and key government welfare programs. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** the key concepts, elements, and approaches of rural development. | Level-1 Remember |
| CO2 | **Explain** the significance of rural management and the role of institutions in the rural development process. | Level-2 Understand |
| CO3 | **Apply** knowledge of development programs and information systems to propose improvements in rural planning and implementation. | Level-3 Apply |
| CO4 | **Analyze** economic and sectoral issues in rural areas and assess the effectiveness of various development strategies and institutional interventions. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| **Unit-I** | **Introduction:** Rural Development: Concept, Elements, Importance and Scope - Approaches: Sectoral Approach, Area Approach, Target Group Approach, Participatory Approach, Integrated Approach - Sustainable Rural Development- Rural Management: Scope and Significance of Rural Management - Economic perspectives of Rural Development: Lack of access to assets, Micro finance, Capital market - Sectoral Issues in Rural development: Agriculture, Industries, Land Reforms. |

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|---|---|
| **Unit-II** | **Institutions for Rural Development and Management**: Structure, Functions and Role in Rural Development National level Institutions: NITI Aayog, Ministry of Rural Development, Ministry of Panchayati Raj, NIRD, CAPART and NABARD; State Level Institutions: State Planning Board, State Institute of Rural Development and Kerala Institute of Local Administration - District and Other Level Institutions: District Planning Committee; Panchayati Raj Institutions - Community Based Institutions - Scientific inputs and support from the Institutions like ICAR, ISRO, CSIR Institutes etc. |
| **Unit-III** | **Rural Development Information System (RDIS):** Management Information System - Impact of MIS on organization - RDIS: RD professionals" responsibility in phase of RDIS development - RDIS Planning and RDIS Implementation - Emerging Trends in RDIS |
| **Unit-IV** | **Major Development and Welfare Programmes** - Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGA) – Schemes for self-employment of the rural poor, Schemes for Housing to the rural poor- Rural Health Mission Schemes - Sanitation Programme - Drinking water supply programme – Backward Region Grant Fund (BRGF) - Pradhan Mantri Grameen Sadak Yojana (PMGSY) - Integrated Wasteland Development Programme (IWDP) - Provisions of Urban Amenities in Rural Areas (PURA) - PPP/ CSR Initiatives in Rural Development |

**Suggested Readings:**


- Rural Development: Concept, Approach and Strategy by B. K. Prasad, Sarup and Sons, New Delhi.
- Rural Development - Principles, Policies and Management by Katar Singh, Sage Publications, New Delhi.
- Rural Development in India: Approaches, Strategies, and Programmes edited by Madhuri Srivastava & Alok Kumar Singh, Deep and Deep Publications, New Delhi.
- Rural Development by Satya Sundaram, Himalaya Publishing House, Mumbai.
- Greening Rural Development in India by Government of India, Ministry of Rural Development and UNDP, New Delhi.
- Co-operatives and Rural Development in India by Katar Singh & R. S. Pundir, IRMA


**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Rural Development | https://www.youtube.com/watch?v=KFAw_h0n0q0 |
| **Unit-II** | NABARD<br>Ministry of Panchayati Raj | https://www.youtube.com/watch?v=bYMgCXdhHSM<br>https://www.youtube.com/watch?v=QXBc6ylWNEQ |
| **Unit-III** | Remote Sensing and GIS for rural development | https://www.youtube.com/watch?v=jmDs-E7h6dc&list=PLOzRYVm0a65f5H3WD0Zom99yITuCHahnK |
| **Unit-IV** | Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGA) | https://www.youtube.com/watch?v=sV2QI7SIZgw |



| Course Code | DEC-PP-MBA-297A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-PP | | | | |
| Course Title | **Social Campaign Promotion** | | | | |
| Scheme and Credits | **L** | **T** | **P** | **Credits** | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are as following:<br>1. To understand the concept and importance of social campaigns in business and society.<br>2. To explore tools and strategies for planning and implementing effective social campaigns.<br>3. To develop skills in research, communication, media planning, and stakeholder engagement.<br>4. To foster innovation and creativity in promoting social causes. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

Course Outcomes: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** in-depth understanding of the principles, significance, and societal impact of social campaigns by critically analyzing real-world initiatives | Level2-Understand |
| CO2 | **Use** complete social campaign plan by integrating research insights, behavioral targeting, message framing, stakeholder engagement, and creative strategy to effectively promote social causes. | Level-3 Apply |
| CO3 | **Illustrate** integrated communication and media tools—including traditional, digital, and experiential methods | Level-3 Apply |
| CO4 | **Outline** the effectiveness of social campaigns using appropriate performance metrics, data collection tools, and ethical considerations, and suggest actionable improvements for future campaigns. | Level-4 Analyze |

Note:

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Foundations of Social Campaigns**: Introduction to Social Campaigns: Definition, Scope, and Objectives, Distinction between Commercial and Social Marketing, Importance of Social Campaigns in Business and Society, Social Campaigns and Sustainable Development Goals (SDGs) |
| Unit-II | **Planning and Designing a Social Campaign**: Problem Identification and Research Methods, Audience Segmentation, Targeting, and Behavioral Insights, Goal Setting and Message Formulation, Campaign Strategy and Creative Planning, Stakeholder Mapping and Role of NGOs, Government, and Corporate Partners |

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|---|---|
| **Unit-III** | **Media, Communication, and Implementation Tools**: Integrated Marketing Communication (IMC) for Social Campaigns, Use of Traditional Media: Print, Radio, TV, Digital and Social Media Promotion: SEO, Content Marketing, Influencers, Viral Campaigns, Event Marketing, Road shows, and Grassroots Activations, Budgeting, Scheduling, and Resource Allocation |
| **Unit-IV** | **Monitoring, Evaluation, and Ethical Issues**: Campaign Monitoring Tools and Performance Indicators (KPIs), Evaluation Techniques: Surveys, Feedback, Data Analytics, Impact Assessment, Report Writing and Documentation, Ethical Considerations in Social Messaging, Legal Frameworks and Advertising Standards (ASCI Guidelines, CSR Policies) |

**Suggested Readings:**

- Social Marketing: Influencing Behaviors for Good by Kotler, P., & Lee, N., Sage Publications.
- Social Marketing in the 21st Century by Andreasen, A. R., Sage Publications.
- Hands-On Social Marketing: A Step-by-Step Guide. by Weinreich, N. K., Sage Publications.
- Selected Campaign Reports and Articles by WHO, UNICEF, NITI Aayog, ASCI, and industry portals.

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Sustainable Development Goals (SDGs) | https://onlinecourses.nptel.ac.in/noc22_hs61/preview |
| **Unit-II** | Promotion in Social Campaign | https://onlinecourses.nptel.ac.in/noc25_mg04/preview |
| **Unit-IV** | Integrated Marketing Communication | https://onlinecourses.nptel.ac.in/noc22_mg38/preview |



| Course Code | DEC-PP-MBA-299A | | | | |
|---|---|---|---|---|---|
| Category | Discipline Elective Course-PP | | | | |
| Course Title | **Indian Social and Political System** | | | | |
| Scheme and Credits | L | T | P | Credits | **Semester-III** |
| | 3 | 1 | 0 | 4 | |
| Course Objectives | The objectives of this course are as following:<br>1. To provide a comprehensive understanding of the Indian social structure and the foundational values of the Indian Constitution.<br>2. To examine the institutional framework of the Indian political system.<br>3. To analyze the dynamics of political processes and the role of political institutions.<br>4. To explore key social and political challenges in contemporary India | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

Course Outcomes: After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Describe** the core principles of the Indian Constitution and the socio-political scenario of India. | L2-Understand |
| CO2 | **Demonstrate** the constitutional provisions, legal frameworks, and governance mechanisms. | L-3 Apply |
| CO3 | **Illustrate** how knowledge of political institutions, electoral processes, and social structures helps the functioning of Indian democracy and citizen participation. | L-3 Apply |
| CO4 | **Outline** the challenges and contradictions within the Indian social and political system. | L-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Indian Social and Political System**: Features of Indian society: Diversity, Unity in Diversity, Caste, Class, Religion, Language, Social stratification: Caste system and its impact, Indian secularism and pluralism ; Framing of the Indian Constitution: Historical background, Constituent Assembly, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy, Citizenship and constitutional values. |

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|---|---|
| **Unit-II** | **Structure of Indian Government:** Parliamentary democracy: Features and functions; Union Government: President: Powers and functions, Prime Minister and Council of Ministers, Parliament: Lok Sabha and Rajya Sabha; State Government: Governor, Chief Minister and State Legislature; Judiciary: Supreme Court, High Courts, Judicial Review and Judicial Activism; Election Commission and Electoral Process; Local Self Government: Panchayati Raj and Municipalities |
| **Unit-III** | **Political Processes and Institutions;** Political Parties: National and Regional parties, party systems, Pressure Groups and Interest Groups, Voting behavior and political participation<br>Coalition politics and role of opposition, Role of media in Indian democracy, Political corruption and criminalization of politics, Electoral reforms and democratic accountability. |
| **Unit-IV** | **Social Issues and Challenges in Indian Polity :** Social justice and affirmative action: Reservations and policies for SCs, STs, OBCs, and minorities, Communalism, Regionalism, and Secessionism, Gender issues: Women's representation and empowerment, Marginalized communities and tribal issues, Corruption and administrative reforms, Role of civil society and NGOs in democracy, Contemporary debates on nationalism, secularism, and federalism. |

**Suggested Readings:**

- India's Struggle for Independence by Bipin Chandra ,Penguin Books India
- Indian Society and Social Institutions by N. Jayapalan , Atlantic Publishers & Distributors
- Annihilation of Caste by B. R. Ambedkar , Navayana Publishing
- Introduction to the Constitution of India by D.D. Basu , S.C. Sarkar & Sons
- The Indian Constitution: Cornerstone of a Nation by Granville Austin Clarendon Press
- Politics in India by Rajni Kothari, Orient BlackSwan

**Useful Video Links:**

| Unit no | Topics | Links |
|---|---|---|
| **Unit-I** | Indian Political system | https://onlinecourses.nptel.ac.in/noc21_hs18/ |
| **Unit-II** | Indian Social system | https://onlinecourses.nptel.ac.in/noc21_hs18/ |
| **Unit-III** | Political Processes | https://onlinecourses.nptel.ac.in/noc21_hs18/ |
| **Unit-IV** | Challenges in Indian Polity | https://onlinecourses.nptel.ac.in/noc21_hs18/ |

| Course Code | SEC-MBA-205A | | | | |
|---|---|---|---|---|---|
| Category | Skill Enhancement Course | | | | |
| E-Commerce and Applications | **Digital Marketing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 3 | 0 | 0 | 3 | |
| Course Objectives | The objectives of this course are<br>1. To understand the basics and importance of digital marketing.<br>2. To understand how to build websites and blogs using WordPress.<br>3. To understand SEO, email marketing, and related digital tools.<br>4. To understand digital marketing strategies and analytics tools. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** the basic concepts of digital marketing, website/blog creation, and various digital platforms. | Level-1 Remember |
| CO2 | **Explain** the differences between traditional and digital marketing, SEO techniques, email campaigns, and social media platforms | Level-2 Understand |
| CO3 | **Apply** digital marketing tools to create a WordPress website/blog, perform on-page SEO, and run basic email/social media marketing campaigns. | Level-3 Apply |
| CO4 | **Analyze** digital marketing strategies using analytics tools to measure ROI, segment the market, and optimize ad placements. | Level-4 Analyze |

**Note:**

1. Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each from all units and remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.
2. At least four cases will be discussed, one from each unit.

| Unit No. | Contents |
|---|---|
| Unit-I | **Introduction to Digital Marketing & Website and Blog Development**: Introduction to Digital Marketing and its Significance; Traditional Marketing Vs Digital Marketing; Digital Marketing Process; The contemporary digital revolution, digital transformation framework. Types of websites, Keywords, Understanding Domain and Webhosting, Building Website/Blog using CMS Word Press, Using Word Press Plug-ins; Blog Creation: Including Headlines, Links, Posts ; Using various plugins like Elimentor, Skills in Digital Marketing, Digital marketing Plan. |
| Unit-II | **SEO& Email-Marketing**: Introduction to SEO; SEO Keyword Planner Tools; On Page SEO Techniques: Indexing and Key Word Placement, Content Planning & Optimization, Display Advertising, Various SEO Plug-in, Off –Page SEO Techniques; Email Marketing- Introduction and Significance, campaigns using Mail Chimp; Email Marketing Strategy and Monitoring, Google web-master and analytics overview, Affiliate Marketing, Mobile Marketing |

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|---|---|
| **Unit-III** | **SEM & Social Media Marketing**: Introduction to SEM, Mobile Marketing, Video Marketing on YouTube. Introduction to Social Media Marketing: Facebook, Instagram, Linked-in, Twitter, Google G Suit and online marketing campaigns on theses Social Media platforms. Content Marketing, Content creation process, Influencer marketing. |
| **Unit-IV** | **Marketing Strategies & Analytics Tools**: Understanding Digital marketing Strategies, Using Marketing analytics tools to segment, target, position; Online PR and reputation management, Digital Marketing Strategies and its ROI. Using Google Analytics and other social media analytics tools. Display advertising terminology, types of display ads, different ad formats, Ad placement techniques, Important ad terminology, Programmatic Digital Advertising. |

**Suggested Readings:**

- Digital Marketing by Vandana, Ahuja;, Oxford University Press India.
- Digital Marketing by Seema Gupta;, McGraw Hill Education; First edition.
- Understanding Digital Marketing: marketing strategies for engaging the digital generation by Ryan, Damian; Kogan Page.
- Quick win Digital Marketing by H. Annmarie , A. Joanna, Paperback edition

**Useful Video Links:**

| Unit no. | Topics | Links |
|---|---|---|
| **Unit-I** | Type of Digital Marketing | https://www.youtube.com/watch?v=iRhIYaOw0Sk&list=PLi3oNa09iwJRByiNwEJNaZ3XVKcveovzk&index=5 |
| **Unit-II** | Search Engine Optimization (SEO) | https://www.youtube.com/watch?v=RJyCbMY4kjc |
| **Unit-III** | Social Media Marketing | https://www.youtube.com/watch?v=2oO7Xy5y_nM |
| **Unit-IV** | Marketing Strategies | https://www.youtube.com/watch?v=eRF1BtI6e_8 |



| | | | | | |
|---|---|---|---|---|---|
| Course Code | LC-MBA-207A | | | | |
| Category | Skill Enhancement Course | | | | |
| Course Title | Digital Marketing Lab | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | 0 | 0 | 2 | 1 | |
| Course Objectives | The objectives of this course are<br>1. To understand how to build websites using WordPress and Elementor.<br>2. To understand keyword research using Google Keyword Planner.<br>3. To understand on-page SEO techniques using SEO plugins.<br>4. To understand digital marketing tools like Mailchimp and Facebook Ads. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO2 | **Explain** the fundamental concepts of website creation, keyword research, and SEO optimization in digital marketing | Level 2: Understand |
| CO3 | **Apply** on-page SEO techniques and set up social media and email marketing campaigns using appropriate digital tools | Level 3: Apply |
| CO4 | **Analyze** web traffic data using Google Analytics to identify trends and user behavior for performance optimization | Level 4: Analyze |
| CO5 | **Evaluate** the effectiveness of paid ad campaigns across Google Ads and social media platforms to enhance ROI. | Level 5: Evaluate |
| CO6 | **Design** and implement a comprehensive digital marketing strategy by integrating content creation, advertising, SEO, and analytics | Level 6: Create |

**List of Experiments:**

| S. No. | Description |
|---|---|
| 1 | Build and Customize a Website Using WordPress and Elementor |
| 2 | Perform Keyword Research Using Google Keyword Planner |
| 3 | Optimize a Webpage with On-Page SEO Techniques Using SEO Plugins |
| 4 | Create and Execute an Email Marketing Campaign Using Mailchimp |
| 5 | Set Up and Run a Google Ads SEM Campaign |
| 6 | Create and Manage a Facebook Business Page with Paid Ad Campaigns |
| 7 | Develop and Schedule Social Media Content Across Multiple Platforms |
| 8 | Integrate and Analyze Website Traffic Using Google Analytics |
| 9 | Design and Launch a Display Advertising Campaign via Google Display Network |
| 10 | Monitor and Manage Online Brand Reputation Using Google Alerts and Social Mention |

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|---|---|
| 11 | Calculate HRA, DA, TA, PF, LIC. Gross Salary, Net Salary from the below given data with the help of MS-Excel. |
| 12 | Create a data base in Ms-Access. |

**Suggested Readings:**

- Digital Marketing by Vandana, Ahuja;, Oxford University Press India.
- Digital Marketing by Seema Gupta;, McGraw Hill Education; First edition.
- Understanding Digital Marketing: marketing strategies for engaging the digital generation by Ryan, Damian; Kogan Page.
- Quick win Digital Marketing by H. Annmarie , A. Joanna, Paperback edition

**Useful Video Links:**

| Unit no. | Topics | Links |
|---|---|---|
| Unit-I | Type of Digital Marketing | https://www.youtube.com/watch?v=iRhIYaOw0Sk&list=PLi3oNa09iwJRByiNwEJNaZ3XVKcvcovzk&index=5 |
| Unit-II | Search Engine Optimization (SEO) | https://www.youtube.com/watch?v=RJyCbMY4kjc |
| Unit-III | Social Media Marketing | https://www.youtube.com/watch?v=2oO7Xy5y_nM |
| Unit-IV | Marketing Strategies | https://www.youtube.com/watch?v=eRF1Btl6e_8 |



| Course Code | INT-MBA-209A | | | | |
|---|---|---|---|---|---|
| Category | Internship Course | | | | |
| Course Title | **Internship-3** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | | | | 4 | |
| Course Objectives | The objectives of this course are<br>1. To apply theoretical knowledge to real-world situations and gain hands-on experience in the field.<br>2. To strengthen key skills like communication, teamwork, and problem-solving for career readiness.<br>3. To understand industry practices, trends, and expectations through direct exposure.<br>4. To build professional relationships with mentors and peers for future career prospects. | | | | |
| Assessment | 50 Marks | | | | |
| Viva-Voce | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** workplace processes, industry standards, and theoretical concepts applied during the internship. | Level 2: Understand |
| CO2 | **Apply** academic knowledge and technical skills to solve real-world challenges in the workplace. | Level 3: Apply |
| CO3 | **Analyze** complex work problems and propose potential solutions. | Level 4: Analyze |
| CO4 | **Evaluate** various strategies, providing reasoned judgments and recommendations based on experience. | Level 5: Evaluate |
| CO5 | **Develop** a network of contacts and collaborate with professionals to enhance career opportunities. | Level 6: Create |

Note: The evaluation will be based on two parts: 50 marks for the Viva-Voce Examination and and 50 marks for the report writing.

Students will be required to undergo Internship Training for **120 hours** after 2nd semester, if they choose the INR-3 option, with the option to select between SEC-3, VOC-3, and INR-3.

The Internship Project (IP) is an optional part of the academic curriculum for MBA 3rd semester students. Students who choose Internship-3 as an option must complete the Internship Project for successful completion of the MBA 2nd semester. They are required to undergo the internship as per the given duration. Students must work with an organization to gain hands-on experience during the semester. The internship can be undertaken at an organization located within the geographical boundary of the Delhi NCR.



| Course Code | PR-MBA-211A | | | | |
|---|---|---|---|---|---|
| Category | Project Report | | | | |
| Course Title | **Project Report-1** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | | | | **4** | |
| Course Objectives | The objectives of this course are<br>1. Apply MBA concepts to real-world business problems through practical project work.<br>2. Develop strategic thinking and analytical decision-making skills.<br>3. Strengthen managerial abilities in planning and execution.<br>4. Enhance professional communication and report-writing skills. | | | | |
| Assessment | 50 Marks | | | | |
| Viva-Voce | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** business theories and frameworks in the context of real-world project scenarios. | Level 2: Understand |
| CO2 | **Apply** appropriate business tools, models, and techniques to analyze and solve organizational problems in the project. | Level 3: Apply |
| CO3 | **Analyze** business data and processes to examine key issues, uncover trends, and diagnose performance gaps in the chosen project area. | Level 4: Analyze |
| CO4 | **Evaluate** alternative strategies or solutions using data-driven insights and managerial judgment. | Level 5: Evaluate |
| CO5 | **Develop** and present innovative recommendations or business models based on project findings and industry best practices. | Level 6: Create |

Note: The evaluation will be based on two parts: 50 marks for the Viva-voce of the report and 50 marks for the Project report writing.

**Guidelines:**

**1. Topic Selection and Approval**

- Students must select a relevant and feasible research topic aligned with their area of specialization.
- The proposed topic must be finalized in consultation with the assigned Research Supervisor.
- A brief synopsis (1–2 pages) outlining the objectives, rationale, and proposed methodology must be submitted for approval within the **first month** of the third semester.

**2. Role of the Research Supervisor**

- Each student will be allotted a faculty member as Research Supervisor by the Head of the Department (HOD).

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HOD MGMT

- The Supervisor will provide guidance on topic finalization, research design, data analysis, and report writing.
- Regular meetings with the Supervisor are mandatory to ensure timely progress.

**3. Submission and Evaluation**

- The final project report must be submitted by the deadline specified by the department.
- Evaluation will be based on quality of research, originality, application of concepts, clarity of presentation, and adherence to academic standards.
- Students may be required to give a viva-voce or presentation before a panel of faculty members.

**4. Academic Integrity**

- The project must be the student's original work. Plagiarism will lead to rejection or disciplinary action.
- All sources must be properly cited using a recognized citation style (e.g., APA, MLA).



| Course Code | RT-MBA-201A | | | | |
|---|---|---|---|---|---|
| Category | Project Report | | | | |
| Course Title | Report Thesis-1 | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-III |
| | | | | 20 | |
| Course Objectives | The objectives of this course are<br>1. Build ability to design, conduct, and evaluate research addressing academic or practical problems effectively.<br>2. Improve capacity to write clear, well-structured, and coherent academic reports aligned with thesis standards.<br>3. Promote critical analysis to evaluate sources, interpret data, and construct sound, evidence-based arguments.<br>4. Ensure correct application of citation styles to maintain academic integrity and prevent any form of plagiarism.<br>5. Develop skills to present, articulate, and defend thesis work clearly using effective verbal communication strategies. | | | | |
| Assessment | 200 Marks | | | | |
| End Semester Examination | 200 Marks | | | | |
| Viva-Voce | 100 Marks | | | | |
| Total | 500 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Recall** key concepts of research methodology, academic writing formats, and ethical standards in thesis preparation. | Level 1: Remember |
| CO2 | **Explain** the structure and components of a formal thesis and the purpose of each section clearly. | Level 2: Understand |
| CO3 | **Apply** appropriate research methods, writing techniques, and citation styles in the development of a thesis report. | Level 3: Apply |
| CO4 | **Analyze** research data, literature sources, and arguments to identify gaps, trends, and relationships relevant to the thesis topic. | Level 4: Analyze |
| CO5 | **Assess** the quality, coherence, and originality of research findings and written content. | Level 5: Evaluate |
| CO6 | **Design** a complete, well-structured, and academically sound thesis report, culminating in a successful oral defense. | Level 6: Create |

**Note:**

All candidates who have opted for Option 3 are required to submit a detailed project report or synopsis comprising a minimum of 50 pages by the end of the third semester. The report must include a comprehensive literature review, clearly defined research problem, proposed plan of work, detailed methodology, and any practical work or case studies conducted. The document should reflect originality, critical thinking, and adherence to academic standards. Proper formatting, structured writing, and accurate referencing (APA/MLA/Chicago style) are essential. Plagiarism must be strictly avoided, and the report will be subject to similarity checks prior to acceptance.

The submitted report will undergo evaluation by a Board of Examiners comprising one internal faculty member (appointed by the Director) and two external experts from academia and industry, selected from a

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HOD MGMT

panel approved by the Board of Studies (BOS) of the Department of Management Studies. A viva voce will be conducted to assess the candidate's understanding, analytical skills, and ability to defend the research. Candidates are advised to maintain regular contact with their supervisors (if assigned), follow submission deadlines strictly, and ensure professional presentation of their work.



**DEPARTMENT OF COMPUTER SCIENCE AND APPLICATIONS**

**GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR**

An Autonomous Institute | NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

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**Dated: 28th May 2025**

**Minutes of 2nd meeting of Board of Studies of Department of Computer Science and Applications**

The 2nd meeting of Board of Studies of Department of Computer Science and Applications was held on 23.05.2025 at 11:00 A.M in the Conference Hall of the Institute.

The following members were present for the BOS meeting:

| S. No. | Name of the Member | Affiliation/Organization | Designation within Board of Studies |
|---|---|---|---|
| 1 | Mr. Jitender Singh | Chairperson | Assistant Prof. & Head, CSA, GITAM, Kablana |
| 2 | Prof. Rahul Rishi (Deptt. of CSE, UIET, MDU, Rohtak) | Member | Subject Expert, (University Nominee) |
| 3 | Prof. Shailender Verma (Deptt of CSE, DTU, Delhi) | Member | Subject Expert, Outside the Parent University |
| 4 | Dr. Praveen Kumari | Member | Assistant Professor, CSA, GITAM Kablana |
| 5 | Dr. Prince | Member | Assistant Professor, CSA, GITAM Kablana |
| 6 | Dr. Kavita | Member | Assistant Professor, CSA, GITAM Kablana |
| 7 | Mrs. Meenu Sharma | Member | Assistant Professor, CSA, GITAM Kablana |
| 8 | Mr. Lakshay Khanagwal | Member | Assistant Professor, CSA, GITAM Kablana |
| 9 | Mrs. Sonika | Member | Assistant Professor, CSA, GITAM Kablana |
| 10 | Ms. Bhawna | Member | Assistant Professor, CSA, GITAM Kablana |
| 11 | Mrs. Mahima | Member | Assistant Professor, CSA, GITAM Kablana |
| 12 | Mr. Shubham | Member | Assistant Professor, CSA, GITAM Kablana |

| | | | |
|---|---|---|---|
| 13 | Ms. Priya | Member | Assistant Professor, CSA, GITAM Kablana |
| 14 | Ms. Pooja | Member | Assistant Professor, CSA, GITAM Kablana |
| 15 | Ms. Rani | Member | Assistant Professor, CSA, GITAM Kablana |
| 16 | Ms. Seema Rani | Member | Assistant Professor, CSA, GITAM Kablana |
| 17 | Ms Inderjeet Kaur | Member | Assistant Professor, CSA, GITAM Kablana |
| 18 | Dr. Vivek Kumar | Special Invitee | Registrar & COE, GITAM Kablana |
| 19 | Dr. Nitin Kumar | Special Invitee | HOD, CSE, GITAM Kablana |
| 20 | Ms. Nitika | Member | Industry/ Corporate Sector (Associate Analyst, Content Engineering) |
| 21 | Mr. Yumesh | Member | Alumni (Embedded Designs Services India Private Limited) |

At the outset the Chairperson welcomed all the members present in the meeting. The agenda items, as circulated prior to the meeting, were taken up for discussion.

**Agenda wise Discussion and Resolutions**

**Item No. 2.1**
Confirmation of the minutes of 1st Meeting of the Board of Studies of Department of Computer Science and Applications held on 10.01.2025.

**The minutes of 1stmeeting of the Board of Studies of Department of Computer Science and Applications held on 10.01.2025 (Annexure-I Page No. 1 to 4 already circulated) be confirmed.**

**Item No. 2.2**
Follow up action report of the decisions taken in the 1st Meeting of Board of Studies held on 10.01.2025.

**The follow up action of the decisions taken in the 1st Meeting of Board of Studies held on 10.01.2025 be noted.**

| Sr. No. | Particulars | Follow-up Action |
|---|---|---|
| 1 | Review and Approval of the Syllabus Prescribed for 1st Year under Autonomous Status of BCA and MCA Program. | Approved the SOE and syllabus of MCA 1st year for session 2024-25 and recommended to the Academic council for approval. The academic Council approved the syllabus and the same was uploaded on the institute website. |
| 2 | Panel of Examiner for Theory and Practical's of BCA and MCA Program. | The panel of examiners was finalized and approved for the academic session 2024–25. |

**Item No. 2.3**
Scheme of Examinations and Syllabus of 2nd year MCA from Academic Session 2025-26.

a) **Resolved that the Scheme of Examinations and Syllabus of 2nd year MCA from Academic Session 2025-26 be approved and recommended to the Academic Council for the approval (Annexure II Pages 5-55).**

b) **Amendment in the Course Name (Nomenclature) of MCA 1st and 2nd Semester w.e.f. 2025-26 and correction in Course Code (Foundation Elective Courses) of MCA 2nd Semester.**

| Existing Course Name | Course Code | Amended Course Name with same code | Semester | Course category |
|---|---|---|---|---|
| Digital Design & Computer Architecture | DSEC-MCA-111A | Computer Organization and Architecture | 1st | Elective-I |
| Computer Networks and Distributed System | DSEC-MCA-116A | Computer Network | 2nd | Elective-IV |
| Advance Computer Architecture and Quantum Computing | DSEC-MCA-118A | Advance Computer Architecture | 2nd | Elective-IV |

**Foundation Elective Courses**

| Existing Course Code | Course Name | Amended Course Code | Offered by Department |
|---|---|---|---|
| FEC-168A | Communication and Soft Skills | FEC-166A | Applied Science and Humanities (English) |
| FEC-170A | Entrepreneurship Development | FEC-168A | Management Department |
| FEC-172A | Electronics Engineering | FEC-170A | Electronics and Communication Engineering |

**Resolved that the amendment in the Nomenclature of MCA 1st and 2nd sem *w.e.f* 2025-26 is approved and recommended to Academic Council for approval(Annexure II pages 56 –62 )**

**Item No. 2.4**

Scheme of Examinations and Syllabus of 2nd year BCA (A-Scheme) and 1st semester BCA (B-Scheme) from Academic Session 2025-26.

**Resolved that Scheme of Examinations and Syllabus of 2nd year BCA (A-Scheme) and 1st semester BCA (B-Scheme) from Academic Session 2025-26 be approved and recommended to the Academic Council for the approval (Annexure III BCA Pages 63-142).**

**Item No. 2.5**

Review of the Panel of Examiners for Theory and Practical Examinations of BCA and MCA programs for academic year 2025-26.

**The panel of examiners for Theory and Practical Examinations of BCA and MCA programs for academic year 2025-26 be reviewed and approved. The same are sent to the Controller of Examinations of the Institute for the Information(Annexure IV Pages 143-146).**

**Item No. 2.6**

**Any Other Item with the Permission of the Chair.**

The meeting concluded with the thanks to the Chair.




**Chairperson**
**Board of Studies**
**Deptt. of Computer Science and Applications**

**Endst No.** GITAM/BOSCSA/002

The copy of the same is forwarded to

- Hon'ble Director Sir for kind information and approval
- Hon'ble Registrar for further necessary action
- IQAC
- In-charge website of the Institute to upload the same
- All the Members of Board of Studies
- All HODs




**Chairperson**
**Board of Studies**
**Deptt. of Computer Science and Applications**

**ANNEXTURE-II**

**Scheme of Studies and Examination**
**MCA – 3rd Semester**
***w.e.f.* 2025-26**

| SN | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Exam | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Discipline-Specific Courses | DSC-MCA-201A | Data Mining & Big Data Analytics | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Discipline-Specific Courses | DSC-MCA-203A | Machine Learning & Python Programming | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Discipline-Specific Courses | DSC-MCA-205A | Network Programming | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Discipline Specific Elective Courses | Refer Table-II (a) | Elective-V | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Discipline Specific Elective Courses | Refer Table-II (b) | Elective-VI | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 6 | Experiential Learning | EL-MCA-207A | Software Lab-5 | 0 | 0 | 6 | 6 | 3 | 50 | | 50 | 100 | 3 |
| 7 | Experiential Learning | EL-MCA-209A | Software Lab-6 | 0 | 0 | 6 | 6 | 3 | 50 | | 50 | 100 | 3 |
| 8 | Open Elective (OEC) | Refer Table-IV | To be Chosen from the pool of Open Electives provided by the Institute in Table-V | 3 | 0 | 0 | 3 | 3 | 40 | 60 | | 100 | 3 |
| **Total** | | | | | | | | **29** | 340 | 360 | 100 | **800** | |

**Scheme of Studies and Examination**
**MCA – 4th Semester**
***w.e.f.* 2025-26**

| SN | Category | Course Code | Course Title | Hours per week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration in Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Exam | | Total | |
| | | | | | | | | | | Theory | Practical | | |
| 1 | Discipline-Specific Courses | DSC-MCA-202A | Advance Software Engineering | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 2 | Discipline-Specific Courses | DSC-MCA-204A | IoT & Sensor Networks | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 3 | Discipline-Specific Courses | DSC-MCA-206A | Web Development Using.NET Framework | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 4 | Discipline Specific Elective Courses | Refer Table-II (c) | Elective-VII | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 5 | Discipline Specific Elective Courses | Refer Table-II (d) | Elective-VIII | 4 | 0 | 0 | 4 | 4 | 40 | 60 | | 100 | 3 |
| 6 | Experiential Learning | EL-MCA-208A | Software Lab-7 | 0 | 0 | 6 | 6 | 3 | 50 | | 50 | 100 | 3 |
| 7 | Experiential Learning | EL-MCA-210A | Software Lab-8 | 0 | 0 | 6 | 6 | 3 | 50 | | 50 | 100 | 3 |
| 8 | Research Report | RR-MCA-212A | Industry Internship Report/ Project Report/Dissertation–II | 0 | 0 | 0 | 6 | 3 | 50 | | 50 | 100 | 3 |
| | | | | | | | **Total** | **29** | 340 | 300 | 160 | **800** | |

**Table No. II (a) (Discipline Specific Elective Courses)**

**Elective- V**

| Sr. No. | Course Code | Course Title |
|---|---|---|
| 1 | DSEC-MCA-211A | Cyber Security & Block chain Technology |
| 2 | DSEC-MCA-213A | Software Testing & Quality Assurance |

**Table No. II (b) (Discipline Specific Elective Courses)**
**Elective- VI**

| Sr. No. | Course Code | Course Title |
|---|---|---|
| 1 | DSEC-MCA-215A | Android Mobile Application Development |
| 2 | DSEC-MCA-217A | Full Stack Development |

**Table No. II (c) (Discipline Specific Elective Courses)**
**Elective- VII**

| Sr. No. | Course Code | Course Title |
|---|---|---|
| 1 | DSEC-MCA-214A | Artificial Intelligence |
| 2 | DSEC-MCA-216A | Mixed Reality & Wearable Computing |

**Table No. II (d) (Discipline Specific Elective Courses)**
**Elective-VIII**

| Sr. No. | Course Code | Course Title |
|---|---|---|
| 1 | DSEC-MCA-218A | High Speed Networks |
| 2 | DSEC-MCA-220A | Neural Networks & Deep Learning |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-MCA-201A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Data Mining and Big Data Analytics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand fundamental concepts of data mining and knowledge discovery.<br>• Explore data mining techniques like frequent pattern mining, classification, and clustering.<br>• Gain practical experience using WEKA for real dataset mining.<br>• Learn Big Data architecture and tools like Hadoop, MapReduce, Pig, Hive, and apply analytics using R and Big R. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall data mining basics, classification/clustering methods, Hadoop architecture, and MapReduce tools. | Level 1: Remember |
| **CO2** | Explain data mining steps, classification/clustering techniques, Hadoop components, and tools like Pig, Hive, and HBase. | Level 2: Understand |
| **CO3** | Apply data preprocessing, classification, clustering in WEKA, and process big data using Hadoop and its tools. | Level 3: Apply |
| **CO4** | Analyze data patterns, evaluate mining results, and assess performance of Hadoop-based analytics frameworks. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Data Mining Concepts:** Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Applications, Data Objects and Attribute types, Statistical description of data; Data Pre-processing – Cleaning, Integration, Reduction, Transformation and Discretization; Data Visualization, Data similarity and dissimilarity measures.

**Frequent Pattern Analysis:** Mining Frequent Patterns, Associations and Correlations; Mining Methods-Pattern Evaluation Method, Pattern Mining in Multilevel; Multi-Dimensional Space – Constraint Based Frequent Pattern Mining; Classification using Frequent Patterns.

## Unit-II

**Classification and Clustering:** Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy. Clustering Techniques: Cluster analysis, Partitioning Methods - Hierarchical Methods, Density Based Methods, Grid Based Methods; Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis-outlier detection methods.

**WEKA Tool:** Introduction to Datasets, WEKA sample Datasets, Data Mining Using WEKA tool.

## Unit-III

**Overview of Big Data and Hadoop:** Types of Digital Data, Overview of Big Data, Challenges of Big Data,Modern Data Analytic Tools, Big Data Analytics and Applications;Overview and History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Environment.

**HDFS:** Concepts of Hadoop Data File System, Design of HDFS, Command Line Interface, Hadoop file system interfaces, Data flow; Hadoop I/O: Compression and Serialization.

## Unit-IV

**Map Reduce:** Introduction, Map Reduce Features, How Map Reduce Works, Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats.

**Hadoop Eco System:** Pig - Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase: HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL: Introduction.

**Data Analytics with R:** Introduction of R and Big R, Collaborative Filtering, Big Data Analytics with Big R.

**Suggested Readings:**


- Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
- I.H. Whiffen: Data Mining, Practical Machine Learning tools & techniques with Java (Morgan Kanffmen)
- A.K. Pujari: Data Mining Techniques, University Press.
- Pieter Adriaans Dolf Zant inge: Data Mining, Addition Wesley.
- David Hand, Heikki Mannila, and Padhraic Smyth: Principles of Data Mining, PHI Publication.
- Michael Berthold, David J. Hand: Intelligent Data Analysis, Springer.
- Tom White: Hadoop- The Definitive Guide, Third Edition, O'reilly Media.
- Seema Acharya, Subhasini Chellappan: Big Data Analytics, Wiley.
- Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos: Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data, Mc Graw Hill publishing.
- Anand Rajaraman and Jeffrey David Ullman: Mining of Massive Datasets, Cambridge University Press.
- Bill Franks: Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streamswith Advanced Analytics, John Wiley &Sons.
- Glenn J. Myatt: Making Sense of Data, John Wiley & Sons.
- Pete Warden: Big Data Glossary, O'Reilly.

