Master of Computer Applications (MCA) Regular Programme
Syllabus and Scheme of Examination
MCA First Year

### Semester-I

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Course</th>
<th>Course Requirements (Hrs)</th>
<th>University Exams</th>
<th>Internal Assessment</th>
<th>Total</th>
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<tbody>
<tr>
<td>MCA-101</td>
<td>Mathematical Foundation of Computer Science</td>
<td>5</td>
<td>80</td>
<td>20</td>
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<tr>
<td>MCA-102</td>
<td>Computer Fundamentals &amp; Programming in C</td>
<td>5</td>
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<td>MCA-103</td>
<td>Digital Design</td>
<td>5</td>
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<tr>
<td>MCA-104</td>
<td>Internet and Web Designing</td>
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<td>MCA-105</td>
<td>Object Oriented Programming Using C++</td>
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<td>80</td>
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<td>MCA-106</td>
<td>Software Lab-1</td>
<td>8</td>
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<tr>
<td></td>
<td>i) Programming in C</td>
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<tr>
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<td>ii) Web Programming Using HTML</td>
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<td>MCA-107</td>
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<td>i) Programming in C++</td>
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<td>ii) Use of MS-Office</td>
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<tr>
<td>MCA-108</td>
<td>Soft skills-I</td>
<td>2</td>
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<td><strong>Total</strong></td>
<td><strong>42</strong></td>
<td><strong>525</strong></td>
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<td><strong>725</strong></td>
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*Practical Examination of MCA-106 & 107 may be conducted on the same day in 2 sittings each maximum of 4 hours.

### Semester-II

<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Course</th>
<th>Course Requirements (Hrs)</th>
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<tbody>
<tr>
<td>MCA-201</td>
<td>Data Structures</td>
<td>5</td>
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<td>MCA-202</td>
<td>Computer Organisation &amp; Architecture</td>
<td>4</td>
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<tr>
<td>MCA-203</td>
<td>Computer Based Management System &amp; E-Commerce</td>
<td>5</td>
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<td>MCA-204</td>
<td>Data Base Management Systems</td>
<td>5</td>
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<tr>
<td>MCA-205</td>
<td>Principles of System Programming &amp; Compiler Design</td>
<td>5</td>
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<tr>
<td>MCA-206</td>
<td>Software Lab-3</td>
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<tr>
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<td>i) Data Structure implementation in C/C++</td>
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<tr>
<td></td>
<td>ii) Programming in 8086/88/80x6 Assembly</td>
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<tr>
<td>MCA-207</td>
<td>Software Lab-4</td>
<td>8</td>
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<tr>
<td></td>
<td>i) Oracle &amp; SQL Prog.</td>
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<tr>
<td></td>
<td>ii) System Programming Using C/C++</td>
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</tr>
<tr>
<td>MCA-208</td>
<td>Soft skills-II</td>
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<td><strong>Total</strong></td>
<td><strong>42</strong></td>
<td><strong>525</strong></td>
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*Practical Examination of MCA-206 & 207 may be conducted on the same day in 2 sittings each maximum of 4 hours.*
# MCA Second Year

## Semester-III

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<tr>
<th>Paper Code</th>
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<th>Internal Assessment</th>
<th>Total</th>
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<tbody>
<tr>
<td>MCA-301</td>
<td>Computer Graphics &amp; Multimedia</td>
<td>5</td>
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<tr>
<td>MCA-302</td>
<td>Operating Systems</td>
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<tr>
<td>MCA-303</td>
<td>Artificial Intelligence &amp; Expert Systems</td>
<td>5</td>
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<td>Data Communication &amp; Computer Networks</td>
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<tr>
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<td>Object Technology</td>
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<tr>
<td>MCA-306</td>
<td>SoftwareLab-5 i) Graphics Programming in C/C++ ii) Use of MatLab iii) PROLOG Programming</td>
<td>8</td>
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<td>MCA-307</td>
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*Practical Examination of MCA-306 & 307 may be conducted on the same day in 2 sittings each maximum of 4 hours.

