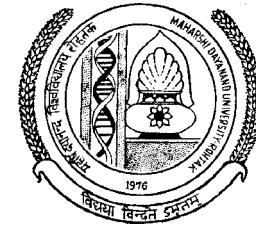


# Maharshi Dayanand University Rohtak



## Syllabus and Courses of Reading for M.Tech (Electronics & Communication Engg.) Examination

Session 2011-2012

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**M.D.UNIVERSITY, ROHTAK  
SCHEME OF STUDIES & EXAMINATION  
MASTER OF TECHNOLOGY COURSE IN ELECTRONICS & COMMUNICATION ENGG.  
SEMESTER - I**

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam
		L	T	P	Sessional	Exam.	Total	Sessional	Exam.	Total	
MEEC-501	Advanced Microprocessor & Micro Controllers	4	-	-	50	100	150	2	4	6	3
MEEC-503	Satellite & Space Communication	4	-	-	50	100	150	2	4	6	3
MEEC-505	Information & Communication Theory	4	-	-	50	100	150	2	4	6	3
MEEC-507	Advanced Digital Signal processing	4	-	-	50	100	150	2	4	6	3
	Elective-I	4	-	-	50	100	150	2	4	6	3
MEEC-517	Satellite Lab.	-	-	3	50	50	50	2	2	4	3
MEEC-519	Advanced Microprocessor & Micro Controllers Lab.	-	-	3	50	50	50	2	2	4	3
Total		20	-	6	350	600	950	14	24	38	

**Elective-I**

**Advanced Digital Communication Techniques  
(MEEC-509)**

**Advanced Mathematics for Engineers  
(MEEC-511)**

**Computational methods  
(MEEC-513)**

**Data Communication Networks  
(MEEC-515)**

Note : 1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus. However, the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A+, A, B, C, D and E. The Examination of practical courses shall also be evaluated on the basis of three grades.

- The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of these grades.
- The choice of students for any elective shall not be binding on the Deptt. to offer it.
- The Grading System is defined at the end of the Scheme of Studies & Examinations.

**M.D.UNIVERSITY, ROHTAK  
SCHEME OF STUDIES & EXAMINATION  
MASTER OF TECHNOLOGY COURSE IN ELECTRONICS & COMMUNICATION ENGG.  
SEMESTER-II**

Course No.	Course Title	Teaching Schedule			Marks			Credits			Duration of Exam
		L	T	P	Sessional	Exam.	Total	Sessional	Exam.	Total	
MEEC-502	Electronics System Design	4	-	-	50	100	150	2	4	6	3
MEEC-504	Optical Communication	4	-	-	50	100	150	2	4	6	3
MEEC-506	VLSI Design	4	-	-	50	100	150	2	4	6	3
MEEC-508	Wireless Mobile Communication	4	-	-	50	100	150	2	4	6	3
	Elective-II	4	-	-	50	100	150	2	4	6	3
MEEC-518	VLSI Lab.	-	-	3	50	50	50	2	2	4	3
MEEC-520	Optical communication Lab.	-	-	3	50	50	50	2	2	4	3
Total		20	-	6	350	600	950	14	24	38	

**Elective-II**

**Switching Systems  
(MEEC-512)**

**Multimedia Systems  
(MEEC-514)**

**Statistical Models  
(MEEC-516)**

Note : 1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus. However, the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A+, A, B, C, D and E. The Examination of practical courses shall also be evaluated on the basis of three grades.

- The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of these grades.
- The choice of students for any elective shall not be binding on the Deptt. to offer it.
- The Grading System is defined at the end of the Scheme of Studies & Examinations

**M.D.UNIVERSITY, ROHTAK  
SCHEME OF STUDIES & EXAMINATION  
MASTER OF TECHNOLOGY COURSE IN ELECTRONICS & COMMUNICATION ENGG.  
SEMESTER - III**

Course No.	Course Title	Teaching Schedule			Marks			Credits		Duration of Exam	
		L	T	P	Sessional	Exam.	Total	Sessional	Exam.		Total
MEEC-601	Neural Networks & fuzzy Logic	4	-	-	50	100	150	2	4	6	3
MEEC-603	CDMA System	4	-	-	50	100	150	2	4	6	3
	Elective-III	4	-	-	50	100	150	2	4	6	3
MEEC-613	Seminar	-	-	2	50	-	50	2	-	2	-
MEEC-615	Project	-	-	4	50	50	100	2	2	4	3
MEEC-617	Dissertation (Phase-I)	-	-	4	100	-	100	4	-	4	-
Total		12	-	10	350	350	700	14	14	28	

**Elective-III**

**Reliability Engineering  
Emerging Networks Technologies  
Digital Signal Processors & Applications  
Image Processing  
Computer Communications**

**(MEEC-619)  
(MEEC-605)  
(MEEC-607)  
(MEEC-609)  
(MEEC-611)**

Note : 1. The paper setter shall set each theory paper of 100 marks covering the entire syllabus. However, the examiner shall evaluate the performance of the student in the theory paper finally by assigning one of the grades out of A+, A, B, C, D & E. The Examination of practical courses shall also be evaluated on the basis of three grades.

2. The Sessionals of Theory/Practical Courses shall also be evaluated on the basis of these grades.
3. The choice of students for any elective shall not be binding on the Deptt. to offer it.
4. The Grading System is defined at the end of the Scheme of Studies & Examinations.

**M.D.UNIVERSITY, ROHTAK  
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MASTER OF TECHNOLOGY COURSE IN ELECTRONICS & COMMUNICATION ENGG.  
SEMESTER-IV**

Course No.	Course Title	Teaching Schedule			Marks			Credits		Duration of Exam	
		L	T	P	Sessional	Exam.	Total	Sessional	Exam.		Total
MEEC-602	Dissertation	-	-	20	150	600	750	6	24	30	3
Total		-	-	20	150	600	750	6	24	30	-

Note : 1. Sessionals of Dissertation Course shall be evaluated on the basis of the grades out of A+, A, B, C, D & E.

2. The dissertation shall be evaluated through an exam. by a Committee of Examiners consisting of Head of the Department, Dissertation supervisor & one External Examiner. The evaluation shall be based upon the above grades.
3. The Grading System is defined at the end of the Scheme of Studies & Examinations.