- Zikopoulos, Paul, Chris Eaton: Understanding Big Data- Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Data Mining Systems | https://youtu.be/m5c27rQtD2E?si=j9lfWHPW0RkokaTP |
| | Knowledge Discovery Process, Data Mining Techniques, | https://youtu.be/ykZ-_UGcYWg?si=15AkhCFzN7AN5yvS |
| **Unit-II** | Decision Tree Induction, Bayesian Classification | https://youtu.be/NSxEiohAH5o?si=rfY7KUnGXhoN5DoI |
| | Data Preprocessing – II | https://youtu.be/wZQM_9vhulg?si=LSUr17zIn67NzJZW |
| | WEKA sample Datasets, Data Mining Using WEKA tool. | https://youtu.be/qKueRV2yq_E?si=Apq8hUAzgNstLJ_K |
| **Unit-III** | Types of Digital Data, Overview of Big Data | https://youtu.be/La-NZ6jOfoQ?si=m1iiH_9rS_Si44oO |
| | Apache Hadoop, Analysing Data with Unix tools | https://youtu.be/r5k-_RLIpuA?si=UNcaPp8uVI90lO1T |
| **Unit-IV** | Hadoop Eco System: Pig - Introduction to PIG, Execution Modes of Pig | https://youtu.be/YAzzGal41hA?si=9mQkCaZBcUMEomIL |
| | Introduction of R and Big R | https://youtu.be/3iSKFCKLUsI?si=OVzksmHyIA8Sp8yO |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-MCA-203A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Machine Learning and Python Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand machine learning fundamentals and apply supervised learning algorithms like decision trees and regression models.<br>• Explore ensemble, unsupervised learning methods, and reinforcement learning techniques like Q-learning and policy iteration.<br>• Develop Python programming skills for machine learning, focusing on data types, control structures, and NumPy operations.<br>• Apply Python for data visualization, file handling, database operations, and machine learning tasks like regression and data distribution. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall core machine learning paradigms, Python syntax, NumPy functions, and data visualization concepts in 2D and 3D contexts. | Level 1: Remember |
| **CO2** | Describe supervised, unsupervised, and reinforcement learning methods, ensemble techniques, and Python modules for data analysis and manipulation. | Level 2: Understand |
| **CO3** | Implement machine learning models, perform clustering and dimensionality reduction, and visualize datasets using Python libraries like Matplotlib and Mayavi. | Level 3: Apply |
| **CO4** | Compare learning algorithms, interpret regression results, and examine statistical patterns using data distributions, deviation, and scatter plots. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Machine Learning:** Introduction, various learning paradigms, perspective and issues, Version spaces, finite and infinite hypothesis spaces, PAC learning, learning versus Designing, Training versus Testing, Predictive and descriptive tasks.

**Supervised Learning:** Decision trees- ID3, classification and regression trees; Regression- linear regression, Multiple linear regression, logistic Regression; Support Vector Machines- linear and non-linear, kernel functions, K-nearest neighbors.

## Unit-II

**Ensemble Learning:** Model combination Schemes, Voting, Error-correcting output codes; Bagging: Random Forest Trees; Boosting: Adaboost, Stacking.

**Unsupervised Learning:** Introduction to Clustering, Hierarchical: AGNES, DIANA; Partitional: K-means clustering, K-mode clustering, Expectation Maximization, Dimensionality Reduction, Feature Selection, PCA, factor analysis, manifold learning.

**Reinforcement Learning:** Value iteration; policy iteration; TD learning; Q learning; actor critic

## Unit-III

**Introduction to Python:** History and Origin of Python Language, Features, Python, two modes of using Python interpreter, variable and data types, operator and their precedence, Python string & slicing, Python lists, mutable and immutable types, Input from keyboard. Loops and Iterations, Functions, Strings & Lists.

**Modules and Packages:** Python Modules and Packages, Different ways to import Packages, File Input/Output,The pickle module, Formatted Printing, Exception Handling.

**Arrays and Matrices:** The NumPy Module, Creating Arrays and Matrices, Copying, Arithmetic Operations, Cross product & Dot product, Saving and Restoring, Matrix inversion, Vectorized Functions.

## Unit-IV

**2D & 3D Data Visualization:**The Matplotlib Module, Multiple plots, Polar plots, Pie Charts, Plotting mathematical functions, Sine function and friends, Parametric plots, Astroid, Ellipse, Spirals of Archimedes and Fermat, Polar Rose, Power Series & Fourier Series, 2D plot using colors, Fractals, Meshgrids, 3D Plots, Surface Plots & Line Plots, Wire-frame Plots, Mayavi, 3D visualization; Files and Streams:File modes and permissions, Reading & Writing data from a file, Redirecting output streams to files, Working with directories, CSV files and Data Files.

**Python and Databases:** ODBC and Python, Working with database in MySQL.

**Machine Learning:** Getting started, Mean, median, Mode, Deviation, percentile, Data distribution, Scatter plot, Regression

**Suggested Readings:**


- Ethem Alpaydin: Introduction to Machine Learning, MIT Press, PHI, 3rd Edition 2014.
- M. Gopal: Applied Machine Learning, TMH.
- Tom Mitchell: Machine Learning, McGraw Hill.
- Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar: Foundations of Machine Learning, MIT Press, 2012.
- Vinod Chandra and Anand Harindra: Artificial Intelligence and Machine Learning, PHI.
- E. Alpaydin: Introduction to Machine Learning, Prentice Hall of India.
- Ethem Alpaydin: Introduction to Machine Learning, PHI learning.
- Pooja Sharma: Programming in Python", BPB Publications, 2017.
- R. Nageswara Rao: Core Python Programming, Dreamtech.
- Langley: Elements of Machine Learning, Morgan Kaufmann.
- Hans Fangohr: Introduction to Python for Computational Science and Engineering(A beginner's guide).

- Timothy A. Budd: Exploring Python, McGraw Hill Education
- Mark Lutz: Learning Python 4th Edition, O'Reilly Publication
- Jason Bell: Machine Learning: Hands-On for developers and Technical Professionals Wiley Publication, 2015.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Machine Learning | https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77 |
| | Supervised Learning | https://www.youtube.com/watch?v=OTAR0kT1swg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=3 |
| **Unit-II** | Unsupervised Learning | https://www.youtube.com/watch?v=NhimXdFenrg |
| | Reinforcement Learning | https://www.youtube.com/watch?v=ewkm38skUlY&list=PLEAYkSg4uSQ0Hkv_1LHlJtC_wqwVu6RQX |
| **Unit-III** | Introduction to Python | https://www.youtube.com/watch?v=eoPsX7MKfe8&list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO |
| **Unit-IV** | 2D & 3D Data Visualization | https://www.youtube.com/watch?v=eFByJkA3ti4 |

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|---|---|---|---|---|---|
| Course Code | **DSC-MCA-205A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Network Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand UNIX OS fundamentals and networking protocols like TCP/IP, IPv4, IPv6, UUCP, and XNS.<br>• Implement network communication using Berkeley, Windows, and Java sockets with multithreaded client-server models.<br>• Explore web technologies and security concepts like RMI, JavaScript, WAP, CORBA, cryptography, and firewalls.<br>• Build and deploy networked applications using client-server programming, HTTP servers, URL handling, and multithreading. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall UNIX concepts, socket APIs, JavaScript, CORBA, and client-server programming steps. | Level 1: Remember |
| **CO2** | Explain UNIX sockets, Windows I/O models, WAP, RMI, and client-server communication flow. | Level 2: Understand |
| **CO3** | Apply sockets, Winsock APIs, multithreading, Java/CORBA for web apps, and URL content retrieval. | Level 3: Apply |
| **CO4** | Analyze UNIX communication, compare APIs and models, evaluate web security, and assess server performance. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Overview of UNIX OS, Environment of a UNIX process, Process control,Process relationships Signals, Interprocess Communication, Overview of TCP/IP, Networkarchitecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures.

**Socket Programming:** Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal &fcntl functions, socket implementation (client & serverprograms), UNIX domain protocols.

**Unit-II**

**APIs & Winsock Programming:** Windows socket API, window socket & blocking I/Omodel, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

**Unit-III**

**Web Programming & Security:** Java network programming, packages, RMI, Overview ofJavascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

**Unit-IV**

**Client Server Programming:** Client-side programming: Creating sockets, implementing generic network client, Parsing data using string Tokenizer, retrieving file from an HTTP server, retrieving web documents by using the URL class. Server-side programming: Steps for creating server, accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

**Suggested Readings:**


- W.Richard Stevens: Advanced Programming in the UNIX Environment, AddisonWesley.
- W. Stevens, Bill Fenner, Andrew Rudoff: UNIX Network Programming -Volume 1 (The Sockets Networking API), Pearson Education/Prentice-Hall International.
- Meeta Gandhi,Tilak Shetty and Rajiv Shah: The 'C' Odyssey Unix –The openBoundless C, BPB Publications.
- Steven.W.R: UNIX Network Programming (Volume I& II), PHI.
- Bobb Quinn and Dave Schutes: Window Socket Programming byDavis.R.: Windows Network Programming, Addison Wesley.
- Baner.P.: Network Programming with Windows Socket, Prentice Hall


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Overview of UNIX OS, Environment of a UNIX process | https://youtu.be/jciGIvn7UfM?si=9L5lcL629bnWHngD |
| | Socket Programming | https://youtu.be/JExfKvUgrtI?si=iKBrou1Vvou9PAYa |
| **Unit-II** | APIs & Winsock Programming | https://youtu.be/JExfKvUgrtI?si=DL1vk8AtNQlpOBHu |
| **Unit-III** | Web Programming & Security | https://youtu.be/HIQsZGx52QY?si=OT9sTb-eRAK2U86H |
| **Unit-IV** | Client Server Programming | https://youtu.be/XlryaovT_3k?si=t4ub0AwC62DSe77n |

| Course Code | **EL-MCA-207A** | | | | |
|---|---|---|---|---|---|
| Category | Experiential Learning | | | | |
| Course Title | **Software Lab-5 Based on Python Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• To introduce the foundational concepts, history, and applications of Artificial Intelligence.<br>• To develop an understanding of knowledge representation and reasoning techniques.<br>• To explore computational intelligence methods such as genetic algorithms and neural networks.<br>• To study fuzzy logic and neuro-fuzzy systems for decision-making under uncertainty. | | | | |
| Internal Assessment | 50 Marks | | | | |
| External Practical | 50 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply fundamental definitions, concepts, and historical developments of AI, search algorithms, and intelligent systems to practical problem scenarios. | Level 3: Apply |
| **CO2** | Analyze AI techniques such as search, reasoning, and learning for solving real-world problems across diverse application domains. | Level 4: Analyze |
| **CO3** | Evaluate the effectiveness of AI algorithms such as A*, DFS, BFS, and game strategies in solving structured and unstructured problem scenarios. | Level 5: Evaluate |
| **CO4** | Design and develop AI-based solutions by selecting and integrating appropriate algorithms for games, puzzles, optimization, and decision-making tasks. | Level 6: Create |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | Write a Program to Implement Breadth First Search using Python. |
| **2** | Write a Program to Implement Depth First Search using Python. |
| **3** | Write a Program to Implement Tic-Tac-Toe game using Python. |
| **4** | Write a Program to Implement 8-Puzzle problem using Python. |
| **5** | Write a Program to Implement Water-Jug problem using Python. |
| **6** | Write a Program to Implement Travelling Salesman Problem using Python. |
| **7** | Write a Program to Implement Tower of Hanoi using Python. |

| | |
|---|---|
| **8** | Write a Program to Implement Monkey Banana Problem using Python. |
| **9** | Write a Program to Implement Alpha-Beta Pruning using Python. |
| **10** | Write a Program to Implement 8-Queens Problem using Python. |
| **11** | Write a program to implement A* Algorithm using Python |
| **12** | Write a function that allows you to generate random problem instances for the knapsack program using Python |

**Suggested Readings:**


- Rich Elaine and Knight Kevin: Artificial Intelligence, Tata McGraw Hill.
- M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
- J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI,
- Pearson Education.
- Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
- Davis E.Goldberg: Genetic Algorithms: Search, Optimization and MachineLearning, Addison Wesley.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Artificial Intelligence | https://youtu.be/GHpchgLoDvI?si=Yupehj9mqMxeHHaL |
| **Unit-II** | Knowledge &Its Representation | https://youtu.be/zT0sGjOSPt8?si=aPh-4h591rWIzgPO |
| **Unit-III** | Computational Intelligence | https://youtu.be/XCPZBD9lbVo?si=Cvu36ZDVeM8a1k0S |
| **Unit-IV** | Fuzzy Systems | https://youtu.be/K7S3TgfqnX0?si=QZXSnDjodoEJcv3d |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **EL-MCA-209A** | | | | |
| Category | Experiential Learning | | | | |
| Course Title | **Software Lab-6** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Understand fundamental web technologies including HTML, CSS, JavaScript, XML, and server-side scripting for static and dynamic web development.<br>• Develop web applications using client-server architecture, enhancing interactivity and data handling through JavaScript, JSP, and Servlets.<br>• Apply web design principles to create responsive, user-friendly interfaces and structured web documents using HTML and CSS.<br>• Implement data validation, session management, and database connectivity in web applications using JavaScript, JSP, and backend programming techniques. | | | | |
| Internal Assessment | 50 Marks | | | | |
| External Practical | 50 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Develop interactive web pages using HTML forms, JavaScript validation, and CSS styling to create responsive and usable interfaces. | Level 3: Apply |
| **CO2** | Compare client-side scripting with server-side technologies to identify appropriate use cases in full-stack web application development. | Level 4: Analyze |
| **CO3** | Assess the effectiveness of web pages and applications based on usability, structure, functionality, and adherence to web standards. | Level 5: Evaluate |
| **CO4** | Design and build a complete static and dynamic web application integrating front-end and back-end components using taught technologies. | Level 6: Create |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | Write a HTML program for the demonstration of Lists. Unordered List, Ordered List, Definition List, Nested List. |
| **2** | Write a HTML program for demonstrating Hyperlinks.<br>• Navigation from one page to another. • Navigation within the page |
| **3** | Write a HTML program for time-table using tables. |
| **4** | Write a HTML program to develop a static Home Page using frames.<br>• Write a HTML program to develop a static Registration Form.<br>• Write a HTML program to develop a static Login Page |

| | |
|---|---|
| **5** | Write a HTML program to develop a static Web Page for Catalog.<br>• Write a HTML program to develop a static Web Page for Shopping Cart. |
| **6** | Write HTML for demonstration of cascading stylesheets.<br>• Embedded stylesheets. • External stylesheets. • Inline styles. |
| **7** | Write a javascript program to validate USER LOGIN page. |
| **8** | Write a javascript program for validating REGISTRATION FORM |
| **9** | Write a program for implementing XML document for CUSTOMER DETAILS. • Write an internal Document Type Definition to validate XML for CUSTOMER DETAILS? |
| **10** | Write a JSP that reads parameters from user login page. |
| **11** | Write a JSP that reads a value, creates a cookie and retrieves it. |
| **12** | Write a servlet that connects to the database and retrieves the data and displays it. |

**Suggested Readings:**


- Deitel H.M., Deitel P.J., Internet & World wide Web: How to program, Pearson Education.
- Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.
- Boronczyk, Naramore, Beginning PHP, Apache, MySQL Web Development, Wiley India Pvt.Ltd.
- Thomas Powell, Ajax: The Complete Reference, McGraw Hill.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **1.** | INTRODUCTION OF WEB BROWSER,HTML, CSS | https://www.youtube.com/live/AnD2xH72jHg?feature=shared |
| **2.** | Java script | https://www.nptelvideos.com/video.php?id=2352&c=6 |
| **3.** | PHP | https://youtu.be/OQ14NjbEXJM?feature=shared |
| **4.** | INTRODUCTION TO AJAX | https://youtu.be/XdXbDw7LwBE?feature=shared |

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|---|---|---|---|---|---|
| Course Code | **EL-MCA-209A** | | | | |
| Category | Experiential Learning | | | | |
| Course Title | **Software Lab-6 Based on ANDROID** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• To understand the fundamentals of Android architecture and application components.<br>• To design and implement user interfaces using Android UI elements and layouts.<br>• To develop mobile applications with data storage, SQLite, and internet connectivity.<br>• To integrate device features such as camera, GPS, and background services in Android apps. | | | | |
| Internal Assessment | 50 Marks | | | | |
| External Practical | 50 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Develop functional Android apps using UI elements, storage, services, and device features like camera, location, and notifications. | Level 3: Apply |
| **CO2** | Differentiate between storage methods, threading models, and user interaction patterns in various Android development scenarios. | Level 4: Analyze |
| **CO3** | Assess Android app performance, user experience, and efficiency by testing features like alarms, menus, and internal or external storage. | Level 5: Evaluate |
| **CO4** | Design and implement complete Android applications integrating UI, SQLite, multimedia, background tasks, and device services creatively. | Level 6: Create |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | Design an application representing a simple calculator. |
| **2** | Develop an application for working with Menus and Screen Navigation. |
| **3** | Develop an application for working with Notifications. |
| **4** | Develop an application demonstrating Internal Storage to store private data on the device memory. |
| **5** | Design a simple to-do list application using SQLite. |
| **6** | Develop an application for connecting to the internet and sending email. |
| **7** | Develop an application for working with graphics and animation. |
| **8** | Develop an application for working with device camera. |
| **9** | Develop an application for working with location-based services. |
| **10** | Using Worker thread writes Android code for a click listener that downloads an image from a |

| | |
|---|---|
| | separate thread and displays it in an Image View. |
| **11** | Develop an Android Application that creates Alarm Clock. |
| **12** | Develop an Android Application that writes data to the SD Card. |

**Suggested Readings:**


- Zigurd Mednieks, Laird Dornin, G, BlakeMeike and Masumi Nakamura: Programming Android, O'Reilly Publications.
- Wei-Meng Lee: Beginning iPhone SDK Programming with Objective-C, Wiley India Ltd.
- James C.S: Android Application development, CENGAGE Learning.
- Gargenta M., Nakamura M.: Learning Android, O'Reilly Publications.
- Reto Meier: Professional Android 2 Application Development, WROX Publication- Wiley-India.
- James Edward: J2ME: The Complete Reference, James Edward – Publication.
- Chris Haseman: Android Essentials, Apress Publication.
- Mark L Murphy: Beginning Android - Wiley India Pvt Ltd.
- Sayed Y Hashimi and Satya Komatineni: Pro Android – Wiley India Pvt Ltd.
- Lauren Darcey, Shane Conder: Android Wireless Application Development, 2nd edition –Pearson Education.


**Useful Video links:**

| **Unit No.** | **Topics** | **Links** |
|---|---|---|
| **Unit-I** | Mobile Application Development | https://youtu.be/swiXnLo5nL8?si=PGsZiXQpGQSJEyzh |
| **Unit-II** | Introduction to Android | https://youtu.be/fzQcQV0UCUM?si=HwvV3Sw4YvYPb5yy |
| **Unit-III** | Android Application | https://youtu.be/m2vLrtxyGuE?si=-55381gRS71mbtzT |
| **Unit-IV** | Using Google Maps, GPS and Wi-Fi Integration | https://youtu.be/PEdjbn2B-rY?si=eiJ6AEG84HuM2wH3 |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-211A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Cyber Security & Blockchain Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand the Core Concepts of Cyber Security.<br>• Develop Proficiency in Vulnerability Scanning and Network Security Tools.<br>• Gain Expertise in Web Application Security and Ethical Hacking Techniques.<br>• Explore Blockchain Technology and Its Applications in Cyber Security. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall cyber security basics, scanning tools, cybercrime types, laws, and blockchain fundamentals. | Level 1: Remember |
| **CO2** | Explain threats, scanning methods, firewall/VPN functions, cybercrimes, and blockchain principles. | Level 2: Understand |
| **CO3** | Apply tools like Nmap, Wireshark, Metasploit, and Sqlmap; configure firewalls; investigate crimes; implement blockchain basics. | Level 3: Apply |
| **CO4** | Analyze vulnerabilities, compare attack methods, evaluate legal aspects, and assess blockchain for data integrity and trust. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Cyber Security:** Overview of Cyber Security, Internet Governance –Challenges and Constraints; Cyber Threats: Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage; Need for a Comprehensive Cyber Security Policy. Introduction to Vulnerability Scanning: Overview of vulnerability scanning, Open Port/Service Identification, Banner/Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples,OpenVAS, Metasploit.Network Vulnerability Scanning: Netcat, Socat; understanding Port and Services tools - Data pipe,Fpipe, WinRelay; Network Reconnaissance – Nmap, THC-Amap and System tools, Network Sniffersand Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping, Kismet.

## Unit-II

**Network Defense Tools:** Firewalls and Packet Filters - Firewall Basics, Packet Filter VsFirewall; Network Address Translation (NAT) and Port Forwarding; Basics of Virtual Private Networks, Linux Firewall,

Windows Firewall.

**Web Application Tools:** Scanning for web vulnerabilities tools- Nikto, W3af; HTTP utilities - Curl, OpenSSL; and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat; Password Cracking and Brute-Force Tools – John the Ripper, L0htcrack, Pwdump, HTCHydra

**Unit-III**

**Cyber Crimes and Law:** Introduction to Cyber Crimes, Types of Cybercrime, Hacking,Attack vectors, Cyberspace and Criminal Behavior, Digital Forensics, Realms of the Cyber world, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers asTargets, Contaminants and Destruction of Data, Indian IT ACT 2000.

**Cyber Crime Investigation:** Firewalls and Packet Filters, password Cracking, Keyloggers and Spyware, Virus and Warms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks.

**Unit-IV**

**Blockchain Technology:** Cryptography - Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof; Blockchain Overview: Introduction, Advantage over conventional distributed database, Blockchain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain. Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin. Blockchain Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Blockchain.

**Suggested Readings:**


- Mike Shema: Anti-Hacker Tool Kit, McGraw Hill
- Nina Godbole and Sunit Belpure: Cyber Security Understanding Cyber Crimes,ComputerForensics and Legal Perspectives, Wiley.
- Achyut S.Godbole: Data Communication and Networking, McGraw –Hill Education
- New Delhi.
- Forouzan: Data Communication and Networking (Global Edition) 5/e, McGraw HillEducation India.
- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven
- Goldfeder: Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction,Princeton University Press.
- Wattenhofer: The Science of the Blockchain.
- Antonopoulos: Mastering Bitcoin - Unlocking Digital Cryptocurrencies.
- Satoshi Nakamoto: Bitcoin: A Peer-to-Peer Electronic Cash System
- Forouzan, B.A.: Cryptography & Network Security. Tata McGraw-Hill Education.
- Kahate, A. Cryptography and Network Security. McGraw-Hill Higher Ed.
- Peter Szor, The Art of Computer Virus Research and Defense, Symantec Press.
- Markus Jakobsson and Zulfikar Ramzan, Crimeware, Understanding New Attacksand Defenses, Symantec Press, 2008, ISBN: 978-0-321-50195-0.
- S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology:Cryptocurrency and Applications', Oxford University Press, 2019.
- Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to BlockchainTechnology and Blockchain Programming', CSI Publishing Platform, 2017.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Overview of Cyber Security | https://youtu.be/OYsY5B9pqYU?si=mIWU9xh-YmzwYZnB |
| | Overview of vulnerability scanning, Open Port/Service Identification | https://youtu.be/Mfwu4ZwAvos?si=utAAsh3o1_L-8UyT |
| **Unit-II** | Firewalls and Packet Filters | https://youtu.be/2YGUvopGkQc?si=-DQLPe_5ZFaqyVIk |
| | Web Application Tools | https://youtu.be/-lyr-vm9w5Q?si=HTDDopxjqbaEPiND |
| **Unit-III** | Types of Cybercrime | https://www.youtube.com/live/BP52YjPi27Y?si=WfWuCvZ6AI-ZRBw1 |
| | Trojan and backdoors, Steganography, DOS and DDOS attack | https://www.youtube.com/live/B_rM-ntOr5w?si=JzLAh7XfLIc5d6MR |
| **Unit-IV** | Cryptography | https://youtu.be/iTVyKbDCJrA?si=gGxNvA5LUHwNqLfs |
| | Domain Name Service and future of Blockchain | https://youtu.be/4aLdi_2rS3M?si=OWU5LgzIBl2A6BkU |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-213A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Software Testing & Quality Assurance** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand and Apply Software Testing Strategies and Processes.<br>• Master dynamic, static, regression, and validation testing techniques.<br>• Explore object-oriented and web application testing methods.<br>• Learn software quality standards like ISO 9000, CMM, and CMMI. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of testing strategies, techniques, object-oriented/web testing, and quality standards like ISO and CMM. | Level 1: Remember |
| **CO2** | Explain testing processes, integration/system testing, web testing types, Rational Rose features, and quality management roles. | Level 2: Understand |
| **CO3** | Apply black-box and white-box testing, debugging, object-oriented testing, and quality assurance using ISO and CMMI. | Level 3: Apply |
| **CO4** | Analyze software risks, evaluate testing tools and metrics, assess web testing methods, and review QA frameworks. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Testing Strategy and Environment:** Minimizing Risks, Writing a Policy for SoftwareTesting, Economics of Testing, Testing-an organizational issue, Management Support for Software Testing, Building a Structured Approach to Software Testing, Developing a Test Strategy Building Software Testing Process: Software Testing Guidelines, workbench concept, Customizing the Software Testing Process, Process Preparation checklist – Software Testing Techniques: Dynamic Testing – Black Box testing techniques, White Box testing techniques, Static testing, Validation Activities, Regression testing.

## Unit-II

**Software Testing Strategies:** Approach, Issues; integration, incremental, System, alpha,Beta testing etc; Comparative evaluation of techniques: Testing tools; Dynamic analysistools, test data generators, Debuggers, test drivers etc.Technical Metrics for Software: Quality Factors, framework**;** Metrics for analysis, design,testing source code.

## Unit-III

**Object Oriented Testing:** Introduction to Object Oriented testing, Path Testing, State Based Testing, Class Testing, Testing Web Applications: Web testing, Functional Testing, User interface Testing, Usability Testing, Configuration and Compatibility Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. Rational Rose Software: Introduction, Features, Various types of software testing using Rational Rose.

## Unit-IV

**Software Quality Assurance and Standards:** Software Quality, Software Quality Challenges, Software Quality factors. Software Quality Assurance: concept, components, importance and essence; FTR, structured walk-through technique etc. Software Quality Management Standards, Management and its role in Software Quality Assurance, Quality Standards: ISO 9000 and Companion ISO Standards, CMM, CMMI.

**Suggested Readings:**


- Meyers, G.: The art of Software Testing, Wiley-Inter-Science.
- Deutsch, Willis: Software Quality Engineering: A Total Technical and Management
- Approach, Prentice Hall.
- Pressman: Software Engineering, TMH.
- Gill, Nasib Singh: Software Engineering: Reliability, Testing and Quality Assurance,
- Khanna Book Publishing Co.(P) Ltd, N. Delhi
- Ghazzi, Carlo: Fundaments of Software Engineering, PHI.
- Chhillar Rajender Singh: Software Engineering: Testing, Faults, Metrics, Excel
- Books, New Delhi.
- Jalote, Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.
- Doug Bell, Ian Murrey, John Pugh: Software Engineering-A Programming Approach, Prentice Hall.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Dynamic Testing – Black Box testing techniques, White Box testing techniques, | https://youtu.be/reTh1y7ZH_A?si=5v-nfbJeJ1i45yJj |
| **Unit-II** | Integration test strategy | https://youtu.be/jBtipG06R04?si=yCx-wn-tTHHQhFuv |
| **Unit-III** | Path testing | https://youtu.be/TAFhCV721tY?si=K0R-xMV3V1xb7m8i |
| | White box testing | https://youtu.be/pXkCkRgPFrc?si=lo7GVHD1HgVXXCEF |
| **Unit-IV** | Software Quality Assurance | https://youtu.be/KqDlDubS-OU?si=mq5chYjmYK3_bHht |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-215A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Android Mobile Application Development** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand mobile application fundamentals, architecture, and resource management for efficient, responsive, and portable software design.<br>• Develop Android apps using Activities, Intents, UI components, multimedia, data storage, and location-based services with Android SDK.<br>• Explore advanced Android features like sensors, camera, Bluetooth, maps, client-server apps, concurrency, and deployment processes.<br>• Gain foundational knowledge of Flutter for cross-platform development and compare it with native Android application development techniques. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Define key concepts of mobile applications, architecture, tools, and Android components for effective development understanding. | Level 1: Remember |
| **CO2** | Explain mobile software engineering principles, Android framework, and application models including UI design and device integration techniques. | Level 2: Understand |
| **CO3** | Develop Android applications using activities, services, intents, storage, sensors, and UI components across multiple screen formats. | Level 3: Apply |
| **CO4** | Analyze application workflows, memory management strategies, and component interactions in Android to optimize resource usage and performance. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Mobile Applications, Characteristics and Benefits, Application Model, Infrastructure and Managing Resources, Mobile Software Engineering, Frameworks and Tools, Mobile devices Profiles. Application Design: Memory Management, Design patterns for limited memory, Work flow for Application Development, Techniques for composing Applications, Dynamic Linking, Plug-ins and rules of thumb for using DLLs, Concurrency and Resource Management.

## Unit-II

**Google Android:** Introduction, JDK & ADK, Android Application Architecture, Traditional Programming Model and Android, Activities, Intents, Tasks, Services. Android Framework: GUI and MVC Architecture, Fragments and

**Multi-platform development, Creating Widgets:** Layouts, Shadows, Gradients; Applications with multiple screens. Development: Intents and Services, Storing and Retrieving data, Graphics and Multimedia, Telephony, Location based services, Packaging and Deployment.

## Unit-III

**Android Applications:** Working with Android, Various life cycles for applications, building a User Interface: Blank UI, Folding and Unfolding a scalable UI, Making Activity, Fragment, Multiple layouts; Content Provider, Location and Mapping: location-based services, Mapping, Google Maps activity, Working with Map View and Map Activity; Sensors and Near Field Communication; Native libraries and headers, Building client server applications.

## Unit-IV

Using Google Maps, GPS and Wi-Fi Integration, Android Notification, Audio manager, Bluetooth; Camera and Sensor integration, Sending SMS, Phone Calls. Runtime Environment for Applications, Callbacks and Override in application, Concurrency, Serialization, Application Signing, API keys for Google Maps, Publishing Android Application; Introduction to Flutter, Android features, UI, implementation.

**Suggested Readings:**


- Zigurd Mednieks, Laird Dornin, G, BlakeMeike and Masumi Nakamura: Programming Android, O'Reilly Publications.
- Wei-Meng Lee: Beginning iPhone SDK Programming with Objective-C, Wiley India Ltd.
- James C.S: Android Application development, CENGAGE Learning.
- Gargenta M., Nakamura M.: Learning Android, O'Reilly Publications.
- Reto Meier: Professional Android 2 Application Development, WROX Publication- Wiley-India.
- James Edward: J2ME: The Complete Reference, James Edward – Publication.
- Chris Haseman: Android Essentials, Apress Publication.
- Mark L Murphy: Beginning Android - Wiley India Pvt Ltd.
- Sayed Y Hashimi and Satya Komatineni: Pro Android – Wiley India Pvt Ltd.
- Lauren Darcey, Shane Conder: Android Wireless Application Development, 2nd edition –Pearson Education.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Mobile Application Development | https://youtu.be/swiXnLo5nL8?si=PGsZiXQpGQSJEyzh |
| **Unit-II** | Introduction to Android | https://youtu.be/fzQcQV0UCUM?si=HwvV3Sw4YvYPb5yy |
| **Unit-III** | Android Application | https://youtu.be/m2vLrtxyGuE?si=-55381gRS71mbtzT |
| **Unit-IV** | Using Google Maps, GPS and Wi-Fi Integration | https://youtu.be/PEdjbn2B-rY?si=eiJ6AEG84HuM2wH3 |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-217A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Full Stack Development** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand web browsers, static web design with HTML5 and CSS3, and explore concepts like buffering, caching, and web security.<br>• Develop interactive web pages using JavaScript, including DOM manipulation, event handling, user input processing, form validation, and object handling.<br>• Learn server-side programming with PHP and MySQL, covering form processing, sessions, cookies, dynamic content generation, and database connectivity.<br>• Explore AJAX for asynchronous communication, integrate PHP with AJAX, and ensure secure, accessible, and responsive web applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall foundational web development concepts, HTML5, CSS3 properties, JavaScript syntax, PHP basics, and AJAX communication techniques. | Level 1: Remember |
| **CO2** | Describe the behavior of client-side and server-side technologies including DOM, form handling, session management, and asynchronous communication. | Level 2: Understand |
| **CO3** | Develop interactive websites using HTML, CSS, JavaScript, PHP, and AJAX with dynamic content and user-driven functionality. | Level 3: Apply |
| **CO4** | Differentiate between synchronous and asynchronous applications, scripting versus markup, and cookie-based versus session-based user data handling. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Web browsers and its functions, web optimizations; Static page design; designing static web pages with HTML5.0-HTML basic, multimedia, Graphics, Form tags, CSS 2.0 concept and its properties & CSS 3.0 properties i.e. borders, backgrounds, fonts, text effects, Buffering, Weblog, Web Cache Poisoning.

## Unit-II

**JavaScript:** Document Object Model (DOM), Obtaining user inputs, memory concepts, Operators, Control Structures, Looping constructs, break, continue statements, Programmer defined functions, Scoping rules, Recursion and iteration, Array declaration and allocation, passing arrays to function, Objects: String, Date, Boolean, Window, document; using cookies, form validation in Java Script, Handling Events Using JavaScript.

## Unit-III

**PHP:** Installing and Configuring MySQL and PHP, Basic Security Guidelines, Variables, Data Types, Operators and Expressions, Constants, Flow Control Functions; Switching Flow, Loops, Code Blocks and Browser Output, Objects, Strings Processing, Form processing, Connecting to database, cookies, Session, dynamic contents.

## Unit-IV

**Introduction to AJAX:** Exploring different web technologies, creating a simple AJAX application, interacting with the Web Server Using the XMLHttpRequest Object, Create an XMLHttpRequest Object, Interact with the Web Server. Differentiating AJAX and Non-AJAX application. Working with PHP and AJAX: Introduction, Process Client Requests, Accessing Files Using PHP, Implementing Security and Accessibility in AJAX applications: Introduction, Secure AJAX Applications, and Accessible Rich Internet Applications.

**Suggested Readings:**


- Deitel H.M., Deitel P.J., Internet & World wide Web: How to program, Pearson Education.
- Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.
- Boronczyk, Naramore, Beginning PHP, Apache, MySQL Web Development, Wiley India Pvt.Ltd.
- Thomas Powell, Ajax: The Complete Reference, McGraw Hill.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | INTRODUCTION OF WEB BROWSER, HTML, CSS | https://www.youtube.com/live/AnD2xH72jHg?feature=shared |
| **Unit-II** | Java script | https://www.nptelvideos.com/video.php?id=2352&c=6 |
| **Unit-III** | PHP | https://youtu.be/OQ14NjbEXJM?feature=shared |
| **Unit-IV** | INTRODUCTION TO AJAX | https://youtu.be/XdXbDw7LwBE?feature=shared |

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|---|---|---|---|---|---|
| Course Code | **DSC-MCA-202A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Advance Software Engineering** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand and apply emerging software engineering practices, including Aspect-Oriented Development, Agile Methods, Security Engineering, and Component-Based Software Engineering.<br>• Gain proficiency in Agile development processes, covering Scrum, Extreme Programming (XP), Agile Risk Management, Agile Architecture, and Agile Testing techniques.<br>• Develop skills for engineering web-based applications and applying Cleanroom Software Engineering and Component-Based Software Engineering methods, including domain engineering and economic considerations.<br>• Explore and implement DevOps principles and tools to automate development workflows, integrate continuous deployment pipelines, and utilize platforms like Azure DevOps and AWS DevOps. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts, terminology, and tools in data mining, big data, Hadoop, and data analytics using R programming techniques. | Level 1: Remember |
| **CO2** | Explain the functioning of data mining algorithms, Hadoop architecture, and data analytics workflows across various real-world applications and datasets. | Level 2: Understand |
| **CO3** | Implement data mining techniques, Hadoop operations, and R-based analytics to analyze, clean, and transform complex datasets efficiently. | Level 3: Apply |
| **CO4** | Compare various data processing models, mining methods, and analytical techniques to determine suitable approaches for specific data-driven problems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Emerging Software Engineering Practices:** Aspect Oriented Software Development, Agile Methods, Security Engineering, Client/Server Software Engineering, Software Engineering Aspects of Programming Languages.

**Cleanroom Software Engineering:** Approach, functional specification, design and testing.

**Component-Based Software Engineering:** Software Component and its Elements, Component Models - Concepts and Principles, COTS Myths, CBSE process, domain engineering, component-based development, classifying and retrieving components, and economics of CBSE.

**Engineering Web Applications:** Web-based applications and their attributes, Web Engineering process, framework for Web Engineering, formulating, analysing web-based systems, design and testing for web-based applications.

**Unit-II**

**Agile Software Development:** Basics and Fundamentals of Agile Process Methods, Values of Agile, Principles of Agile, stakeholders, Challenges.

**Agile and Scrum Principles:** Agile Manifesto, Twelve Practices of Extreme Programming (XP), Scrum Practices, Applying Scrum. Need of scrum, working of scrum, advanced Scrum Applications, Scrum and the Organization, scrum values.

**Agile Requirements:** User Stories, Backlog Management. **Agile Architecture:** Feature Driven Development. **Agile Risk Management:** Risk and Quality Assurance, Agile Tools.