## Semester-IV

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<td>MCA-402</td>
<td>Data Warehousing &amp; Mining</td>
<td>5</td>
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<td>MCA-403</td>
<td>Software Engineering</td>
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<tr>
<td>MCA-404</td>
<td>Advanced Database Systems</td>
<td>5</td>
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<tr>
<td>MCA-405</td>
<td>Visual Languages Programming</td>
<td>4</td>
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<td>MCA-406</td>
<td>SoftwareLab-7 i) Advance Java Programming</td>
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<tr>
<td>MCA-407</td>
<td>Software Lab-8 i) Visual Programming Using VB ii) ADS (Working with MS SQL Server)</td>
<td>8</td>
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<td>MCA-408</td>
<td>Minor Project-I</td>
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*Practical Examination of MCA-406 & 407 may be conducted on the same day in 2 sittings each maximum of 4 hours.
## Semester-V

<table>
<thead>
<tr>
<th>Paper Code</th>
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<tbody>
<tr>
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<td>MCA-502</td>
<td>Software Testing &amp; Quality Assurance</td>
<td>5</td>
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<td>MCA-503</td>
<td>Windows Programming &amp; Visual C++</td>
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<td>MCA-504</td>
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<td>MCA-505</td>
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<td>Computer Security</td>
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<td>MCA-506</td>
<td>Software Lab-9</td>
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<td>i) .NET Programming Using C# and/or VB.NET</td>
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<td>MCA-507</td>
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<td>i) Windows Programming Using Visual C++</td>
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<td><em>Practical Examination of MCA-506 &amp; 507 may be conducted on the same day in 2 sittings each maximum of 4 hours.</em></td>
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| Total      |                                |                           |                  |                     |       |
|------------|                                |                           |                  |                     |       |
|            |                                | **42**                    | **525**          | **200**             | **725** |

## Semester-VI

<table>
<thead>
<tr>
<th>Paper Code</th>
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<th>Course Requirements (Hrs)</th>
<th>University Exams</th>
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<tr>
<td>MCA-601</td>
<td>Major Project</td>
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| Grand Total of 3 Years | 3000 | 1100 | 4100 |

### ELECTIVE – I*

At present only ‘Soft Computing’ course (MCA-504) is being offered under Elective-I but depending upon the availability of expertise and the required infrastructure determined by the University, any one of the following subjects could be offered in place of ‘Soft Computing’.

- i) Simulation and Modeling
- ii) Theory of Computation
- iii) Unix and Network Programming
- iv) Enterprise Resource Planning
- v) Object Oriented Analysis and Design
- vi) Analysis & Design of Algorithms
- vii) Multimedia and Its Applications
- viii) Distributed Computing

### ELECTIVE – II*

At present only ‘Computer Security’ course (MCA-505) is being offered under Elective-II but depending upon the availability of expertise and the required infrastructure determined by the University, any one of the following subjects could be offered in place of ‘Computer Security’.

- i) Digital Image Processing
- ii) Software Project Management
- iii) Embedded Systems
- iv) Bio-Informatics
- v) Mobile Computing
- vi) Neural Networks
- vii) Perl Programming
Semester –I

MCA-101: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit – I

Relation: Relations, Properties of Binary relation, Matrix representation of relations, Closures of relations, Equivalence relations, Partial order relation. Function: Types, Composition of function, Recursively defined function.

Algebraic Structures: Properties, Semi group, Monoid, Group, Abelian group, Subgroup, Cyclic group, Cosets, Normal Subgroups, Lagrange’s Theorem, Permutation groups.

Unit – II


Unit – III


Unit – IV

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph.

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with output: Moore machine, Mealy machine, Conversions.

Suggested Readings:

2. Lipschutz, Seymour: Discrete Mathematics, Schaum’s Series
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MCA-102: COMPUTER FUNDAMENTALS & PROGRAMMING IN C

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Unit-II

Problem Solving: Problem Identification, Analysis, flowcharts, Decision Tables, Pseudo codes and algorithms, Program Coding, Program Testing and Execution.

C Programming:
- Concept of variables and constants, structure of a C program. Operators & Expressions: Arithmetic, Unary, Logical, Bit-wise, Assignment & Conditional Operators, Library Functions, Control Statements: while, do..while, for statements, Nested loops, if..else, switch, break, continue and goto statements, Comma operator.