### MEEC-501 ADVANCED MICROPROCESSOR & MICROCONTROLLERS

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Design of basic microprocessor architectural Concepts :** Microprocessor architecture, word Lengths, addressable memory, Microprocessor's speed architectural characteristics, registers, instruction, memory addressing architecture, ALU, GPR's Control logic & internal data bus.

**2. Microprocessor Instructions & Communication:** Instruction Set ,Mnemonics, Basic Instruction Types, Addressing modes ,Microprocessor I/O connecting I/O put to Microprocessor ,Polling and Interrupts , Interrupt and DM. Controllers.

**3. Microcontroller:**Introduction 8051 architecture and programming model. Internal RAM and registers, I/O parts, Interrupt system & Instruction sets.

**4. Advanced microprocessors:**Intel X86 family of advanced Microprocessor, programming model for 86 family. X85 addressing modes, instruction set, hardware. Motorola 68 XXX family of microprocessor, 68 XXX addressing modes , instruction set, hardware.

**5. Microprocessor I/O:** Data Communication, parallel I/O serial communication, Serial interface and UART modems, I/O devices, D/A,A/D interface, special I/O devices.

**6. Developing Microprocessor Based Products:**Introduction to the Design Process, Preparing the specifications, Developing a design, Implementing and Testing and design, Regulatory Compliance Testing, design tool for Microprocessor Development.

### Text Books:

1. C.M. Gilmore, "Microprocessors Principals and Application", MGH
2. Rajkamal, "Embedded System, Architecture & Programming", TMH

### Reference Books:

1. Berry B. Berry, " Inter Series of microprocessors", PHI
2. D. V. Hall, " Microprocessor & Interfacing", TMH
3. Peatman, "Microprocessor Based System Design", Pearson

### NOTE :

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

### MEEC-503 SATELLITE AND SPACE COMMUNICATION

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Satellite communication, Brief History.

**2.Orbits of satellite:** Low, medium and Geo synchronous main characteristics, Angle period, Returning period, Angle of Evaluation, Propagation Delay, Orbital Spacing.

**3. Satellite Links:** Delay transponders, Earth Stations, Antennas and Earth coverage, Altitude and eclipses.

**4. Earth space propagation effects:** Frequency window, Free space loss, Atmospheric absorption, Rainfall Attenuation, Ionospheric scintillation, Telemetry, Tracking and command of satellites.

**5. Detection:** QPSK offset QPSK and MSK. Coherent and non-coherent detection, Error rate performance.

**6. Synchronization:** Principle and techniques, Multiple Access Techniques, FDMA, SPADE system, TDMA system, concept and configuration, system timing frames format, SSMA-Basu Principles, VSAT, Random access, space communication, link design description of operational in TELSAT and INSA T system.

**Text Books:**

1. J. Martin: Communication Satellite System, PH Englewood.
2. D.C. Aggarwal: Satellite Communication, Khanna Publishers.

**Reference Books:**

1. Tri Ha Digital Satellite Communication Tata Mc Graw Hill.
2. Harry and Vam Trees: Satellite Communication, IEEE Proceedings, 1979.

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
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**MEEC-505 INFORMATION & COMMUNICATION THEORY**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Information Theory:** Concept of Information and Entropy, Shanon's theorems, Channel Capacity Self information, Discrete and Continuous entropy, Mutual and joint information, Redundancy.

**2. Coding Theory:** Source encoding & channel encoding, Error detection & Correction, Various codes for channel coding, Rate Distortion functions.

**3. Codes used in Information Theory:** Linear block codes, systematic linear codes & optimum coding for Binary symmetric channel, 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.

**4. Performance of codes:** Performance of linear block codes & convolution codes, code incurable error probability Upper & lower bounds.

**Text books:**

1. Blahut R.E. , Theory and practice of error control codes, AWL1983.
2. Wilson, Digital Modulation and coding, Pearson

**Reference Books:**

1. B.P. Lathi, Communication System, Oxford

2. Ranjan Bose, Information Theory, Coding & Cryptography, TMH
3. J. Dass. , S.K. Malik & P.K. Chatterjee, Principles of digitals communication

**NOTE :**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
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**MEEC-507      ADVANCED DIGITAL SIGNAL PROCESSING**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction of DSP:** Introduction to Signal Processing, Discrete Linear Systems, superposition Principle, Unit-Sample response, stability & causality Criterion.

**2. Fourier Transform & inverse Fourier transform:** Frequency domain design of digital filters, Fourier transform, use of Fourier transform in Signal processing. The inverse fourier transform, Sampling continuous function to generate a sequence, Reconstruction of continuous -time signals from Discrete-time sequences.

**3. DFT & FFT & Z transform with Applications:** Discrete Fourier transform, properties of DFT, Circular Convolution, Fast Fourier Transform, Realizations of DFT. The Z-transform, the system function of a digital filter, Digital Filter implementation from the system function, the inverse Z- transform, properties & applications, Special computation of finite sequences, sequence of infinite length & continuous time signals, computation of fourier series & time sequences from spectra.

**4. Digital Filter Structure & Implementation:** Linearity, time-invariance & causality, the discrete convolution, the transfer function, stability tests, steady state response, Amplitude & Phase characteristics, stabilization procedure, Ideal LP Filter, Physical reliability & specifications. FIR Filters, Truncation windowing & Delays, design example, IIR Filters: Review of design of analog filters & analog frequency transformation. Digital frequency transformation. Design of LP filters using impulse invariance method, Bilinear transformation, Phase equalizer, digital all pass filters.

**5. Implementation of Filters:** Realization block diagrams, Cascade & parallel realization, effect of infinite-word length, transfer function of degree 1&2, Sensitivity comparisons, effects of finite precision arithmetic on Digital filters.

**Text Books**

1. Alam V. Oppenheim & Ronald W. Schafer, "Digital Signal Processing" PHI.
2. JG Proakis, "Digital Signal Processing", (PHI) 3rd Edition.