**Agile Testing:** Agile Testing Techniques, Test-Driven Development, User Acceptance Test.

**Unit-III**

**Agile Management:** Agile Metrics and Measurements, Agile approach to estimating and project variables, Agile Measurement.

**Agile Control:** the 7 control parameters. Agile approach to Risk, Agile approach to Configuration Management, Atern Principles, Atern Philosophy, Rationale for using Atern, Refactoring, Continuous integration, Automated Build Tools.

**Scaling Agile for Large Projects:** Scrum of Scrums, Team collaborations, Scrum, estimate a Scrum Project, Track Scrum Projects, Communication in Scrum Projects, Best Practices to Manage Scrum.

**Unit-IV**

**DevOps:** History of DevOps, DevOps vs Agile, Advantages and Disadvantages of DevOps, DevOps Stakeholders, Architecture, Components and features of DevOps, SDLC models of DevOps, Workflow and Principles of DevOps, DevOps tools, DevOps automation and automation tools, Pipeline and Methodology, Azure DevOps, AWS DevOps.

**Laboratory Work:** Exploring the tools related to Agile Development and DevOps, and developing small projects using this technology.

**Suggested Readings:**


- Roger S. Pressman: Software Engineering a Practitioners Approach, McGraw-Hill, Latest Edition.
- Robert C. Martin: Agile Software Development, Principles, Patterns, and Practices Alan Apt Series.
- Cohen Mike: Succeeding with Agile: Software Development Using Scrum, Pearson.
- Software Engineering for Embedded Systems: Methods, Practical Techniques, and Applications, Robert Oshana, Mark Kraeling, Newnes Publisher.

- Kristin Runyan: Introduction to Agile Methods Sondra Ashmore, Addison-Wesley.
- Pekka Abrahams, OutiSalo, Jussi Ronkainen and Juhani Warsta: Agile Software Development Methods: Review and Analysis.
- Jim Highsmith, Agile Project Management: Creating Innovative Products, Second Edition, Addison-Wesley Professional.
- James A. Crowder, Agile Project Management: Managing for Success, Shelli Friess, Springer.
- Andrew Stellman, Jennifer Greene, Learning Agile: Understanding Scrum, XP, Lean, and Kanban, O Reilly
- Sricharan Vadapalli, DevOps: Continuous Delivery, Integration, and Deployment with DevOp, Packt.
- Janet Gregory, Lisa Crispin, More Agile Testing: Learning Journeys for the Whole Team, Addison Wesley.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Agile Methods | https://www.youtube.com/watch?v=x90kIAFGYKE |
| **Unit-II** | Agile Testing | https://www.youtube.com/watch?v=jRs-aFETAXY |
| | Agile and Scrum Principles | https://www.youtube.com/watch?v=gWYw4gKgmPk |
| **Unit-III** | Agile Management | https://www.youtube.com/watch?v=zyGfLajeWmw |
| **Unit-IV** | DevOps | https://www.youtube.com/watch?v=2N-59wUIPVI |

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|---|---|---|---|---|---|
| Course Code | **DSC-MCA-204A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **IoT & Sensor Networks** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand the foundational concepts of the Internet of Things (IoT), including its architecture, protocols, data management, and the technologies enabling IoT and M2M communications.<br>• Develop skills in IoT system design and prototyping, covering cloud-based data collection and storage, embedded device programming (Arduino), and secure communication using protocols like MQTT.<br>• Learn about wireless sensor networks (WSNs), including their architecture, enabling technologies, design principles, optimization goals, and gateway concepts.<br>• Explore communication protocols for WSNs, focusing on physical layer considerations, MAC protocols, routing protocols, address management, and techniques for energy-efficient networking. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts, protocols, components, and technologies involved in IoT, cloud computing, wireless sensor networks, and communication models. | Level 1: Remember |
| **CO2** | Explain IoT architectures, cloud-based services, WSN principles, and protocol operations involved in device communication, data transmission, and security. | Level 2: Understand |
| **CO3** | Develop IoT applications by interfacing sensors, using Arduino, programming MQTT clients, and deploying cloud services for data storage and processing. | Level 3: Apply |
| **CO4** | Differentiate communication protocols, sensor network architectures, and cloud models to determine optimal solutions for specific IoT applications. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**IoT Overview:** Introduction to Internet of Things, IoT Applications, IoT Conceptual Framework, IoT Architectural View, Technology Behind IoT, Sources of IoT, M2M communication, Examples of IoT. Modified OSI Model for the IoT/M2M Systems, data enrichment, data consolidation and device management at IoT/M2M Gateway, web communication protocols used by connected IoT/M2M devices, Message communication protocols (CoAP-SMS, CoAPMQ, MQTT,XMPP) for IoT/M2M devices.

**Architecture and Design Principles for IoT:** Internet connectivity, Internet-based communication,IPv4, IPv6,6LoWPAN protocol, IP Addressing in the IoT, Application layer protocols: HTTP, HTTPS,FTP,TELNET and ports.

**Unit-II**

**Data Collection, Storage and Computing using a Cloud Platform:** Introduction, Cloud computing paradigm for data collection, storage and computing, Cloud service models, IoT Cloud- based data collection, storage and computing services using Nimbits.

**Prototyping and Designing Software for IoT Applications:** Introduction, Prototyping Embedded device software, Programming Embedded Device Arduino Platform using IDE, Reading data from sensors and devices, Devices, Gateways, Internet and Web/Cloud services software development.

**Programming MQTT clients and MQTT server.**

**IoT Security:**Introduction to IoT privacy and security, Vulnerabilities, Security requirements and threat analysis, IoT Security Tomography and layered attacker model.

**Unit-III**

**Wireless Sensor Networks:** Overview of WSNs, Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

**Architectures:** Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design principles for WSNs, Service interfaces of WSNs, Gateway Concepts.

**Unit-IV**

**Communication Protocols:** Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - S-MAC, The Mediation Device Protocol, Wakeup Radio Concepts, Contention based protocols (CSMA,PAMAS), Schedule based protocols (LEACH, SMACS, TRAMA) Address and Name Management in WSNs, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing, Hierarchical Networks by Clustering.

**Suggested Readings:**


- Raj Kamal: Internet of Things-Architecture and design principles, McGraw Hill Education.
- Holger Karl & Andreas Willig: Protocols and Architectures for Wireless Sensor Networks, John Wiley.
- Feng Zhao & Leonidas J. Guibas: Wireless Sensor Networks- An Information Processing Approach, Elsevier.
- Kazem Sohraby, Daniel Minoli, &TaiebZnati: Wireless Sensor NetworksTechnology, Protocols, And Applications, John Wiley.
- Anna Hac, Wireless Sensor Network Designs, John Wiley.
- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle: From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Academic Press.
- Peter Waher, Learning Internet of Things, PACKT publishing, BIRMINGHAM – MUMBAI
- Bernd Scholz-Reiter, Florian Michahelles: Architecting the Internet of Things, Springer.
- Daniel Minoli: Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, Willy Publications

- C.S Raghavendra, Krishna M.Sivalingam, Taiebznati: Wireless Sensor Networks, Springer Science.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Internet of Things | https://nptel.ac.in/courses/106105166 |
| | Internet connectivity | https://youtu.be/GHUR_GfQQsQ?si=qUES9QKnjrnavXdX |
| **Unit-II** | Prototyping and Designing Software for IoT Applications | https://www.youtube.com/watch?v=urUBLmXFKl0 |
| **Unit-III** | Wireless Sensor Networks | https://www.youtube.com/watch?v=GUSrkWJ_Z2g |
| **Unit-IV** | Communication Protocols | https://www.youtube.com/watch?v=TrFaCBV7joY |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-MCA-206A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Web Development Using .Net Framework** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• To understand the fundamentals of web development using the .NET framework, including its architecture, execution model, and development tools such as IIS, SQL Server, and Visual Studio.<br>• To develop proficiency in object-oriented programming concepts such as classes, inheritance, polymorphism, interfaces, and exception handling using C#.<br>• To design and implement Windows-based applications with user interfaces and database connectivity using ADO.NET for data access and manipulation.<br>• To build dynamic and interactive web applications using ASP.NET, implement state management techniques, and develop secure web services with authentication and authorization. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall .NET architecture, C# syntax, web technologies, and ADO.NET components used in developing Windows and web applications. | Level 1: Remember |
| **CO2** | Explain object-oriented programming concepts, .NET framework components, and ASP.NET features including state management and data controls. | Level 2: Understand |
| **CO3** | Develop C# programs, implement Windows forms, and connect to SQL Server using ADO.NET and Visual Studio tools. | Level 3: Apply |
| **CO4** | Differentiate between monolithic and component-based applications, and evaluate server-side vs. client-side technologies in web development. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Overview of Web Development:** Introduction, .NET Overview, Assemblies (monolithic vs. component-based applications), Execution Model, Client-Side vs. Server-Side Programming, Web Technologies, Development Environment Setup, IIS, SQL Server and Visual Studio.

**Introduction to .NET Framework:** Microsoft .NET Platform, Design, Goals and Overview, .NET Architecture, Console, Environment, IL, JIT, .NET framework Class library (System, Collections, I/O, Networking, Threading, Transactions, Exceptions), Common Language Runtime, CLR Execution, Common Type System, Common Language Specification, Managed and Unmanaged code.

**C# Programming:** Introduction to C#, program structure; Variables and Data types: Initialization of Variables, Variable Scope, Constants, Value Types and Reference Types, CTS Types. Operators. Conditional Statements, Loops. Arrays. Strings.

**Structures:** Defining Structs, Creating Structs, Creating Enums

**Unit-II**

**Object Oriented Programming:**Objects and Classes, Methods and Properties, Constructors and Destructors.

**Inheritance:** Introduction, Types of Inheritance, Implementation versus Interface Inheritance, Multiple Inheritance.

**Polymorphism:** Abstract Classes Implementing Polymorphism by Method Overloading & Method Overriding.

**Interfaces:** Defining and Implementing Interfaces, Derived Interfaces, Accessing Interfaces, Overriding Interfaces.

**Exception Handling:** Exception Classes, Standard Exceptions, User Defined Exceptions. Delegates, Events and Attributes.

**Unit-III**

**Building Windows Based Applications: Standard Controls:** Components, Forms, Menus and Dialogues, Validating user inputs.

**Databases and Data Access Using ADO.NET:** Overview of ADO.NET, Accessing Data, Using Dataset Objects and Updating Data Binding, Viewing, and Filtering Data, Connecting with the Database.

**Unit-IV**

**ASP.NET:** Introduction to ASP.NET, Configuring ASP.NET Applications, Programming Model.

**ASP.NET Frameworks:**Code Behind, Page Directives, Page Events, Post Back.

**ASP.NET Controls:** Basic Web Server Controls, Data List Web Server Controls, Web Server Controls: Calendar Control, Ad rotator Control, Validation Controls, Grid View Controls.

**Performing Data Access:** Data bound Controls, List Controls, Tabular & Hierarchical Data bound Controls, Data source Controls.

**State Management, Web Services:** View State, Session, Cookies, Application, Hidden Field; Authentication & Authorization; Developing Secure Web Services.

**Suggested Readings:**

- Jeffrey Richter, Francesco Balena: Applied .Net Framework Programming in MS VB.Net, TMH Publication.
- Herbert Schildt: Complete Reference C#, TMH Publication.
- Michael Halvorsan: Microsoft Visual Basic.NET step by step, PHI Publication.
- G.Andew Duthie: Microsoft ASP.Net With C#.Net step by step, PHI Publication.
- Daniel Geron: Programming for Beginners: This Book Includes: SQL, C++, C#, Arduino Programming, Daniel Geron.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Client-Side vs. Server-Side Programming | https://www.youtube.com/watch?v=XlryaovT_3k |
| **Unit-II** | Inheritance | https://www.youtube.com/watch?v=PaqAhlb5XVw&list=Ly_2iUCG87Ah844iZW3w3nzWSTA8KSZA&index=14 |
| **Unit-III** | Using Dataset Objects and Updating Data Binding | https://www.youtube.com/watch?v=meWQLWq7QSE |
| **Unit-IV** | State Management, Web Services | https://www.youtube.com/watch?v=Ho2bpbqpkiM |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-214A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Artificial Intelligence** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• To provide a foundational understanding of Artificial Intelligence.<br>• To develop an in-depth knowledge of expert systems and knowledge representation techniques.<br>• To introduce students to advanced computational intelligence approaches.<br>• To enable practical application of AI techniques across diverse domains. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall AI fundamentals, expert systems, knowledge types, neural and fuzzy systems, and applications. | Level 1: Remember |
| **CO2** | Explain AI problem-solving, expert system design, knowledge acquisition, neural learning, GAs, and fuzzy inference. | Level 2: Understand |
| **CO3** | Apply search methods, knowledge representation, ANN and GA models, and fuzzy logic in control tasks. | Level 3: Apply |
| **CO4** | Analyze AI strategies, expert system processes, inference techniques, PSO/ACO, and fuzzy-neuro system applications. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Artificial Intelligence:** Definition, history and applications of AI; Problemsolving: Definingthe problem as state space search, Production System, Problem characteristics; Search techniques: Brute Force and Heuristic Search.

**Expert System:** Definition, role of knowledge, architecture and life cycle of Expert System.

## Unit-II

**Knowledge &Its Representation:** Types of knowledge, Knowledge acquisition and its techniques, Knowledge engineering, Cognitive behavior; Knowledge representation: Level of representation; Knowledge representation schemes: Formal logic, Inference Engine, Semantic net, Frame, Scripts.

**Perception:** Sensing, Speech recognition, Vision, Action

## Unit-III

**Computational Intelligence:** Introduction to Computational Intelligence, Biological and Artificial Neural Network (ANN), artificial neural network models; learning in artificial neural networks; neural network and its applications.

**Evolutionary Computation:** Fundamentals of evolutionary computation, Design and Analysis of Genetic Algorithms, Evolutionary Strategies, comparison of GA and traditional search methods. Genetic Operators and Parameters, Genetic Algorithms in Problem Solving; Optimization: Particle Swarm Optimization, Ant Colony Optimization, Artificial Immune Systems; Other Algorithms: Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-Evolution, Multi-Objective Optimization, Tabu Search,Constraint Handling.

## Unit-IV

**Fuzzy Systems:** Crisp sets, Fuzzy sets: Basic types and concepts, characteristics andsignificance of paradigm shift, Representation of fuzzy sets, Operations, membership functions, Classical relations and fuzzy relations, fuzzyfication, defuzzyfication, fuzzy reasoning, fuzzy inference systems, fuzzy control system, fuzzy clustering, applications of fuzzy systems.Neuro-fuzzy systems, neuro-fuzzy modeling; neuro-fuzzy control.

**Applications**: Pattern Recognition, Image Processing, Biological Sequence Alignment and Drug Design, Robotics and Sensors, Information Retrieval Systems, Share Market Analysis, Natural Language Processing.

**Suggested Readings:**


- Rich Elaine and Knight Kevin: Artificial Intelligence, Tata McGraw Hill.
- M. Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall.
- J.S.R.Jang, C.T.Sun and E.Mizutani: Neuro-Fuzzy and Soft Computing, PHI,
- Pearson Education.
- Timothy J.Ross: Fuzzy Logic with Engineering Applications, McGraw-Hill.
- Davis E.Goldberg: Genetic Algorithms: Search, Optimization and MachineLearning, Addison Wesley.


### Useful Video links:

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Artificial Intelligence | https://youtu.be/GHpchgLoDvI?si=Yupehj9mqMxeHHaL |
| **Unit-II** | Knowledge &Its Representation | https://youtu.be/zT0sGjOSPt8?si=aPh-4h591rWIzgPO |
| **Unit-III** | Computational Intelligence | https://youtu.be/XCPZBD9lbVo?si=Cvu36ZDVeM8a1k0S |
| **Unit-IV** | Fuzzy Systems | https://youtu.be/K7S3TgfqnX0?si=QZXSnDjodoEJcv3d |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-216A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Mixed Reality & Wearable Computing** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand creative coding, open-source platforms, and hardware frameworks including Arduino, Raspberry Pi, and sensors.<br>• Apply Python and C/C++ to interface software with real-world hardware using iterative methodology.<br>• Explore cybernetics, humanistic intelligence, AR/VR, and smart wearable systems for interactive environments.<br>• Analyze IoT, wearable computing, and augmented reality for innovative, real-time data-driven applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of creative coding, electronics, sensors, microcontrollers, and communication protocols used in IoT and AR systems. | Level 1: Remember |
| **CO2** | Explain how mobile, wearable, and embedded systems interact with hardware, software, and real-world inputs through various coding platforms. | Level 2: Understand |
| **CO3** | Develop functional prototypes using Arduino, Raspberry Pi, and sensors to interface software with physical devices in creative applications. | Level 3: Apply |
| **CO4** | Analyze digital and analog systems, communication protocols, and data processing techniques in IoT, AR, and wearable computing environments. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** History, Creative Coding Platforms, Open-Source Platforms, PIC, Arduino, Sketch, Raspberry Pi, Iterative coding methodology. Python Programming - Mobile phones and similar devices, Arm Devices, Basic Electronics (circuit theory, measurements, parts identification)

**Sensors and Software:** Understanding Processing Code Structure, variables and flow control, Interfacing to the Real World.

## Unit-II

**Software and Hardware Frameworks:** Software-Open Frameworks as our IDE (C/C++) - Arduino Language (C/C++), Hardware- Desktop / Laptop / Raspberry Pi - How to approach a programming problem? Representing "reality" with computers. Digital vs. Analog circuits, audio, communication, etc. Analog to Digital Conversion (ADC) - Digital to Analog Conversion (DAC)– Microcontrollers - Communication – Serial & Parallel - Hardware to Hardware Communication - I2C/IIC (Inter-Integrated Circuit) - SPI (Serial Peripheral Interface) – Serial UART Communication.

## Unit-III

**Cybernetics and Humanistic Intelligence Wearables:** Augmented Reality – Mixed Reality. AR versus VR - IoT and Wearables: Smart Cites and Wearable Computing as a form of urban design - Advanced I/O – open Frameworks: Live Network feeds (push and pull) - Data persistence (saving data and preferences) - Database interface (MySQL, SQLite, XML, PHP/Web) - Arduino: Wired/Wireless Networking (hardware vs. USB proxy) - Software serial (RS-232).

## Unit-IV

**Internet of Everything:** Humanistic Intelligence; Wearable Computing and IoT (Internet of Things), Overview of Mobile and Wearable Computing, Augmented Reality, and Internet of Things. The fundamental axes of the Wearables + IoT + AR space - Free-roaming AR: Wearable Computing, Wireless, Sensing, and Meta sensing with light bulbs Phenomenal Augmented Reality: Real world physical phenomena as the fundamental basis of mobile and wearable AR.

**Suggested Readings:**


- Woodrow Barfield: Fundamentals of Wearable Computers and Augmented Reality, Second Edition.
- Omesh Tickoo, Ravi Iyer: Making Sense of Sensors: End-to-End Algorithms and Infrastructure Design.
- Josha Noble: Programming Interactivity, Second Edition.
- Raspberry Pi: Getting Started with Python, second edition, 2016


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Mixed Reality & Wearable Computing History, Creative Coding Platforms | https://www.youtube.com/watch?v=w8Dq8blTmSA |
| | Sensors and Software | http://digimat.in/nptel/courses/video/108108147/L01.html |
| **Unit-II** | Software and Hardware Frameworks | https://www.youtube.com/watch?v=AN5I6fFxyfs |
| **Unit-III** | Cybernetics and Humanistic Intelligence Wearables: | https://www.youtube.com/watch?v=dvBG4aknTX0 |
| **Unit-IV** | Internet of Everything | http://digimat.in/nptel/courses/video/106105166/L02.html |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-218A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **High Speed Networks** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand Frame Relay, ATM protocols, and high-speed LAN technologies for modern network infrastructure.<br>• Analyze network performance using stochastic models, queuing theory, and congestion control techniques.<br>• Evaluate ATM traffic control, Integrated Services (IntServ), and Differentiated Services (DiffServ) architectures.<br>• Explore QoS protocols and Internet routing principles for scalable, efficient network design and management. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall concepts of Frame Relay, ATM, Ethernet, LAN types, network protocols, QoS mechanisms, and internet routing fundamentals. | Level 1: Remember |
| **CO2** | Explain the structure, operation, and integration of high-speed networks, traffic models, and QoS-based internet communication protocols. | Level 2: Understand |
| **CO3** | Implement queuing models, flow control, and network routing algorithms to evaluate and manage performance in data communication systems. | Level 3: Apply |
| **CO4** | Analyze congestion control techniques, ATM traffic management models, and service differentiation methods for scalable, high-performance networks. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Frame Relay Network:** Introduction, Packet-Switching Networks, Frame Relay Networks;

**Asynchronous Transfer Mode:** ATM Protocol Architecture and Logical Connection, ATM Cells, ATM Service Categories, ATM Adaption Layer;

**High Speed LANs:** Fast Ethernet LAN, Gigabit Ethernet, ATM LAN, Network Attached Storage (NAS), Wireless LAN and Wi-Fi, LAN Interoperability.

## Unit-II

**Network Performance Evaluation Models:** Introduction, Overview of Probability and Stochastic Processes, Queuing Analysis, Self-Similarity Network Traffic.

**Congestion Management:** Congestion – An Overview, Effects of Congestion, Congestion Control, Traffic Management, Frame Relay Congestion Control, Flow Control Techniques, Error Control Techniques; TCP Traffic and Congestion Control: TCP Flow control, TCP Congestion Control, Performance of TCP over ATM.

## Unit-III

**ATM Traffic and Congestion Control:** ATM Traffic and Congestion Control, Traffic Management Framework, ABR Traffic Management, GFR Traffic Management;

**Integrated Services:** Integrated Service (IntServ) Model, Flow and Service Description, Queuing Discipline, Integrated Services in IP-ATM Networks;

**Differentiated Services:** Differentiated Service Architecture, Scalability of DiffServ, DiffServ Functional Elements, Per-Hop Behavior (PHB), Models of DiffServ.

## Unit-IV

**Protocols for Quality of Service (QoS) Support:** Multicasting, Multicast Transport Protocol (MTP), Resource Reservation Protocol (RSVP), Real-Time Transport Protocol (RTP), Multiprotocol Label Switching (MPLS), Subnet Bandwidth Management (SBM), QoS Architectures, QoS Support for Multicast;

**Internet Routing Basics and Design:** Basics of Graph Theory, Internet Routing Principles, Analysis of Shortest Route, Intra-Domain Routing Protocol, Border Gateway Protocol, Inter-Domain Routing Protocol (IDRP).

**Suggested Readings:**


- Kaven Pahlavan and Prashant Krishnamoorthy: Principles of Wireless Network, Prentice Hall of India.
- Adrian Farrel: The Internet and Its Protocols, Elsevier Publications.
- Larry L. Peterson and Bruce S.Davie: Computer Networks, Elsevier Publications.
- William Stallings: High-Speed Networks and Internets, Performance and Quality of Service, Pearson Publications.
- Behrouz A. Forouzan: Data Communications and Networking, Fourth Edition, McGraw Hill.
- B Muthukumaran: Introduction to High Performance Networks, McGraw-Hill
- Douglas E. Comer: Internetworking with TCP/IP Volume – I, Principles, Protocols, and Architectures, Fourth Edition, Pearson Education.
- Mahbub Hassan, Raj Jain: High Performance TCP/IP Networking, Concepts, Issues, and Solutions, Pearson Education.
- Andrew S. Tanenbaum: Computer Networks, PHI.
- James F. Kurose, Keith W. Ross: Computer Networking, A Top-Down Approach Featuring the Internet, Pearson Education.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Frame Relay Network | https://www.youtube.com/watch?v=DU7IZMciHJE |
| | Asynchronous Transfer Mode | https://www.youtube.com/watch?v=aQGeSDauRso |
| **Unit-II** | Network Performance Evaluation Models | http://kcl.digimat.in/nptel/courses/video/106106048/L21.html |
| | Congestion Management | https://www.youtube.com/watch?v=ZYIdYIt7W_g |
| **Unit-III** | ATM Traffic and Congestion Control Integrated Services | https://www.youtube.com/watch?v=ZYIdYIt7W_g |
| **Unit-IV** | Protocols for Quality of Service (QoS) Support | https://www.youtube.com/watch?v=utvwelCCfas |
| | Internet Routing Basics and Design | http://digimat.in/nptel/courses/video/106105084/L07.html |

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|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-220A** | | | | |
| Category | Discipline Specific Courses | | | | |
| Course Title | **Neural Networks & Deep Learning** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand biological neurons, perceptron learning, and foundational concepts of feedforward and deep learning models.<br>• Explore advanced neural network training methods, recurrent networks, and optimization algorithms for better performance.<br>• Analyze convolutional networks, generative models, and recent advances like autoencoders and GANs.<br>• Learn deep reinforcement learning concepts, algorithms, and practical implementations using TensorFlow and policy optimization. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall foundational concepts of neural networks, optimization algorithms, CNNs, RNNs, generative models, and deep reinforcement learning methods. | Level 1: Remember |
| **CO2** | Explain architectures and training techniques of deep networks including convolutional, recurrent, generative, and reinforcement learning models. | Level 2: Understand |
| **CO3** | Implement deep learning models using optimization methods for classification, sequence modeling, generative tasks, and reinforcement learning in Python. | Level 3: Apply |
| **CO4** | Analyze challenges in training deep networks, evaluate optimization strategies, and interpret results of deep reinforcement learning algorithms. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Biological neuron, Idea of Computational units, McCulloch-Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning algorithm, Linear separability; Convergence theorem for Perceptron Learning algorithm.

**Feedforward Networks:** Empirical Risk Minimization, regularizing a deep network, model exploration and hyper parameter tuning.

**Deep Learning:** Historical context and motivation for deep learning, Basic Supervised classification task, optimizing logistic classifier using gradient descent, Stochastic gradient descent, Momentum, and adaptive sub-gradient method.

**Unit-II**

**Deep Neural Networks:** Difficulty of training deep neural networks, Greedy layerwise training.

**Better Training of Neural Networks:** Newer optimization methods for neural networks (Adagrad, Adadelta, rmsprop, adam, NAG), second order methods for training, Saddle point problem in Neural network, Regularization methods.

**Recurrent Neural Network:** Bidirectional RNNs, Encoder-Decoder sequence to sequence architecture, Backpropagation through time, Long Short-Term Memory (LSTM), Gated Recurrent Units, Bidirectional LSTMs, Deep Recurrent networks.

**Unit-III**

**Convolutional Neural Networks:** Basics of convolutional neural networks, stacking, striding and pooling, Applications such as image and text classification, LeNet, AlexNet.

**Generative Models:** Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, Gradient computations in RBMs, Deep Boltzmann Machines.

**Recent Trends:**Varitional Autoencoders (Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, denoising autoencoders), Representational power, layer, size and depth of autoencoders, Stochastic encoders and decoders, Generative Adversarial Networks, Multi-Task Deep Learning, Multi-view Deep learning.

**Unit-IV**

**Deep Reinforcement Learning:** Basic concepts of Deep Reinforcement Learning (DRL), DRL process and RL approaches, Algorithms of DRL(Value Learning, Policy Learning),Q Learning algorithm and its implementation, Digging deeper into Q function, Deep Q Learning algorithm and its implementation with Tensorflow,Deep Q-Network, DRL Applications. Policy optimization: Introduction to policy-based methods, Policy Gradient; Model based RL, Recent Advances and Applications.

**Suggested Readings:**


- Ian Goodfellow: Deep Learning, MIT Press.
- Jeff Heaton: Deep Learning and Neural Networks, Heaton Research Inc.
- Mindy L Hall: Deep Learning, VDM Verlag.
- Li Deng, Dong Yu: Deep Learning: Methods and Applications (Foundations and Trends in Signal Processing), Now Publishers Inc.
- Richard S. Sutton and Andrew G. Barto: Reinforcement Learning: An Introduction, Second Edition, MIT Press.
- Wiering, Marco, and Martijn Van Otterlo: Reinforcement learning - Adaptation, Learning, and Optimization.
- Russell, Stuart J., and Peter Norvig: Artificial Intelligence: AModern Approach, Pearson Education Limited.
- Goodfellow, Ian, Yoshua Bengio, and Aaron Courville: Deep learning, MIT Press.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Neural Networks & Deep Learning Biological neuron, Idea of Computational units | http://kcl.digimat.in/nptel/courses/video/106106184/L01.html |
| | Feedforward Networks | https://www.youtube.com/watch?v=AASR9rOzhhA |
| **Unit-II** | Deep Neural Networks | |
| | Better Training of Neural Networks | https://www.youtube.com/watch?v=W3_yaf3HvHU |
| **Unit-III** | Convolutional Neural Networks | https://www.youtube.com/watch?v=cFgASecJGo8 |
| | Generative Models | https://www.youtube.com/watch?v=IZgvgLy1wyg |
| **Unit-IV** | Deep Reinforcement Learning | https://www.youtube.com/watch?v=ZGmj8UgYuuk |

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|---|---|---|---|---|---|
| Course Code | **EL-MCA-208A** | | | | |
| Category | Experiential Learning | | | | |
| Course Title | **Software Lab-7** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Understand .NET Framework fundamentals and develop basic applications using VB.NET and C# programming languages.<br>• Implement object-oriented concepts like constructors, interfaces, overloading, and overriding in VB.NET programs.<br>• Utilize advanced data structures such as jagged arrays, array lists, and hash tables in .NET.<br>• Develop database connectivity and web applications using ADO.NET and ASP.NET with practical coding skills. | | | | |
| Internal Assessment | 50 Marks | | | | |
| External Practical | 50 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Develop VB.NET and C# programs for calculator, array handling, collections, delegates, events, and database connectivity using ADO.NET. | Level 3: Apply |
| **CO2** | Analyze code behavior involving overloading, overriding, jagged arrays, hash tables, and event-driven programming in .NET applications. | Level 4: Analyze |
| **CO3** | Evaluate the design and implementation of user interface-driven database connectivity and web form applications in ASP.NET. | Level 5: Evaluate |
| **CO4** | Design and build efficient .NET applications integrating GUI, collections, delegates, events, and database connectivity using ADO.NET and ASP.NET. | Level 6: Create |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | Introduction to .NET Framework. |
| **2** | Write a program to display message in VB.net using message Box.<br>Write a program to display message in C# using message Box. |
| **3** | Write a calculator program in VB.NET. |
| **4** | Write a program for constructor in VB.NET.<br>Write a program to implement interface in VB.NET. |
| **5** | Write a program to implement overloading.<br>Write a program to implement overriding. |
| **6** | Write a program to implement jagged array.<br>Write a program for an array list. |

| | |
|---|---|
| | Write a program to implement hash table. |
| **7** | Write a program to implement multicast Delegates.<br>Write a program to implement multicast Events. |
| **8** | Write a program to implement ADO.net Connectivity via user interface. |
| **9** | Write a program to demonstrate ado connectivity viva coding in asp.net. |
| **10** | Write a program to demonstrate asp.net Web form. |
| **11** | Write a program to implement GridView Data Display with ADO.NET in ASP.NET. |
| **12** | Write a program to implement HashTable, Stack, Queue. |

**Useful Video Links:**

| **Unit No.** | **Topics** | **Links** |
|---|---|---|
| **Unit-I** | Client-Side vs. Server-Side Programming | https://www.youtube.com/watch?v=XlryaovT_3k |
| **Unit-II** | Inheritance | https://www.youtube.com/watch?v=PaqAhlb5XVw&list=PLLy_2iUCG87Ah844iZW3w3nzWSTA8KSZA&index=14 |
| **Unit-III** | Using Dataset Objects and Updating Data Binding | https://www.youtube.com/watch?v=meWQLWq7QSE |
| **Unit-IV** | State Management, Web Services | https://www.youtube.com/watch?v=Ho2bpbqpkiM |

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|---|---|---|---|---|---|
| Course Code | **EL-MCA-210A** | | | | |
| Category | Experiential Learning | | | | |
| Course Title | **Software Lab-8** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Develop problem-solving skills using Python for algorithms like GCD, power, and square root calculations.<br>• Implement and analyze fundamental search algorithms including linear and binary search techniques.<br>• Design and apply sorting algorithms such as selection, insertion, and merge sort efficiently.<br>• Create Python programs to generate prime numbers and manipulate lists for algorithmic practice. | | | | |
| Internal Assessment | 50 Marks | | | | |
| External Practical | 50 Marks | | | | |
| Total | 100Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Implement algorithms in Python for computing GCD, square roots, powers, searching, sorting, and prime number generation. | Level 3: Apply |
| **CO2** | Analyze algorithm efficiency and correctness for searching, sorting, and numerical methods within computational problem contexts. | Level 4: Analyze |
| **CO3** | Evaluate different algorithmic approaches and their performance trade-offs in solving computational problems effectively. | Level 5: Evaluate |
| **CO4** | Design and develop efficient Python programs to solve real-world computational problems using appropriate algorithms and data structures. | Level 6: Create |

**List of Experiments**

| Sr. No. | Contents |
|---|---|
| **1** | Write a Program in Python to Compute the GCD of two numbers. |
| **2** | Write a Program in Python to find the square root of a number by using Newton's Method. |
| **3** | Write a Program in Python to find the Power of a Number. |
| **4** | Write a Program in Python to find the Maximum of a list of Numbers. |
| **5** | Write a Program in Python to Implement Linear Search. |
| **6** | Write a Program in Python to Implement Binary Search. |
| **7** | Write a Program in Python to Implement Selection Sort. |
| **8** | Write a Program in Python to Implement Insertion Sort. |
| **9** | Write a Program in Python to Implement Merge Sort. |
| **10** | Write a Program in Python to find first n Prime Numbers. |
| **11** | Write a program to Compare bubble vs merge sort on same dataset |

| | |
|---|---|
| **12** | Write a program to Compare selection vs insertion sort on same dataset |

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Machine Learning | https://www.youtube.com/watch?v=r4sgKrRL2Ys&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77 |
| | Supervised Learning | https://www.youtube.com/watch?v=OTAR0kT1swg&list=PL1xHD4vteKYVpaIiy295pg6_SY5qznc77&index=3 |
| **Unit-II** | Unsupervised Learning | https://www.youtube.com/watch?v=NhimXdFenrg |
| | Reinforcement Learning | https://www.youtube.com/watch?v=ewkm38skUlY&list=PLEAYkSg4uSQ0Hkv_1LHlJtC_wqwVu6RQX |
| **Unit-III** | Introduction to Python | https://www.youtube.com/watch?v=eoPsX7MKfe8&list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO |
| **Unit-IV** | 2D & 3D Data Visualization | https://www.youtube.com/watch?v=eFByJkA3ti4 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **RR-MCA-212A** | | | | |
| Category | Research Report | | | | |
| Course Title | **Industry Internship Report/ Project Report/Dissertation–II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-IV** |
| | 0 | 0 | 6 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Develop project planning and management skills for successful technical execution.<br>• Enhance software development, database design, and system integration capabilities.<br>• Apply structured problem-solving methods to resolve complex technical issues.<br>• Improve professional communication skills, both written and verbal.<br>• Understand and apply ethical principles in software engineering practices. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Identify emerging technologies and interdisciplinary fields for hands-on industrial training. | Level 1: Remember |
| **CO2** | Demonstrate report writing and presentation skills in technical and industrial contexts. | Level 2: Understand |
| **CO3** | Apply engineering principles to analyze and solve real-world industrial problems. | Level 3: Apply |
| **CO4** | Assess ethical standards and tools across diverse technological domains. | Level 4: Analyze |
| **CO5** | Evaluate personal performance in communication, teamwork, and technical proficiency. | Level 5: Evaluate |
| **CO6** | Design and develop industry-relevant software or hardware systems. | Level 6: Create |

**Overview:**

MCA Dissertation-I is a foundational course that introduces students to the research process in computer science and information technology. This course provides students with the necessary skills and knowledge to undertake independent research projects. Students will learn to identify research problems, conduct literature reviews, design research methodologies, collect and analyze data, and present their findings effectively.

**General Guidelines:**

| | |
|---|---|
| **Project Selection** | Choose a project that is relevant to the field of computer science and information technology. Ensure that the project is feasible and achievable within the given timeframe. Consult with the supervisor to refine the project scope and objectives. |
| **Approval Process** | The selected project must be approved by the faculty members/committee appointed by the Head of Department. |
| **Presentation Guidelines** | Each student will have 30-40 minutes for their presentation, followed by 5 minutes for Q&A. |
| **Evaluation** | The presentation will be evaluated by a committee constituted by the Head of Department. The evaluation will be based on: |

**Parameters for the Evaluation of Seminar:**

| Sr. No. | Parameters | Marks Allotted |
|---|---|---|
| 1 | Clarity of the topic | 5 |
| 2 | Project Planning and Management | 5 |
| 3 | Technical Implementation | 10 |
| 4 | Testing and debugging | 10 |
| 5 | Documentation | 10 |
| 6 | Teamwork and Collaboration | 10 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-111A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Computer Organization and Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand number systems, binary arithmetic, and Boolean algebra for logic simplification.<br>• Design and analyze combinational and sequential circuits, including adders, multiplexers, flip-flops, and counters.<br>• Apply computer architecture concepts like instruction sets, CPU design, and assembly language programming.<br>• Understand I/O organization, memory management, and advanced architectures (parallel processing, pipelining, SIMD) for real-world applications. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe number systems, binary arithmetic, Boolean algebra, and basic instruction sets in computer architecture. | Level 1: Remember |
| **CO2** | Explain combinational and sequential circuits, CPU micro-operations, addressing modes, and pipelining principles in computer systems. | Level 2: Understand |
| **CO3** | Implement basic digital circuits, registers, counters, and assembly language programs for 8086/8088 processors. | Level 3: Apply |
| **CO4** | Analyze control unit designs, instruction cycles, and the functioning of parallel processing architectures for improved efficiency. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Number System:** Binary, Octal, Hexadecimal and Decimal, 1's and 2's Complements, Inter conversion of numbers. Codes: Weighted and non-weighted codes, BCD Codes, Gray codes, Self-complementing codes, Error-Detecting/Correcting codes, Alphanumeric Codes, Hamming Codes, Floating Point Numbers.