Unit-III

Functions:
- Defining & Accessing: Passing arguments, Function Prototype, Recursion, Use of Library Functions, Storage Classes: Automatic, External and Static Variables (Register), Arrays: Defining & Processing, Passing to a function, Multidimensional Arrays.

String:
- Operations of Strings (String handling through built-in & UDF: Length, Compare Concatenate, Reverse, Copy, Character Search using array)

Pointers:
- Declarations, Passing to a function, Operations on Pointers, Pointers & Arrays, Array of Pointer, Pointer Arithmetic, Array accessing through pointers, Pointer to structure, Pointer to functions, Function returning pointers, Dynamic Memory Allocations.

Unit-IV

Structures:
- Defining & Processing, Passing to a function, Unions (Array within structure, Array of structure, Nesting of structure, Passing structure and its pointer to UDF, Introduction to Unions and its Utilities)

Data Files:
- Open, Close, Create, Process Unformatted Data Files. (Formatted Console I/O functions, Unformatted Console I/O functions, Modes Of Files, Use Of fopen(), fclose(), fgetc(), fputc(), fgets(), fprintf(), fscanf(), fread(), fwrite(), Command Line Arguments).

Documentation, debugging, C Processors, Macros. Examples illustrating structured program development methodology and use of a block structured algorithmic language to solve specific problems.
Suggested Readings

7. Kerninghan & Ritchie: The C Programming Language, PHI.
11. Y. Kanetkar: Let us C, BPB Publication
12. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-103: DIGITAL DESIGN

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Number System: Binary, Octal, Hexadecimal and Decimal, 1’s and 2’s Complements, Interconversion of numbers. Codes: BCD Code, Excess -3 Code, Gray code, Alphanumeric Codes, Parity Bits, Hamming Code, Floating Point Numbers.


Unit-II


Boolean Algebra vs. Ordinary Algebra, Boolean Expressions- Variables and Literals, Boolean Expressions– Equivalent and Complement, Theorems of Boolean Algebra, Minimisation Techniques, SOPs & POSs Boolean Expressions, Quine- McCluskey Tabular Method, Karnaugh Map Method.

Unit-III

Combinational Circuits, Implementing Combinational Logic, Arithmetic Circuits –Basic Building Blocks, Adder- Subtractor, BCD Adder, Magnitude Comparator, Parity Generator and Checker, De-multiplexers and Decoders, Encoders, Read Only Memory (ROM), Programmable Logic Array (PLA).

**Unit-IV**

Ripple Counter vs. Synchronous Counter, Modulus of a Counter, Propagation Delay in Ripple Counters, Binary Ripple Counters, Up/Down Counters, Decade and BCD Counters, Pre-settable Counters, Shift Register, Controlled Shift Registers.

RAM Architecture, Static RAM (SRAM), Dynamic RAM (DRAM)

**Suggested Readings**

5. Anand Kumar: Fundamentals of Digital Circuits, PHI.
6. Tokheim: Digital Electronics, TMH.
7. S. Rangnekar: Digital Electronics, ISTE/EXCE.L
8. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

**MCA–104: INTERNET AND WEB DESIGNING**

Max. Marks: 80  
Time: 3 Hrs.

**Note:** There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

**Unit-I**

Introduction to Internet, Internet Services, WWW, Working of Internet, Internet Connection Concepts, Introduction to Intranet, DNS working, Configuring Internet Connection, Connecting LAN to Internet.


E-Mail Concepts – Configuring E-Mail Program, Sending and Receiving Files through E-Mail, Fighting Spam, Sorting Mail, and avoiding E-Mail viruses.

**Unit-II**

Web Browsers, Search Engines, Categories of Search Engines, Searching Criterion, Surfing the Net, Hypertext Transfer Protocol (HTTP), URL, Other Internet Tools.


Unit-III
HTML: Internet Language, Understanding HTML, Create a Web Page, Linking to other Web Pages, Publishing HTML Pages, Text Alignment and Lists, Text Formatting Fonts Control, E-mail Links and link within a Page, Creating HTML Forms.