**Reference Books**

1. Rabiner & Gold, "Theory & application of digital Signal Processing", PHI 1992.
2. Roman kuc, "Introduction to Digital Signal Processing," McGraw hill Edition.

**NOTE:**

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**MEEC-509    ADVANCED DIGITAL COMMUNICATION TECHNIQUES**

L	T	P		Marks	Credits
4	-	-	Exams	: 100	4
			Sessionals	: 50	2
			Total	: 150	6
			Duration of Exam	: 3 hrs.	

1. Vector quantization, sub band coding of speech, audio and video signals, linear predictive coding of speech, CELP coders, and MPEG standards for audio and video.
2. Characterization of band pass signals, and systems, orthonormal expansion of signals, representation of digitally modulated signals, non-linear modulation methods, with memory. Optimum demodulation for known signals in additive Gaussian noise.
3. Probability of error for binary and M-ary signaling, DPSK demodulator, carrier and symbol synchronization techniques, characterization of band limited channels and ISI, signal design for zero ISI, and controlled ISI, optimum demodulator, for ISI and AWGN.
4. Linear equalization and decision feedback, equalization, adaptive equalizer, fading dispersion channels, and tapped delay line model

optimum demodulation for binary signals over fading dispersive channels, RAKE receiver.

**Text Books:**

1. Proakis, J.G, "Digital Communication", Mc Graw hill 1995
2. Haykin, S., "Digital Communication", Wiley.

**Reference Books:**

1. Bhattachary, "Digital Communication Electrical & Electronic Series", TMH
2. Couch, "Digital & Analog Communication System", Pearson

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
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**MEEC-511    ADVANCED MATHEMATICS FOR ENGINEERS**

L	T	P		Marks	Credits
4	-	-	Exams	: 100	4
			Sessionals	: 50	2
			Total	: 150	6
			Duration of Exam	: 3 hrs.	

1. Fourier Transforms: Introduction, Fourier Integral Theorem, Fourier Sine and Cosine Integral, Complex form of Fourier Integrals, Fourier Transforms, Inverse Fourier Transform, Properties, Modulation Theorem, Convolution Theorem for Fourier

Transforms, Parseval's Identity, Fourier Transforms of derivative of functions, Relation between Fourier and Laplace transform.

**2. Z – Transform : Introduction, Properties of Z- Transform, Evaluation of inverse Z – Transform.**

**3. Matrices And Linear System Of Equations:** Solution of linear simultaneous equations by Gaussian elimination and its modification, Crout's triangularization method, Iterative methods- Jacobins method, Gauss-Seidal method, Determination of Eigen values by iteration.

**4. Conformal Mapping:** Conformal mapping, linear transformations, Bi-linear transformations, Schwarz's-Christoffel transformations.

**5. Calculus Of Variations:** Euler-Lagrange's differential equation, The Brachistochrone problems and other applications. Isoperimetric problem, Hamilton's Principle and Lagrange's Equation. Rayleigh-Ritz method, Galerkin method.

**Text Book:**

1. Dr. B.S. Grewal; "Higher Engineering Mathematics", Khanna Publishers
2. Churchill, "Fourier Series and Boundary Values Problems", McGraw Hill.
3. Galfand & Fomin, "Calculus of Variations", Prentice Hall.

**Reference Books:**

1. Churchill, "Complex Variables & Applications", McGraw Hill.
2. Elsgole, "Calculus of Variations", Addison Wesley.
3. I.N. Sneddon. "The Use of Integral Transforms", Tata McGraw Hill.

**NOTE :**

1. In the semester exam., the examiner will set 8 questions in

all covering the entire syllabus. Students will be required to attempt any five questions.

2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
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**MEEC-513**

**COMPUTATIONAL METHODS**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1.** Computational complexity, Error analysis in science and engineering, Fourier series, Fourier Integral, example of transforms' and orthogonal polynomials, Time series calculation of power spectra, convolution and correlation using FETs, introduction to wavelets.

**2.** Evaluation of integrals, Elementary Analytical methods, Trapezoidal and Simpson's rules, Summation of series, Gaussian Quadrature and orthogonal 1 polynomials, Multidimensional integrals.

**3.** Ordinary differential equations, solution in closed form, Power series methods, approximate methods, Predictor and corrector methods, Numerical differentiation, and estimation of errors, extermination of functions, optimization and simple search, simplex method of Nelder and Mend, Gradient based method, Finite elements method.



4. Vectors and matrices, solution of linear and algebraic equations by direct and interactive methods, Gaussian elimination, minimal residual and conjugate gradient methods, preconditioning techniques.

#### Text Books:

1. Kreyszig F: Advanced Engineering Mathematics, John Wiley seventh ed 1993.
2. Dr. B.S. Grewal, "Numerical Methods in Engg. & science", Khanna Publisher

#### Reference Books:

1. Gerald/ Wheatley: Applied Numerical Analysis, Pearson Education Asia, 2002.
2. S.S Sastry, "Introduction methods of Numerical analysis", PHI
3. J.B. Scarborough, Numerical Mathematical Analysis, oxford
4. M.K. Jain, "Numerical Solution of differential Equations", Wiley Eastern

#### NOTE:

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### MEEEC-515

### DATA COMMUNICATION NETWORKS

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction to Data Transmission:** Overview of Data Communication and networking, Analog And Digital Data Transmission, Transmission Impairments, Various Transmission Media, Data Encoding.

**2. Digital Data Communication Techniques : Asynchronous And Synchronous Transmission, Error Detection and correction techniques, Physical interfaces**

**3. Data Link Control: Link Configurations, Protocol principles (Error control, Flow control), Bit Oriented and character oriented protocol, Data link layer services, Link Control.**

**4. Multiplexing:** F.D.M. Synchronous TDM, Statistical TDM

**5. 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).

**6. 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**

**7. ISDN Networks: Concepts & Architecture, Protocols**

#### Text Books :

1. William Stallings, "Data and Computer Communication", PHI, 4<sup>th</sup> Ed.

2. Forouzan, "Data communications and networking", TMH

### Reference Books:

1. Andrew Tanenbaum, "Computer Networking", PHI
2. Godbole, "Data communications and network", TMH

### NOTE:

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

### MEEC-517 SATELLITE LAB

L	T	P	Marks	Credits
-	-	3	Exams : 50	2
			Sessionals : 50	2
			Total : 100	4
			Duration of Exam : 3 hrs.	