**Binary Arithmetic:** Binary Addition and Subtraction, 2's Complement Arithmetic, Booth Coding, Binary Multiplication.

**Logic Design:** Logic Gates, Truth Tables, Boolean Algebra, Boolean Expressions-Variables and Literals, Boolean Expressions–Equivalent and Complement, Theorems of Boolean Algebra, Simplification Techniques, SOPs & POSs Boolean Expressions.

## Unit-II

**Combinational Circuits:** Combinational Logic, Arithmetic Circuits– Adder and Subtractor, BCD Adder, Code Converters, Magnitude Comparator, Parity Generators/Checkers, Multiplexers, Demultiplexers, Decoders, Encoders.

**Sequential Circuits:** Latches, R S Flip Flop, Level Triggered and Edge Triggered Flip Flops, JK Flip-Flop, Master-Slave Flip Flops, T Flip-Flop, D Flip-Flops.

**Registers and Counters:** Controlled Buffer Registers, Shift Registers, Applications of Shiftregisters; Ripple Counter, Synchronous Counter, Modulus Counter, Binary Ripple Counters, Up/Down Counters, Decade and BCD Counters.

## Unit-III

**Basic Computer Design:** Computer Instructions and types, Instruction Set, Instruction Cycle, Instruction Formats, Addressing Modes, Computer Registers, Bus System, Register Transfer Language terminology.

**Programming in 8086/8088 Assembly Language:** A/L program structure, segments, registers, instructions, macros, A/L directives.

**CPU Design:** CPU Registers, Micro-operations and its types, Design of ALU. Control Unit Design-Microprograms, Control Unit of a basic computer–Timing and Control; Hardwired and Micro-programmed controlled unit. Architectures -RISC, CISC, Scalar, Superscalar and pipelined architectures.

## Unit-IV

**Input/output Organization:** Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Mode of Transfer, Priority Interrupt, Direct Memory Access, Input-output Processor, Serial Communication.

**Advance Architecture:** Introduction to parallel processing– Pipelining, Parallel Computer structures, Architectural classification. Pipelining & Vector processing; Instruction and Arithmetic pipelines, Principles of designing pipelined processors, Structures for array processors: SIMD Array processor, SIMD Interconnection networks. Parallel Processing Applications a multimedia project.

**Suggested Readings:**


- Mano, M.M.: Digital Logic and Computer Design, Prentice-Hall of India, 1979 (First Edition).
- Gill Nasib Singh and Dixit J.B: Digital Design and Computer Organisation, University Science Press (Laxmi Publications),New Delhi, 2009 (First Edition).
- Stallings, William: Computer Organisation& Architecture, 2020 (10th Edition).
- Mano, M.M.: Digital Design, Prentice-Hall of India, 2001 (4th Edition).
- Anand Kumar: Fundamentals of Digital Circuits, PHI, 2008 (2nd Edition).
- Kai Hwang: Advanced Computer Architecture, McGraw Hill International, 1993 (First Edition)
- Mano,M.M.: Computer System Architecture, Prentice-Hall of India, 2007 (3rd Edition).
- Tokheim: Digital Electronics, TMH, 1999 (5th Edition).
- Any other book(s) covering the contents of the paper in more depth.

**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Binary, Octal, Hexadecimal, Decimal Conversions | https://www.nptelvideos.com/lecture.php?id=5269 |
| **Unit-II** | Multiplexers and Decoders | https://www.nptelvideos.com/lecture.php?id=5836 |
| | Error-Detecting/Correcting codes | https://www.nptelvideos.com/lecture.php?id=5841 |
| **Unit-III** | Computer Instructions and types | https://archive.nptel.ac.in/courses/106/105/106105163/ |
| | pipelined architectures | https://archive.nptel.ac.in/courses/117/105/117105078/ |
| **Unit-IV** | Input-output Interface | https://www.youtube.com/watch?v=09jCRiVWsJw&t=2s |
| | Introduction to parallel processing | https://www.youtube.com/watch?v=NypfUUd6M8k |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-116A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Computer Network** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand the fundamentals of data communication, including network models and protocols.<br>• Comprehend the principles of distributed systems, focusing on synchronization, fault tolerance, and security.<br>• Analyze network and transport layer protocols, data link functions, and implement practical communication mechanisms. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Describe the fundamental concepts of data communication, network classification, communication models, and protocols used in distributed systems. | Level 1: Remember |
| **CO2** | Explain data encoding, modulation techniques, multiplexing, and the layered architecture of network reference models system, communication models, and fault tolerance mechanisms. | Level 2: Understand |
| **CO3** | Implement various data link layer protocols, such as HDLC and sliding window protocol, and apply network protocols and replication management. | Level 3: Apply |
| **CO4** | Analyze data link protocols, error correction, medium access, synchronization, and fault tolerance in distributed systems. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Data Communication:** Introduction to data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation techniques, broadband and base band transmission, multiplexing, transmission medium.

**Network Classification:** Wired Network, Wireless Network, Internetworking Devices.

**Network Reference Models:** Layered architectures, protocol hierarchies, interface and services: ISO- OSI reference model, TCP/IP reference model; internet protocol stacks.

## Unit-II

**Data Link Layer Functions and Protocols:** Framing, error-control, flow-control; sliding window protocol; HDLC, Error detection and correction, Data link layer of internet.

**Medium Access Sub-layer:** CSMA/CD protocol, IEEE standards for LAN and MAN, X.25, frame relay, Narrowband and Broadband ISDN, Asynchronous Transfer Modes.

**Network Functions & Protocols:** Switching mechanism and its various types, routing and congestion control, Internetworking-TCP/IP, IP Packet, IP address, IPv6

**Transport Layer:** Design issues, Connection management (UDP, TCP and their Frame Format); Application Layer: File Transfer, Access and Management, E-Mail, Virtual Terminal, Public Network

## Unit-III

**Introduction to Distributed Systems:** Introduction, Design Goals, Types of Distributed systems, System Architecture and Fundamental models, Middleware, Threads, Virtualization, Client-server model, multiple servers, proxy servers and caches, peer processes, code migration.

**Communication Fundamentals:** Basic concepts, Remote Procedure Call, Message Oriented Communication, Stream Oriented Communication, Multicast Communication.

**Synchronization:** Clock synchronization, Logical clocks, Mutual exclusion algorithms: centralized, decentralized, distributed and token ring algorithms, election algorithms.

## Unit-IV

**Replication Management:** Need for replication, Consistency models, Consistency protocols, Replica management.

**Fault Tolerance:** Basic concepts and failure models, Process resilience, Reliable client-server and group communication, Distributed commit recovery mechanisms.

**Security in Distributed Systems:** Secure channels, Access control, Security management, Cryptographic algorithms; Digital signatures; certificates, firewalls.

**Naming:** Flat naming, Structured naming, Name space and Resolution, Attribute- based naming, Directory services, LDAP, Decentralized implementations.

**Suggested Readings:**


- W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
- P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.
- Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.
- L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan
- Kaufmann.
- William Stallings: Data and Computer Communications, Pearson Education.
- George Coulouris, Jean Dollimore, Tim Kindberg: Distributed Systems-Concepts and Design, Pearson Education

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSEC-MCA-118A** | | | | |
| Category | Discipline Specific Elective Courses | | | | |
| Course Title | **Advance Computer Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-II** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Understand evolution and classification of computer architectures and their performance characteristics.<br>• Analyze program and network properties influencing hardware and software parallelism.<br>• Explore interconnection network architectures and memory hierarchy for efficient data access.<br>• Examine multiprocessor and multicomputer systems, coherence protocols, and message-passing mechanisms. | | | | |
| Assessment | 40 Marks | | | | |
| End Semester Examination | 60 Marks | | | | |
| Total Marks | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of computer architecture, interconnect systems, memory hierarchies, and multiprocessor structures to understand fundamental design principles. | Level 1: Remember |
| **CO2** | Explain parallelism conditions, flow mechanisms, memory organization, and network topologies used in modern high-performance computer systems. | Level 2: Understand |
| **CO3** | Apply knowledge of interconnection networks and cache mapping techniques to solve performance and architectural configuration problems. | Level 3: Apply |
| **CO4** | Analyze program flow models, routing algorithms, and cache coherence protocols to identify system bottlenecks and architectural trade-offs. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 8 parts of 1.5 marks each from all units and remaining eight questions of 12 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Evolution of Computer Architecture:** Introduction of computer architecture, Elements of Modern Computers, Evolution of Computer Architectures, Classification of parallel computers, System attributes to performance.

**Program and Network Properties:** Conditions of Parallelism - data and resource dependences, Bernstein's conditions, hardware and software parallelism. Program Flow Mechanisms - control flow versus data flow, data flow architecture, demand driven mechanisms, comparison of flow mechanisms.

## Unit-II

**System Interconnect Architectures:** Network properties and routing, Static connection Networks –Linear Array, Ring & Chordal Ring, Barrel Shifter, Fat Tree, Mesh & Torus, Systolic Arrays, Hypercubes; Dynamic connection Networks – Digital Buses, Switch modules, MINs, Omega-, Baseline-, Crossbar-Network.

## Unit-III

**Memory Hierarchy Design:** Memory hierarchy, Inclusion, coherence & locality; memory capacity planning; Virtual Memory technology – Models, TLB, Paging and Segmentation; Cache Memory Organization - Cache basics & cache performance, cache addressing models & mapping, multilevel cache hierarchies, interleaved memory.

## Unit-IV

**Multiprocessor and Multicomputer Architectures:** Multiprocessor System Interconnects – Hierarchical bus systems, Crossbar Switch and Multiport memory, Multistage and Combining networks; Symmetric shared memory architectures, distributed shared memory architectures, Cache coherence problem, Snoopy cache coherence protocol, directory-based protocols; Multicomputer Generations, Message passing mechanisms – message routing schemes, deadlock and virtual channels, flow control strategies, multicast routing algorithms.

**Suggested Readings:**


- Kai Hwang &NareshJotwani: Advanced Computer Architecture; McGraw-Hill.
- Kai Hwang: Advanced computer architecture; TMH.
- D.Sima, T.Fountain, P.Kasuk: Advanced Computer Architecture-A Design space Approach, Addison Wesley.
- M.J Flynn: Computer Architecture, Pipelined and Parallel Processor Design; Narosa Publishing.
- D. A. Patterson and J. L. Hennessey: Computer organization and design, Morgan Kaufmann.


**Useful Video links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Computer Architecture | https://www.nptelvideos.com/lecture.php?id=5631 |
| | Basics of Computer Architecture | https://youtu.be/4TzMyXmzL8M?si=cmIOLt9Fnsyi4OUb |
| **Unit-II** | Memory Hierarchy in Computer Organization | https://www.nptelvideos.com/lecture.php?id=5658 |
| | Cache Memory in Computer Architecture | https://www.nptelvideos.com/lecture.php?id=5286 |
| **Unit-III** | Parallel Processing and Multiprocessing | https://youtu.be/TE4cJqrIHvI?si=UnmelScrq9kRDy_L |
| | Symmetric and Distributed Memory Architecture | https://youtu.be/WdqdebPmPuQ?si=WQwvPZ9gnUvRcbhS |
| | Message Passing and Routing in Multiprocessors | https://www.youtube.com/watch?v=T_A4LgEJaIo |
| **Unit-IV** | Quantum Computing Overview | https://youtu.be/2SPjEA-4lKk?si=KWUiY4G0mne8CDV8 |
| | Quantum Computing | https://youtu.be/xnmpWfQKPSE?si=gZH7hGpIIdja0wdM |

**ANNEXURE-III**

# Scheme of Studies and Examination

## BCA – 3rd Semester

## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per Week | | | Total Load Per Week | Credits | Examination Schedul (Marks) | | | | Exam Duration In Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Exam | Practical | Total | |
| 1 | Discipline-Specific Courses-Major Courses | DSC-BCA-201A | Operating Systems | 4 | 0 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 2 | Discipline-Specific Courses-Major Courses | DSC-BCA-203A | Object Oriented Programming Using C++ | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| | | LC-BCA-205A | Object Oriented Programming Using C++ Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| 3 | Discipline-Specific Courses-Major Courses | DSC-BCA-207A | Database Management System & SQL | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| | | LC-BCA-209A | Database Management System & SQL Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| 4 | Minor Vocational | MV-BCA-211A | Web Development-I | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| | | LC-BCA-213A | Web Development-I Lab | 0 | 0 | 4 | 4 | 2 | 15 | - | 35 | 50 | 3 |
| 5 | Skill Enhancement Courses | SEC-215A | Data Science | 1 | 0 | 0 | 1 | 1 | - | 25 | - | 25 | 3 |
| | | LC-SEC-217A | Data Science Lab | 0 | 0 | 4 | 4 | 2 | 15 | - | 35 | 50 | 3 |
| 6 | Multidisciplinary Courses | Refer Table VII | ---------- | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 | 3 |
| 7 | Ability Enhancement Courses | Refer Table VIII | ---------- | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| **Total Credits** | | | | | | | | **24** | **185** | **315** | **100** | **600** | |

# Scheme of Studies and Examination
## BCA – 4th Semester
## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per Week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | | Exam Duration In Hours |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Exam | Practical | Total | |
| 1 | Discipline-Specific Courses Major Courses | DSC-BCA-202A | Computer System Architecture | 4 | 0 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 2 | Discipline-Specific Courses Major Courses | DSC-BCA-204A | Data Communication & computer Networks | 4 | 0 | 0 | 4 | 4 | 30 | 70 | - | 100 | 3 |
| 3 | Discipline-Specific Courses-Major Courses | DSC-BCA-206A | Java Programming | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| | | LC-BCA-208A | Java Programming Lab | 0 | 0 | 4 | 2 | 2 | 15 | - | 35 | 50 | 3 |
| 4 | Discipline-Specific Courses-Major Courses | DSC-BCA-210A | Computer Graphics | 3 | 0 | 0 | 3 | 3 | 25 | 50 | | 75 | 3 |
| | | LC-BCA-212A | Computer Graphics Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 | 3 |
| 5 | Minor Vocational | MV-BCA-214A | Web Development-II | 1 | 0 | 0 | 1 | 1 | - | 25 | | 25 | 3 |
| | | LC-BCA-216A | Web Development-II Lab | 0 | 0 | 6 | 3 | 3 | 25 | - | 50 | 75 | 3 |
| 6 | Ability Enhancement Courses | Refer Table IX | ---------- | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| 7 | Value Added Courses | Refer Table X | ---------- | 2 | 0 | 0 | 2 | 2 | 15 | 35 | - | 50 | 3 |
| | | | **Total Credits** | | | | | **24** | **180** | **320** | **100** | **600** | |

## Semester-III

Table No VII (Multidisciplinary Courses)

| S. No. | Category | Course Code | Course Title | Offered By |
|---|---|---|---|---|
| 1 | Multidisciplinary Courses | MDC-BBA-201A | Corporate Social Responsibility | Department of Management (UG) |
| 2 | | MDC-BBA-203A | Finance for Non-Finance Managers | Department of Management (UG) |
| 3 | | MDC-BBA-205A | Group Dynamics and Leadership | Department of Management (UG) |
| 4 | | MDC-CSA-207A | Web Technology | Department of Computer Application |
| 5 | | MDC-CSA-209A | Graphic Designing | Department of Computer Application |
| 6 | | MDC-CSA-211A | Multimedia Systems | Department of Computer Application |

Table No. VIII (Ability Enhancement Course)

| S. No. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | Ability Enhancement Courses | AEC-201A | English-II |
| 2 | | AEC-203A | German |

## Semester-IV

Table No. IX (Ability Enhancement Course)

| S. No. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | Ability Enhancement Course | AEC-202A | Hindi-II |
| 2 | | AEC-204A | Sanskrit-II |

Table No. X (Value Added Courses)

| S. No. | Category | Course Code | Course Title |
|---|---|---|---|
| 1 | Value Added Courses | VAC-213A | Basics of GST |
| 2 | | VAC-215A | Professional Networking Skills |
| 3 | | VAC-217A | Social and Emotional Learning |
| 4 | | VAC-219A | Social Networks |
| 5 | | VAC-221A | Cyber Security |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-BCA-201A** | | | | |
| Category | Discipline- Specific Courses-Major Courses | | | | |
| Course Title | **Operating Systems** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To understand the fundamental concepts of operating systems, including process management, memory management, and scheduling algorithms.<br>• To explore I/O management, secondary storage structures, and the role of system calls in OS operations. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts, types, operations, and structures related to operating systems, processes, memory, I/O, and file systems. | Level 1: Remember |
| **CO2** | Explain the functioning of processes, scheduling, memory management, I/O systems, and file structures in operating systems. | Level 2: Understand |
| **CO3** | Apply process scheduling, memory allocation, and file access strategies to optimize system performance. | Level 3: Apply |
| **CO4** | Analyze process interactions, memory techniques, I/O mechanisms, and file system methods for system-level efficiency. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 2 marks each from all units and remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Operating Systems:** Objectives and Characteristics. Classification: Batch, Multiprogramming, Multi-processing, Multi-tasking, Time-sharing, Distributed, Network and Real time Operating systems. System Calls and Services.

**Functions and Structures:** Operating System Functions- Process management, Memory management, Secondary storage management, I/O management, File management, Protection and Security. Structures: Simple Structure, Monolithic structure, Layered approach

## Unit-II

**Process Management and Scheduling:** Process concept- Process State Model, Process Control Block and Threads. Process Scheduling- Scheduling Queues, Schedulers and Context Switch. Operations on Processes, Cooperating processes and Inter-Process Communication.

**Process Scheduling:** Scheduling Criteria, Scheduling Algorithms: Single Processor Scheduling: FCFS, SJF, Round Robin, Multi Feedback Queue. Multiple Processor Scheduling and Real Time scheduling. Scheduling Algorithm Evaluation.

**Unit-III**

**Memory Management:** Concepts of Memory Management, Logical and Physical address space, Swapping, Memory allocation: Contiguous and Non-Contiguous. Paging: Hardware Support. Page Map Table and Protection. Segmentation: Hardware Support and Protection and Sharing.
**Virtual Memory:** Need of Virtual Memory, Demand paging, Pure Demand Paging. Handling page faults, Performance of Demand Paging. Page replacement Algorithms and Allocation of Frames: Allocation algorithms and Global vs Local Allocation. Thrashing.

**Unit-IV**

**I/O Management:** Basic I/O Devices, Types of I/O Devices: Block and Character Devices. I/O Software: Device Independent I/O, User Space I/O and Kernel I/O Software. Device Controllers, Device Drivers and Interrupt Handlers. Communication Approaches to I/O Devices: Special Instruction I/O, Memory Mapped I/O and Direct Memory Access (DMA). Secondary Storage Structure: Disk Structure and Disk Scheduling Algorithms.
**File System Interface:** File Concept: Attributes, Operations and Types. File Access Methods: Sequential Access, Direct Access and Indexed Sequential. Free Space Management. Directory Structures: Single Level, Two level and Tree Structured. File Protection and Sharing.

**Suggested Readings:**

- Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, and Greg Gagne
- Modern Operating Systems by Andrew S. Tanenbaum and Herbert Bos
- Operating Systems: Internals and Design Principles by William Stallings
- Operating System Principles by Peter B. Galvin and Abraham Silberschatz
- Operating Systems: A Concept-Based Approach by D.M. Dhamdhere
- Understanding Operating Systems by Ann McHoes and Ida M. Flynn

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Operating Systems | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | Operating System Structures | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| **Unit-II** | Process Management | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | CPU Scheduling | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | Threads and Inter-Process Communication | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| **Unit-III** | Memory Management | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | Virtual Memory | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | Page Replacement Algorithms | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| **Unit-IV** | I/O Management | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | File Systems | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| | Disk Scheduling | https://archive.nptel.ac.in/courses/106/105/106105214/ |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-203A** | | | | |
| Category | Discipline- Specific Courses-Major Courses | | | | |
| Course Title | **Object Oriented Programming Using C++** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand object-oriented programming concepts such as classes, inheritance, polymorphism, and encapsulation in C++.<br>• To develop proficiency in memory management, exception handling, file operations, and the use of templates in C++ applications. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the basic concepts of object-oriented programming, C++ syntax, data types, classes, inheritance, polymorphism, and file handling. | Level 1: Remember |
| **CO2** | Explain the principles of OOP, class structures, memory management, function overloading, templates, and exception handling in C++. | Level 2: Understand |
| **CO3** | Apply OOP principles to develop C++ programs using classes, inheritance, polymorphism, dynamic memory, and file I/O operations. | Level 3: Apply |
| **CO4** | Analyze OOP features like inheritance, polymorphism, encapsulation, and exception handling for efficient and modular program design. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 mark each from all units and remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction to OOP concepts:** Procedural vs. Object- Oriented Programming, Principles of OOP and their benefits. Object, classes, Inheritance, Abstraction, Encapsulation Polymorphism, Dynamic Binding, and Message passing.

**C++ Programming Basics:** Syntax and structure of C++ programs, Data types, variables, and constants in C++, Control structures: decision making and looping constructs

**Unit-II**

**Classes and objects:** Defining and using classes and objects, Member functions and data members, Access specifiers: public, private, protected, Functions and parameter passing in C++, Arrays and strings in C++, Pointer, Constructors and destructors.

**Inheritance:** Derived class and Base class, Types of inheritance: single, multiple, multilevel, hierarchical, Access control in inheritance.

## Unit-III

**Polymorphism:** function overloading, Operator overloading, Virtual functions and dynamic polymorphism, Abstract classes and pure virtual functions, Encapsulation and data hiding, Friend functions, static function.
**Memory Management:** Dynamic Memory Allocation: new, delete, Object Creation at run time

## Unit-IV

**Exception handling:** Throwing, Catching, Re-throwing an exception, specifying exception: processing unexpected exceptions; try-catch blocks, Exception propagation, Templates: class and function templates, Standard Template Library: benefits of STL and generic programming
**Working with Files:** Stream Classes, File input and output Operations in C++, Error handling during file operations.

**Suggested Readings:**

- Object-Oriented Programming with C++ by E. Balagurusamy
- Let Us C++ by YashavantKanetkar
- Programming: Principles and Practice Using C++ by Bjarne Stroustrup
- C++ Primer (5th Edition) by Stanley B. Lippman, JoséeLajoie, and Barbara E. Moo
- Accelerated C++: Practical Programming by Example by Andrew Koenig and Barbara E. Moo
- C++ Programming: From Problem Analysis to Program Design by D.S. Malik

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to OOPS | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| | Classes and Objects | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| | Introduction to C++ | https://onlinecourses.nptel.ac.in/noc20_cs07/preview |
| **Unit-II** | Inheritance | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| | Classes and Objects | https://onlinecourses.nptel.ac.in/noc20_cs07/preview |
| **Unit-III** | Polymorphism | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| **Unit-IV** | Exception Handling | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| | File Handling | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |
| | Templates and Generics | https://onlinecourses.nptel.ac.in/noc25_cs34/preview |

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|---|---|---|---|---|---|
| Course Code | **LC-BCA-205A** | | | | |
| Category | Discipline- Specific Courses-Major Courses | | | | |
| Course Title | **Object Oriented Programming Using C++ Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To develop object-oriented programming skills in C++ through concepts like classes, inheritance, polymorphism, and memory management.<br>• To implement data handling, control structures, operator overloading, and dynamic memory allocation in real-world applications. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply fundamental C++ programming concepts including variables, control structures, functions, and memory management to develop functional applications. | Level 3: Apply |
| **CO2** | Analyze and implement object-oriented programming principles such as encapsulation, inheritance, and polymorphism in class-based design. | Level 4: Analyze |
| **CO3** | Evaluate program design decisions using friend functions, access specifiers, and function overloading to enhance code readability and efficiency. | Level 5 Evaluate |
| **CO4** | Create robust and reusable C++ applications by integrating constructors, destructors, operator overloading, and advanced OOP techniques. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Write a C++ program to demonstrate basic syntax, variables, constants, and control structures (if-else, loops). |
| **2.** | Implement a simple program that demonstrates Object-Oriented Programming (OOP) principles: encapsulation, abstraction, and polymorphism. |
| **3.** | Define a Student class with attributes (name, age, and grade) and methods to display student details. Create multiple objects and test them. |
| **4.** | Write a program that accepts user input and uses loops (for, while, do-while) and conditional statements (if-else, switch) to perform computations. |
| **5.** | Implement a Bank Account class with attributes like account number, balance, and methods for deposit and withdrawal. Use access specifiers. |
| **6.** | Create a class Employee that stores an array of employee names and their salaries. Implement functions to update and display employee details. |
| **7.** | Write a program that dynamically allocates memory for an integer array using new and deallocates it using delete. |
| **8.** | Implement a class Car with a constructor to initialize brand and model details and a destructor to clean up resources. |
| **9.** | Demonstrate single, multiple, and multilevel inheritance by creating a Person base class and |

| | |
|---|---|
| | derived classes (Employee, Student). |
| **10.** | Implement function overloading for calculating the area of different shapes. Overload the + operator to add two complex numbers. |
| **11.** | Create a base class Shape with a virtual function draw (). Derive classes like Circle and Rectangle and override the function. |
| **12.** | Implement a Rectangle class with private members and a friend function to calculate the area. |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-207A** | | | | |
| Category | Discipline- Specific Courses-Major Courses | | | | |
| Course Title | **Database Management System & SQL** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand the principles of database management, including database design, relational models, and query processing.<br>• To apply normalization techniques, transaction management, concurrency control, and recovery mechanisms for reliable and efficient database operations. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall basic concepts of database systems, models, ER design, relational structures, normalization, and recovery techniques. | Level 1: Remember |
| **CO2** | Explain database design approaches, relational operations, query languages, normalization forms, and concurrency control methods. | Level 2: Understand |
| **CO3** | Apply ER modeling, relational algebra/calculus, normalization techniques, and transaction protocols to develop efficient databases. | Level 3: Apply |
| **CO4** | Analyze schema designs, normalization impacts, concurrency issues, and recovery mechanisms for data consistency and efficiency. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each from all units and remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Database Management System:** Introduction, Database System Applications, History of Database Systems, Database System Vs. File Processing System, View of Data, Data Abstraction, Instances and Schemas. DBMS Environment, Database languages, Database Models.
**Database design and ER Model:** Physical, Conceptual and Logical Database design, Entity-Relationship model: Entities, Relationships, Representation of entities, attributes, Representation of relationship set, Generalization, Aggregation, Conceptual design with ER Mode

## Unit-II

**Relational Model:** Introduction to the Relational Model, Attributes, Domains, Tuples, Relations and their schemes, relation representation, Keys, relationship, relational operations, Integrity Constraint Over relations, Enforcing Integrity constraints, querying relational data, View: Introduction to Views, Destroying / altering Views.

**Relational Algebra and Calculus:** Relational Algebra & its operations, Relational calculus & its types, Power of Algebra and calculus.

**Unit-III**

**Normalization:** Schema Refinement, Problems caused by redundancy, Decomposition & its properties; Normalization: First, Second, Third Normal forms, BCNF, Multivalued Dependencies, and Join Dependencies.
**Transaction Management & Concurrency Control:** ACID properties, Transactions and Schedules, Concurrent execution of transaction, Serializability and Recoverability, Lock based Concurrency control, Lock Management, Lock Conversion, Dealing with deadlocks, Concurrency without Locking.

**Unit-IV**

**Crash Recovery and Backup:** Failure classifications, storage structure, Recovery & Atomicity, Log base recovery, Recovery with concurrent transactions, Failure with loss of nonvolatile storage, Database backup & recovery from catastrophic failure, Remote Backup System.**Storage and File Organization:** Overview of physical storage media, Storage access; File organization, Operations on Files, Serial Files, Sequential Files, Index-Sequential Files, Direct Files.

**Suggested Readings:**

- Database Management Systems by Raghu Ramakrishnan and Johannes Gehrke
- Database Management System by R.P. Mahapatra and GovindVerma
- Database Management Systems: A Practical Approach by Rajiv Chopra
- Fundamentals of Database Systems by RamezElmasri and Shamkant B. Navathe
- An Introduction to Database Systems by C.J. Date
- Database System Concepts by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Database Management System | https://archive.nptel.ac.in/courses/106/105/106105175/?utm |
| Unit-II | Relational Model | https://archive.nptel.ac.in/courses/106/105/106105175/?utm |
| Unit-III | Transaction Management & Concurrency Control | https://archive.nptel.ac.in/courses/106/105/106105175/?utm |
| Unit-IV | Recovery & Atomicity | https://archive.nptel.ac.in/courses/106/105/106105175/?utm |

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|---|---|---|---|---|---|
| Course Code | **LC-BCA-209A** | | | | |
| Category | Discipline- Specific Courses-Major Courses | | | | |
| Course Title | **Database Management System & SQL Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To design, implement, and manage relational databases using SQL, including schema creation, data manipulation, and view management.<br>• To apply normalization techniques, transaction handling, and backup strategies for database optimization, integrity, and recovery. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply relational database concepts to create, modify, and query databases using SQL. | Level 3: Apply |
| **CO2** | Analyze database structures and queries by interpreting ER models, comparing file systems vs. DBMS, and applying relational algebra operations. | Level 4: Analyze |
| **CO3** | Evaluate database designs and normalization techniques to improve schema efficiency and eliminate anomalies. | Level 5 Evaluate |
| **CO4** | Create reliable and secure database systems by implementing transaction management, concurrency control, and backup mechanisms. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Install MySQL/PostgreSQL/Oracle. Create and manage a simple database with tables. |
| **2.** | Demonstrate how data is stored and retrieved in file systems vs. databases. |
| **3.** | Design an ER diagram for a university database with entities like Student, Course, Instructor, and Department. |
| **4.** | Convert an ER diagram into a relational schema and implement it using SQL. |
| **5.** | Write SQL queries to create tables with different constraints (Primary Key, Foreign Key, NOT NULL, UNIQUE). |
| **6.** | Perform basic SQL operations: SELECT, INSERT, UPDATE, DELETE with WHERE conditions. |
| **7.** | Create, modify, and delete views for a relational database. |
| **8.** | Implement relational algebra operations (Selection, Projection, Union, Intersection, Join) using SQL. |
| **9.** | Normalize a given unnormalized database schema step by step up to BCNF. |
| **10.** | Create transactions for a banking system using SQL commands like COMMIT, ROLLBACK. |
| **11.** | Demonstrate deadlock occurrence and resolution strategies in a DBMS. |
| **12.** | Perform a full database backup and restore using MySQL/PostgreSQL. |

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| Course Code | **MV-BCA-211A** | | | | |
| Category | Minor Vocational | | | | |
| Course Title | **Web Development-I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand the fundamentals of Node.js, including its history, features, and use cases. Set up the development environment and write basic scripts.<br>• To create and manage REST APIs, perform file system operations, and utilize version control with Git for effective project management and collaboration. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of JavaScript, Node.js features, core modules, and development environment setup. | Level 1: Remember |
| **CO2** | Explain Node.js architecture, modular programming, advanced JavaScript usage, and Git-based version control processes. | Level 2: Understand |
| **CO3** | Apply Node.js tools to develop servers, manage dependencies, create REST APIs, and perform file operations. | Level 3: Apply |
| **CO4** | Analyze project structures, code modularity, error handling, and integration of Node.js features in real-time solutions. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 1 marks each from all units and remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Node.js Overview and JavaScript Fundamentals:** Introduction, history, key features, and applications. Comparison between JavaScript and Node.js. Differences between client-side and server-side programming. Use cases of Node.js in real-time applications and its integration with JavaScript.
**Installation and Environment Setup:** Installing Node.js and npm, understanding the Node.js runtime, writing and executing basic scripts.
**JavaScript Refresher:** JavaScript fundamentals including variables, data types, functions, control structures (if/else, loops), and arrays.

## Unit-II

**Node.js Modules and HTTP Server:** Understanding modules: core modules (fs, http, path, etc.), global modules, and non-global modules. Creating and managing a basic HTTP server.

**Advanced JavaScript Concepts in Node.js:** Using functions as parameters, callback functions, and arrow function syntax. Understanding modular programming and organizing code into separate files for scalability.

**Unit-III**

**Project Structure and Dependency Management:** Introduction to package. Son, initializing Node.js projects, managing dependencies, and configuring scripts.
**Version Control and Git Integration:** Basic Git commands, initializing repositories, tracking changes, gitignore usage, and project collaboration using Git.
**Development Tools:** Usage of No demon and other automation tools for improving the development experience.

**Unit-IV**

**API Development and File System Operations:** Creating simple REST APIs using Node.js, handling GET and POST requests, parsing and sending JSON data.
**File System Module:** Reading from and writing to files, directory operations, working with file paths, and handling errors during file operations.
**Practical Application and Mini Project:** End-to-end mini project integrating concepts from all units, including module usage, server creation, file operations, and basic API routes.

**Suggested Readings:**

- Node.js in Action by Mike Cantelon, Marc Harter, and T.J. Holowaychuk
- Learning Node.js Development by Andrew Mead
- Node.js for JavaScript Developers by Richard Blum
- Mastering Node.js by Sandro Pasquali
- Node.js 8 Cookbook by David Mark Clements
- The Node Beginner Book by Manuel Kiessling

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Client-side JavaScript | https://archive.nptel.ac.in/courses/106/106/106106156/ |
| | APIs and Mobile Apps Use Web-Servers | https://archive.nptel.ac.in/courses/106/106/106106156/ |
| **Unit-II** | Introduction to Server-side JavaScript and HTML/CSS | https://archive.nptel.ac.in/courses/106/106/106106156/ |
| | Introduction to Databases | https://archive.nptel.ac.in/courses/106/106/106106156/ |
| **Unit-III** | Setting up a Website | https://onlinecourses.nptel.ac.in/noc20_cs52/preview |
| | Using Third-party Web Services | https://onlinecourses.nptel.ac.in/noc20_cs52/preview |
| **Unit-IV** | Extended Project | https://onlinecourses.nptel.ac.in/noc20_cs52/preview |

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|---|---|---|---|---|---|
| Course Code | **LC-BCA-213A** | | | | |
| Category | Minor Vocational | | | | |
| Course Title | **Web Development-I Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• To set up Node.js and npm, write and execute a "Hello, World!" script, and ensure Node.js is correctly installed.<br>• Create a basic HTTP server using the http module to handle GET requests and respond with a "Hello, World!" message. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply foundational Node.js concepts to build and execute basic scripts, handle files, and create simple servers. | Level 3: Apply |
| **CO2** | Analyze and structure Node.js applications by organizing modules, handling asynchronous operations, and integrating external packages. | Level 4: Analyze |
| **CO3** | Evaluate development tools and practices by integrating Git version control, automation tools like nodemon, and dependency management in Node.js projects. | Level 5 Evaluate |
| **CO4** | Create full-fledged RESTful APIs and file-based backend services using Node.js and Express, implementing modular and scalable code. | Level 6 Create |

| Exp. No. | Contents |
|---|---|
| **1.** | Install Node.js and npm. Write a "Hello, World!" script and execute it to ensure that Node.js is set up correctly. |
| **2.** | Use the fs module to create a script that reads the contents of a file and displays it on the console. |
| **3.** | Create a basic HTTP server using the http module in Node.js that responds with a "Hello, World!" message on a GET request. |
| **4.** | Write a JavaScript function that takes two numbers as arguments and returns their sum. Add error handling to ensure both arguments are numbers. |
| **5.** | Implement a function that takes a callback to read a file asynchronously and display its contents once the reading is complete. |
| **6.** | Organize your Node.js application into modules. Split the HTTP server code into a separate module and import it into your main file. |
| **7.** | Initialize a Node.js project using npminit, install a package (e.g., express), and create a basic server using that package. |

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| **8.** | Initialize a Git repository in your project. Commit the initial changes and push to a remote repository (e.g., GitHub). Add node_modulesto.gitignore. |
| **9.** | Install and set up nodemon to automatically restart your server whenever there are changes to your code. |
| **10.** | Use express to create a simple REST API with routes for handling GET and POST requests. Ensure that the server can handle basic JSON data. |
| **11.** | Create a script that uses the fs module to write data to a file, read the content of the file, and display it on the console. |
| **12.** | Build a simple API in Node.js that reads data from a file when a GET request is made and writes new data to the file when a POST request is sent. |

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|---|---|---|---|---|---|
| Course Code | **SEC-215A** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Data Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 1 | 0 | 0 | **1** | |
| Course Objectives | The objectives of this course are<br>• To apply Excel-based data manipulation, transformation, and visualization techniques for effective data analysis and decision-making.<br>• To utilize predictive analysis, descriptive statistics, and advanced Excel functions for building data models, generating insights, and creating interactive dashboards. | | | | |
| Assessment | | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of data science, Excel fundamentals, data types, functions, and basic statistical measures. | Level 1: Remember |
| **CO2** | Explain techniques for data cleaning, transformation, validation, visualization, and analysis using Excel tools. | Level 2: Understand |
| **CO3** | Apply Excel functions, PivotTables, charts, and predictive tools for data manipulation, forecasting, and optimization. | Level 3: Apply |
| **CO4** | Analyze datasets using statistical methods, advanced Excel functions, and dashboards to derive and present insights. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 1 marks each from all units and remaining eight questions of 5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Data Science**: Overview of Data Science and its significance in various industries, Key concepts: Data collection, data analysis, data visualization, Data Science workflow: Data Cleaning, Data Analysis, Data Visualization, Data Modeling.