Unit-IV

Web Page Design and layout, Advanced Layout with Tables, Using Style Sheets.

Suggested Readings:

1. Dick Oliver: Tech Yourself HTML 4 in 24 Hours, Techmedia.
2. Satish Jain: "O" – Level Information Technology.
3. Craig Zacker: 10 minutes Guide to HTML Style Sheets, PHI.
6. Margaret Levine Young: Internet – The Complete Reference
7. Harley Hahn: The Internet – Complete Reference, TMH.
8. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-105: OBJECT ORIENTED PROGRAMMING USING C++

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I
Introduction to object oriented programming, user defined types, polymorphism, and encapsulation. Getting started with C++ - syntax, data-type, variables, strings, functions, exceptions and statements, namespaces and exceptions, operators. Flow control, functions, recursion. Arrays and pointers, structures.

Unit-II
Abstraction Mechanisms: Classes, private, public, constructors, destructors, member functions, static members, references etc. Class hierarchy, derived classes.

Inheritance: simple inheritance, polymorphism, object slicing, base initialization, virtual functions.

Unit-III
Prototypes, linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operators etc. Memory management: new, delete, object copying, copy constructors, assignment operator, this Input/output.
Exception handling: Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Unit-IV

Templates and Standard Template library: template classes, declaration, template functions, namespaces, string, iterators, hashes, iostreams and other type.

Design using C++ design and development, design and programming, role of classes.

Suggested Books:

4. Shah & Thakker: Programming in C++, ISTE/EXCEL.
5. Johnston: C++ Programming Today, PHI.
8. Samanta: Object Oriented Programming with C++ & JAVA, PHI.
10. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-201: DATA STRUCTURES

Max. Marks: 80
Time : 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Introduction to Algorithm Design and Data Structures: Design and analysis of algorithm: Algorithm definition, comparison of algorithms. Top down and bottom up approaches to Algorithm design. Analysis of Algorithm; Frequency count, Complexity measures in terms of time and space. Structured approach to programming.

Unit-II

Arrays: single and multidimensional arrays. Address calculation using column and row major ordering. Various operations on Arrays. Vectors. Application of arrays: Matrix multiplication, Sparse polynomial representation and addition,

Stacks and Queues: Representation of stacks and queues using arrays and linked-list. Circular queues, Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks.

Unit-III

Linked list: Singly linked list; operations on list, Linked stacks and queues. Polynomial representation and manipulation using linked lists. Circular linked lists, Doubly linked lists.

**Unit-IV**


**Suggested Readings:**

1. Hubbard JR: Schaum’s outline of Data Structures with C++, TMH.
8. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

**MCA-202: COMPUTER ORGANIZATION & ARCHITECTURE**

Max. Marks: 80  
Time: 3 Hrs.

**Note:** There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

**Unit-I**

Basic organization of the computer and block level description of the functional units as related to the execution of a program. Operational concepts, Bus structures, Von Neumann Concept. Fetch, decode and execute cycle. Role of operating systems and compilers.

**Basic Processing:** Instruction code, Instruction set, Instruction sequencing, Instruction cycle, Instruction format, Addressing modes, Micro instruction, Data path, Hardwired controlled unit, Micro programmed controlled unit.

**Unit-II**

Timing and Control Unit, Micro-operations, Instruction cycle, Design of ALU: Binary arithmetic, Addition and Subtraction of signed number, Multiplication of Positive number, Signed operand multiplication, Division, Floating point number representation and arithmetic.
General Register Organization, Stack Organization, Instruction Formats, Addressing Models, Data Transfer and Manipulation, Program control, RISC Vs. CISC architectures.

Programming in Assembly Language for 8086/8088/80x6 micro-processor.

Unit-III


Unit-IV


Suggested Readings

6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-203: Computer Based Management System & E-Commerce

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Unit-II

Unit-III


Unit-IV


Suggested Readings:

4. Jeffery: Introduction to E-Commerce, TMH.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-204: DATA BASE MANAGEMENT SYSTEMS

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Unit-II

Relational Model: Introduction to the Relational Model, Integrity Constraint Over relations, Enforcing Integrity constraints, Querying relational data, Logical data base Design, Introduction to Views, Destroying /altering Tables and Views.