(A few experiments may be designed & included in this list depending upon the infrastructure available in the institute)

1. To Study the process of Transmitting Signal.
2. To Study the Base band Signal in a Satellite Link.
3. To estimate C/N Ratio.
4. To estimate S/N Ratio.
5. To setup digital satellite Communication Link.

6. To Study Black & White and Color T.V.
7. To plot radiation pattern of parabolic reflector.
8. To Study Satellite Communication Receiver.
9. To set up a PC to PC Sat. Com.Link using RS –232 port.
10. To measure the propagation delay of signal in a Sat.Com. Link.
11. To transmit & receive the function generator waveform through a Sat.Com. Link.
12. To set up a active & passive satellite communication link & study their difference.

### NOTE:

The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner.

### MEEC-519 ADVANCED MICROPROCESSOR & MICROCONTROLLER LAB

L	T	P	Marks	Credits
-	-	3	Exams : 50	2
			Sessionals : 50	2
			Total : 100	4
			Duration of Exam : 3 hrs.	

(A few experiments may be designed & included in this list depending upon the infrastructure available in the institute)

1. To study the architecture of 8086 Kit
2. Write an ALP to convert a hexadecimal No. to decimal No. in single step execution (DEBUG)
3. Write an ALP to enter a word from keyboard and to display

4. Write an ALP for addition of two one digit Numbers.
5. Write an ALP to display a string
6. Write an ALP reverse a string
7. Write an ALP to check whether the No. is Palindrome
8. To study the Microcontroller Kit
9. Write an ALP to generate 10 KHz frequency square wave
10. Write an ALP to generate 10 KHz & 100KHz frequency using interrupt
11. Write an ALP to interface intelligent LCD display
12. Write an ALP to interface intelligent LED display
13. Write an ALP to Switch ON alarm when Microcontroller receive interrupt
14. Write an ALP to interface one microcontroller with other using serial / parallel communication.

**NOTE:** The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner.

**MEEC-502                      ELECTRONICS SYSTEM DESIGN**

L	T	P		Marks	Credits
4	-	-		Exams : 100	4
				Sessionals : 50	2
				Total : 150	6
				Duration of Exam : 3 hrs.	

**1. Review of Digital Electronics concept**

**2. MSI and LSI Circuits And Their Applications:** Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR And AND-OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

**3. Sequential Machines:** The Concept Of Memory, The Binary Cell, The Cell And The Bouncing Switch, Set / Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.

**4. Multi Input System Controller Design:** System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design. Introduction to the CPLD & FPGA.

**5. Asynchronous Finite State Machines:** Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method.

Text Books:

1. Fletcher, "An Engineering Approach to Digital Design" PHI 1990
2. Z. Kohavi, "Switching and Finite Automata Theory", TMH

**Reference Books**

1. Markovitz, "Introduction to Logic Design", TMH
2. Mano, " Digital Design", PHI

**NOTE:** 1 In the semester exam., the examiner will set 8 questions

in all covering the entire syllabus. Students will be required to attempt any five questions.

2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.

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## **MEEC-504 OPTICAL COMMUNICATION**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Advantage of optical fiber communication, Elements of fiber communication link, Ray theory and electromagnetic mode theory for optical propagation, step index and graded index fibers, Numerical Aperture.

**2. Optical fibers, Losses & Dispersion:** Attenuation, Absorption, Linear and non-linear scattering losses, Dispersion, overall fiber dispersion, polarization, fiber bending losses, multimode step index and graded index fibers, single mode fiber, plastic clad and all- plastic fibers, optical fiber cables, dispersion shifted and dispersion flattened fibers, practical fiber profiles.

**3. Optical Sources:** Basic concepts: LED for Optical Communication, Burrus type double hetro-structure, Surface emitting LEDs, Shape geometry, Edge emitting LEDs, LED to fiber launch systems semiconductor Lasers Theory, modulation and characteristics, Fabry-Perot lasers quantum well lasers and distributed feedback lasers.

**4. Photo Detectors:** P.I.N Photo Diodes: Theory and their

characteristics, Avalanche photo diode detectors, Theory and their band width noise in APD.

**5. Optical fiber communication System:** Optical transmitter circuit : LED and laser drive circuits, optical receiver circuit; Structure, Pre amplifier, AGC, Equalization, Optical power budgeting line loading , analog systems : analog modulation , direct modulation , sub carrier modulation , distribution system, Optical TDM sub-carrier multiplexing , WDM .

**6. Coherent Systems :** Coherent receiver, Homodyne and heterodyne detection, noise in coherent receiver, polarization control, Homodyne receiver , Reusability and laser line-width, heterodyne receiver , synchronous, Asynchronous and self synchronous demodulation, phase diversity receivers.

### **Text books :**

1. John Gowar, "Optical Communication Systems", PHI.
2. Gerd Keiser, "Optical Fiber Communication", TMH

### **Reference Books:**

1. Franz JH & Jain VK, "Optical Communication", Narosa Publins
2. John M. Senior, "Optical Communication", PHI

**NOTE:** 1 In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.

2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.

3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-506****VLSI DESIGN**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Review of MOS technology:** Basic MOS Transistors, Enhancement and Depletion mode transistors, N MOS and C MOS process, thermal aspects of processing, Production of masks.

**2. Electrical properties of MOS circuit :** Parameters of MOS transistors, pass transistors, N MOS inverter, Pull-up to pull down ratio for an N MOS inverter, C MOS inverters, MOS transistor circuit model, Latch up on C MOS circuits.

**3. Design processes :** MOS Layers, stick diagrams, Design rules, AWA OX C MOS process description, double metal single poly silicon, C MOS process.

**4. Basic circuit concepts:** Sheets resistance, area capacitance, delay unit, inverter delay, super buffers, propagation delays.

**5. Subsystem Design & Layout :** Architectural issues in VLSI, switch logic, gate logic, Examples of Combinational logic, Clocked sequential circuits, other system consideration.