**Excel Fundamentals for Data Science**: Introduction to Excel Interface and Key Features Basic Excel Functions: SUM, AVERAGE, COUNT, COUNTA, MAX, MIN, Data Formatting: Conditional formatting, cell formatting, number formatting, Working with Excel Sheets and Workbooks

**Data Types and Data Structure in Excel**: Types of Data: Numeric, Text, Date, Boolean, organizing data: Rows, Columns, and Tables, Importing Data into Excel (CSV, text files, and databases)

## Unit-II

**Data Cleaning Techniques**: Handling missing values: Techniques for filling or removing missing data, Duplicate Data: Identifying and removing duplicates, Data Validation: Using data validation rules to maintain data integrity.

**Data Transformation in Excel**: Using Text Functions: CONCATENATE, LEFT, and RIGHT, MID, TRIM, Date and Time Functions: YEAR, MONTH, DAY, TEXT, and Data Sorting and Filtering: Basic Sorting, Advanced Filters, Custom Filters.
**Data Manipulation Techniques**: Using Excel Pivot Tables for summarizing data, aggregating data with SUMIF, COUNTIF, AVERAGEIF functions, working with Excel Power Query for data transformation.

**Unit-III**

**Descriptive Statistics**: Calculating measures of central tendency: Mean, Median, Mode, and Measures of Dispersion: Range, Variance, Standard Deviation, Creating Frequency Distributions and Histograms.
**Excel Charts and Graphs**: Introduction to Excel charts: Bar, Line, Pie, Scatter, and Area charts, and Customizing charts: Axis formatting, adding titles, changing colors, Creating Pivot Charts.
**Data Analysis Tools in Excel**: Using the Data Analysis Toolpak for Regression Analysis, ANOVA, and Descriptive Statistics, Introduction to Excel Solver for optimization problems, Scenario Analysis using Excel What-If tools: Goal Seek, Data Tables.

**Unit-IV**

**Introduction to Predictive Analysis**: Introduction to basic predictive analytics: Linear regression, Using Excel's Regression tool to perform simple linear regression, forecasting with Excel: Using TREND, FORECAST, and LINEST functions.
**Advanced Excel Functions for Data Science**: Array Formulas and Dynamic Arrays, Using INDEX-MATCH functions for advanced lookups, Conditional aggregation: SUMIFS, AVERAGEIFS, and COUNTIFS.
**Reporting and Presentation**: Creating Dashboards with Excel: Combining charts, tables, and Pivot Tables, Automating reports with Excel macros and VBA, Best practices for presenting data and insights: Formatting, layout, and storytelling with data.

**Suggested Readings:**

- Data Analysis with Excel by Manisha Nigam
- Data Analysis and Business Modelling Using Microsoft Excel by Hansa Lysander Manohar
- Statistical Data Analysis Using MS-Excel by Dr. B.G. Kore
- Modern Data Analytics in Excel by George Mount
- Microsoft Excel Data Analysis for Dummies by Stephen L. Nelson
- Business Statistics Using Excel: A Complete Course in Data Analytics by R. Panneerselvam

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Data and Excel Environment | https://nptel.ac.in/noc/courses/noc22/SEM1/106106235/Week_01.html |
| **Unit-II** | Data Cleaning and Manipulation | https://nptel.ac.in/noc/courses/noc22/SEM1/106106235/Week_03.html |
| **Unit-III** | Descriptive Statistics and PivotTables | https://nptel.ac.in/noc/courses/noc22/SEM1/106106235/Week_05.html |
| **Unit-IV** | Regression, Forecasting, and Solver | https://nptel.ac.in/noc/courses/noc22/SEM1/106106235/Week_07.html |

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|---|---|---|---|---|---|
| Course Code | **LC-SEC-217A** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Data Science Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester III** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• To develop proficiency in Node.js, focusing on core modules, JavaScript fundamentals, and building real-time applications using server-side programming.<br>• To create and manage REST APIs, perform file system operations, and utilize version control with Git for effective project management and collaboration. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply Excel functions and tools to organize, analyze, and visualize data for real-world business scenarios. | Level 3: Apply |
| **CO2** | Analyze and manipulate complex data sets by identifying patterns, performing calculations, and cleaning data to ensure accuracy. | Level 4: Analyze |
| **CO3** | Evaluate and optimize data organization and visualization strategies to improve decision-making and reporting accuracy. | Level 5 Evaluate |
| **CO4** | Create advanced Excel solutions to automate tasks, generate forecasts, and develop interactive dashboards for data-driven decision-making. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Import the "Employee_Data.csv" file into Excel, convert it into a table, and apply conditional formatting to highlight salaries above $50,000 in green and below $20,000 in red. |
| **2.** | Identify and remove duplicate records based on "Employee ID" and apply data validation to the "Email" column for valid formats. |
| **3.** | Calculate Mean, Median, Mode, Range, Variance, and Standard Deviation for the "Monthly Sales" data and create a Histogram to visualize the distribution. |
| **4.** | Create Bar, Line, and Pie charts for the "Quarterly Revenue" dataset and customize them with titles, axis labels, and data points. |
| **5.** | Concatenate "First Name" and "Last Name" into a "Full Name" column and extract the first three characters of the last name into a separate column. |
| **6.** | Create a Pivot Table from "Sales_Data.xlsx" to display total sales by region and product category, and filter the top 5 regions. |

| | |
|---|---|
| **7.** | Perform linear regression on the "House Price Data" using Excel's Analysis Toolpak and plot the regression line on a scatter chart. |
| **8.** | Identify missing values in the "Order Date" and "Order Amount" columns, and fill the dates with the average date and amounts with the median value. |
| **9.** | Sort the "Product Inventory" sheet by category and quantity in descending order, and filter only "Electronics" with quantities below 50. |
| **10.** | Create an interactive dashboard using Excel with charts, PivotTables, and slicers to filter data by region and product type. |
| **11.** | Record a macro to automate sorting data by "Revenue," applying conditional formatting, and generating a summary report. |
| **12.** | Perform a 6-month sales forecast using the "Monthly_Sales_Data.xlsx" with Excel's FORECAST and TREND functions, and visualize the results in a line chart. |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-202A** | | | | |
| Category | Discipline-Specific Courses Major Courses | | | | |
| Course Title | **Computer System Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To understand the fundamental structure and functioning of digital computers, including data representation, register transfer, and CPU organization.<br>• To explore instruction formats, memory and I/O organization, addressing modes, and interrupt handling mechanisms in computer systems. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall concepts of computer architecture, including data representation, register operations, instruction types, and memory hierarchy. | Level 1: Remember |
| **CO2** | Explain the structure and functioning of CPU, instruction execution, addressing modes, and interrupt mechanisms. | Level 2: Understand |
| **CO3** | Apply knowledge of register transfer, instruction cycles, and addressing modes to analyze computer system behavior. | Level 3: Apply |
| **CO4** | Analyze CPU and memory operations, I/O organization, and performance aspects like cache coherence and DMA for efficient data handling. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 2 marks each from all units and remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Basic Computer Concepts:** Computer Types: Analog and Digital, Digital Computer Organization and Architecture: Functional Units, Basic Organizational Concepts, Von-Neumann Architecture, Bus Structure. Data representation: Number Systems, Fixed and Floating point representation.
**Register Transfer and Micro-operations**: Basic concepts and types of Registers, Register Transfer Language, Data Transfer between Registers, Bus and Memory Transfer, Micro-operations: Arithmetic, Logic and Shift Micro-operations.

## Unit-II

**Basic Computer Design:** Instruction codes, Common Bus System Architecture, Computer Instructions: Instruction Set and Instruction Cycle. Types of Instructions: Register Reference, Memory Reference and Input-Output Reference.

**Interrupts:** Classifications of Interrupts: Maskable and Non maskable, Hardware and Software. Interrupt Service Routine, Context Switching, Interrupt Identification: Daisy Chaining, Polling and Vectored Interrupt. Interrupt Cycle.

**Unit-III**

**Central Processing Unit:** Introduction, General Register Organization, Stack Organization: Register and /memory Stack, Reverse Polish Notation. Instruction Formats: Three Address, Two Address, One Address and Zero Address.
**Data Transfer and Manipulation:** Addressing Modes: Implied, Immediate, Register Direct and Indirect Mode and Direct Address Mode. Data Transfer and Data Manipulation Instructions, Program Control, Reduced Instruction Set Computer (RISC) and Complex Instruction Set Computer (CISC).

**Unit-IV**

**Memory Organization:** Memory Hierarchy, Main Memory Technologies, Auxiliary Memory, and Associative Memory: Hardware requisites, Working Principle and Operations. Cache Memory: Characteristics, Types of Mapping, Writing into Cache, Cache Coherence.
**Input-Output Organization:** Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer: Programmed I/O and Interrupt Initiated I/O. Concepts related to Priority Interrupt: Daisy Chaining Priority and Parallel Priority Interrupt. Direct Memory Access (DMA): DMA Controller and DMA Transfer.

**Suggested Readings:**


- M. Morris Mano: Computer System Architecture (3rd Edition), Prentice Hall of India.
- Carl Hamacher, ZvonkoVranesic, SafwatZaky: Computer Organization, 5th Edition, McGraw Hill.
- William Stallings: Computer Organization and Architecture: Designing for Performance, 10th Edition, Pearson Education.
- John L. Hennessy and David A. Patterson: Computer Architecture: A Quantitative Approach, Morgan Kaufmann.
- P. Pal Chaudhuri: Computer Organization and Design, Prentice Hall of India.
- Govindarajalu B.: Computer Architecture and Organization: Design Principles and Applications, Tata McGraw Hill.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction and Evolution of Computers | https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs13/lecture1.html |
| **Unit-II** | Instruction Set and Cycle | https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs13/lecture5.html |
| | Common Bus System and Instruction Types | https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs13/lecture6.html |
| **Unit-III** | General Register and Stack Organization | https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs13/lecture8.html |
| **Unit-IV** | Memory Hierarchy and Cache | https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs13/lecture11.html |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-204A** | | | | |
| Category | Discipline-Specific Courses –Major Courses | | | | |
| Course Title | **Data Communication and Computer Network** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are<br>• To understand the fundamental principles of data communication, network models, transmission media, and protocols across various network layers.<br>• To explore network architectures, protocols, and mechanisms in the data link, network, transport, and application layers for effective communication. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of data transmission, network models, transmission media, and basic network protocols. | Level 1: Remember |
| **CO2** | Explain the functions and protocols of data link, network, transport, and application layers in a computer network. | Level 2: Understand |
| **CO3** | Apply network protocols and algorithms to establish connections, route packets, manage congestion, and support communication services. | Level 3: Apply |
| **CO4** | Analyze network architectures, communication techniques, and protocol mechanisms for performance and efficiency in network operations. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 2 marks each from all units and remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction:** Data Transmission concepts, transmission impairments, switching, modulation, multiplexing.
**Network Hardware:** LAN, MAN, WAN, Wireless networks, Internet-works.
**Network Software:** Layer, Protocols, interfaces and services.
**Reference Models:** OSI, TCP/IP and their comparison

**Transmission Media:** Magnetic, twisted pair, coaxial cable, fibre optics, wireless transmission (radio, microwave, infrared).

## Unit-II

**Data Link Layer:** Framing, Error control, sliding window protocols (one bit, Go back n, selective repeat). DLL Protocols–HDLC, PPP.
**Medium Access Sub layer:** Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.

## Unit-III

**Network Layer:** Design issues, Routing algorithms (shortest path, flooding, flow based, distance vector, hierarchical, broadcast, multicast, for mobile hosts), Congestion control algorithms (Leaky bucket, Token bucket, Choke Packet, Load shedding), Internetworking, IP Protocol, ARP, RARP.

## Unit-IV

**Transport Layer:** Addressing, establishing and releasing connection, flow control, buffering, Internet Transport Protocol (TCP and UDP).
**Application Layer:** Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, TELNET.

**Suggested Readings:**


- Tanenbaum, Andrew S.: Computer Networks (4th Edition), PHI.
- Gill Nasib Singh: Handbook of Computer Fundamentals, Khanna Book Publishing Company(Pvt.) Ltd, New Delhi.
- Forouzan, B. A.: Data Communications and Networking, Fourth Edition, Tata McGraw Hill.
- Douglas E. Comer: Internet Working with TCP/IP (Vol.1, 4th Edition), CPE.
- Stallings, William: Data and Computer Communications (8th Edition), PHI.
- Nance, Bary: Introduction to Networking, PHI, 4th Edition.
- Doerr Alan &Levasseur Kenneth: Applied Discrete Structures for Computer Science, Galgotia Pub. Pvt. Ltd.
- Any other book covering the contents of the subject.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Computer Networks | https://nptel.ac.in/noc/courses/noc20/SEM1/noc20cs29/lec01.html |
| | OSI and TCP/IP Models | https://nptel.ac.in/noc/courses/noc20/SEM1/noc20cs29/lec04.html |
| **Unit-II** | Framing & Error Detection | https://nptel.ac.in/noc/courses/noc20/SEM1/noc20cs29/lec07.html |
| **Unit-III** | Congestion Control | https://nptel.ac.in/noc/courses/noc20/SEM1/noc20cs29/lec13.html |
| **Unit-IV** | Transport Layer (TCP & UDP) | https://nptel.ac.in/noc/courses/noc20/SEM1/noc20cs29/lec15.html |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-206A** | | | | |
| Category | Discipline-Specific Courses –Major Courses | | | | |
| Course Title | **JAVA Programming** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand the core concepts of Java programming, including object-oriented principles, language syntax, exception handling, and multithreading.<br>• To explore Java packages, I/O streams, and advanced features like interfaces, strings, vectors, and file handling for robust application development. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall the fundamental concepts of Java, including language syntax, data types, control structures, and object-oriented elements. | Level 1: Remember |
| **CO2** | Explain object-oriented principles, Java classes, exception handling, and Java standard library usage. | Level 2: Understand |
| **CO3** | Apply Java programming constructs to develop multithreaded applications, handle files and streams, and manage user-defined exceptions. | Level 3: Apply |
| **CO4** | Analyze Java code for object-oriented structure, exception flow, and thread behavior to ensure efficient application performance. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 1 marks each from all units and remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Introduction to Java:** Java Features, Java Virtual Machine (JVM), Byte code, Java API, Java Development Kit (JDK), Garbage Collection. Language Basics: Keywords, Constants, Variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping.

**Introducing Classes, Objects and Methods:** Defining a Class, Methods Declaration, Creating Objects and accessing Class members, Constructors, Methods Overloading, Wrapper Classes, Inheritance, Methods Overriding, Final Class, variables and methods, Abstract Class and Methods, Interfaces.

## Unit-II

**Arrays, Strings and Vectors:** Creating and using Arrays, String operations, String Buffer, String builder, and String Tokenizer class, Vector class.

**Packages and Exceptions:** Java API packages, Creating and using packages, static import, Exceptions handling, Types of Exceptions, multiple catch statements, 'throw' and 'throws', using 'finally' statement, Creating your own exceptions.

## Unit-III

**Multithreaded Programming**: Single threaded and multi-threaded program, Creating threads using Thread class, Life cycle of a Thread, Stopping and blocking a Thread, getting and setting the Thread Priority, Synchronization, implementing the Runnable interface.
**Managing Input/output Streams:** Concept to fstreams, Byte and Character streams, Reading and Writing from Console and Files. Input output exceptions.

## Unit-IV

**Applet Programming:** How Applets differs from Java Application, Applet Life Cycle, APPLET Tag, Running an Applet, Passing Parameters to Applet.
**Event Handling:** Mechanism, The Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and inner classes.
**GUI Programming:** Working with Frame Window, Graphics and Text, AWT Controls and classes. Layout Managers, working with Menus.

**Suggested Readings:**

- Balagurusamy, E.: Programming with Java: A Primer, McGraw Hill Education.
- Schildt, Herbert: Java: The Complete Reference (11th Edition), McGraw Hill.
- Deitel&Deitel: Java: How to Program, Pearson Education.
- Bruce Eckel: Thinking in Java, Prentice Hall.
- Cay S. Horstmann, Gary Cornell: Core Java Volume I—Fundamentals, Prentice Hall.

**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Java & OOP Concepts | https://archive.nptel.ac.in/courses/106/105/106105191/ |
| **Unit-II** | Java Programming Steps | https://archive.nptel.ac.in/courses/106/105/106105191/ |
| **Unit-III** | Encapsulation | https://archive.nptel.ac.in/courses/106/105/106105191/ |
| **Unit-IV** | Multithreaded Programming | https://archive.nptel.ac.in/courses/106/105/106105191/ |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-208A** | | | | |
| Category | Discipline-Specific Courses –Major Courses | | | | |
| Course Title | **Java Programming-Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• To equip students with the knowledge and practical skills required to apply object-oriented programming principles using Java, including inheritance, polymorphism, abstraction, and exception handling.<br>• To enable students to design and develop robust Java applications by leveraging multithreading, file I/O, user-defined packages, and standard library features. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply object-oriented programming concepts such as classes, objects, method overloading, method overriding, inheritance, and abstraction in Java. | Level 3: Apply |
| **CO2** | Analyze Java programs that implement exception handling, packages, and vector operations to understand program behavior and flow. | Level 4: Analyze |
| **CO3** | Evaluate multithreading, synchronization, and file I/O operations in Java to determine efficient and secure program execution. | Level 5 Evaluate |
| **CO4** | Design and develop robust and reusable Java applications by integrating object-oriented principles, custom exceptions, packages, and file handling techniques. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Write a Java program to define a class `Student` with data members for name and age. Include member functions to input and display the details of a student. |
| **2.** | Create a Java program to demonstrate method overloading by creating multiple methods with the same name but different parameters in a class |
| **3.** | Create a Java program to demonstrate method overriding by creating a base class `Animal` and a derived class `Dog` that overrides a method from the base class. |
| **4.** | Implement a Java program to define an abstract class `Shape` with an abstract method `draw () `. Create derived classes `Circle` and `Square` that implement the `draw ()` method. |

| | |
|---|---|
| **5.** | Implement a Java program to demonstrate the use of the `Vector` class by performing operations like adding, removing, and displaying elements of a vector. |
| **6.** | Write a Java program to create a user-defined package and use it in another class. |
| **7.** | Create a Java program to handle multiple exceptions using try-catch blocks. |
| **8.** | Implement a Java program to demonstrate the use of the `finally` statement in exception handling. |
| **9.** | Write a Java program to create and throw a custom exception. |
| **10.** | Create a Java program to implement a multithreaded application by extending the `Thread` class. |
| **11.** | Implement a Java program to demonstrate thread synchronization. |
| **12.** | Create a Java program to read and write data to a file using `File Input Stream` and File Output Stream`. |

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|---|---|---|---|---|---|
| Course Code | **DSC-BCA-210A** | | | | |
| Category | Discipline-Specific Courses –Major Courses | | | | |
| Course Title | **Computer Graphics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are<br>• To understand the core concepts, mathematical foundations, and algorithms used in 2D and 3D computer graphics.<br>• To explore various techniques including transformations, clipping, shading, and rendering to create and manipulate graphical content. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall basic concepts, coordinate systems, and fundamental graphics algorithms used in 2D and 3D computer graphics. | Level 1: Remember |
| **CO2** | Explain drawing techniques, color models, transformations, and clipping methods in both 2D and 3D environments. | Level 2: Understand |
| **CO3** | Apply transformation algorithms, clipping techniques, and projection models to implement graphical rendering and image processing tasks. | Level 3: Apply |
| **CO4** | Analyze rendering techniques, lighting models, and hidden surface algorithms to enhance visual realism in computer-generated imagery. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each from all units and remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Computer Graphics**: Overview of computer graphics and its applications, Historical development, Application areas e.g. entertainment, scientific visualization, user interfaces, Basics of raster and vector graphics, differences between raster and vector graphics, Representation and storage formats, Graphics pipeline and rendering process, stages of the graphics pipeline (modelling, transformation, rendering), concepts of rendering primitives, vertices, and fragments.

**Graphics primitives**: Coordinate systems, types of primitives (points, lines, polygons), Cartesian and homogeneous coordinate systems, transformation matrices and their applications

## Unit-II

**2D Graphics Programming**: Pixel operations and drawing algorithms, color models (RGB, CMYK, HSL), pixel operations (blending, interpolation), Line drawing algorithms (Digital differential analyser

algorithm, Bresenham's line drawing algorithm), Circle drawing algorithms (Midpoint circle algorithm, Bresenham's circle drawing algorithm).
**2D Transformations:** translation, rotation, scaling in 2D space, mirror reflection basic and advance problems involving composite operations.

**Windowing techniques**: basic terminologies-window, viewport, clipping window, region codes.

**Unit-III**

**Clipping techniques:** Mathematics of point clipping, line clipping (midpoint subdivision method, Cohen-Sutherland line clipping algorithm), polygon clipping (Sutherland-Hodgman polygon clipping algorithm)
**3D Graphics Programming:** 3D transformations, Translation, Rotation, Scaling in 3D space, Homogeneous coordinates and transformations.

**Projection techniques**: Orthographic projection, Perspective projection and vanishing points

**Unit-IV**

**Lighting and shading models:** Phong reflection model, Gouraud and Phong shading techniques
**Hidden surface removal algorithms**: Z-buffer algorithm, Scan line algorithm for hidden surface removal

**Texture mapping and image rendering**: Texture coordinates and mapping techniques, Texture filtering and misshaping.

**Suggested Readings:**


- J. F. Hughes, A. van Dam, M. McGuire, D. F. Sklar, and J. D. Foley: Computer Graphics: Principles and Practice, Addison-Wesley.
- D. Shreiner, G. Sellers, J. M. Kessenich, and B. M. Licea-Kane: OpenGL Programming Guide: The Official Guide to Learning OpenGL, Addison-Wesley.
- D. Hearn and M. P. Baker: Computer Graphics with OpenGL, Pearson.
- E. Angel and D. Shreiner: Interactive Computer Graphics: A Top-Down Approach with WebGL, Addison-Wesley.
- F. Klawonn: Introduction to Computer Graphics: Using Java 2D and 3D, Springer.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| Unit-I | Introduction to Computer Graphics | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec1.html |
| | Raster Graphics | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec2.html |
| Unit-II | 2D Transformations | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec6.html |
| | Composite Transformations | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec7.html |
| Unit-III | Clipping | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec8.html |
| | Polygon Clipping | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec9.html |
| Unit-IV | Illumination Models | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec17.html |
| | Shading Techniques | https://nptel.ac.in/noc/courses/noc19/SEM2/noc19cs34/lec18.html |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-212A** | | | | |
| Category | Discipline-Specific Courses –Major Courses | | | | |
| Course Title | **Computer Graphics Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are<br>• To develop a foundational understanding of 2D graphics concepts and algorithms such as line and circle drawing, transformations, and clipping techniques.<br>• To enable students to apply and implement computer graphics algorithms for visualizing geometric transformations, object rendering, and graphical manipulations using programming. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply basic computer graphics algorithms such as DDA, Bresenham's line and circle drawing to construct and render 2D primitives. | Level 3: Apply |
| **CO2** | Implement 2D geometric transformations such as translation, rotation, scaling, reflection, and shearing on graphical objects. | Level 4: Analyze |
| **CO3** | Analyze and compare different line and polygon clipping algorithms, and implement solutions to clip graphics primitives within a defined window. | Level 5 Evaluate |
| **CO4** | Evaluate the effect of various transformations and coloring techniques in rendering graphical scenes. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Implement a program to define and use basic graphics primitives such as points, lines, and polygons. |
| **2.** | Implement a program to draw a line using the Digital Differential Analyzer (DDA) algorithm. |
| **3.** | Create a program to draw a line using Bresenham's line drawing algorithm. |
| **4.** | Write a program to draw a circle using the Midpoint Circle algorithm. |
| **5.** | Implement a program to draw a circle using Bresenham's circle drawing algorithm. |
| **6.** | Create a program to perform 2D transformations: translation, rotation, and scaling on a given set of points. |
| **7.** | Write a program to perform mirror reflection of a 2D shape across the x-axis and y-axis. |

| | |
|---|---|
| **8.** | Create a program to draw basic two-dimensional objects like rectangles, triangles, and polygons using inbuilt functions |
| **9.** | Write a program to implement the Cohen-Sutherland line clipping algorithm to clip a line within a rectangular clipping window. |
| **10.** | Write a program to apply a shearing transformation to a 2D object (like a square or triangle) and display the original and transformed objects |
| **11.** | Write a program to apply various coloring techniques to 2D pictures.. |
| **12.** | Write a program to implement line clipping using the Cohen-Sutherland line clipping algorithm |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MV-BCA-214A** | | | | |
| Category | Minor Vocational | | | | |
| Course Title | **Web Development-II** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• Understand the fundamentals of backend development using Node.js, including asynchronous programming and the event-driven architecture.<br>• Learn to develop scalable and modular backend applications using Express.js and implement routing and middleware logic. | | | | |
| Assessment | - | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall fundamental concepts of backend development including Node.js runtime, event-driven architecture, and the difference between frontend and backend systems. | Level 1: Remember |
| **CO2** | Explain the use of Express.js, routing mechanisms, middleware functionalities, and the structure of modular backend applications. | Level 2: Understand |
| **CO3** | Apply backend development techniques to create RESTful APIs, integrate MongoDB using Mongoose, and manage data operations with validation and error handling. | Level 3: Apply |
| **CO4** | Analyze backend system requirements to implement authentication, secure APIs, and enable real-time communication using Web Sockets and deployment practices. | Level 4: Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 1 marks each from all units and remaining eight questions of 5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Backend Overview and Node.js Runtime Fundamentals:** Introduction to backend development, differences between frontend and backend, key features of Node.js in server-side development. Understanding event-driven architecture and non-blocking I/O model in Node.js.

**Installation and Project Setup:** Installing Node.js and npm. Creating backend projects using npminit. Understanding Node.js runtime, REPL, and writing backend scripts.

**Asynchronous Programming in Node.js:** Introduction to callbacks, promises, and async/await. Understanding the event loop and how asynchronous execution improves performance.

## Unit-II

**Express.js Framework and Routing Mechanism:** Introduction to Express.js. Creating RESTful routes with GET, POST, PUT, DELETE methods. Route parameters, query strings, and router-level middleware.
**Middleware in Express.js:** Using built-in, third-party, and custom middleware for handling requests, logging, authentication, and error responses.
**Project Structure and Static Files:** Organizing backend code into controllers, routes, and services. Serving static files and managing modular code for scalability.

## Unit-III

**Database Integration with MongoDB:** Introduction to NoSQL databases and MongoDB. Installing MongoDB locally and using cloud services like MongoDB Atlas.
**Using Mongoose for Data Handling:** Creating schemas and models using Mongoose. Performing CRUD operations. Implementing data validation, error handling, and defining schema relationships using population.
**Version Control and Development Tools:** Using Git for version control. Basic commands, creating repositories, .gitignore usage, collaboration. Using Nodemon and other tools for live-reloading and automation.

## Unit-IV

**Authentication and Security in Backend:** Implementing user registration and login using Express and MongoDB. Password hashing with bcrypt. Token-based authentication using JSON Web Tokens (JWT).
**API Protection and Deployment Practices:** Route protection using middleware, validating inputs, setting up environment variables using .env. Deploying backend projects using platforms like Render, Railway, or parcel.
**Real-Time Communication and Mini Project:** Implementing real-time features using Web Sockets and Socket.IO. Integrating backend with frontend using fetch/axios. Final mini project showcasing full-stack backend integration with authentication, CRUD, and real-time functionality.

**Suggested Readings:**


- Sharma, Narayan Prusty: Learning Node.js Development, Packt Publishing.
- ValeriKarpov& Bret McLaughlin: Professional JavaScript for Web Developers, Wrox Press.
- Ethan Brown: Web Development with Node and Express (2nd Edition), O'Reilly Media.
- Brad Traversy: Modern Full-Stack Development, Packt Publishing.
- SaswatPriyadarshi: Mastering Node.js: Develop and deploy scalable real-time apps, Packt Publishing.
- MongoDB, Inc.: The Little MongoDB Book, Open-source Publication.
- Any other book covering the contents of the subject


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Node.js and Backend Development | https://nptel.ac.in/courses/106/106/106106222/ |
| **Unit-II** | Introduction to Express.js | https://nptel.ac.in/courses/106/106/106106222/ |
| **Unit-III** | Introduction to MongoDB and Mongoose | https://nptel.ac.in/courses/106/106/106106222/ |
| **Unit-IV** | User Authentication with JWT | https://nptel.ac.in/courses/106/106/106106222/ |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-216A** | | | | |
| Category | Minor Vocational | | | | |
| Course Title | **Web Development-II Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester IV** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are<br>• Enable students to set up and configure backend environments using Node.js and Express.js.<br>• Teach the development of RESTful APIs with proper routing, middleware, and data persistence using MongoDB and Mongoose. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply Node.js and Express.js to build RESTful APIs with routing, middleware integration, and MongoDB connectivity using Mongoose. | Level 3: Apply |
| **CO2** | Analyze backend application structure, route protection mechanisms, and middleware to manage authentication and error handling effectively. | Level 4: Analyze |
| **CO3** | Evaluate backend services for efficiency, maintainability, and security, including use of .env configuration and JWT-based authentication. | Level 5 Evaluate |
| **CO4** | Design, build, and deploy a full-stack application integrating real-time communication using Web Socket, backend API, and frontend interface on a cloud platform. | Level 6 Create |

| Exp. no. | Contents |
|---|---|
| **1.** | Install and configure Node.js, npm, and set up backend project using npminit. |
| **2.** | Create a basic Express.js server with a homepage route. |
| **3.** | Implement RESTful routes using Express for a resource (e.g., users). |
| **4.** | Integrate MongoDB and perform CRUD operations using Mongoose. |
| **5.** | Design a schema and model for a blog or user profile system. |
| **6.** | Use middleware to log request info and handle errors. |
| **7.** | Implement JWT-based login and signup routes with hashed passwords. |
| **8.** | Create a protected route that requires authentication. |
| **9.** | Upload environment variables using .env and use them in config. |
| **10.** | Build a Web Socket-based real-time chat feature using Socket.IO. |
| **11.** | Connect backend API to frontend UI (fetch/display data). |
| **12.** | Develop and deploy a full-stack mini project on a cloud platform. |

| | | | | | |
|---|---|---|---|---|---|
| Course code | AEC-202A | | | | |
| Category | Ability Enhancement Course | | | | |
| Course title | **Hindi-II** | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-IV |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. पत्र–लेखन और पत्रकारिता कौशल विकसित करना तथा प्रभावी भाषा अभिव्यक्ति सिखाना।<br>2. प्रूफ–रीडिंग कौशल, भाषा–शुद्धि क्षमता और त्रुटि पहचान दक्षता विकसित करना।<br>3. साक्षात्कार तकनीक, भाषा–प्रस्तुतीकरण और प्रभावी संचार कौशल में दक्ष बनाना।<br>4. जीवन–कौशल, व्यक्तित्व विकास, आत्मविश्वास और निर्णय–क्षमता को सुदृढ़ करना। | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Exam | 35 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | पत्र–लेखन, प्रूफरीडिंग, साक्षात्कार तथा जीवन–कौशल की मूल अवधारणाएँ पहचानना। | Level 1: Remember |
| CO2 | पत्र–लेखन, प्रूफरीडिंग, प्रस्तुतीकरण और जीवन–कौशल का महत्व समझकर व्याख्या करना। | Level 2: Understand |
| CO3 | पत्र–लेखन, प्रूफरीडिंग, संप्रेषण और जीवन–कौशल को व्यावहारिक परिस्थितियों में लागू करना। | Level 3: Apply |
| CO4 | पत्र, प्रूफ, प्रस्तुतीकरण और जीवन–कौशल तत्वों का विश्लेषण कर प्रभाव बढ़ाना। | Level 4: Analyze |

Note: Examiner will set Nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

| Unit No. | Content |
|---|---|
| **Unit-I** | **पत्रकारिता** का अर्थ, उद्भव और विकास, वर्तमान समय में पत्रकारिता का महत्व, हिंदी पत्रकारिता में रोजगार की संभावनाएँ, समाचार लेखन, रिपोर्टिंग, प्रेस विज्ञप्ति, समाचार लेखक की भाषा, समाचार लेखक का वैचारिक उत्कर्ष, हिंदी भाषा संवर्धन में पत्रकारिता का योगदान |
| **Unit-II** | **प्रूफ संशोधन** की परिभाषा, प्रूफ शोधक के आवश्यक गुण, प्रूफ के प्रकार, प्रूफ संशोधन के महत्त्वपूर्ण चिह्न, प्रूफ रीडर के लिए आवश्यक सावधानियाँ, प्रूफ संशोधन में रोजगार, प्रूफ संशोधन का हिंदी भाषा संवर्धन में महत्त्व |
| **Unit-III** | **साक्षात्कार** का अर्थ, परिभाषा एवं स्वरूपः कैरियर में साक्षात्कार कौशल का महत्त्व, समालाप्य की भाषा, सम्प्रेषणः अर्थ, परिभाषा एवं प्रक्रियाः भाषा – संप्रेषण के चरणः श्रवण, अभिव्यक्ति, वाचन, लेखनः सम्प्रेषण को प्रभावी बनाने के नियम |
| **Unit-IV** | **जीवन कौशल** का अर्थ एवं स्वरूपः जीवन कौशल की विशेषताएँ, जीवन कौशल की आवश्यकता एवं महत्त्व, जीवन कौशल के आधारः स्वावलंबन, सहयोगपूर्ण भावना, समस्या समाधान की योग्यता, ज्ञानार्जन की प्रवृत्ति, कुशाग्रता, चातुर्य, मधुर भाषी, संवेदनशील, स्वजागरूक, अन्वेषणात्मक दृष्टिकोण, उदात्त सुदृढ़ – मनोबल, निश्चयात्मकवृत्तिः |

प्रेरणास्पद पुस्तकें

1. डॉ0 हरिश्चन्द्र वर्मा, भाषा और भाषाविज्ञान, लक्ष्मी पब्लिशिंग हाऊस, रोहतक 3.
2. सम्पा० कालिका प्रसाद, राजवल्लभ सहाय, मुकुन्दीलाल श्रीवास्तव, बृहत् हिन्दी कोश: ज्ञानमण्डल लिमिटेड, वाराणसी
3. मुख्य सम्पादक, डॉ० लक्ष्मीनारायण शर्मा, परिशोध, मानव – मूल्य विशेषांक, 1993
4. डॉ० धर्मपाल मैनी, भारतीय जीवनमूल्य, भारतीय संस्कृति संस्थान, गुड़गाँव
5. बृहत् प्रशासन शब्दावली, हिन्दी–अंग्रेज़ी, वैज्ञानिक तथा तकनीकी शब्दावली आयोग, नई दिल्ली–110

**Useful Video links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | पत्रकारिता | https://www.youtube.com/watch?v=WL_hsThX7c8 |
| Unit-II | प्रूफ संशोधन | https://www.youtube.com/watch?v=VLXq3EXOHQI |
| Unit-III | साक्षात्कार | https://www.youtube.com/watch?v=0QfVFZnAJks |
| Unit-IV | जीवन कौशल | https://www.youtube.com/watch?v=Fwm-HjQ6060 |

| | | | | | |
|---|---|---|---|---|---|
| Course code | AEC-204A | | | | |
| Category | Ability Enhancement Course | | | | |
| Course title | संस्कृत-II | | | | |
| Scheme and Credits | L | T | P | Credits | Semester-IV |
| | 2 | 0 | 0 | 2 | |
| Course Objectives | The objectives of this course are<br>1. To understand Sanskrit sounds, their classification, and points of articulation in linguistic study.<br>2. To understand phonetic changes through Sandhi rules involving vowels, consonants, and visarga.<br>3. To understand Sanskrit sentence structure and different types of word formations.<br>4. To understand nominal compounding processes and major types of Sanskrit Samāsa. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total Marks | 50 | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After studying this course, the students will be able to

| CO | Course Outcome | RBT Level |
|---|---|---|
| CO1 | **Identify** Sanskrit sounds, Sandhi types, sentence elements, and compounds. | Level 1: Remember |
| CO2 | **Explain** Sanskrit phonetics, Sandhi rules, sentence structure, and compounds. | Level 2: Understand |
| CO3 | **Apply** phonetic rules, Sandhi, sentence formation, and compounding techniques. | Level 3: Apply |
| CO4 | **Analyze** Sanskrit phonetics, Sandhi, sentence structure, and compounds. | Level 4: Analyze |

Note: Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question is compulsory and selecting one from each Unit.

| Unit No. | Content |
|---|---|
| Unit-I | **General introduction to Sanskrit Sounds**<br>संस्कृत ध्वनियों का सामान्य परिचय<br>i. Vowels (Simple Vowels, Complex Vowels)<br>स्वर (अच्) ( शुद्ध स्वर, संयुक्त स्वर)<br>ii. Consonants (Stops Nasal, Semi Vowels, Sibilants, Anusvara and Visarga)<br>व्यञ्जन (हल् ) (स्पर्श नासिक्य अन्तस्थ, ऊष्म, अनुस्वार, विसर्ग)<br>iii. Points of Articulation (Throat, Roof, Palate, Teeth, Lips, Nose)<br>उच्चारण स्थान (कण्ठ, मूर्धा, तालु, दन्ताः, ओष्ठौ, नासिका) |

| | |
|---|---|
| Unit-II | **General introduction to Conditional Phonetic Changes**<br>सन्धि का सामान्य परिचय<br>i. Phonetic change where vowel is replaced<br>स्वरसन्धि<br>ii. Phonetic change where consonant is replaced<br>व्यञ्जनसन्धि<br>iii. Phonetic change where visarga is replaced<br>विसर्गसन्धि |
| Unit-III | **General introduction to the Structure of Sentences**<br>वाक्य संरचना का सामान्य परिचय<br>i. Sentence<br>वाक्य<br>ii. Word (Subanta, Tinanta, Kridanta, Taddhita)<br>पद (सुबन्त, तिङन्त, कृदन्त, तद्धित |
| Unit-IV | **General introduction to Nominal Compounding**<br>समास का सामान्य परिचय<br>i. Avyayeebhava, Tatpurusha<br>अव्ययीभाव, तत्पुरुष<br>ii. Dvandva, Bahuvreehi<br>द्वन्द्व, बहुव्रीहि |

**Suggested Readings:-**


- Anuvada Chandrika, by Dr. Yadunandan Mishra, Chaukhambha Orientaliya, Delhi, 2021.
- students Guide to Sanskrit Composition,by Apte, Vaman Shivram, The Standard Publishing Company, Girgaon, Bombay, 1925.
- Rupa Chandrika by Dr. Brahmananda Tripathi, Chaukhamba Surbharati Prakashan, Varanasi, 2008.
- Kridanta Rupa Mala – Srijan Jha – App. Available on Google Play Store.
- Online tools for Sanskrit grammer developed by computational linguistics group, Department of Sanskrit, University of Delhi:http://du.ac.in.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| Unit-I | अच् [ स्वर ] तथा हल् [ व्यंजन | https://www.youtube.com/watch?v=BTTRaMpE4XE |
| Unit-II | स्वरसन्धि | https://www.youtube.com/watch?v=XYQ-PNN9D9w |
| Unit-III | वाक्य संरचना | https://www.youtube.com/watch?v=SQoZIOz6RYs |
| Unit-IV | अव्ययीभाव, तत्पुरुष, द्वन्द्व, बहुव्रीहि | https://www.youtube.com/watch?v=L-a2w7heyOE |

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, KABLANA
# (JHAJJAR)
## An Autonomous Institute (UGC)

## 'A' GRADE ACCREDITED BY NAAC

## Evaluation Scheme and Syllabus for
## Bachelor of Computer Applications
## BCA/BCA (Honours) / BCA (Honours with Research) and Specialization in

**(i) AI & ML**
**(ii) Data Science**

Based on AICTE Curriculum and Credit Framework for BCA Program and Formative Assessment Guidelines under NEP-2020)

(With effect from the Session 2025-26)

## Approved by AICTE, New Delhi and Affiliated to MDU, Rohtak

## GENERAL COURSE STRUCTURE & THEME

### 1. DEFINITION OF CREDIT:

| | | |
|---|---|---|
| 1 | 1 Hr. Lecture (L) per week | 1 Credit |
| 2 | 1 Hr. Tutorial(T) per week | 1 Credit |
| 3 | 1 Hr. Practical(P) per week | 0.5Credit |
| 4 | 2 Hr. Practical(P) per week | 1 Credit |

### 2. COURSE CODE AND DEFINITION:

| Course code | Definitions |
|---|---|
| L | Lecture |
| T | Tutorial |
| P | Practical |
| DSC | Discipline- Specific Courses (Core Courses) |
| AEC | Ability Enhancement Courses |
| MDC | Multi-Disciplinary Elective Course |
| VAC | Value Added Courses |
| SEC | Skill Enhancement Courses |
| DSE | Discipline Specific Elective |
| OE | Open Elective |
| LC | Lab Courses |

**COURSE NAME:** Bachelor in Computer Application, Bachelor in Computer Application (Honours) and Bachelor in Computer Application (Honours with Research)

**COURSE LEVEL/ DURATION/SYSTEM:**

Undergraduate / Three or Four years/ 6 or 8 Semesters with multiple entry and exit. The following option will be made available to the students joining BCA Research Program:

a. **One Year:** Under Graduate Certificate in Computer Application
b. **Two Years**: Under Graduate Diploma in Computer Application
c. **Three years**: Bachelor in Computer Application(BCA)
d. **Four years**: Bachelor in Computer Application with Honours: BCA (Honours) or Bachelor in Computer Application Honours with Research: BCA (Honours with Research)

**MINIMUM ELIGIBILITY CRITERIA:**

**Minimum eligibility criteria for opting the course in the fourth year will be as follows:**

1. **BCA (Honours with Research):** BCA Degree

2. **For BCA (Honours)** : BCA Degree

Note: The students who are eligible for BCA (Honours with Research) shall have choice to pursue either BCA (Honours) or BCA (Honours with Research).