Unit-III

Form of Basic SQL Query – Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries Set, Comparison Operators, Aggregative Operators, NULL values, Comparison using Null values, Logical connectivity’s – AND, OR and NOT. Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.


Unit-IV

Overview of Transaction Management: ACID Properties, Transactions and Schedules, Concurrent Execution of transaction, Lock Based Concurrency Control, Performance Locking, Transaction Support in SQL, Introduction to Crash recovery.

Concurrency Control: Serializability, and recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Dead Locks, Specialized Locking Techniques, Concurrency without Locking.

Suggested Readings:

4. C.J.Date: Introduction to Database Systems, Pearson Education.
9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
Unit-II
Compiler: Phases of Compiler, Compiler writing tools, Lexical Analysis, Finite Automata, Regular Expression, From a Regular expression to an NFA, NFA to DFA, Design of Lexical Analyzer.

Syntax Analyzer, CFG, Role of the Parser, CFG, Top Down Parsing, Recursive descent parsing, predictive Parsers, Bottom up Parsing, Shift reduce, operator precedence parsers, LR Parsers.

Unit-III

Symbol table: contents of Symbol table, Data Structures for Symbol table; Runtime storage Administration.

Unit-IV

Suggested Readings:

5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-301: COMPUTER GRAPHICS & MULTIMEDIA

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Unit-II
Unit-III

Two-dimensional Geometric Transformations: Basic Transformations, Matrix Representations and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing

Two-Dimension Viewing: The viewing Pipeline, Window to view port coordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping Three–Dimensional Concepts: Three Dimensional Display Methods, 3D Transformations, Parallel Projection and Perspective Projection.

Unit-IV


Case Study: A graphics software MatLab, Use of MatLab in graphics application, Features of MatLab, Generalize application by using MatLab.

Suggested Readings:

9. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-302: OPERATING SYSTEMS

Max. Marks: 80
Time: 3 Hrs.

Note:
There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Process and CPU Scheduling - Process concepts and scheduling, Operation on processes, Cooperating Processes, Threads, and Interposes Communication Scheduling Criteria, Scheduling Algorithm, Multiple - Processor Scheduling, Real-Time Scheduling.
Unit-II


**Unit-III**


**Unit-IV**

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

**I/O Management** – I/O software and its types, Disk Scheduling.

**Shell Programming**: Concept of shell, Types of shell, Editors for shell programming (e.g. vi), basics of Shell programming.

**Case Study-** UNIX, LINUX, and Windows NT.

**Suggested Readings:**

7. Any other book(s) covering the contents of the paper in more depth.

**Note:** Latest and additional good books may be suggested and added from time to time.

**MCA-303: ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS**

**Max. Marks: 80**

**Time: 3 Hrs.**

**Note:** There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

**Unit-I**

Introduction and applications of artificial intelligence, Problem solving: Defining the problem as state space search, Production system, Problem characteristics, Problem system characteristics, Search techniques: Generate and test, Hill climbing, Best first search, A* algorithm, Problem reduction, Expert system: Definition, Role of knowledge in expert system, Architecture of expert system.
Unit-II


Unit-III


Unit-IV


Suggested Readings:

3. Carl Townsend: Introduction to Turbo Prolog, BPB
4. Stamations V. Kartalopous: Understanding Neural Networks and Fuzzy Logic, PHI
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-304: DATA COMMUNICATION & COMPUTER NETWORKS

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Data Communication: Theoretical basis of data communication; analog and digital signals; asynchronous and synchronous transmission; data encoding and modulation, techniques, broadband and base band transmission; pulse code modulation, bandwidth, channel, baud rate of transmission; multiplexing; transmission medium; transmission errors - error detection and correction.

Unit-II

Network Classification and Data Communication Services: Local area networks, metropolitan area network, wide area network, wireless network, internetworking; switched multi-megabit data services, X.25, frame relay, narrow band and broad band ISDN, asynchronous transfer modes.

Unit-III

Datalink Layer Functions and Protocols: Framing, error-control, flow -control; sliding window protocol; HDLC; Data link layer of internet and ATM.