**6. Scaling of MOS circuits :** Scaling factor, limitations, scaling of wires and interconnection, PLA and Finite state Machines.

**7. Design Examples :** Design of an ALU subsystems, carry look ahead address, parallel.

**Text Books:**

1. Pucknell D. A. and Eshrachain K, "Basic VLSI Design System & Circuits". (PHI), 1988.
2. Geiger, Rr, Allen P. E. Strader N. R., "VLSI Design Techniques for Analog and Digital Circuit", MGH1990

**Reference Books:**

1. Wolf, "Modern VLSI Design", Pearson
2. SZE, "VLSI Technology", TMH

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-508 WIRELESS MOBILE COMMUNICATION**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction to mobile radio systems:** Paging systems, cordless telephone system, Cellular telephone systems- Cellular concept, frequency reuse, channel assignment strategies, Interference and system capacity, trunking and grade of service, cell splitting, sectoring, microcell zone concept, HO strategies.

**2. Mobile radio propagation:** mechanism, free space path loss, log-distance path loss models, Okumara model, Hata model, PCS model, Wideband PCS microcell model, indoor propagation models, Jake's channel model, Multi path characteristics of radio waves, signal fading, Time dispersion, Doppler spread, coherence time LCR, fading statistics, diversity techniques

**3. Introduction to spread spectrum communication, multiple access techniques used in mobile wireless communication:** FDMA/TDMA/CDMA, Cellular CDMA, packet radio protocols, CSMA, reservation protocols, capacity of cellular CDMA, soft HO

**4. Wireless systems and standards:** GSM standards, signaling and call control, mobility management, location tracing, wireless data networking, packet error modeling on fading channels, Performance analysis of link and transport layer protocols over wireless channels, mobile data networking (mobile IP), wireless data services, IS-95, GPRS

**Text Books:**

1. T. S. Rappaport, "wireless Communications: Principles and practices", PHI 1996.
2. William C. Y. Lee, " Mobile Cellular Telecommunications, Analog and Digital Systems", 2nd ed, MGH-1995.

**Reference Books:**

1. Kaveh Pahlavan & Allen H. Levesque, "Wireless Information Networks", Wiley series in Telecommunications and signal processing.
2. Kamilio Feher: Wireless Digital communications, Modulation and Spread Spectrum Applications PHI 2001.

**NOTE:** 1 In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.

2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.

3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEEC-512**

**SWITCHING SYSTEMS**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Basic line circuits in telephony and telegraphy; long-haul communication circuits; statistical bandwidth sharing, principles of traffic switching, & signaling: schemes, CCS7.

**2. Review of Switching System:** Strowger's and crossbar switches; switching system hierarchy, SPC switching, basic call processing, Level 1, 2 & 3 controls, interface controller, network control processor, central processor, switching fabric-SDS, TDS, STS, TST, TTT, single stage and multi-stage switching network, principles of large-scale, switch design.

**3. Traffic Engineering and Tele-traffic Theory :** Markov processes representing traffic. Calculation of blocking probability, stationary probability measures for Ergodic Markov processes. Combinatorial interpretation, calculation of blocking probability.

**4. Switching Network Control and management:** Data networks and protocols, ISDN. Message handling systems/intelligent networks, multi service broadband switching fabrics-ATM., current trends in digital switching systems.

**Text Books:**

1. Thiagarajan Viswanathan, "Telecommunication Switching Systems and Networks", PHI
2. Syed Riffat Ali, "Digital switching Systems, system reliability and analysis", Tata MC Graw, 2002.

**Reference Books:**

1. Keshav S, "An Engineering Approach to Computer Network

Networking”, Addison Wesley, 1998.

2. Martin, “Telecommunication & Computer 3e”, PHI

**NOTE :**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-514 MULTIMEDIA SYSTEMS**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Concept of Multimedia, Emerging Applications, Multimedia Systems and Appliances. Distributed Multimedia Systems, Synchronization, Orchestration and QOS Architecture standards.

**2. Digital audio representation and processing:** Audio in computer applications, its digital representation, transmission and digital processing, speech recognition and generation.

**3. Digital video and image compression:** Video compression techniques and standardization of algorithms, JPEG, MPEG, DVI technology.

**4. Multimedia Information Systems:** Workstation OS, New OS support, Real Time Mach, Multimedia system service architecture, Media Stream Protocol, service and window system, client control

of continuous media, Hyper applications. Multimedia Information systems, File system support, Data Models.

**5. Multimedia communication systems:** Public Network services and N/W Protocols, Quick time Movie File (QMF), format, OMFI, MHEG, Format function Real time Interchange, Track Model and Object Model Teleconferencing systems, Shared Application Architectures, Embedded Distributed objects, Multimedia conferencing architecture, architecture of team workstation.

**6. Multimedia and Internet:** The internet, client server technology, Communication Protocols, Internet Addressing, WWW, HTML, and Web Authorizing, Web page browsers and development, bandwidth and applications considerations, Design Considerations for Web pages, Accessing Content on internet

**Text Books:**

1. John F. Koegel Bufod, “Multimedia Systems”, Addison Wesley, Edition. 2000
2. David Hillman, “Multimedia Technology and Application”, Galgotia Publication – Edition 1998.

**Reference Books:**

1. Fred Halsall, “Multimedia Communications”, Pearson
2. Rao, Bojkovic & Milovanovic, “Multimedia Comm. System: Technology , Std. & Network”, PHI

**NOTE :**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.

3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

### MEEC-516 STATISTICAL MODELS

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

Random Variables and distribution function. Probability mass and probability density function, Two dimensional random variables : joint, Marginal and conditional distributions, Independence of random variables. Moments, Expectation, Variance covariance, conditional expectation.

Probability generating and Moment generating functions, Characteristics function.

Probability distributions; Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Beta, Gamma, Weibull and Normal

General / Stochastic Process, definition, classification and examples, compound distribution, Random walk Gambler's ruin problem.

Markov chains, higher transition probabilities. Classification of states and chain, determination of higher transition probabilities, Stability of Markov systems, limiting behaviour.

Poisson process and related distribution, Generalization of Poisson process. Birth process. Generalized Birth death processes, Linear Birth death processes.