**SEMESTER WISE CREDIT DISTRIBUTION:**

SEMESTER WISE CREDIT DISTRIBUTION OF PROPOSED [BCA/BCA (HONOURS)/ BCA (HONOURS WITH RESEARCH)] PROGRAM:

| Semester | Core Courses | Ability Enhancement Courses | Multi-Disciplinary Elective Course | Value Added Courses | Skill Enhancement Courses | Discipline Specific Elective | Total |
|---|---|---|---|---|---|---|---|
| I | 8 | 2 | 2 | 2 | 7 | - | 21 |
| II | 14 | - | - | 2 | 5 | - | 21 |
| III | 11 | 0 | 0 | 2 | 4 | 3 | 20 |
| IV | 15 | 0 | 0 | 0 | 2 | 3 | 20 |
| V | 0 | 0 | 0 | 0 | 6 | 15 | 21 |
| VI | 4 | 1 | 0 | 0 | 4 | 10 | 19 |
| TOTAL | | | | | | | 122* |
| *Minor Variation are allowed as per the need of program.<br>BCA (Honours) | | | | | | | |
| VII | 5 | 0 | 3 | 0 | 4 | 8 | 20 |
| VIII | | | | | 8 | 12 | 20 |
| BCA (Honours with Research) | | | | | | | |
| VII | 12 | | | | | 8 | 20 |
| VIII | 20 | | | | | | 20 |

Category-Wise Distribution

| Description | Core Courses | Ability Enhancement Courses | Multi- Disciplinary Elective Course | Value Added Courses | Skill Enhance-ment courses | Discipline Specific Elective | Total |
|---|---|---|---|---|---|---|---|
| BCA | 52 | 3 | 2 | 6 | 28 | 31 | 122 |
| BCA (Honours) | 57 | 3 | 5 | 6 | 40 | 51 | 162 |
| BCA (Honours with Research) | 84 | 3 | 2 | 6 | 28 | 39 | 162 |
| **3 Years BCA Program** | | | | | **Total Credits=122*** | | |
| **4 Years BCA (Honours) and BCA (Honours with Research)** | | | | | **Total Credits=162*** | | |

**Note**: Students can take extra credit course from their own department or from other department as per the Institute norms.

# Scheme of Studies and Examination
## BCA –1st Semester
## *w.e.f.* 2025-26

| Sr. No. | Category | Course Code | Course Title | Hours per Week | | | Total Load Per Week | Credits | Examination Schedule (Marks) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | | Assessment | End Semester Exam | Practical | Total |
| 1 | Core Courses | DSC-BCA-101B | Mathematical Foundations of Computer Science | 4 | 0 | 0 | 4 | 4 | 30 | 70 | - | 100 |
| 2 | Skill Enhancement Courses | SEC-BCA-103B | Computer Fundamental and Problem-Solving using C | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 |
| | | LC-BCA-105B | Computer Fundamental and Problem-Solving using C Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 |
| 3 | Core Courses | DSC-BCA-107B | PC Software | 3 | 0 | 0 | 3 | 3 | 25 | 50 | - | 75 |
| | | LC-BCA-109B | PC Software Lab | 0 | 0 | 2 | 2 | 1 | 10 | - | 15 | 25 |
| 4 | Skill Enhancement Courses | SEC-BCA-111B | Internet& Web Design | 1 | 0 | 0 | 1 | 1 | - | 25 | - | 25 |
| | | LC-BCA-113B | Internet & Web Design Lab | 0 | 0 | 4 | 4 | 2 | 15 | - | 35 | 50 |
| 5 | Multidisciplinary Courses | Refer Table No.- I | …….. | 2 | 0 | 0 | 2 | 2 | 50 | 50 | - | 100 |
| 6 | Ability Enhancement Courses | AEC-101B | General English-I | 1 | 1 | 0 | 2 | 2 | 65 | 35 | - | 100 |
| 7 | Value Added Courses | VAC-113B | Environmental Studies | 2 | 0 | 0 | 2 | 2 | 65 | 35 | - | 100 |
| 8 | Additional Course | Refer Table No.- II | **(Additional Course)** Foreign Language (To be decided by the Institute/College at their level) (1-1-0) OR Any Course of Similar Credits on Any Foreign Languages from SWAYAM portal | 1 | 1 | 0 | 2 | 0 | - | - | - | - |
| **Total Credits** | | | | | | | | **21** | **295** | **315** | **65** | **675** |

**Note:**

1. The duration of all the end-term theory examinations shall be 3 hours.

2. The Criteria for awarding the formative assessment for Core Courses and Skill Enhancement Courses for 1st semester shall be as under:

a) Sessional Examination: 50 %

b) Assignments/ Presentations/ Seminars and Class Participation: 30%

c) Attendance: 20%

(Less than 65% - 0 marks; Up to 70% - 2 marks; Up to 75% - 3 marks; Up to 80% - 4 marks; above 80% - 5 marks)

3. The panel of examiners for end-semester theory examinations shall be prepared and approved by the BOS, comprising internal and external examiners based on their expertise, specialization, and area of interest.

4. The formative assessment criteria for Multi-Disciplinary Course in Semester I will be as follows

| | |
|---|---|
| Sessional Test | 20 Marks |
| Assignment/ Case Study/ Mini Project | 15 Marks |
| Quiz/ Group Discussion/ Debate | 10 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

5. The formative assessment criteria for **Ability-Enhancement Course** in Semester I will be as follows:

| | |
|---|---|
| Sessional Test | 30 Marks |
| Peer Discussion/ Debate/ Extempore Speech | 10 Marks |
| Role Play | 05 Marks |
| Assignment/Essay/ Article/ Report Writing | 15 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

6. The formative assessment criteria for **Value Added Course** in Semester I will be as follows:

| | |
|---|---|
| Sessional Test | 30 Marks |
| Class Assignment/ Case Study/ Mini Project | 15 Marks |
| Quiz/ Seminar/ Group Discussion/ Debate | 15 Marks |
| Attendance (Criteria as mentioned above in 2(c)) | 05 Marks |

7. An '**Additional Course'** is a non-credit course that is undertaken for learning purposes only. If completed, the '**Additional Course'** may be recorded and will be assessed on a **Grading** basis.

| Marks (%) | Letter Grade | Grade Point |
|---|---|---|
| >90 | O(Outstanding) | 10 |
| >75 to 90 | A+(Excellent) | 9 |
| > 65 to 75 | A(Very good) | 8 |
| >55 to 65 | B+(Good) | 7 |
| > 50 to 55 | B(Above average) | 6 |
| > 40 to 50 | C(Average) | 5 |
| 40 | P (Pass) | 4 |
| Less than 40 | F(Fail) | 0 |
| - | Ab(Absent) | 0 |

**Evaluation Scheme for Practical/Lab Examination: 25Marks**

| | | Marks Distribution |
|---|---|---|
| Program 1 | Flowchart/Algorithm | 01 |
| | Writing Program | 01 |
| | Execution and ProgramFormat | 02 |
| Program 2 | Flowchart/Algorithm | 01 |
| | Writing Program | 01 |
| | Execution and Program Format | 02 |
| Viva Voce | | 07 |
| Practical File* | | 05 |
| Attendance* | | 05 |
| Total | | 25 |

*****Marks to be given by internal teacher.

**Evaluation Scheme for Practical/Lab Examination: 50Marks**

| | | Marks Distribution |
|---|---|---|
| Program 1 | Flowchart/Algorithm | 02 |
| | Writing Program | 03 |
| | Execution and Program Format | 05 |
| Program 2 | Flowchart/Algorithm | 02 |
| | Writing Program | 03 |
| | Execution and Program Format | 05 |
| Viva Voce | | 15 |
| Practical File* | | 10 |
| Attendance* | | 05 |
| Total | | 50 |

*****Marks to be given by internal teacher.

**Semester-I**

**Table No. I (Multidisciplinary Courses)**

| S. NO. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | Multidisciplinary Courses | MDC-BBA-101B | Foundations of Management |
| 2 | Multidisciplinary Courses | MDC-ASH-103B | Introductory Mathematics |
| 3 | Multidisciplinary Courses | MDC-105B | Indian Vision for Human Society |
| 4 | Multidisciplinary Courses | MDC-107B | Indian Culture and Civilization |
| 5 | Multidisciplinary Courses | MDC-109B | Indian Science, Engineering and Technology |
| 6 | Multidisciplinary Courses | MDC-111B | Indian Town Planning and Architecture |
| 7 | Multidisciplinary Courses | MDC-113B | Indian Health, Wellness and Psychology |

**Table No. II Additional Course**

| S. No. | Category | Course Code | Course Name |
|---|---|---|---|
| 1 | **Additional Course** | AEC-103B | French |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-BCA-101B** | | | | |
| Category | Core Courses | | | | |
| Course Title | **Mathematical Foundation of Computer Science** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 4 | 0 | 0 | **4** | |
| Course Objectives | The objectives of this course are to<br>• Build a strong mathematical foundation of computer science.<br>• Learn different concepts such assets, functions, matrices, determinants, limits, differentiation, and statistics for effective problem-solving and analysis. | | | | |
| Assessment | 30 Marks | | | | |
| End Semester Examination | 70 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall and define fundamental concepts of sets, functions, trigonometry, limits, differentiation, matrices, and determinants. | Level-1 Remember |
| **CO2** | Explain and interpret the relationships between mathematical concepts and demonstrate basic Understanding of functions and their applications. | Level-2 Understand |
| **CO3** | Apply mathematical principles to solve problems involving sets, functions, differentiation, trigonometry, matrices, and determinants. | Level-3 Apply |
| **CO4** | Analyze mathematical problems, identify patterns, and breakdown complex concepts into simpler Components using algebraic methods. | Level-4 Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 7 parts of 2 marks each from all units and remaining 8 questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Sets:** Sets, Subsets, Equal Sets Universal Sets, Finite and Infinite Sets, Operation on Sets, Union, Inter-section and Complements of Sets, Cartesian product, Cardinality of Set, Practical applications of set theory.

**Relations And Functions:** Relations, Equivalence Relation, Function: Domain and Range, Onto, Into and One to One Functions, Composite and Inverse Functions.

**Unit-II**

**Trigonometry:** Introduction, Measurement of angles, trigonometric functions, relation between trigonometric functions, signs of trigonometric functions, trigonometric functions of standard angles. Basic of inverse trigonometry.

**Limits & Continuity:** Limit at a Point, properties of limit, computation of limits of various types of functions, Continuity of a function at a point, Continuity over an interval.

## Unit-III

**Differentiation**: Derivative of a function, Derivatives of sum, differences, product & quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain rule and differentiation by substitution.

## Unit-IV

**Matrices:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices. Adjoint of matrix, Inverse of matrix, solving a system of linear equations using matrix method.

**Determinants:** Definition, Minors, Cofactors, Properties of Determinants, Applications of determinants in finding area of triangle.

**Suggested Readings:**


- Business Statistics Gupta by S. P. & M. P. Gupta,
- An Introduction to Statistical Methods by Gupta, C.B.,
- A Text Book of Business Mathematics Reddy by R. Jaya Prakash, Y. Mallikarjuna Reddy, Ashish Publishing House, New Delhi.
- Business Mathematics by JanardanDinodia and Dr. DalipKumar, Jeevansons Publications New Delhi.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Set Theory | https://youtube.com/playlist?list=PLEHGYFbPuuMEMCD8hwgnsZS0xKd8ydie&si=wr6io6TNmtN9CNsa |
| **Unit-II** | Trigonometry | https://www.youtube.com/watch?v=F2NqTIej98Q |
| | Limits &Continuity | https://www.youtube.com/watch?v=tffrrtzUhmw&list=PL7oBzLzHZ1wXBSiJEgqz_iwVoLiY8qhbv |
| **Unit-III** | Differentiation | https://www.youtube.com/watch?v=N2PpRnFqnqY |
| **Unit-IV** | Matrices | https://www.youtube.com/watch?v=T7I_C_lL75I |
| | Determinants | https://www.youtube.com/watch?v=7SQbz96xUyg |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SEC-BCA-103B** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Computer Fundamental and Problem-Solving Using C** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Develop problem-solving skills by applying logical thinking to write efficient C programs.<br>• Study about how to work with files for input/output operations in C. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts related to computer fundamentals, programming techniques, data structures, and System components. | Level-1 Remember |
| **CO2** | Explain the functioning of computer systems, programming concepts, decision-making structures, And basic data handling techniques in C. | Level-2 Understand |
| **CO3** | Apply programming skills in C to solve computational problems, manipulated at a structures, and Implement algorithms effectively. | Level-3 Apply |
| **CO4** | Analyze complex programming problems, identify appropriate solutions, and breakdown problems into sub-tasks using logical structures and functions. | Level-4 Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each from all units and remaining 8 questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Computer Fundamentals**: Generations of Computers, Block Diagram along with its components, classification of computers, Applications of computers in various fields. Input/output Devices, Memory: Concept of primary & secondary memory, Cache Memory, Secondary storage devices.

**Overview of Networking & Operating System**: Introduction to computer networking, Network types, Network topologies, Internet and its applications, Operating system and its functions.

**Unit-II**

**Planning the Computer Program**: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Techniques of Problem Solving, Documentation, Algorithms, flowchart, decision tables, pseudo code.

**Overview of C:** History of C, Importance of C, Elements of C: C character set, identifiers and keywords, Data types, Constants and Variables, Assignment statement, Symbolic constant, Structure of a C Program,

printf(), scanf() Functions, Operators & Expression, type casting and conversion, operator hierarchy & associativity.

**Unit-III**

**Decision making & Branching**: Decision making with IF statement, IF-ELSE statement, Nested IF statement, ELSE-IF ladder, switch statement, go to statement.
**Decision making & Looping**: while, do-while and for loop, jumps in loops, break, continue statement, Nested loops
**Functions:** Standard Mathematical functions, Input/output: Unformatted & formatted I/O function in C, Input functions output functions, string manipulation functions User defined functions, Introduction/Definition, function prototype, Local and global variables, passing parameters, recursion.

**Unit-IV**

**Arrays & Pointers**: Definition, types, initialization, processing an array, passing arrays to functions, Declaration and initialization of string, Input/output of string data, Introduction to pointers.
**Structure & Union:** Structure definition, Declaration, structure Assignments, Arrays in structure, Structure Arrays, Pointer Structure, Nested Structure, Arrays and Arrays of Structure, Union and File Handling.

**Suggested Readings:**


- Programming with C by Gottfried, Byron S., and Tata Mc GrawHill.
- Computing Fundamentals and Programming in C by Gill Nasib Singh, Khanna Books Publishing Co. New Delhi.
- Programming in ANSIC by Balagurusamy, E., 4E, Tata Mc Graw-Hill.
- Problem Solving and Program Design in C by Jeri R. Hanly& Elliot P. Koffman, Addison Wesley.
- Let us C by Yash want Kanetker, BPB.
- Computer Programming in C by Rajaraman, V., PHI.
- Working with C by Yash want Kanetker, BPB.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Generations of Computers | https://archive.nptel.ac.in/courses/106/105/106105163/ |
| | Introduction to computer networking | https://archive.nptel.ac.in/courses/106/105/106105183/ |
| | Introduction to operating system | https://archive.nptel.ac.in/courses/106/105/106105214/ |
| **Unit-II** | Algorithm & Flow Chart | https://www.youtube.com/watch?v=5AHRXOtn9bY |
| | Introduction To C Programming | https://www.youtube.com/watch?v=IoT0zP4YlMk |
| **Unit-III** | Conditional Control Statements&Loops | https://www.youtube.com/watch?v=HyDpW7Al6_E |
| | Call By value & Call By reference | https://www.youtube.com/watch?v=1iwmwEJhcMw |
| **Unit-IV** | Introduction to Array | https://www.youtube.com/watch?v=I9828WOCEMg |
| | String | https://www.youtube.com/watch?v=rcGeNl95Gv4 |
| | Structures | https://www.youtube.com/watch?v=kDDd7AmXq1w |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-105B** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Computer Fundamental and Problem Solving Using C Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are to<br>• Equip students with the ability to write correct and well-structured C programs.<br>• Enhance student's logical thinking and problem-solving abilities. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT LEVEL |
|---|---|---|
| **CO1** | Write and execute C programs to perform operations like sum, finding largest number, swapping values, and using recursion and iteration. | Level-3 Analyze |
| **CO2** | Analyze and debug C programs to identify logical errors, optimize code, and ensure correctness in Solving problems like Fibonacci series and arrays. | Level-4 Apply |
| **CO3** | Evaluate the efficiency and correctness of functions, mathematical operations ,string manipulations, and memory management techniques in C. | Level-5 Evaluate |
| **CO4** | Design and develop complex C programs using arrays, functions, pointers, structures, and file Handling techniques to solve real- world problems. | Level-6 Create |

| Exp. No. | Contents |
|---|---|
| 1. | Introduction to the programming environment (Turbo C IDE). |
| 2. | Write a C program to calculate the sum of two numbers. |
| 3. | Write a C program to find the largest of three numbers using if-else statements |
| 4. | Write a program to swap the values of two given variables. |
| 5. | Apply the concepts of recursive functions to solve problems like factorial, Fibonacci series. |
| 6. | Apply the concepts of Iteration to solve problems e.g., sum of series. |
| 7. | Apply the concepts of arrays for 1D & 2D Array manipulation |
| 8. | Apply various string manipulation functions. |
| 9. | Apply the concepts of functions, call by value & call by reference. |
| 10. | Apply various mathematical functions like abs(), pow(), sqrt() floor(), etc. |
| 11. | Apply the concepts of pointers, structures and dynamic memory allocation. |
| 12. | Analyze the concept of file handling techniques and their operations |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **DSC-BCA-107B** | | | | |
| Category | Core Courses | | | | |
| Course Title | **PC Software** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 3 | 0 | 0 | **3** | |
| Course Objectives | The objectives of this course are to<br>• Develop a foundational understanding of MS-Windows operating system interface.<br>• Enable students to proficiently use key office applications, including word processors, spreadsheets, and presentation software. | | | | |
| Assessment | 25 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 75 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall basic concepts of MS-Windows, word processing, spreadsheet, and presentation software Functionalities and tools. | Level-1Remember |
| **CO2** | Explain the essential functions of MS-Windows, word processing, spreadsheet, and presentation software, including their practical applications. | Level-2Understand |
| **CO3** | Apply their skills in MS-Windows, word processing, Excel, and Power Point to create and manage documents, presentations, and spreadsheets. | Level-3Apply |
| **CO4** | Analyze and organize data, documents, and presentations, determining effective layouts, formatting, And data analysis methods. | Level-4Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each from all units and remaining 8 questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**MS-Windows:** Operating System-Definition & functions, basics of Windows. Basic components of windows, icons, types of icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel – display properties, adding and removing software and hardware, setting date and time, screensaver and appearance. Using windows accessories.

## Unit-II

**Documentation Using word processing software:** Introduction to word processing, Toolbars, Creating & Editing Document, Formatting Document and printing document, Finding and replacing text, Format painter, Header and footer, Spelling and Grammar Tool, Page Formatting, Bookmark, Mail Merge, Macros, Tables and File Management, Clipart, Templates, Tracking changes.

## Unit-III

**Slide based Presentation:** Starting MS–Power Point, working with power point, Creating, Saving and Printing a presentation, working with Animation, adding a slide to presentation, navigating through a presentation, Slide- sorter, Slide-show, editing slides, Working with Graphics and Multimedia in Power Point (Inserting Photo, Video &Sound).

## Unit-IV

**Electronic Spreadsheet using Excel Workbook:** Introduction to MS-Excel, Feature of MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Cell referencing, Pivot table & Pivot Chart, Linking, Sorting, Filtering.

**Suggested Readings:**


- Learn Microsoft Office by Russell A. Stultz– BPB Publication
- Microsoft Office 2000 by Courter, G Marquis (1999), Professional Edition. BPB.
- Microsoft Office XPF astand Easy by Koers, D (2001),PHI.
- Office XP: The Complete Reference by Nelson, S Land Kelly, J (2002), Tata Mc Graw- Hill.
- Microsoft Office Complete Reference –BPB Publication.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | MS-Windows | https://www.youtube.com/watch?v=DzTCFsdxMP4 |
| **Unit-II** | Documentation Using word processing software | https://www.youtube.com/playlist?app=desktop&list=PLyqSpQzTE6M_Da0qvy98D8Me7MWQc78Cj |
| **Unit-III** | Slide based Presentation | https://www.youtube.com/watch?v=HyDpW7Al6_E |
| **Unit-IV** | Electronic Spreadsheet using Excel Workbook | https://www.youtube.com/watch?v=I9828WOCEMg |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-109B** | | | | |
| Category | Core Courses | | | | |
| Course Title | **PC Software Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 0 | 0 | 2 | **1** | |
| Course Objectives | The objectives of this course are to<br>• Equip students with hands- on experience in using various PC software applications, including word processors, spreadsheets, presentation tools.<br>• Enable students to create, format, and edit various types of documents, applying advanced features and tools for professional presentation. | | | | |
| Assessment | 10 Marks | | | | |
| End Semester Examination | 15 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Apply office automation tools like MS-Word, Excel, and Power Point to create, format, and manage documents, spreadsheets, and presentations. | Level-3 Apply |
| **CO2** | Analyze data, charts, and formulas in MS-Excel, identifying patterns and drawing conclusions to Support decision-making. | Level-4 Analyze |
| **CO3** | Evaluate the effectiveness of document formatting, Excel formulas, and presentation designs, Ensuring accuracy, clarity, and professional standards. | Level-5 Evaluate |
| **CO4** | Design and create professional documents, presentations, and reports by integrating advanced Features like macros, charts, and mail merge. | Level-6 Create |

| Exp. No. | Contents |
|---|---|
| 1. | To study about various concepts of office automation Tools. |
| 2. | Use the concept of find and replace text in MS-Word. |
| 3. | Use the features of Format Painter, Header and Footer, Drop Cap, Auto Text, and Autocorrect In MS-Word. |
| 4. | Analyze the marks of the students of a class using various chart (Line, XY, Bar and Pie) With the help of MS-Excel. |
| 5. | Evaluate the accuracy of Microsoft Excel formulas (SUM, AVERAGE, etc.) and conditional formatting. |
| 6. | Create a professional resume using Microsoft Word, including headers, footers, and bullet points. |
| 7. | Create a document in MS-Word with macros to automate repetitive tasks. Explain how to record and execute macros. |
| 8. | Create personalized letter with the help of mail merge features. |
| 9. | Design a worksheet in MS-Excel with a header and footer. |
| 10. | Create a Microsoft Power Point presentation with various slide layouts, images, and charts. |
| 11. | Implement slide transitions and animations in MS-PowerPoint. |
| 12. | Design a presentation in MS-PowerPoint with Excel charts and WordArt. |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **SEC-BCA-111B** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Internet &Web Design** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 1 | 0 | 0 | **1** | |
| Course Objectives | The objectives of this course are to<br>• Guide students in designing visually appealing and functional websites using HTML.<br>• Enable students to apply CSS techniques for improving user experience and web accessibility. | | | | |
| Assessment | ---------- | | | | |
| End Semester Examination | 25 Marks | | | | |
| Total | 25 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts related to the Internet, web browsers, HTML, CSS, web publishing, and webpage elements. | Level-1 Remember |
| **CO2** | Explain the principles of web development, including HTML, CSS, webpage structures, and the role of different web technologies. | Level-2 Understand |
| **CO3** | Apply web development techniques to create and design basic websites using HTML and CSS, integrating text, graphics, and forms. | Level-3 Apply |
| **CO4** | Analyze web design problems, evaluate design options, and implement effective solutions for layout, content, and user interaction. | Level-4 Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 1 mark each from all units and remaining 8 questions of 5 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

## Unit-I

**Introduction to Internet and World Wide Web:** A brief Introduction to the Internet, Evolution of World Wide Web, Basic features, Web Browsers, Web Servers; Hypertext Transfer Protocol, URLs, Searching and Web- Casting Techniques, Search Engines and Search Tools, Domain Name System, Home Page, Web page and website.

## Unit-II

**Web Publishing**: Hosting your Site; Internet Service Provider, Phases of Planning and designing your Web Site, steps for developing your Site, Choosing the contents

**Web Development:** Introduction to HTML, Hypertext and HTML; HTML Document Features; HTML command Tags; Headers; Text styles; Text Structuring; Text colors and Background; formatting text.

**Unit-III**

**List:** Ordered and Unordered lists, Table Creation and Layouts. Images; Inserting Graphics; Frame Creation and Layouts; Creating Links; Working with Forms and Menus; Working with Radio Buttons and Check Boxes; Text Boxes; Page layouts.

**Unit-IV**

**Cascading Style Sheets (CSS):** Basic Concepts, Properties, Creation of Style Sheets. Common Tasks with CSS: Text, Fonts, Margins, Links, Tables, Colors. Marquee. Mouse Overs. Filters and Transitions. Adding Links. Adding Tables. Adding Forms. Adding Image and Sound. Use of CSS in HTML Documents, Linking and Embedding of CSS in HTML.

**Suggested Readings:**


- Fundamentals of the Internet and the World Wide Web by Raymond Green law and Ellen Hepp– 2001, TMH.
- Internet & World Wide Programming by Deitel& Nieto, 2000, Pearson Education.
- Web Technologies by Uttam K. Roy, Oxford University Press.
- HTML Black Book by Stephen Holzner, Wiley Dream tech.
- Web Technology by Rajkamal, Tata McGraw-Hill.


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction To Internet | https://www.youtube.com/watch?v=YOXwcbwSEUo |
| | Internet and www | https://www.youtube.com/watch?v=-2hpoIjNSb4 |
| **Unit-II** | Web Development | https://www.youtube.com/watch?v=QEtWL4lWlL4 |
| **Unit-III** | List and table creation | https://www.youtube.com/watch?v=omuyzDmNaf4 |
| **Unit-IV** | Cascading style sheets | https://www.youtube.com/watch?v=h_RftxdJTzs |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **LC-BCA-113B** | | | | |
| Category | Skill Enhancement Courses | | | | |
| Course Title | **Internet &Web Design Lab** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 0 | 0 | 4 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Create structured and well-formatted web pages using HTML, incorporating various elements such as text, images, links, lists, tables, and forms.<br>• Use CSS to make web pages look attractive by adding colors, fonts, and layouts. | | | | |
| Assessment | 15 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 50 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Write and implement HTML programs to create headings, insert images, format text, change background, and design forms. | Level-3 Apply |
| **CO2** | Analyze the application of different style sheets (inline, internal, external) in web pages and evaluate their impact on design. | Level-4 Analyze |
| **CO3** | Evaluate the usability and effectiveness of HTML forms for user interaction and assess their Integration into web pages. | Level-5 Evaluate |
| **CO4** | Design and develop multi-page websites using HTML, incorporating tables, lists, forms, framesets, and linked pages for user navigation. | Level-6 Create |

| Exp. No. | Contents |
|---|---|
| 1. | To study the basic Structure of HTML. |
| 2. | Write a program to use Heading Element in HTML. |
| 3. | Write a program to insert image in HTML. |
| 4. | Write a program to use Formatting text in HTML. |
| 5. | Write a program for changing Background and Style. |
| 6. | Analyze the use of various types of style sheets in a web page (inline, internal and external style sheets). |
| 7. | Evaluate the usability of the form for user interaction. |
| 8. | Write a program to Create a Table in HTML. |
| 9. | Write a program to Create list in HTML. |
| 10. | How to implement Frame set in HTML. |
| 11. | Write a program to Design a student registration and Log-in form. |
| 12. | Create a simple multi-page website with linked HTML pages. |

**Useful Video links:**

| Experiment no. | Experiment name | Links |
|---|---|---|
| 1 | Basic Structure of HTML. | https://www.youtube.com/watch?v=QEtWL4lWlL4 |
| 2 | Program to use Heading Element inHTML. | https://www.youtube.com/watch?v=omuyzDmNaf4 |
| 3 | Program to insert image in HTML. | https://www.youtube.com/watch?v=zGedWVlx6hQ |
| 4 | Program to Create a Form in HTML. | https://www.youtube.com/watch?v=TeV2eDHtVa0 |
| 5 | Program to Create a Table in HTML. | https://www.youtube.com/watch?v=WRdTXaz4_Ls |

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|---|---|---|---|---|---|
| Course Code | **MDC-BBA-101B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Foundations of Management** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are to<br>• Help the students develop fundamental and transfer able skills in order to become effective managers.<br>• The students will understand how planning, organizing, and controlling<br>Have impacts on a manager's effectiveness and efficiency. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| **CO1** | Recall key concepts of management, including managerial levels, functions, planning, organizing, controlling, and decision-making processes. | Level-1Remember |
| **CO2** | Explain the nature and purpose of management, various planning and decision-making processes, and the significance of control techniques in organizations. | Level-2Understand |
| **CO3** | Apply management principles to real-world scenarios, demonstrating effective decision-making, organizational structuring, and control techniques in different business contexts. | Level-3Apply |
| **CO4** | Analyze management problems, assess organizational structures, and evaluate strategies and control systems to improve business performance. | Level-4Analyze |

**Note:** Examiner will set nine questions in total. Question one will be compulsory. Question one will have 5 parts of 2 marks each form all units and remaining 8 questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

**Unit-I**

**Overview of Management:** Concept, Nature, Process, Managerial levels (Technical, Conceptual, Interpersonal), Skills, Functions and Role of managers, Challenges of Management.

**Unit-II**

**Planning:** Nature and purpose of planning, Planning process, Types of plans, Management by Objectives (MBO), Strategies, types of strategies (Corporate Strategy, Business Strategy, Differentiation Strategy, Retrenchment Strategy, Growth Strategy), Decision making: Types of

decision, Decision making process, Rational decision making.

**Unit-III**

**Organizing:** Meaning, Nature and purpose of organizing, organization structure, Departmentation, Span of control, Centralization and Decentralization, Delegation of authority and responsibility.

**Unit-IV**

**Controlling:** Meaning, Nature and scope of control, Types of control, Control process, Control techniques (Budgetary Control, Financial Control, Quality Control, Inventory Control, Statistical Control, Production Control), Cost Control, Effective control system.

**Suggested Readings:**


- Management Theory and Practice by C. B. Gupta, Sultan Chand and Sons
- Essentials of Management by KoontzandWechrich, Tata McGraw-Hill
- Management: Concepts and Strategies by J. S. Chandan, Vikas Publishing House, New Delhi
- Management byRobbins and Coulter, Prentice Hall of India, New Delhi
- Developing Communication Skills by Krishna MohanandMeera Banerji, Macmillan India Ltd., New Delhi
- Management and Organizational Behavior by Wendy Blaoisi, Curtis W. Cook, and Phillip L. Hunsaker, McGraw Hill


**Useful Video Links:**

| Unit No. | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Management | https://youtu.be/TtbImDfUt4c?feature=shared |
| **Unit-II** | Decision Making | https://youtu.be/B96-Gpn56sU?feature=shared |
| **Unit-III** | Delegation Of Authority | https://youtu.be/GlLXV7JLVnk?feature=shared |
| **Unit-IV** | Controlling: Issues, Types, Techniques and Importance | https://youtu.be/v7XmhnenEGs?feature=shared |

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|---|---|---|---|---|---|
| Course Code | **MDC-ASH-103B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Introductory Mathematics** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand the types, representation, and operations on sets, along with the basic laws of indices.<br>• Toexplorematrixoperationsanddeterminantsinsolvinglinearequations<br>• To understand arithmetic and geometric progressions, their sums, and applications, along with some special sequences.<br>• To understand permutation, combination and the binomial theorem<br>• For solving problems. | | | | |
| Assessment | 50 Marks | | | | |
| Summative Assessment | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Out comes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall the definitions and properties of sets, indices, matrices, determinants, sequences, series, permutations, combinations, and binomial theorem.. | Level-1Remember |
| CO2 | Explain the operations on sets, matrix algebra, determinants, sequences, series, and the application of permutation, combination, and binomial theorem principles. | Level-2Understand |
| CO3 | Apply the set theory, matrix operations, determinants, sequence and series calculations, and permutation and combination techniques to solve practical problems. | Level-3Apply |
| CO4 | Analyze the results from set operations, matrix methods, sequences, series, permutations, and combinations to analyze their practical applications and implications. | Level-4Analyze |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. The remaining eight questions of 10 marks each are to be set by taking two questions from each unit. The students have to attempt five questions in total, the first question being compulsory and selecting one from each unit.

**Unit-I**

**Theory of Sets:** Meaning and Types of Sets, Representation of Sets, Venn diagram, Operation on Sets, Union, Intersection and Complements of Sets, Cardinality of Finite Set, Practical Applications of Set Theory, Ordered Pairs, Cartesian Product of Two Sets. **Indices:** Introduction, Law of Indices.

## Unit-II

**Algebra of Matrices:** Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication, Multiplication of Matrices and Its Properties.
**Determinants:** Introduction, Minors, Co-Factors, Properties of Determinants, Applications of Determinants in Finding Solution of Linear Equations.
**Matrices (Continued):** Transpose of Matrix, Symmetric and Skew-Symmetric Matrices, Singular and Non-Singular Matrices, Adjoint of Matrix, Inverse of Matrix, Solution of System of Linear and Homogeneous Linear Equations by using Matrix Method.

## Unit-III

**Sequence and Series:** Sequence, Series and Progression, Arithmetical Progression and Its Representation, Sum of N Terms of an A.P., Arithmetic Mean, Geometrical Progression and Sum of G.P., Geometric Mean, Application of A.P. and G.P., Some Special Sequences.

## Unit-IV

**Permutation and Combination:** Factorial Notation, Permutation, Circular Permutation, Combination, Practical Problems on Combinations.
**Binomial Theorem:** Introduction, General Term, Middle Term, Absolute Term, Coefficient of Any Power of x.