Queueing systems, general concepts, Queueing models /M/M/1, M/M/1/R, M/M/C, M/M/1, M/M/C/C, M/E<sub>k</sub> models. Machine interference problem.

### TEXT BOOK:

1. Bailey, N.T.J : Elements of stochastic Process.
2. K.S. Trivedi : Probability and Statistics, PHI. 3<sup>rd</sup> Edition.

### Reference Books:

1. Medhi, J, New International publication
2. Bhatt B.R., Stochastic models
3. Kashyap, B.R.K. and Chaudhary, M.L. : An Introduction to Queuing Theory .

### NOTE :

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

### MEEC-518

### VLSI LAB

L	T	P	Marks	Credits
-	-	3	Exams : 50	2
			Sessionals : 50	2
			Total : 100	4
			Duration of Exam : 3 hrs.	

A few experiments may be designed & included in this list depending upon the infrastructure available in the institute)

1. Write a spice programme for CMOS inverter with following details.



pmos L = .8um W=12.0um, nmos = 8um W=2.4um, nmos (kp=60u Vto=0.6v)

pmos(kp=20u Vto=-0.8v)

2. Write a spice programme for CMOS nand gate with following details :

Vdd=5 volt, pmos L=.8 um W=20um, nmos L = 8um W=um, nmos (kp=45u V to = 1.0v) pmos (kp=25u Vto=-1.2v)

3. Write a spice programme for CMOS nor gates with following details :

Vdd=5volt, pmos L=8um W=20um, nmos L=Burn W=8um, nmos (kp=45u Vto-1.0v) Pmos (kp=25u Vto=-1.2v)

4. Design a d-latch with clk time period=6ns using nand gates with following specification :

L=2U W=100U for n&p-mos, For n-mos Kn'=60U Vto = 0.6V) for p-mos kp=20U Vto=0.8V)

5. Design a half adder using nand gates with following specifications :

for n-mos : L=20 W=100U, for p-mos L=2U W=650U, for n-mos Kn'=600 Vto=0.6V)

for P-mos Kp=20U Vto=0.8v)

6. Design a full adder using half adder designed above.  
 7. Design the layout for PMOS in layout editor.  
 8. Design the Layout for NMOS in layout editor.  
 9. Design the layout for CMOS inverter with equal rise and fall time in layout editor.  
 10. Design the layout for 2-Input NAND gate.  
 11. Design the layout for 2-Input NOR gate.  
 12. Design the layout for clocked S-R flip-flop.

Note : The Scheme of awarding the grades to a student in the course will be supplied by the University to examiner.

## MEEC-520 OPTICAL COMMUNICATION LAB

L	T	P	Marks	Credits
-	-	3	Exams : 50	2
			Sessionals : 50	2
			Total : 100	4
			Duration of Exam : 3 hrs.	

(A few experiments may be designed & included in this list depending upon the infrastructure available in the institute)

1. Study of optical devices.
2. Study of fiber optical detector.
3. Study of fiber optical transmitters
4. Determination of numerical aperture of optical fiber
5. Study of characteristics of LED.
6. Study of characteristics of LASER diode.
7. Setting a fiber optic analog link.
8. Setting a fiber optic digital link.
9. Study of modulation demodulation of light source by direct amplitude modulation techniques.
10. Forming a PC to PC communication link using optical fiber & RS 232.
11. Setting up a fiber optic voice link.
12. Study of modulation & Demodulation of light source by PPM technique.
13. Study of modulation & Demodulation of light source by PWM technique.
14. Study of Propagation loss & sending loss in optical fiber.

**NOTE :** The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner.

**MEEC-601 NEURAL NETWORKS & FUZZY LOGIC**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Neural networks characteristics, History of development in neural networks principles, Artificial neural net terminology, Model of a neuron, Topology.

**2. Learning Methods & Neural network models:** types of learning, Supervised, Unsupervised, Re-inforcement learning. Knowledge, representation and acquisition. Basic Hop field model, Basic learning laws, Unsupervised learning, Competitive learning, K-means clustering algorithm, Kohonen's feature maps.

**3. 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.

**4. Applications of neural nets:** Applications such as pattern recognition, Pattern mapping, Associative memories, speech and decision-making..

**5. 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.

**Text Books:**

1. B. Yegnanarayana, "Artificial Neural Networks" PHI
2. J.M. Zurada, "Introduction to artificial neural systems", Jaico Pub.

3. ROSS J.T , "Fuzzy logic with engineering application", TMH

**Reference Books:**

1. Simon Haykin, "Neural Networks", PHI
2. Ahmad M.Ibrahim, "Introduction to applied Fuzzy Electronics", (PHI)
3. P.D. Wasserman , "Neural computing theory & practice", (ANZA PUB).

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-603 CDMA SYSTEMS**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

- 1: Direct sequence and frequency hopped spread spectrum, spreading sequence and their correlation functions, Acquisition and tracking of spread spectrum signals.
- 2: Error probability for DS-CDMA, on AWGN channels, DS-CDMA on frequency selective fading, channels, Performance analysis of cellular CDMA.

**3:** Capacity estimation, Power control, effect of imperfect power control on DS CDMA performance, Soft Handoffs.

**4:** Spreading /coding tradeoffs, multi-carrier CDMA, IS-95 CDMA system, third generation CDMA systems, multi-user detection.

**Text Books:**

1. Andrew J. Viterbi, "CDMA Principles of spread spectrum communications", Addison Wesley 1995.
2. J.S. Lee and L.E. Miller, " CDMA system Engineering handbook", Artech house 1998.

**Reference Books:**

1. Garg, "CDMA : 2000 : Cellular/ PCS system Implementation", Pearson
2. Steve Lee, "Spread spectrum CDMA", TMH

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-605 EMERGING NETWORK TECHNOLOGIES**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Foundations:** virtual circuits, PVC, SVC, SPVC, connection oriented and connectionless systems, variable bit rate and constant bit rate applications, flow control and connection management, addressing and identification schemes, multiplexing methodologies, network interface.

**2. System & topology:** TI/IE I CARRIER systems, topology, X.25, layers, POUs, ISON- typical topology, layers, and PDUs, SS7, FOOL, Frame relay, standards, topology, layers, OSI and ANSI layers. frame relay protocol data unit Frame relay network to network interface.

**3. Fast and switched Ethernet:** generation of LANs, switched Ethernet, architecture, store and forward and Cut through switches, virtual LAN, Fast Ethernet, 100BASET.

**4. ATM standards & topology:** ATM standards, topology, VPI and VCI Labels, ATM layers, ATM and B-ISDN model, cells, ATM switching, AAL types, traffic management in ATM network, SONET/ SDH: synchronous networks, standards, topology, automatic protection switching, multiplexing structure, payloads and envelopes, payload pointers, Introduction to broad band signaling networks.

**Text Books:**

1. Uyles Black, " Emerging Communication Technologies", 2nd Ed, Prentice hall 1997.
2. Sumit Kasera and Pankaj Sethi, "ATM Networks, Concepts and Protocols", TMGH 2001

**Reference Books:**

1. Behrouz Forouzan: Introduction to Data Communication and Networking, Tata Mc-Graw hill 1999.

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
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### **MEEC-607      DIGITAL SIGNAL PROCESSORS AND APPLICATIONS**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. SDP 56002:** Architecture, CPU, ALU, Program Controller, Address Generation Unit, Addressing Modes, Interrupt, Priority register.

**2. DSP 56002 Instruction Set:** Instruction Formats Parallel move operating parallel move types, instructions set, move arithmetic logic, bit manipulation, loop, programmed control instructions.

**3. Applications:** Designing and implementing FIR, IIR filters, implementing Fast Fourier. Transforms with DSP 56002.

**4. TMS - 320 Architecture, and Instruction Set.**

**TEXT BOOK:**

1. Mohammed EL. Sharkawy: Digital Signal Processor Applications with Motorola's DSP 56002. PTR.
2. Venkat Ramani, "Digital Signal Processor :Theory, Programming & Applications", TMH

**NOTE:**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

### **MEEC-609      IMAGE PROCESSING**

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction:** Elements of Digital Image Processing Systems, Image Acquisition, Storage, Processing Communication Display.

**2. Digital Image Fundamentals:** Visual Perception, simple image models, concept of uniform and nonuniform sampling & quantization, Relationships between pixels-neighbors of pixel, connectivity labeling of connected components. Relations, equivalence and Transitive closure, Distance measures, Arithmetic/ Logic operation, Imaging Geometry Basic and perspective transformation stereo imaging.

**3. Image Transforms:** Discrete Fourier transform, 2-D Fourier Transforms and its properties. Fast Fourier transform and its uses. Walsh, Hadamard Discrete cosine, Heir and slant transforms hostelling their algorithms and computer implementations.

**4. Image Enhancement:** Spatial and frequency domain methods point processing, intensity transformation, Histogram processing image substation and Averaging spatial filtering, LP, HP and homo-morphic felling, generation of spatial marks, Color image processing.

**5. Image Restoration:** Degradation model, digitalization of circulate and block circulate metrics, Algebraic approved invoice filtering, wiener filter, constrained least square restoration, Interactive restoration in spatial domain geometric transformation.

**6. Image Compression:** Redundancy models, error free compression, Lossy compression, Image compression standards.

**7. Image Segmentation:** Detection of Discontinuity, Edge detection, Boundary detection, Thresholding, Regional oriented segmentation use of motion in segmentation.

**8. Representation and Description:** Image analysis, Pattern and their classes, Decision theoretical methods, Structural methods, Interpretation.

#### Text Books:

1. Anil K Jain, "Fundamentals of Digital Image Processing", PHI Edition 1997.
2. Keenneth R Castleman, " Digital Image Processing", Pearson

#### Reference Books:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Pearson
2. Chanda & Majumder, "Digital Image Processing & Analysis", PHI

#### NOTE:

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

#### MEEC-611 COMPUTER COMMUNICATIONS

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Data communication:** Introduction to data communication. Concept of analog and digital signals. Bandwidth. Transmission media. Wired and wireless connectivity. FDM, TDM and CDMA. Circuit and packet switching. Frame relay and ATM switching. ISDN.

**2. Network architecture:** Basics of OSI and TCP/IP reference models. Example architecture of other reference models.

**3. Network protocols:** Local area network protocols. IEEE standards for LAN. Fibre optic networks. Satellite networks. Data link layer design issues: its functions and protocols.

**4. Internet Protocol:** Internet protocol. Routing algorithms. Congestion control algorithms. IP addressing schemes. Internetworking and sub-netting.

**5. Transport and application layer:** Transport and application layer design issues. Connection management. Transport protocol

on top of X.25. File transfer and access management.

**6. Cryptography:** Traditional cryptography. The Data Encryption Standard. Key distribution problem. Public cryptography. Authentication and digital signatures.

**7. Modelling and Analysis:** Modelling and Analysis of Computer Communication Networks: Pure Birth and Birth-Death Process. Bernoulli Trials-Markov Chains. Poisson Process. Calculation of Delay-Little's Formula, Burke's Theorem. Queueing Models: M/M/1, M/M/1/N, M/M/S, M/M/S/N queues. Imbedded Markov Chains-M/G/1 queue. Network layout and reliability considerations.

#### Text Books

1. Stallings, "Data communication & Networking", PHI
2. Tanenbaum, "Computer Networks", PHI

#### References Books:

1. Jeremiah F. Hayes: Modelling and Analysis of Computer Communication Networks, PHI
2. Forouzan, "Data communications and networking", TMH
3. Godbole, "Data communications and network", TMH

#### NOTE :

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

## MEEC-619 RELIABILITY ENGINEERING

L	T	P	Marks	Credits
4	-	-	Exams : 100	4
			Sessionals : 50	2
			Total : 150	6
			Duration of Exam : 3 hrs.	

**1. Introduction** : Definition for Reliability , Need for Reliability engineering, Causes of failures, catastrophic failures and degradation failures. Characteristics types of failures, useful life of components, Exponential case of chance failures, Reliability measure4s, Derivation for exponential distribution function, other kinds of distributions, Binomial, Poisson uniform, Rayleigh, Weibull, Gamma distribution, Markov chains, failures data analysis.