**Suggested Readings:**

- Business Mathematics by Sancheti, D.C., A.M. Malhotra, V.K. Kapoor, Sultan Chand & Sons
- Business Mathematics by Zameerudin, Qazi, S.K. Bhambri, Vikas Publishing House Pvt. Ltd.
- Text Book of Business Mathematics by R. Jaya Prakash, Ashish Publishing House
- Business Mathematics by JanardanDinodia, Dr. Dalip Kumar, Jeevansons Publications

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Set Theory | https://youtube.com/playlist?list=PLEHGYFbPuuMEMCD-8hwgnsZS0xKd8ydie&si=wr6io6TNmtN9CNsa |
| **Unit-II** | Arithmetic Progression | https://youtube.com/playlist?list=PLaAhQ2ofZZRD6WKjeCFg890_07QXWNT6i&si=udeAM9Kq_4CZwK_K |
| **Unit-III** | Sequence and Series | https://youtube.com/playlist?list=PLVFqK_9GOGXm-Ia53fONR8XhwGknj9Z&si=YXFrCI3YdJnjYAez |
| **Unit-IV** | Permutation and Combination | https://youtu.be/iyIq1YSSA5E?si=Qukhh4uhRDgADByC |

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|---|---|---|---|---|---|
| Course Code | **MDC-105B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Vision for Human Society** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are:<br>• To help the learner to understand the concept of "VasudhaivaKutumbkam" and its realization process as a base for the development of vision for a humane society.<br>• To help to identify the universality in humans and its coexistence in existence.<br>• To introduce the sense of responsibility, duties, and participation of individuals for establishment of a fearless society.<br>• To understand the apparently rational, verifiable, and universal solution from the ancient Indian knowledge system for the holistic development of physical, mental, and spiritual wellbeing of one and all, at the level of individual, society, nation, and ultimately the whole world. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| Cos | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Remember** core concepts related to human existence, consciousness, and social harmony. | Level-1Remember |
| CO2 | **Understand** the aims of human life and the ethical foundations of individual and societal well-being | Level-2Understand |
| CO3 | **Apply** philosophical and ethical principles to personal conduct and social interactions. | Level-3Apply |
| CO4 | **Apply** integrated knowledge to promote harmony, balance, and purposeful living in society. | Level-3Apply |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

## Unit-I

**The World View & Vision of Human Society:**The concept of non-duality of Prakriti (Jad) and Purush (Chetana), human as coexistence of Jad&Chetan, PanchaMahabhutas, the root of sorrow and suffering, freedom from sorrow, salvation, eternal peace, truth (Vyaharika Satya), ultimate truth. The acceptance of various systems of philosophy for realization of truth and complementariness in society in the ancient Indian system.

**Unit-II**

**Aspiration and Purpose of Individual and Human Society:** Aims of human life at individual level and societal level. At the societal level: Four Purusharthas — Dharma, Artha, Kama, Moksha.
At the individual level: Abhyudaya (progress), Nihsreyasa (perfection), Pravritti, Nivritti.
**Dharma:** Dharma Sutras (Gautama, Apastamba, Baudhayana, Vasistha).
**Dharma Shastra:** (Manusmriti, NaradaSmriti, Vishnu Smriti, YajnavalkyaSmriti) — sociology, different stages of life like studenthood, householdership, retirement and renunciation, rights and duties, judicial matters, and personal laws (Aachara, Vyavahara, Prayaschitta).
**Artha:**KautilyaArthashastra, KamandakiyaNitisara, Brihaspati Sutra, SukraNiti.
**Moksha:** Human liberation (Ignorance to Knowledge).

**Unit-III**

**Program for Ensuring Human Purpose: At Individual and Societal Level – I:** Fundamental concept of Nitishastra: SatyanishthaAurAbhiruchi (Ethics, Integrity & Aptitude).The true nature of self: ShikshaValli, BhriguValli (concept of Atman–Brahman: self, soul).The true constitution of human: Ananda Valli (Annamaya Kosha, Pranamaya Kosha, Manomaya Kosha, Vijnanamaya Kosha, Anandamaya Kosha).
The four states of consciousness (Waking State, Dreaming State, Deep Sleep State, Turiya — the fourth state), Consciousness (seven limbs and nineteen mouths), Prajna, Awareness.The life force Prana (Prana, Apana, Vyana, Udana, Samana).
**Program for Ensuring Human Purpose: At Individual and Societal Level – II:** Differentiating Vidya and Avidya, human bondages, Higher and Lower Knowledge (Para Vidya&AparaVidya). Concept of Sattva, Rajas, Tamas and the need of balancing the same.Patanjali Yoga Sutra: Yama, Niyama, Asanas, Pranayama, Pratyahara, Dharana, Dhyana, Samadhi.
Sixteen categories of Padartha, Pramanas (Pratyaksha, Anumana, Upamana, Shabda).SadhanaChatushtaya (Viveka, Vairagya, Mumukshatva, Shadsampatti — Sama, Dama, Uparama, Titiksha, Shraddha, Samadhana).
Understanding Nitya Karma, Naimittika Karma, Kamya Karma, Prayaschitta Karma, Nishiddha Karma. Meditation and Progressive Meditation (Narada's education), Ativadin to Self-knowledge. Jnana Yoga, Karma Yoga, Sanyasa Yoga in aspect to harmonious practice in society.

**Unit-IV**

**Practices for Ensuring Human Purpose – III:** Practice in philosophy, architecture, grammar, mathematics, astronomy, metrics, sociology, economy and polity, ethics, geography, logic, military science, weaponry, agriculture, mining, trade and commerce, metallurgy, shipbuilding, medicine, poetics, biology, and veterinary science.

**Suggested Readings:**


- Textbook on IKS by Prof. B. Mahadevan, IIM Bengaluru.
- Maharaj Swami Chidatmanjee, Ancient Indian Society, Anmol Publication Pvt. Ltd., India.
- S. C. Manerjee, *Society in Ancient India: Evolution since the Vedic Times Based on Sanskrit, Pali, Prakrit and Other Classical Sources: No. 1 (Reconstructing Indian History and Culture)*, DK Printing, India.
- Rao, N. (1970). *The Four Values in Indian Philosophy and Culture*. Mysore: University of Mysore.
- Chakraborti, K. (2001). *Religious Process: The Puranas and the Making of Regional Tradition*. Delhi: OUP.
- Kuhn, T. (1970). *The Structure of Scientific Revolutions* (2nd ed.). University of Chicago Press, USA.

**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Indian Philosophy | https://www.youtube.com/watch?v=ddJg3gzYEb8 |
| **Unit-II** | Indian Philosophy(Orthodox & Heterodox Systems) | https://www.nptelprep.in/courses/109106059/videos |
| **Unit-III** | Indian Knowledge Systems | https://www.youtube.com/playlist?list=PLRfu94TCePTtVPR-kC4RpIGIwo7-ViCGP |
| **Unit-IV** | Philosophy & Consciousness (Sankhya/Yoga Focus) | https://archive.nptel.ac.in/courses/109/106/109106059/ |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MDC-107B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Culture and Civilization** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are:<br>• To introduce the fundamentals of Ancient Indian Education to understand the pattern and purpose of studying Vedas, Vedangas, Upangas, Upaveda, Purana&Itihasa.<br>• To help students to trace, identify, and develop the ancient knowledge systems.<br>• To help to understand the apparently rational, verifiable, and universal solution from the ancient Indian knowledge system for the holistic development of physical, mental, and spiritual wellbeing.<br>• To build in the learners a deep-rooted pride in Indian knowledge, committed to universal human rights, well-being, and sustainable development. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | **Remember** core ideas and texts of Indian knowledge traditions. | Level-1 Remember |
| CO2 | **Understand** philosophical and scientific foundations of knowledge systems. | Level-2 Understand |
| CO3 | **Apply** traditional concepts to interpret science, language, and culture. | Level-3 Apply |
| CO4 | **Apply** integrated knowledge to real-life and managerial contexts. | Level-3 Apply |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

**Unit-I**

**Introduction to IKS:** CaturdaśaVidyāsthānam, 64 Kalas, ShilpaŚāstra, Four Vedas, Vedāṅga,Indian Philosophical Systems, Vedic Schools of Philosophy ( Sāṃkhya and Yoga,Nyaya and Vaiśeṣika, Pūrva-Mīmāṃsā and Vedānta), Non-Vedic schools of Philosophical Systems (Cārvāka, Buddhist, Jain), Puranas (Maha-puranas,Upa-Puranas and Sthala-Puranas), Itihasa (Ramayana, Mahabharata), NitiSastras, Subhasitas

## Unit-II

**Foundation concept for Science & Technology:** Linguistics & Phonetics in Sanskrit (panini's), Computational concepts in Astadhyayi Importance of Verbs, Role of Sanskrit in Natural Language Processing, Number System and Units of Measurement, concept of zero and its importance, Large numbers & their representation, Place Value of Numerals, Decimal System, Measurements for time, distance and weight, Unique approaches to represent numbers (BhūtaSaṃkhya System, Kaṭapayādi System), Pingala and the Binary system, Knowledge Pyramid, Prameya – A Vaiśeṣikan approach to physical reality, constituents of the physical reality, Pramāṇa,Saṃśaya

## Unit-III

**Indian Mathematics & Astronomy in IKS:** Indian Mathematics, Great Mathematicians and their contributions, Arithmetic Operations, Geometry (Sulba Sutras, Aryabhatiya-bhasya), value of Trigonometry, Algebra, Chandah Sastra of Pingala,Indian Astronomy, celestial coordinate system, Elements of the Indian Calendar Aryabhatiya and the Siddhantic Tradition Pancanga – The Indian Calendar System Astronomical Instruments (Yantras) JantarMantar or Raja Jai Singh Sawal.

## Unit-IV

**Indian Science & Technology in IKS:** Indian S & T Heritage, sixty-four art forms and occupational skills (64 Kalas ) Metals and Metalworking technology (Copper, Gold, Zinc, Mercury, Lead and Silver), Iron & Steel, Dyes and Painting Technology), Town & Planning Architecture in India, Temple Architecture, Vastu Sastra,

**Humanities & Social Sciences in IKS:** Health, Wellness & Psychology, Ayurveda Sleep and Food, Role of water inwellbeing Yoga way of life Indian approach to Psychology, the Triguṇa System Body-Mind-Intellect- Consciousness Complex. Governance, Public Administration & Management reference to Ramayana, Artha Sastra, Kauṭilyan State

**Suggested Readings:**


- Textbook on IKS by Prof. B. Mahadevan, IIM Bengaluru.
- Kapur, K. and Singh, A. K. (Eds.) (2005). *Indian Knowledge Systems*, Vol. 1. Indian Institute of Advanced Study, Shimla. *Tatvabodh* of Shankaracharya, Central Chinmaya Mission Trust, Bombay, 1995.
- Nair, Shantha N. *Echoes of Ancient Indian Wisdom*. New Delhi: Hindology Books, 2008.
- S. K. Das, *The Education System of Ancient Hindus*,Gyan Publication House, India.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introduction to Indian Knowledge Systems (Philosophy & Culture) | https://www.youtube.com/watch?v=5f0phlOdYvU |
| **Unit-II** | Ayurveda & Traditional Medicine in Indian Knowledge Systems | https://www.youtube.com/watch?v=xORzinU4oC8 |
| **Unit-III** | Indian Contributions to Mathematics (Ancient Mathematics & Systems) | https://www.youtube.com/watch?v=T0gCkyKVQUg |
| **Unit-IV** | Indian Astronomy & Calendar Systems | https://www.youtube.com/watch?v=JpZBaHsQ2Ws |

| Course Code | **MDC-109B** | | | | |
|---|---|---|---|---|---|
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Science, Engineering and Technology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To familiarize learners with major sequential development in Indian science, engineering and technology.<br>• To review & strengthen the ancient discovery and research in physics, chemistry, maths, metallurgy, astronomy, architecture, textile, transport, agriculture and Ayurveda etc.<br>• To help students to trace, identify and develop the ancient knowledge systems to make meaningful contribution to development of science today. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes**: After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | **Recall** key ideas, historical contributions of traditional knowledge systems. | Level-1 Remember |
| CO2 | **Understand** the principles, cultural knowledge creation and practice. | Level-2 Understand |
| CO3 | **Apply** traditional scientific concepts to explain natural phenomena, health, and technology. | Level-3 Apply |
| CO4 | **Apply** integrated knowledge to relate traditional practices with contemporary life and sustainability. | Level-3 Apply |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

## Unit-I

**Indian Traditional Knowledge;** Science and Practices: Introduction to the Science and way of doing science and research in India, Ancient Science in Intra & Inter Culture Dialogue & coevolution. Traditional agricultural practices, Traditional water-harvesting practices, Traditional Livestock and veterinary Sciences Traditional Houses & villages, Traditional Forecasting, Traditional Ayurveda & plant-based medicine, Traditional writing Technology

## Unit-II

**Ancient Indian Science (Physics, Chemistry, Maths): Physics in India:**VaisheshikaDarshan atomic theory & law of motion, theory of Panchmahabhoota, BrihathShathaka (divisions of time, unit of

distance), Bhaskaracharya (theory of gravity, Surya Siddhanta&Siddhanta Shiromani), Lilavati (Gurutvakarshan Shakti).

**Chemistry in India:**Vatsyayana, Nagarjuna, Khanda, Al-Biruni, Vagbhaṭa – building of the Ras-shala (laboratory), working arrangements of Ras-shala, material and equipment, YaśodharaBhaṭṭa – process of distillation, apparatus, saranasamskara, saranataila..**Mathematics in India:**Baudhayana'sSulbasutras, Aryabhaṭa, Bhaskaracharya-I, Severus Sebokht, Syria, Brahmagupta, Bhaskaracharya-II, Jyeṣṭhadeva.

**Unit-III**

**Ancient Indian Science (Metallurgy, Astronomy, Architecture): Metallurgy in India:**Suvarna (gold) and its different types, properties; Rajata (silver); Tamra (copper); Loha (iron); Vanga (tin); Naga / Sisa (lead); Pittala (brass).

**Astronomy in India:**VedangaJyotish; Aryabhata Siddhanta; Mahabhaskriya; Laghubhaskriya; VatesvaraSiddhanta; Sisyadhivrddhida; Grahashraya; Goladhyaya; Karana Kutuhala (Aryabhaṭa, Varahamihira, Brahmagupta, Vatesvara, Bhaskara, Paramesvara, NilakanthaSomayaji, Jyeshthadeva, Shankara Varman).

**Architecture in India:**Nagara (northern style), Vesara (mixed style), and Dravida (southern style); Indian vernacular architecture; temple style; cave architecture; rock-cut architecture; Kalinga architecture; Chandela architecture; Rajput architecture; Jain architecture; Sikh architecture; Maratha architecture; Indo-Islamic architecture; Indo-Saracenic revival architecture; Greco-Buddhist style.

**Unit-IV**

**Ancient Indian Science (Textile, Agriculture, Transport): Textile Technology in India:** Cotton (natural cellulose fiber), silk, wool (natural protein fibers), bast and leaf fibres; mridhudhautadhupaitambaram (meaning a practice of fumigating the fabric with incense smoke before use as a part of the finishing process); Sitadhautavasanayugala (bleached white – a finishing process); suchhastah, sutradharah (needle and thread – tools for stitching); dyeing, washing, spinning, and weaving technology.

**Agriculture in India:**KrishiSuktas, Krishiparashara, Brihatsamhita; types of crops; manures; types of land – devamatruka, nadimatruka; use of animals in warfare; animal husbandry; animals for medicines.

**Ancient Transport in India**

**Ancient Indian Science (Ayurveda & Yoga):Ayurveda for Life, Health, and Well-being:** Introduction to Ayurveda; understanding the human body and PanchaMahaBhuta; the communication between body & mind; health regimen for well-being; introduction to Yoga (Raja Yoga, Ashtanga Yoga, Jnana Yoga); understanding of Indian psychological concepts; consciousness; Tridosha&Triguna.

**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatva Bodh of Shankaracharya, Central Chinmay mission trust, Bombay, 1995.
- Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
- SK Das, The education system of Ancient Hindus, Gyan publication house, India
- Dharmpal, Indian science and technology in the eighteen century, rashtrottahanasahitya, 1983


**Useful VideoLinks:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Indian Traditional Knowledge & Research Culture | https://archive.nptel.ac.in/courses/121/106/121106003/? |
| **Unit-II** | Ancient Indian Science (Physics, Chemistry, Maths) | https://www.youtube.com/watch?v=T0gCkyKVQUg |
| **Unit-III** | Ancient Indian Science (Metallurgy, Astronomy, Architecture) | https://www.youtube.com/watch?v=r5KTrbJlKAA |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MDC-111B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Town Planning and Architecture** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To develop the knowledge and analysis on the understanding of eco-friendly, robust and scientific planning and architecture system of ancient India.<br>• To understand the importance of functional, aesthetic, psychological, culture and socio religious concept of ancient India architecture.<br>• To help the learners to trace, identify and develop the approach, process and material used in town and planning, construction and architecture.<br>• To understand the various eco-friendly technology accepted in ancient civilization | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes**: After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | **Recall** the concepts related to human settlements and architectural traditions. | Level-1Remember |
| CO2 | **Understand** how culture, environment, and human needs influence-built forms. | Level-2Understand |
| CO3 | **Apply** principles of form, space, materials in architectural examples. | Level-3Apply |
| CO4 | **Apply** analytical understanding to compare regional and period-based architectural practices. | Level-3Apply |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

## Unit-I

**The Introduction to ancient Architecture:** Introduction to relationship between Man, Nature, Culture and city forms. Study of determinants (Natural and man-made) influencing location, growth &pattern of human settlements including types of settlements growth (Organic and planned) and settlement forms. Architecture as satisfying human needs: functional, aesthetic and psychologicaloutline of components and aspects of architectural form-site, structure, skin, materials, services, use, circulation, expression, character, experience. Understanding of the causative forces - the cultures, history, socio religious practices and institution, political and economic conditions, issues of land, climate and technology, Historical and Primitive Architecture.

## Unit-II

**Ancient Architecture as Expression of Art & Design:** Relationship between Art and Design with man, space and environment. Expression in Art and Architecture – concept of space, sense of enclosure openness,robustness, dynamism, spatial geometry, Eco-friendliness. Architecture through use of elements of visual arts such as point, line, plane, form, space, colour, texture, light, solids and voids, shadow and shade etc. Understanding of effect of scale, proportions, order, material effects such as textures, patterns, light, sound, temperature etc. in architectural spaces.

Allied visual and performing arts and its relationship to build environments using colour theory, symbolism, glass painting, scriptural writing, clay moulding, and stone carving. Important Indian architecture as per elements space & form: specific geometry form (sphere, cube, pyramid, cylinder and cone and its sections as well as their derivatives) Space: build form space, open space, Internal and External space, Continuous spaces Centralized, Linear, Radial Clustered, Grid space Different type of Materials used for construction in Ancient Indian architecture. Clay products: Classification of bricks, Fire Brick, Fly Ash Bricks, Tiles, Terracotta, Earthenware, Porcelain, Stoneware. Stones: Uses of Stones, Qualities of Good Building Stones, Dressing, Common Building Stones of India. Glass: Different glass Forms and their Suitability, Timber: Different Forms and their Suitability Metals: Ferrous & Nonferrous Metals and Alloys, and, their Suitability, limitations, precautions Paints and Varnishes: Different types and their Suitability, limitations, precautions

## Unit-III

**Ancient Architecture Principle & Planning:** Design: Principles of designing – Composition of Plan. Inception and development of the early Hindu temple form with reference to Vedic and

Buddhist planning principles and design elements; Development of regional styles and manifestations thereof; Evolution of temple complexes and temple towns; planning: Residence- site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Vastushastra and its importance in building interrelationship with human, nature and cosmos Town Planning: Town plans of Harappa, Mohenjo-Daro, Pataliputra, and Delhi. Vastushastra and its application in city layout.

## Unit-IV

**Ancient Architecture-I:** The settlement planning pattern, elements, associated forms, typical Vedic village, towns (Dandaka, Nandyavartha etc.), typology of Shelters and civic buildings of ancient architecture in reference to following civilization: Indus Valley, Aryan/Vedic Civilisation, Buddhist Architecture, Indo Aryan & Dravidian Architecture. Role of Shilpasastras and Arthashastra in settlement planning. Important architecture: Great baths, Development of fortification, walled towns, structures developed e.g.: Stupas, Viharas, Chaityas, Stambhas, Torana, sacredrailingetc. Study of worshipping places with especial reference to Indo Aryan / Nagarastyle & Dravidian style (Chola, Chalukya, Pallava, Satavahana, Hoysala,Vijayanagar etc.), design of shikharas&gopuram, rock-cut and structural examples of temples.

**Ancient Architecture-II:** Evolution of Hindu Temples in different period: Gupta, Aihole, Badami,

Pattadakkal, Mahabalipuram, Indo Aryan Style in Orrisa, Khajuraho, Gujarah,Rajasthan. Dravidian Style in Chola, Chalukyan, Pandya, Pallava, HoysalaStyle, Revival of Hindu architecture of South India at Vijaynagara and Madurai Tradition Indian villages & House: Regional house construction, interior &importance e.g. Rajasthani house, bhungas of Kutch, nalukettu of Kerala, Ikraofassam, manduvalogili or illu of Andra Pradesh, Wadas of Maharashtra, Mudhouses of Madhya Pradesh, kathkuni of Himachal Pradesh, khanjagharaoforisha, Taq and dhajjidiwari of Kashmir etc.Scientific achievements though ancient architect: JantarMantar, MusicalPillars of Vitthal temple, Sundial of Konark temple, construction of eight

shivatemple in straight line from Kedarnath to Rameshwaram at longitude 79oE41’54, Veerbhadra temple with 70 hanging pillars, Ellora caves excavating the mountain, Jaipur plan pink city etc.

**Suggested Readings:**


- Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru.
- Kapur K and Singh A. K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatva Bodh of Shankaracharya, Central Chinmay mission trust, Bombay, 1995.
- Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.
- Dr. V. Ganapati Sthapati, Building Architecture of Sthapatya Veda
- BinodeBehariDutt, Town planning in ancient India, Life Span Publishers & Distributors
- NR Dave, A Study of The Hindu Science of Architecture and its Practice with Special Reference to Raja Vallabha, Bharti Vaidya Bhavan, 2011
- M W Meister, South India Lower DravidaDesa - Encyclopaedia of Indian Temple Architecture (Set of 2 Books)- An Old and Rare Books, American Institute of Indian Studies, 1999
- D N Shukla Civil Architecture in Ancient India (Part-I) Meharchand Lakshmi Das publication, 2016.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Early Architecture & Human Settlemen | https://www.youtube.com/watch?v=zq8t_XnJhTQ |
| **Unit-II** | Buddhist, Early Temple & Built Forms | https://www.youtube.com/watch?v=zq8t_XnJhTQ |
| **Unit-III** | Temple Evolution & Material/Spatial Concepts | https://www.youtube.com/watch?v=7Bx9UYSIIDk |
| **Unit-IV** | Historical Examples & Site Planning | https://www.nptelprep.in/courses/124106009/videos? |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **MDC-113B** | | | | |
| Category | Multidisciplinary Courses | | | | |
| Course Title | **Indian Health, Wellness and Psychology** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To Understand the fundamental principles of Indian health systems such as Ayurveda and yoga which are useful in maintaining the health of a healthy person<br>• Understand traditional way of cleansing the body regularly, strengthening body with Yogic exercises, maintaining the internal balance to prevent diseases<br>• To understand our unique Mind Body Constitution and choosing the right lifestyle suitable to maintain the internal balance.<br>• Understanding mind and its dynamics through knowledge of Ayurveda and Yoga and using the knowledge to maintain harmony between body and mind to achieve perfect mental health. | | | | |
| Assessment | 50 Marks | | | | |
| End Semester Examination | 50 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | Recall fundamental concepts related to human constitution, health maintenance, and mind–body interrelationships. | Level-1Remember |
| CO2 | Explain how internal balance, lifestyle practices, and mental factors influence overall wellbeing and immunity. | Level-2 Understand |
| CO3 | Apply principles of daily and seasonal routines, diet, and self-care practices to promote physical and mental health | Level-3 Apply |
| CO4 | Apply integrative mind–body principles to enhance resilience, self-awareness, and holistic health in everyday life. | Level-3 Apply |

**Note:** Examiner will set nine questions in total. Question one will have 5 short questions of 2 marks (each) from all units. Remaining eight questions of 10 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit.

**Unit-I**

**Understanding human body:** Introduction to Ayurveda, the Knowledge of Life, Health and treatment aspectsin Ayurveda, Influence of PanchamahaBhuta on Internal environment of Human being, understanding composition of Human body through the concept of DoshaDhatu Mala, Understanding Prakruthi, the Mind – Body Constitution.

**Unit-II**

**Understanding the communication between body & Mind:** Establishing communication between body and mind by understanding the language of body. Understanding the concept of Agni, Koshta, Sara and Ojasand their relevance in enhancing our immunity to protect from various infections. Looking at the world through the lenses of Dravya, Guna and Karma Applying the principle of Samanya and Visesha in every aspect of life to achieve perfect health.

## Unit-III

**Introduction to Health Regimen:** Understanding Swasthavritta, the healthy regimen to maintain state of wellbeing Dinacharya, the Daily regimen including Daily detoxification, exercise, Intake of Food, Water, Air and Sunlight, work and ergonomics, Rest and sleep hygiene. Ritucharya, the seasonal regimen, Sadvritta and the concept of social wellbeing, understanding trividhaupastambhas, three pillars to health, Concept of Shadrasa in choosing appropriate nourishment to the body and mind.

## Unit-IV

**Introduction to Yoga:** Definition, Meaning and objectives of Yoga, Relevance of yoga in modern age. Brief Introduction of Hatha yoga, Raja yoga, Karma yoga, Gyana Yoga, Bhaktiyoga Understanding eight steps of Ashtanga yoga, Understanding Shatkriyas, the six cleansing procedures of Yoga

**Introduction to Indian Psychology:** Concept of Manas in Ayurveda and understanding Mind Body harmony, Triguna based Psychology in Ayurveda and Yoga, Influence of Tri dosha on Mind, Mind body intellect and consciousness complex, Understanding Consciousness and solution to issues within Human Mind.

**Suggested Readings:**


- Dr Deepak Chopra, Perfect Health--Revised and Updated: The Complete Mind Body Guide, Harmony publication, 2001
- Vasant lad, Ayurveda, the Science of Self-healing: A Practical Guide: Science of Self- healing, lotus press, 1984
- BKS Iyengar, Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority, thronson publication, 2006
- SwamySatyanandaSaraswati, Asana, Pranayama, Mudra and Bandha, Bihar School of Yoga, 2002


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Introductory Concepts & Roots of the Tradition | https://www.youtube.com/watch?reload=9&v=16-q-V9lG5w&embeds_referring_euri=https%3A%2F%m%2F |
| **Unit-II** | Human Body, Constitution & Balance | https://www.youtube.com/watch?v=ty9ZfluxOFk&embeds_referring_euri |
| **Unit-III** | Healthy Living & Well-Being (Daily/Seasonal Regimen) | https://www.youtube.com/watch?v=9AJseqmcrfQ |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **AEC-101B** | | | | |
| Category | Ability Enhancement Course | | | | |
| Course Title | **General English-I** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 1 | 1 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To build a strong foundation in Basic English grammar, including parts of speech, subject-verb agreement, and determiners.<br>• To understand the communication process, barriers, and types of communication, while developing strategies for effective interaction.<br>• To develop listening, speaking, and reading skills, focusing on active listening, public speaking, and voice modulation.<br>• To gain proficiency in writing notices, memos, circulars, and business letters with correct structure and layout. | | | | |
| Assessment | 65 Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes: After** successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Explain** the basics of English grammar and communication for effective interactions. | Level-1Remember |
| CO2 | **Describe** the parts of speech, communication barriers, listening strategies and Frame technical documents. | Level-2Understand |
| CO3 | **Apply** grammar rules, communication principles and skills in personal and Professional contexts. | Level-3Apply |
| CO4 | **Apply** the knowledge of grammar and LSRW skills to communicate effectively. | Level-3Apply |

Note: Examiner will set nine questions in total. Question one will have 07 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first question being compulsory and selecting one from each Unit. At least four cases will be discussed, one from each unit.

**Unit-I**

Basics of English Grammar: Parts of Speech, Conjunction, Prepositions, Articles, Subject-Verb Agreement and Noun-Pronoun Agreement, Determiners.

## Unit-II

Basics of Communication: Definition, Nature, Importance of Communication, Communication Process ,Barriers to Effective Communication and Overcoming Strategies,Types of Communication, Communication Networks.

## Unit-III

Enhancing LSRW Skills: Listening Skills, Cognitive Process of Listening, Types of Listening, Active ListeningTechniques, Barriers to Effective Listening, Speaking Skills, Public Speaking, Voice Modulation, Reading Skills.

## Unit-IV

Technical Writing: Notices, Memo, Circulars, Structure and Layout of Business Letters, Structure, Layout and Types of Letters.

**Suggested Readings:**


- Business Communication Process and Product by Mary Ellen Guffey and Dana Loewy, Cengage Learning
- Effective Communication Skill by John Nielsen, NTC/Contemporary Publishing Company
- Public Speaking for Success by Dale Carnegie, Per Capita Publishing
- Word Power Made Easy by Norman Lewis, Goyal Publishers & Distributors PvtLtd.
- English Grammar in Use by Raymond Murphy, Cambridge University Press


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Basics of English Grammar | https://youtu.be/3oIAICs8N9I?si=B |
| **Unit-II** | Basics of Communication | https://youtu.be/J3oVY0O4PYk?si=3a5hO-SUga5H-ZDQ |
| **Unit-III** | Enhancing LSRW Skills | https://youtu.be/yyUiEp5ny_Y?si=o0VkCYDW4EP4v3PD |
| **Unit-IV** | Technical Writing | https://www.youtube.com/watch?v=BO7j-X87rM8 |

| | | | | | |
|---|---|---|---|---|---|
| Course Code | **VAC-113B** | | | | |
| Category | Value Added Course | | | | |
| Course Title | **Environmental Studies** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 2 | 0 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand the basics of environmental studies, ecosystems, and sustainability.<br>• To explore renewable and non-renewable resources, their issues, and conservation strategies.<br>• To understand biodiversity, its value, threats, and conservation methods.<br>• To understand pollution, climate change andsolutionsfor environmental disasters. | | | | |
| Assessment | 65Marks | | | | |
| End Semester Examination | 35 Marks | | | | |
| Total | 100 Marks | | | | |
| Duration of Exam | 03 Hours | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| **COs** | **Skills Demonstrated** | **RBT Level** |
|---|---|---|
| CO1 | **Recall** key environmental concepts and principles. | Level-1Remember |
| CO2 | **Describe** the environment, sustainability, natural resources, biodiversity, pollution and disaster. | Level-2Understand |
| CO3 | **Apply** environmental knowledge to propose solutions for sustainable practice , Conversation of natural resources, pollution control and disaster management. | Level-3Apply |
| CO4 | **Analyze** the structure and function of ecosystem, effect of human activities on Natural resources, types of biodiversity and role of individual in environment pollution. | Level-4Analyze |

Note: Examiner will set nine questions in total. Question one will have 7 short questions of 1 mark (each) from all units. Remaining eight questions of 7 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total; first question is compulsory and selecting one from each Unit.

**Unit-I**

**Introduction to Environmental Studies**: Multidisciplinary Nature of Environmental Studies, Scope and Importance, Concept of Sustainability and Sustainable Development, Ecosystem, Introduction, Characteristic and Features, Structure and Function of the following Ecosystem-Forest Ecosystem, Aquatic Ecosystems (Ponds, Lakes, Rivers, Oceans).

## Unit-II

**Renewable and Non-renewable resources:** Natural Resources and Associated Problems, Forest Resources – (Use and Over-Exploitation, Deforestation, Timber Extraction, Mining, Dams and their Effects on Forestland Tribal People), Water Resources – (Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams Benefits and Problems), Land Resources–(Land as a Resource, Land Degradation, Role of an Individual in Conservation of Natural Resources).

## Unit-III

**Biodiversity** and its Conservation: Introduction, Genetic, Species and Ecosystem Diversity, Biogeographically Classification of India, Value of Biodiversity, Consumptive Use, Productive Use, Social Use, Ethical Use, Threats to Biodiversity, Habitat Loss, Poaching of Wildlife, Man Wildlife Conflicts, Conservation of Biodiversity: Benefits and Name of the Methods of in-Situ and Ex-Situ Conservation of Biodiversity.

## Unit-IV

Environmental Pollution: Definition, Causes, Effects and Control Measures of (Air Pollution and Water Pollution), Role of an Individual in Prevention of Pollution, Disaster Management: Meaning, Reason and Solutions of Floods, Earthquake, Cyclone and Landslides, Meaning of Climate Change, Reasons and Solution to Greenhouse Gases, Acid Rain and Global Warming.

**Suggested Readings:**


- Text Book of Environmental Studies by D.K.Asthana, S.ChandPublishing.
- Fundamentals of Environmental Studies by M.Basu, S.Xavier, Cambridge University Press.
- Environment, edited by R.N.Basu, University of Calcutta, Kolkata.
- Environmental Science by T.O.Miller Jr., Wads worth PublishingCo.
- EnvironmentalManagementbyK.D.Wagner,W.B.SaundersCo.,Philadelphia


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | Multidisciplinary nature of environmentalStudies | https://nptel.ac.in/courses/122102006 |
| **Unit-II** | Renewable and non-renewable resources | https://archive.nptel.ac.in/courses/121/106/121106014 |
| **Unit-III** | Biodiversity and its conservation | https://nptel.ac.in/courses/129105008 |
| **Unit-IV** | Environmental Pollution | https://archive.nptel.ac.in/courses/123/105/123105001/ |

| Course Code | **AEC-103B** | | | | |
|---|---|---|---|---|---|
| Category | Ability Enhancement Course | | | | |
| Course Title | **French Language** | | | | |
| Scheme and Credits | L | T | P | **Credits** | **Semester-I** |
| | 1 | 1 | 0 | **2** | |
| Course Objectives | The objectives of this course are<br>• To understand foundational language skills necessary for basic communication, including introducing themselves and others, describing places, and talking about their surroundings.<br>• To focus on enhancing students' ability to express personal likes, interests, and other simple ideas, ensuring their ability to engage in basic communicative transactions.<br>• To achieve a partial A1 level by the end of the semester according to the Common European Framework, which will enable them to handle simple communication in everyday situations. | | | | |

**Course Outcomes:** After successful completion of this course, the students will be able to

| COs | Skills Demonstrated | RBT Level |
|---|---|---|
| CO1 | **Define** key concepts related to reading, listening, speaking, and writing in English, focusing on every day communication. | Level-1Remember |
| CO2 | **Explain** basic communication techniques for understanding texts, listening to Simple conversations, and expressing oneself in writing. | Level-2Understand |
| CO3 | **Apply** reading skills to use simple texts (e.g., notices, short passages, emails) and extract relevant information to answer questions or complete given tasks. | Level-3Apply |
| CO4 | **Apply** listening skills to understand simple conversations or audio messages and respond appropriately by completing activities such as answering questions or writing brief personal messages. | Level-3Apply |

**Unit-I**

**Reading:** Reading Simple Texts Related to One's Immediate Environment such as Notices, Posters, Catalogs, Fliers, Personal Messages or Emails and Answering Questions on them.

**Unit-II**

**Listening:** Understanding familiar Words and very Basic Phrases about Oneself, One's Family, and Immediate Concrete Surroundings, such as Very Brief Announcements in Public Spaces, Short, Simple Formal/Informal Conversation, Questions and Instructions. When Speakers are speaking at a Slower Pace.

**Unit-III**

**Writing:** Guided Writing will include activities such as, filling a Form, Writing Simple Phrases (Postcards, Messages, Invitations etc.) on everyday Topics.

## Unit-IV

**Speaking: Monologue:** Describing and presenting oneself, one's Immediate Environment and the People S/He Knows Using Simple Phrases and Sentences.
**Dialogue:** Taking part in a Conversation and Interaction in a Simple way provided the other Person is prepared to repeat or to Rephrase more slowly and help Formulate what s/he is trying to say asking simple Questions on familiar Topics or Matters related to one's Immediate Environment. Making simple Purchases in Shops or Obtaining Services that one requires.

**Suggested Readings:**


- Kizirian, V. M, Daill, E., Berthet, A., Hugot, C., Waendendries, M. Alter Ego + 1. Paris: Hachette.
- Berthet, A., Daill, E., Hugot, C., Waendendries, M. Alter Ego + 1, Cahierd' activités. Paris: Hachette.
- Hachette,Y.,Mérieux,R.Latitudes1,(Livredel'élève&Cahierd'exercices).Paris:Didier.
- Cocton, M-N., Dupleix, D., Heu, E., Kasazian, E., Ripaud, D. Saison1, (Livredel'élève& Cahier d'exercices). Paris : Didier.
- Denyer, M., Garmendia, A., Lions-Olivieri, M-L.Version Originale1, Livredel'élève. Paris:EditionsMaisonsdesLangues.
- Magne, M., Lions-Olivieri, M-L. Version Originale 1, Cahierd'exercices. Paris: Editions MaisonsdesLangues.


**Useful Video Links:**

| Unit No | Topics | Links |
|---|---|---|
| **Unit-I** | French Absolute Beginners Guide | https://www.youtube.com/watch?v=Sk6YQynZ1h8 |
| | Learn how to read in French | https://www.youtube.com/watch?v=sSCEoAWw0q4 |
| **Unit-II** | French Listening Practice -50 Everyday French Sentences | https://www.youtube.com/watch?v=Aofb0XEJIks |
| **Unit-III** | Learn how to write French with me | https://www.youtube.com/watch?v=9iUiei9YMCk |
| **Unit-IV** | Slow and Easy French Conversation Practice | https://www.youtube.com/watch?v=ReVCwcHwnZI |

**Annexure 3.40**

GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR
An Autonomous Institute| NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

## MINUTES OF THE MEETING

**Minutes of meeting of the Academic Committee of the Institute was held on 17th May, 2025.**

The Meeting of the Academic Committee of the Institute was held on 17th May, 2025 in the Board Room of the Institute.