**2. Reliability in Systems** : Reliability Block Diagrams, series systems, parallel systems, K- out of M systems, Open and short circuit failures, standby systems. Reliability Analysis of Non-series Parallel system, Cut- set approach, Bayes Theorem Method.

**3. Reliability Prediction** : Objective of reliability Prediction, Classification , Information sources for failure rate data , prediction methodologies, general requirement, role and limitations of reliability prediction.

**4. Reliability Allocation** : Subsystems reliability improvement, Apportionment for new units, critically.

**5. Redundancy Techniques for reliability** : Forms of maintenance, measures of maintainability and availability, maintainability function, availability function, two unit parallel system with repair, Markov model for two unit systems, preventive maintenance provisioning of spares.

**6. Reliability Testing** : Kinds of testing, components reliability measurements parametric methods , confidence limits, accelerate testing, equipment acceptance testing.

**7. Economics of Reliability Engineering** : Reliability cost, effect of reliability on cost. reliability achievement cost models, replacement policies.

**8. Integrated performance measures for communication system :**

Integration of reliability and capacity, Delay related reliability.

**Text Books :**

1. KK Agarwal, " Reliability Engineering ", Kluwer Academic Netherlands.
2. B Singh, " Quality Control Reliability Analysis", Khanna Publishers.
3. Balaguruswamy : Reliability Engineering

**Reference Books :**

1. KB Mishra : Reliability Prediction & Analysis : A Methodology oriented treatment, Elsevier, Netherlands.
2. Ebeling, " Introduction to Reliability & Maintainability", TMH

**NOTE :**

1. In the semester exam., the examiner will set 8 questions in all covering the entire syllabus. Students will be required to attempt any five questions.
2. Use of scientific calculator will be allowed in the exam. However, Pager, Programmable Calculator & Cellular phone etc. will not be allowed.
3. The scheme of awarding the grades to a student in the course will be supplied by the University to the examiner of answer books.

**MEEC-613 SEMINAR**

L	T	P	Marks	Credits
-	-	2	Sessionals : 50	2
			Total : 50	2

Every student will be required to present a seminar talk on a topic approved by the Deptt. except on his/her dissertation. The committee constituted by the Head of the Deptt. will evaluate the presentation and will award one of the grades out of A+,A,B,C,D and E.

A Student who is awarded the 'F' grade will be required to repeat the seminar on the same topic.

**MEEC-617 DISSERTATION (PHASE-I)**

L	T	P	Marks	Credits
-	-	4	Sessionals : 100	4
			Total : 100	4

Every student will carry out dissertation under the supervision of a Supervisor(s). The topic shall be approved by a Committee constituted by the Head of the concerned Deptt.

Every student will be required to present two seminar talks, first at the beginning of the Dissertation (Phase-I) to present the scope of the work and to finalize the topic, and second towards the end of the semester, presenting the work carried out by him/her in the semester. The committee constituted will screen both the presentations so as to award the sessional grades out of A+, A, B, C, D and E. A student scoring 'F' grade shall have to improve this grade before continuing his/her Dissertation in the 4<sup>th</sup> semester failing which he/she shall have to repeat the Dissertation (Phase-I) next time in the regular 3<sup>rd</sup> semester.

**MEEC-602****DISSERTATION**

L	T	P	Marks	Credits
-	-	20	Sessionals : 150	6
			Practical Exam : 600	6
			Total : 750	
			Duration of Exam. : 3 hours.	

The Dissertation Phase-1 will be continued as dissertation in 4<sup>th</sup> Semester. The award of sessional grades out of A+, A, B, C, D and E will be done by an internal Committee constituted by the Head of the Deptt. This assessment shall be based on presentation (s), report, etc. before this committee. In case a student scores 'F' –grade in the sessional, failing which he/ she will not be allowed to submit the dissertation.

At the end of the semester, every student will be required to submit three bound copies of his/her Master's dissertation of the office of the concerned Department. Out of these, one copy will be kept for department record & one copy shall be for the supervisor. A copy of the dissertation will be sent to the external examiner by mail by the concerned department, after his/her appointment and intimation from the university. Dissertation will be evaluated by a committee of examiners consisting of the Head of the Department, dissertation supervisor(s) and one external examiner. There shall be no requirement of a separate evaluation report on the Master Dissertation from the external examiner.

The external examiner shall be appointed by the University from a panel of examiners submitted by the respective Head of Deptt., to the Chairman, Board of Studies. In case the external examiner so appointed by the University does not turn up, the Director/ Principal of the concerned college, on the recommendation of the concerned Head of the Deptt. Shall be authorized, on behalf of the University., to appointed an external examiner from some other institution.

The student will defend his/her dissertation through presentation before this committee and the committee will award one of the grades out of A+, A, B, C, D and E Student scoring 'F' grade in the exam shall have to resubmit his/her Dissertation after making all correction / improvements and this dissertation shall be evaluated as above.

**Note:** The Scheme of awarding the Grades to the student in the course will be supplied by the University to the examiner(s).

**M.D. University, Rohtak (Haryana)**  
**Scheme of Studies & Examination For**  
**Master of Technology in Electronics & Communication Engg.**

The performance of the student of M.Tech Electronics & Communication Engg. Course shall be graded on the basis of percentage of marks and corresponding grades as mentioned below :

A)

Marks		Grade		Marks
85	≤	A+	≤	100
75	≤	A	<	85
60	≤	B	<	75
50	≤	C	<	60
40	≤	D	<	50
00	≤	E	<	40

Letter Grades	Performance	Division
A+	Excellent	First
A	Very Good	First
B	Good	First
C	Fair	Second
D	Pass	Third
E	Repeat	Fail

**Note :** The candidate who have passed all the semesters examination in the first attempt obtaining at least 75% marks in aggregate shall be declared to have passed in the first division with Distinction mentioned in the degree.

- B) Actual percentage of Marks Obtained and Corresponding grades should be mentioned on detailed marks certificate of student. To obtain 'D' grade a student must have secure at least 40% marks in eac subject of the semester Examination.
- C) Student who earned and 'E' grade or less than 40% marks in any subject shall have reappear in that subject.