The following members were present in the meeting

- Prof. Aman Aggarwal, Director GITAM
- Dr Vivek Kumar, Registrar
- Dr Anurag Jain, Head, Department of Applied Science & Humanities.
- Dr Punam Devi, Head, Department of Management
- Dr Rakesh Kumar Joon, Head, Department of Electronics & Communication Engineering.
- Dr Nitin Kumar, Head, Department of Computer Science & Engineering
- Dr. Jitender Kumar, Head, Department of Fire Technology & Safety
- Mr. Joginder Singh, Head, Department of Electrical Engineering
- Mr. Vivek, Head, Department of Mechanical Engineering.
- Mr. Jitender Singh, Head, Department of Computer Science & Applications

**Agenda**

1. Approval of AICTE approved programs for Working Professionals
2. Preparation of the Modalities and guidelines for running the Programs for Working Professionals
3. Explore the feasibility of Faculty and Infrastructure requirement to run these programs
4. Proposal to offer B.Tech Honours/Minor as per AICTE Guidelines
5. Academic Calendar for the Academic Session 2025-26
6. Any other Item with the permission of chair.

At the outset, the Director welcomed all the members present in the meeting. After that the agenda was taken up for the discussion.

**Proceedings of the Meeting**

**Item No. 1: Approval of AICTE approved programs for Working Professionals**

The Registrar informed all members of Academic Committee that the AICTE vide **F. No. North-West/1-44641001793/ 2025/EOA** on dated 03.04.2025 **(Annexure A1, Pages 1-6)** has granted the approval to offer the following programs for working professionals:

Ganga Institute of Technology and Management
DIRECTOR
Kablana, Jhajjar

| Level | Program | Course | Working Professional Approved Intake 2025-26 |
|---|---|---|---|
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING | 60 |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | FIRE TECHNOLOGY AND SAFETY | 60 |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING | 60 |
| POST GRADUATE | MANAGEMENT | MBA | 60 |

Further the committee discussed that as per **Clause 10.2 (Page No. 15)** of UGC regulations for Autonomous college (Gazetted notification) "*An autonomous college is free to start a new degree programme(s) at undergraduate and postgraduate levels with the approval of the Academic Council of the Autonomous College and concerned Statutory Council(s), wherever required, provided the nomenclature of the degree is in consonance with UGC Notification on Specification of Degrees, 2014 as amended from time to time. Such courses shall fulfill the minimum standards prescribed by the parent university/UGC/Statutory Council(s) in terms of number of hours, curricular content and standards, and the parent University shall be duly informed of such courses*" **(Annexure A2, Page 7).**

**RESOLVED THAT THESE PROGRAMS ARE TO BE OFFERED BY THE INSTITUTE W.E.F. ACADEMIC SESSION 2025-26 AND FURTHER RESOLVED THAT THE SAME IS RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.**

**Item No. 2: Preparation of the modalities and guidelines for running the Programs for Working Professionals**

The committee discussed on the modalities and AICTE guidelines for running B.E./B.Tech Program for Working Professionals in AICTE approved Institutions vide Circular No. AICTE/P&AP/APH/2023-24/01 dated 24.08.2023 and Circular No. AICTE/RB/Misc./2023-24 Dated 21.03.2024 **(Annexure A3, Pages 8-11)**

(i) Minimum Admission required to run the Course (Program) is 1/3 of the Approved Intake in Each Course

(ii) **Eligibility:**

**A. B.Tech (Fire Technology and Safety) and B.Tech (Computer Science and Engineering) (for Working Professionals)**

(a) Professionals working in Registered Industry/ Organization (Central/State)/Private/Public Limited Company/MSMEs located within 50 KM radial distance from the Institute.

Further as per the Circular No. AICTE/RB/Misc./2023-24 Dated 21.03.2024 the distance criteria for the eligibility of a working professionals as mentioned in the aforesaid guidelines is modified to the extent "The existing to 75KM either from place of residence/working place to the enrolled institutions".

(b) Minimum of ONE Year Full time/Regular working Experience



(c) **Qualification** Same as candidates eligible for Lateral Entry to Second Year (As Specified in Approval Process Handbook published by AICTE from time to time)

**B. M.Tech Computer Science and Engineering (For Working Professionals)**

(a) Professionals working in Registered Industry/ Organization (Central/State)/Private/Public Limited Company/MSMEs located within 50 KM radial distance from the Institute.

Further as per the Circular No. AICTE/RB/Misc./2023-24 Dated 21.03.2024 the distance criteria for the eligibility of a working professionals as mentioned in the aforesaid guidelines is modified to the extent "The existing to 75KM either from place of residence/working place to the enrolled institutions".

(b) Minimum of ONE Year Full time/Regular working Experience

(c) **Qualification:** B.E./ B.Tech. or equivalent degree in Computer Science & Engineering/ Computer Engineering/Information Technology/ Electronics & Communication Engineering/ Electronics Engineering / Electrical & Electronics Engineering/ Electronics & Instrumentation Engineering / Electrical Engineering or Master of Computer Applications (MCA) or M.Sc. (Computer Science/IT/ Software) or M.Sc. (Mathematics.) or M.Sc. (Physics) or any other relevant program with at least 50% (47.50% marks for SC/ST candidates of Haryana only) marks in aggregate (As Specified in Approval Process Handbook published by AICTE from time to time or MDU Rohtak Prospectus).

**C. Master of Business Administration- MBA (For Working Professionals)**

(a) Professionals working in Registered Industry/ Organization (Central/State)/Private/Public Limited Company/MSMEs located within 50 KM radial distance from the Institute.

Further as per the Circular No. AICTE/RB/Misc./2023-24 Dated 21.03.2024 the distance criteria for the eligibility of a working professionals as mentioned in the aforesaid guidelines is modified to the extent "The existing to 75KM either from place of residence/working place to the enrolled institutions".

(b) Minimum of ONE Year Full time/Regular working Experience

(c) **Qualification:** Bachelor/ Post Graduate Degree in any discipline with not less than 50% marks (47.5% marks for SC/ST/ Blind/ Visually and Differently Abled candidates of Haryana only) in aggregate or any examination recognized by M.D. University, Rohtak as equivalent thereto (As Specified in Approval Process Handbook published by AICTE from time to time or MDU Rohtak Prospectus)

(iii) **Duration of the Course**

(A) The duration of the Course will be as follows:

DIRECTOR

(a) **B.TECH:** Same as Lateral Entry to Second Year with a total course duration NOT less than THREE years, so as to fulfill the total contact hours as prescribed by the Affiliating University/ Autonomous Institute for completion of duration of the course.

(b) **M.TECH:** A total course duration NOT less than TWO years, so as to fulfill the total contact hours as prescribed by the Affiliating University/ Autonomous Institute for completion of duration of the course.

(c) **MBA:** A total course duration NOT less than TWO years, so as to fulfill the total contact hours as prescribed by the Affiliating University/ Autonomous Institute for completion of duration of the course.

(B) Timing for conduct of classes normally shall be in the evening hours/any flexible convenient timings (including weekends/holidays) in alignment with timings of Industry/Organization or as per the AICTE guidelines published from time to time.

(C) Mode of Conduct of Classes shall be applicable for Regular Programs as defined in the AICTE Public Notice Vide No. AICTE/AB/Academics/2020-21, dated 13th August, 2020.

(iv) **Academic Requirements**

(a) Total credits as specified in the AICTE Model Curriculum/ Affiliating University/ Autonomous Institute are required to be earned for getting the Degree.

(b) As per AICTE Regulation up to 40% of credit transfer is permitted through MOOCs/SWAYAM.

(v) **Mode of Admission or Admission Policy**

(a) Guidelines notified by AICTE from time to time shall be adopted by the Institutions having approval under **Clause (2.6 (i))** for effecting admissions to the Working Professionals

(b) As per the University/State Admission Policy. In absence of any such Admission Policy in respect of working professionals, Institute can devise transparent mechanism for short listing the eligible candidates in highly transparent manner based on Merit of Qualifying Examination.

(c) Reservation Policy of the State is applicable as Specified in MDU Rohak Prospectus

**RESOLVED THAT THE MODALITIES AND GUIDELINES MENTIONED ABOVE ARE APPROVED AND FURTHER RESOLVED THAT THE SAME IS RECOMMENDED TO ACADEMIC COUNCIL FOR APPROVAL.**

**Item No. 3: Explore the feasibility of Faculty and Infrastructure requirements to run these programs**

The committee explore the feasibility of Faculty and Infrastructure requirements as per the AICTE guidelines for running B.E./B.Tech Program for Working Professionals in AICTE approved Institutions vide Circular No. AICTE/P&AP/APH/2023-24/01 dated 24.08.2023 and resolved that

(i) **Faculty & Staff Requirements**

(a) Existing Faculty in the Institute/ Industry Experts with requisite qualification as per AICTE Norms are permitted with additional remuneration / honorarium as per the Institute Norms.
(b) Existing Staff (Technical/ Supporting) are permitted with additional remuneration/ honorarium as per the Institute Norms.

(ii) **Infrastructure Requirements**

Existing Infrastructure can be used

**RESOLVED THAT THE SAME IS APPROVED AND RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.**

**Item No. 4: Proposal to offer B.Tech Honours/Minor as per AICTE Guidelines**

The Academic Committee discussed the B.Tech Honours/Minor as per AICTE Guidelines with required no. of credits. The members were in the view that the guidelines, suitability of specilizations/ minor courses are to be prepared and the matter should be put up in Academic Council for discussion and approval.

**RESOLVED THAT THE SAME IS RECOMMENDED TO THE ACADEMIC COUNCIL FOR CONSIDERATION AND APPROVAL.**

**Item No. 5: Academic Calendar for the Academic Year 2025-26**

The Academic Committee discuss the Academic Calendar for the Academic Year 2025-26 **(Annexure A4, Page 12).**

**RESOLVED THAT THE ACADEMIC CALENDAR IS APPROVED AND FURTHER RESOLVED THAT THE SAME IS RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL.**

Registrar

Director

# All India Council for Technical Education

(A Statutory body under Ministry of Education, Govt. of India)

Nelson Mandela Marg,Vasant Kunj, New Delhi-110070 Website: www.aicte-india.org

## APPROVAL PROCESS 2025-26

## Extension of Approval (EoA)

F.No. North-West/1-44641001793/2025/EOA

Date of Approval: 03-Apr-2025

To,

The Financial Commissioner & Principal Secretary
(Technical) Govt. of Haryana,
Room No. 503/5,
Sector -17 New Secretariat,
Chandigarh-160017

**Sub: Extension of Approval for the Academic Year 2025-26**

Ref: Online application of the Institution submitted for Extension of Approval for the Academic Year 2025-26

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Education), Powers delegated in AICTE ACT 1987, (No 52 of 1987) chapter II - u/s 2(g) to regulate Technical and subsequent Regulations of AICTE, I am directed to convey the approval to:

| | | | |
|---|---|---|---|
| Permanent Id | 1-8077204 | Application Id | 1-44641001793 |
| Name of the Institution | GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT | Name of the Society/Trust | PAWAN GANGA EDUCATIONAL SOCIETY |
| Institution Address | 20 KM MILESTONE, JHAJJAR-BAHADURGARH ROAD VILL. KABLANA, DISTT. JHAJJAR, HARYANA, KABLANA, JHAJJAR, Haryana, 124104 | Society/Trust Address | 4/12, EAST PUNJABI BAGH,NEW DELHI,WEST DELHI,Delhi,110026 |
| Institution Type | Private-Self Financing | Region | North-West |
| Year of Establishment | 2008 | | |

To conduct following Programs/Courses with the Intake indicated below for the Academic Year 2025-26

| Level | Program | Course | Affiliating Body (University /Body) | Intake Approved for 2024-25 | Intake Approved for 2025-26 | NRI Approval Status | FN / Gulf quota/ OCI/ Approval Status |
|---|---|---|---|---|---|---|---|
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | CIVIL ENGINEERING | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE & ENGINEERING | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |

Application No:1-44641001793

Note: This is a Computer generated Report. No signature is required.

Printed By : ae977997

ALL INDIA COUNCIL FOR TECHNICAL EDUCATION

Ganga Institute of Technology and Management

Page 1 of 6

Letter Printed On:20 June 2025

To conduct following Programs/Courses with the intake indicated below for the Academic Year 2025-26

| Level | Program | Course | Affiliating Body (University /Body) | Intake Approved for 2024-25 | Intake Approved for 2025-26 | NRI Approval Status | FN / Gulf quota/ OCI Approval Status |
|---|---|---|---|---|---|---|---|
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINFERING | Maharshi Dayanand University, Rohtak | 120 | 120 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING) | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE) | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | ELECTRICAL ENGINEERING | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | ELECTRONICS & COMMUNICATION ENGG | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | FIRE TECHNOLOGY AND SAFETY | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | MECHANICAL ENGINEERING | Maharshi Dayanand University, Rohtak | 60 | 60 | No | No |
| POST GRADUATE | MANAGEMENT | MBA | Maharshi Dayanand University, Rohtak | 240 | 180 | No | No |
| POST GRADUATE | COMPUTER APPLICATIONS | MASTERS IN COMPUTER APPLICATIONS | Maharshi Dayanand University, Rohtak | 120 | 120 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | ELECTRONICS & COMMUNICATION ENGG | Maharshi Dayanand University, Rohtak | 30 | 18 | No | No |

Application No:1-4464 1001793
Note: This is a Computer generated Report. No signature is required.
Printed By : ee877997

To conduct following Programs/Courses with the Intake indicated below for the Academic Year 2025-26

| Level | Program | Course | Affiliating Body (University /Body) | Intake Approved for 2024-25 | Intake Approved for 2025-26 | NRI Approval Status | FN / Gulf quota/ OCI Approval Status |
|---|---|---|---|---|---|---|---|
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE & ENGINEERING | Maharshi Dayanand University, Rohtak | 30 | 30 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | ELECTRICAL POWER SYSTEMS | Maharshi Dayanand University, Rohtak | 30 | 18 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | MACHINE DESIGN | Maharshi Dayanand University, Rohtak | 12 | 12 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | STRUCTURAL DESIGN | Maharshi Dayanand University, Rohtak | 60 | 42 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | CYBER FORENSICS AND INFORMATION SECURITY | Maharshi Dayanand University, Rohtak | 12 | 12 | No | No |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | MANUFACTURING AND AUTOMATION | Maharshi Dayanand University, Rohtak | 18 | 12 | No | No |

To conduct following Programs/Courses with the Intake indicated below for the Academic Year 2025-26

| Level | Program | Course | Affiliating Body (University /Body) | Intake Approved for 2025-26 | NRI Approval Status | FN / Gulf quota/ OCI Approval Status |
|---|---|---|---|---|---|---|
| UNDER GRADUATE | MANAGEMENT | BBA | Maharshi Dayanand University, Rohtak | 180 | No | No |
| UNDER GRADUATE | COMPUTER APPLICATIONS | BCA | Maharshi Dayanand University, Rohtak | 240 | No | No |

***Note:***

***A) The approval of BBA/BCA/BMS courses is on "as is where is basis" Intake Approved for BBA/BCA/BMS Course is Subject to the approval of the Concern University.***

***B) From next year onwards, the EOA will be issued as per the AICTE norms and not on 'As is where is basis'***



To conduct following Programs/Courses for Working Professional for the Academic Year 2025-26

| Level | Program | Course | Working Professional Approved Intake 2025-26 |
|---|---|---|---|
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE AND ENGINEERING | 60 |
| UNDER GRADUATE | ENGINEERING AND TECHNOLOGY | FIRE TECHNOLOGY AND SAFETY | 60 |
| POST GRADUATE | ENGINEERING AND TECHNOLOGY | COMPUTER SCIENCE & ENGINEERING | 60 |
| POST GRADUATE | MANAGEMENT | MBA | 60 |

All AICTE approved Institutions are empowered to nurture ecosystems for Skilling (through Vocational courses) via making effective use of existing infrastructure facilities and human resources.

**It is mandatory to comply with all the essential requirements as given in APH 2024-27 (Chapter-VI)**

Chanya Institute of Technology and Management
DIRECTOR
Kalaburagi

## Important Instructions

1. As per mandatory Disclosure of APH 2024-27(Annexure-18, page180) Institutions must disclose the following information submitted to Council at the Prominent location on its website.
   i. Department wise availability of Infrastructure along with approved courses and intake approved by the Council.
   ii. Faculty details: Department wise: Name& Designation of the faculty members/teaching staff along with their qualification, tenure of service in your organization, total experience, Institution should also disclose Student Faculty Ratio, Cadre Ratio
   iii. Additionally Audited Financial Statements for last 3 Financial years.
2. Reservation Policy of the Central Government (Including EWS) / Respective State Government/ UT as the case shall be applicable to all the Programmes. The concerned State Government/ UT Admission authority shall decide Modalities of Admission.
3. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time are now amalgamated as total intake and shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2024-25 to 2027 for the Total Approved Intake.
4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the **Executive Council / General Council as available on the record of AICTE shall be final and binding.**
5. All AICTE Institutions are highly encouraged to get NBA/NAAC accreditation. All eligible AICTE Institutions are thoroughly encouraged to participate in NIRF ranking process.
6. Deemed to be University: Institutions Deemed to be Universities (Running Technical Education Programmes), it is mandatory to have AICTE approval from the Academic Year 2018-19 in compliance of the Hon'ble Supreme Court Order dated 03-11-2017 passed in CA No.17869- 17870 /2017.
7. AICTE Approved Institutes are encouraged to utilize SWAYAM PLUS Courses up-to 40%
8. Internship is mandatory for all admitted students.
9. AICTE Approved Institutes are encouraged to make efficient use of the flagship schemes like:
   a. Parakh: Student Gap analysis portal bases services
   b. Students Scholarship schemes like Pragati, Saksham, Swanath, ADF, etc.
   c. Course in Indian Languages.
   d. ATAL FDPs: Faculty training for Emerging areas and cutting edge Technologies
   e. Augmenting Utilization of Research Assets (AURA)
   f. Smart India Hackathon: World's largest Open Innovation Platform.

**Prof.Rajive Kumar**
**Member Secretary, AICTE**

Ganga Institute of Technology and Management
DIRECTOR
Kablana, Jhajjar

Copy to:

1. **The Director Of Technical Education**, Haryana**
2. **The Registrar**,**
   Maharshi Dayanand University, Rohtak
3. **The Principal / Director,**
   GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
   20 Km Milestone, Jhajjar- Bahadurgarh Road

Vill. Kablana, Distt. Jhajjar, Haryana,
Kablana,Jhajjar,
Haryana,124104

4. **The Secretary / Chairman,**
4/12, EAST PUNJABI BAGH
NEW DELHI,WEST DELHI
Delhi,110026

5. **Guard File(AICTE)**

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, a consolidated list of Approved Institutions(bulk) may be downloaded from the respective login id's.

*This is a computer generated Statement. No signature Required*

Ganga Institute of Technology and Management
DIRECTOR
Kablana, Jhajjar

Autonomous Colleges which have applied for reaccreditation six months before the end of the cycle of accreditation period, in case there is a delay in the accreditation process by the accrediting body, the delay period between two consecutive accreditations shall be condoned. Autonomous colleges that have not applied for reaccreditation six months before the end of the accreditation period should get the accreditation within one year from the end of the last accreditation cycle, failing which the autonomy automatically stands withdrawn.

8.4 In case Autonomous College fails to obtain the required accreditation Grade/score as per clauses 8.1, 8.2 and 8.3 above, the autonomy to such College stands automatically withdrawn, and no fresh admissions will be done under autonomy mode after withdrawal of autonomous status. No communication from the parent University and/or UGC will be needed in this regard. It will be the responsibility of the College to inform the parent University and UGC regarding the withdrawal of autonomy. However, for students admitted during autonomy period, such withdrawal shall take effect only after the last batch of students enrolled under autonomy passes out.

8.5 Such Colleges whose autonomy is withdrawn shall be eligible to apply for fresh autonomy on UGC portal, but not before one year from the effective date of withdrawal of autonomy.

## 9. MONITORING OF AUTONOMOUS COLLEGES

9.1 IQAC shall be established in the Autonomous College for regular monitoring of the College. The IQAC shall have an external Peer Team comprising of 2 or more members who shall be academicians of repute not below the rank of Professor. The report regarding the performance of the Autonomous College shall also be put on the public domain on the website of the College. The external peer review shall be conducted at least once in a year.

9.2 On its own or in case of an adverse report by the external peer team of IQAC or on receipt of any information/complaint, UGC may cause an inspection by constituting an Expert Committee for scrutiny and may revoke the autonomous status of the College after giving due opportunity of hearing to the management by way of notification and by passing a speaking order.

9.3 The Autonomous College shall, without fail, upload on its website, information regarding the courses offered by it, the fees for the courses, the details of the faculty along with qualification and unique ID, the admission procedure, the details of relevant infrastructures, research activities of the Autonomous College along with the details of Ph.D. students enrolled, if any, with the date of enrolment, topics and supervisor.

9.4 The Autonomous College shall also put on its website the constitution of various Committees/Cells as mandated in the various UGC Regulations notified from time to time. The Autonomous College shall conduct the meetings of the statutory bodies regularly and upload the minutes of the meetings on the college website.

9.5 The Autonomous College shall also upload such information on such web portals as may be specified by the Commission, from time to time.

## 10. MATTERS REGARDING STARTING OF NEW COURSES

10.1 An autonomous college is free to start certificate or diploma courses without prior approval of the parent University. The Autonomous College should inform the parent University about the introduction of such new courses. Approval of the concerned statutory bodies of the Autonomous College and Statutory Council(s)should be obtained, wherever required. Certificates and Diplomas shall be issued under the seal of the Autonomous College.

10.2 An autonomous college is free to start a new degree programme(s) at undergraduate and postgraduate levels with the approval of the Academic Council of the Autonomous College and concerned Statutory Council(s), wherever required, provided the nomenclature of the degree is in consonance with UGC Notification on Specification of Degrees, 2014 as amended from time to time. Such courses shall fulfill the minimum standards prescribed by the parent university/UGC/Statutory Council(s) in terms of number of hours, curricular content and standards, and the parent University shall be duly informed of such courses.

10.3 An autonomous college can start Ph.D. programme with the prior approval of the parent University. UGC Regulations for Ph.D. programmes as notified from time to time, must be adhered to by the parent University/Autonomous College.

10.4 An autonomous college may rename an existing course as per the UGC Notification on Specification of Degrees, 2014, as amended from time to time after restructuring/redesigning it with the approval of the Academic Council of the Autonomous College. The parent University

Greens Institute of Technology and Management DIRECTOR Kathua, Jammu

Annexure – A 3


प्रो. राजीव कुमार
सदस्य सचिव
**Prof. Rajive Kumar**
**Member Secretary**

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

अखिल भारतीय तकनीकी शिक्षा परिषद
(भारत सरकार का एक सांविधिक निकाय)
शिक्षा मंत्रालय, भारत सरकार
नेल्सन मंडेला मार्ग, वसंत कुंज, नई दिल्ली-110070
दूरभाष : 011-29581399
ई-मेल : ms@aicte-india.org

**ALL INDIA COUNCIL FOR TECHNICAL EDUCATION**
(A STATUTORY BODY OF THE GOVT. OF INDIA)
Ministry of Education, Govt. of India
Nelson Mandela Marg, Vasant Kunj, New Delhi-110070
Phone : 011-29581399
E-mail : ms@aicte-india.org


File No. AICTE/P&AP/APH/2023-24/01

24.08.2023

**CIRCULAR**

To,

**All Vice Chancellors of Technical Education and**
**All Directors/ Principals of AICTE Approved Institutions,**

Subject: - **Guidelines for running B.E/B.Tech Program for Working Professionals in AICTE Approved Institutions.**

Madam/Sir,

AICTE Approved Institutes are eligible to run B.E/B.Tech Program/Courses from the A/Y 2023-24 for working Professionals ONLY in the approved disciplines/courses having NBA Accreditation.

As per the Provisions of the Public Notice issued by AICTE vide No. AICTE/RB/Academic/2023-24 dated 24th July, 2023. The following guidelines are applicable to run the courses for Working Professionals: -

| | | |
|---|---|---|
| 01 | **Courses & Intake** | |
| i. | Permitted Courses | AICTE Approved Courses with NBA Accreditation. |
| ii. | Number of Courses | Maximum Three Courses per Institute |
| iii. | Permitted Intake per Course | 30(Over and above the sanctioned intake) |
| iv. | **Minimum Admission Required to Run the Course** | 1/3 of the Approved Intake in each course |
| 02. | **Eligibility for Admission** | |
| i. | Professionals working in Registered Industry / Organization (Central / State) / Private/ Public Limited Company/ MSMEs located within 50 Km radial distance from the Institute. | |
| ii. | Minimum of ONE Year Full time / Regular working Experience | |
| iii. | Qualification Same as candidates eligible for Lateral Entry to Second Year (As Specified in Approval Process Handbook published by AICTE from time to time) | |
| 03. | **Duration of the Course** | |

Centre Institute of Technology and Management
DIRECTOR
Kukrana, Jhajjar

| | |
|---|---|
| i. | Same as Lateral Entry to Second Year with a total course duration NOT less than THREE years, so as to fulfill the total contact hours as prescribed by the Affiliating University for completion of duration of the course. |
| ii. | Timings for conduct of classes normally shall be in the evening hours/any flexible convenient timings(including weekends/holidays) in alignment with timings of Industry / Organization. |
| iii. | Mode of Conduct of Classes shall be as applicable for Regular Programs as defined in the AICTE Public Notice Vide. No. AICTE/AB/Academic/2020-21, dated 13th August, 2020 |
| 04. | **Academic Requirements** |
| i. | Total Credits as specified in the AICTE Model Curriculum<br>(or)<br>Affiliating University are required to be earned for getting the Degree. |
| ii. | As per the AICTE Regulation up to 40% of credit transfer is permitted through MOOCs / SWAYAM. |
| 05. | **Faculty & Staff Requirement** |
| i. | As per the prevailing AICTE Norms<br>(or)<br>Existing Faculty in the Institute / Industry Experts with requisite qualification as per AICTE Norms are permitted with additional remuneration / honorarium as per the Affiliating University / State Government / Institute Norms |
| ii | Existing staff (Technical / Supporting) are permitted with additional remuneration / honorarium as per the Affiliating University / State Government Norms. |
| 06. | **Infrastructure Requirements** |
| | Existing Infrastructure can be used |
| 07. | **Mode of Admission or Admission Policy** |
| i. | As per the University /State Admission Policy. In absence of any such Admission Policy in respect of working professionals, institute can devise transparent mechanism for short listing the eligible candidates in highly transparent manner based on Merit of the Qualifying Examination. |
| ii | Reservation Policy of the respective State/UT is applicable. |
| 08. | **State Government/ University Requirements** |
| | Universities shall affiliate the Working Professionals admitted in AICTE Approved Institutes for B.E / B.Tech Courses under this Policy in regular mode. |
| 09. | **Other Requirements** |
| | AICTE Approved Institutes shall fulfill any other requirements as specified / required which are notified from time to time. |

Your Sincerely,

24.8.23

(Prof. Rajive Kumar)
Member Secretary



प्रो. राजीव कुमार
सदस्य सचिव
Prof. Rajive Kumar
Member Secretary

सत्यमेव जयते

आज़ादी का अमृत महोत्सव

अखिल भारतीय तकनीकी शिक्षा परिषद
(भारत सरकार का एक सांविधिक निकाय)
शिक्षा मंत्रालय, भारत सरकार
नेल्सन मंडेला मार्ग, वसंत कुंज, नई दिल्ली-110070
दूरभाष : 011-29581399
ई-मेल : ms@aicte-india.org

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Ministry of Education, Govt. of India
Nelson Mandela Marg, Vasant Kunj, New Delhi-110070
Phone : 011-29581399
E-mail : ms@aicte-india.org

**AICTE/RB/Misc./2023-24** **Dated:21.03.2024**

**Circular**

To,

All Vice Chancellors of Technical Education and All Directors/
All Directors of State Technical Boards
Principals of AICTE approved Institutions/All Principals of Polytechics.

**Sub: Revised guidelines for running working professionals (Diploma /UG/PG) in AICTE approved institutions for A.Y. 2023-24-reg.**

Sir,

In continuation to letter no. AICTE/P&AP/APH/2023-24/02 dated 24.08.2023 regarding guidelines for running Diploma Program for working Professionals in AICTE approved Institutions and letter no. AICTE/P&AP/APH/2023-24/01 dated 24.08.2023.

2. In this regard, it is intimated that council has considered and approved relaxation for minimum admission (1/3rd) required to run the courses for working professionals for A.Y. 2023-24 only. The distance criteria for the eligibility of a working professionals as mentioned in the aforesaid guidelines is modified to the extent **"The existing to 75 KM either from place of residence/working place to the enrolled institutions"**

This is for your kind information and necessary action please.

**Your sincerely,**

21.3.2024

**(Prof. Rajive Kumar)**
**Member Secretary**

Copy to:
1. Principal Secretary, State Higher & Technical Education
2. VCs/Registrar of Affiliating Universities
3. DTE, State Dept. of Technical Education



be permitted to convert into courses in Emerging/Multidisciplinary Areas as specified in **Annexure-11** of the Approval Process Handbook.

i. The Institutions offering the Courses in Applied Arts and Crafts, Design, Planning and Hotel Management and Catering Technology shall be eligible to apply for new Course(s) at the Post Graduate Level as specified in **Annexure-11** of the Approval Process Handbook.

j. Scrutiny and EVC shall be conducted for any increase in intake in existing courses or new courses. Also, EVC shall be conducted, any time before the first batch of students passed out (including new course) or within the duration of the course in case of new courses approved to verify the fulfilment of the norms as specified in the Approval Process Handbook.

k. Introduction / Continuation of specialized courses like MBA/PGDM (IEV) will be processed as per the provisions mentioned in Annexure-9.

l. The Institutions offering the Courses in Engineering and Technology, Management, Applied Arts and Crafts, Design, Planning, and Hotel Management & Catering Technology shall be eligible for an additional ONE division with 15/30/60 seats (as supernumerary) in each course at all levels to the interested institutions exclusively for Working Professionals meeting any one of the following criteria:

   i. Institutions having more than 80% average enrollment in last 3 years.

   ii. Institutions operating in Aspirational Districts (as per the latest list notified by NITI Aayog).

   iii. Institutions belonging to Jammu, Kashmir and Leh Ladakh, NER States.

**NOTE:** 1. Guidelines notified by AICTE from time to time shall be adopted by the Institutions having approval under this **Clause (2.6** (i)) for effecting admissions to the Working Professionals.

2. Affiliation with two different Universities for the same Technical programme/Courses shall NOT be permitted. However, Institutions offering Technical Courses in Computer Applications (Viz. MCA/BCA) and Management (Viz. MBA/MMS/BBA/BMS, etc.) are ONLY permitted to have Affiliation with different Universities.

3. It is the sole responsibility of the institution to obtain NOC from the Affiliating University & State Government (if applicable) before starting of the Academic Session.

## 2.7 To Start New Programme(s) / Level in the Existing Institutions

a. The existing Institutions seeking approval to start new Programme's/ Level shall apply on AICTE Web Portal along with the Extension of Approval for the existing Programme(s) and Course(s) with the additional documents as per **Annexure- 2** of the Approval Process Handbook.

b. The Institutions applying under Break in EoA /Restoration of intake /Hibernation are also eligible to apply.

c. The Institutions applying under this category are also eligible to apply for other categories listed under Chapter II/ III of the Approval Process Handbook including Extension of Approval/ Continuation of NRI/ supernumerary seats for Foreign Nationals/ Overseas Citizen of India (OCI)/Children of Indian Workers in Gulf Countries for the existing Course(s).

d. The Institution may apply for multiple Programmes and respective levels.

e. To start new Courses under new Programmme shall be processed as per **Clause 2.6** of this APH.

f. The Constituent Colleges of State/Central Universities shall be permitted to start Post Graduate Level Courses in Engineering & Technology without corresponding/ allied Under Graduate Level Courses. Institutions can offer PG Planning Course without Corresponding UG Course.

g. Building Plan for the entire duration of the Programme(s) of the Institution shall be prepared by an Architect registered with the Council of Architecture/ Licensed Surveyor and shall be approved by

## GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR
## AN AUTONOMOUS INSTITUTE | GRADED 'A' BY NAAC | AFFILIATED TO MDU, ROHTAK

### ACADEMIC CALENDAR SESSION 2025-26

**Odd Semester (1st & 3rd)**

| Sr. No. | Name of Activity | Proposed Dates and Months |
|---|---|---|
| 1 | Commencement of Orientation Program for students of 1st Semester | From 11.08.2025 to 25.08.2025 |
| 2 | Starting of Classes / Academic Session (for 1st & 3rd Semester) | From 25.08.2025 |
| 3 | Teaching Period | From 25.08.2025 to 05.12.2025 |
| 4 | Conduct of 1st Sessional Test | 06.10.2025 to 09.10.2025 |
| 5 | Conduct of 2nd to Sessional Test | 03.11.2025 to 06.11.2025 |
| 6 | External Practical Exams | 08.12.2025 to 12.12.2025 |
| 7 | Final End Semester Examinations | 16.12.2025 onwards(Tentative) |

**Even Semester (2nd & 4th)**

| Sr. No. | Name of Activity | Proposed Dates and Months |
|---|---|---|
| 1 | Starting of Classes / Academic Session (for 2nd & 4th Semester) | From 19.01.2026 |
| 2 | Teaching Period | From 19.1.2026 to 08.05.2026 |
| 3 | Conduct of 1st Sessional Test | 23.02.2026 to 26.02.2026 |
| 4 | Conduct of 2nd to Sessional Test | 30.03.2026 to 02.04.2026 |
| 5 | External Practical Exams | 12.05.2026 to 16.05.2026 |
| 6 | Final End Semester Examinations | 20.05.2026 onwards(Tentative) |

The list of Holidays as per the guidelines of the Govt. of Haryana.

Ganga Institute of Technology and Management
DIRECTOR
Kablana, Jhajjar

**Annexure 3.41**

# GANGA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, JHAJJAR

An Autonomous Institute| NAAC 'A' Grade Institute | Affiliated to MDU, Rohtak

06.06.2025

## MINUTES OF THE MEETING OF THE EXAMINATION COMMITTEE HELD ON 06.06.2025

The meeting of the Academic Committee of the Institute was held on 06.06.2025.

The following members were present

1. **Prof. Aman Aggarwal** – Chairperson, Director, GITAM
2. **Dr. Vivek Arora** – Controller of Examination
3. **Dr. Jitender Kumar** – Associate Controller of Examination & HOD, Fire Technology and Safety
4. **Dr. Hitanshu Saluja** – Associate Controller of Examination
5. **Dr. Anurag Jain** – HOD, Applied Science and Humanities
6. **Dr. Punam Devi** – HOD, Management Department
7. **Dr. Rakesh Joon** – HOD, Electronics & Communication Engineering
8. **Dr. Nitin Kumar** – HOD, Computer Science & Engineering
9. **Mr. Joginder Singh** – HOD, Electrical Engineering
10. **Mr. Vivek** – HOD, Mechanical Engineering
11. **Mr. Jitender Singh** – HOD, Computer Science and Applications
12. **Mr. Virender Singh Rana** – HOD, Civil Engineering

**Agenda:**

- To discuss and recommend the provision of a Special Examination within three weeks of the declaration of result for those students with reappear cases and those who missed exams due to emergencies/unavoidable circumstances.

At the outset The Chairperson, **Prof. Aman Aggarwal**, Director welcomed all members. The agenda was taken up for discussion after that.

**Proceedings:** Suggestions were invited to discuss and recommend the provision of a Special Examination within three weeks of the declaration of result for those students with reappear cases and those who missed exams due to emergencies/unavoidable circumstances.

The purpose of this examination is to provide an opportunity to the following categories of students:

- Students with **reappear cases** in certain courses.
- Students who **missed the regular examinations** due to **emergencies** or **unavoidable circumstances**.

The committee discussed the matter in detail. Several members referenced practices followed by top universities and autonomous colleges, where a **summer sabbatical is utilized for special examinations**, giving students an additional opportunity without disturbing the regular academic calendar. Some of the references of Indian and Foreign Universities are cited below.

References: **"Within India, Institutions like Bangalore University and Manipal University Jaipur (an autonomous university), as well as state universities in Chhattisgarh, routinely schedule make-up, supplementary, or backlog exams in the summer months (e.g. June–August), enabling students with arrears or absences to clear courses before the next academic session. Notably, the Central University of Tamil Nadu recently conducted a special supplementary exam in June July 2025, and autonomous colleges in Odisha follow flexible resit schedules accordingly."

Foreign Universities:

Georg-August-Universität Göttingen (Germany)

- Holds Summer Semester Make-up Exams typically from late August through September.
- Students who either failed ("graded 5.0") or were absent due to illness ("Attest") are eligible to register in a Flex Now window.

Maynooth University (Ireland)

- Offers resit options for most modules via a supplemental August diet.

Aberystwyth University (UK)

- Runs a Summer Resit Assessment period from August 11–21.
- Students with specific failure indicators (e.g., F, R, etc.) are automatically registered, with options to opt-ouy

The committee acknowledged the benefits of such a provision, including:

- Academic flexibility
- Reduced student backlog
- Encouragement for academic improvement
- Alignment with best practices in higher education

**Resolution:**

*After thorough deliberation, the Examination Committee unanimously recommended that a* ***Special Examination*** *be conducted* ***within three weeks of declaration of result every year*** *for eligible students, as per defined criteria.*

**RESOLVED THAT THE SPECIAL EXAMINATIONS MAY BE CONDUCTED WITHIN THREE WEEKS OF THE RESULT DECLARATION PREFEREABLY IN THE MONTH OF AUGUST AND FURTHER RESOLVED THAT THE SAME BE RECOMMENDED TO THE ACADEMIC COUNCIL FOR APPROVAL**

Controller of Examination

Director