Unit-IV

Network functions and protocols: Switching mechanism: Circuit switching, message switching, packet switching, cell switching, routing and congestion control, TCP/IP protocol architecture.


Suggested Readings:

2. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
7. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-305: OBJECT TECHNOLOGY

Max. Marks: 80
Time: 3 Hrs.

Note:
There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Object-Oriented Languages, Java’s History, Creation of Java, Importance of Java for the Internet, Java’s Magic: Byte-code, Its Features, Object-Oriented Programming in Java.


Arrays and Strings: Arrays, Arrays of Characters, String Handling Using String Class, Operations on String Handling Using, String Buffer Class.
Unit-II

Extending Classes and Inheritance: Using Existing Classes, Class Inheritance, Choosing Base Class, Access Attributes, Polymorphism, Multiple Levels of Inheritance, Abstraction through Abstract Classes, Using Final Modifier, The Universal Super class-Object Class.

Packages & Interfaces: Understanding Packages, Defining a Package, Packaging up Your Classes, Adding Classes from a Package to Your Program, Understanding CLASSPATH, Standard Packages, Access Protection in Packages, Concept of Interface.

Exception Handling: The concept of Exceptions, Types of Exceptions, Dealing with Exceptions, Exception Objects, Defining Your Own Exceptions

Unit-III

Multithreading Programming: The Java Thread Model, Understanding Threads, The Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Deadlocks Inter-thread communication, Deadlocks

Input/Output in Java: I/O Basic, Byte and Character Structures, I/O Classes, Reading Console Input Writing Console Output, Reading and Writing on Files, Random Access Files, Storing and Retrieving Objects from File, Stream Benefits.


Unit-IV

Working with Windows: AWT Classes, Window Fundamentals, Working with Frame, Creating a Frame Window in an Applet, Displaying Information Within a Window.


Working with AWT Controls, Layout Managers and Menus.

Suggested Readings:

1. The Complete Reference JAVA, TMH Publication.
2. Beginning JAVA, Ivor Horton, WROX Public.
3. JAVA 2 UNLEASHED, Tech Media Publications.
4. JAVA 2(1.3) API Documentations.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.
MCA-401: ADVANCED JAVA PROGRAMMING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.


Review of Applets, Class, Event Handling, AWT Programming.

Unit-II


Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK Introspection, Using Bound properties, Bean Info Interface, Constrained properties Persistence, Customizers, Java Beans API.

Unit-III

Introduction to Servelets: Lifecycle of a Serverlet, JSDK The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading Initialization parameters. The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies- Session Tracking, Security Issues


Unit-IV

JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data – Memory Usage Considerations


Suggested Readings:

1. Dietel and Nieto: Internet and World Wide Web – How to program?, PHI/Pearson Education Asia.
5. Murach: Murach’s beginning JAVA JDK 5, SPD.
9. Building Web Applications-NIIT PHI.
11. Jon Duckett: Beginning Web Programming, WROX.
13. Any other book(s) covering the contents of the paper in more depth.

**Note**: Latest and additional good books may be suggested and added from time to time.

**MCA-402: DATA WAREHOUSING & MINING**

**Max. Marks: 80**

**Time: 3 Hrs.**

**Note**: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

**Unit-I**

Need for data warehouse, definition, goals of data warehouse, Data Mart, Data warehouse architecture, extract and load process, clean and transform data, star, snowflake and galaxy schemas for multidimensional databases, fact and dimension data, Designing fact tables. Partitioning, partitioning strategy – horizontal partitioning, vertical partitioning,

**Unit-II**

Data warehouse and OLAP technology, multidimensional data models and different OLAP operations, OLAP Server: ROLAP, MOLAP and HOLAP. Data warehouse implementation, efficient computation of data cubes, processing of OLAP queries, indexing OLAP data.

**Unit-III**

Data preprocessing, data integration and transformation, data reduction, Discretization and concept Hierarchy Generation, Data mining primitives, Types of Data Mining, Data Mining query language, Architectures of data mining. Data generation & Summarization based characterization, Analytical characterization, Mining class comparisons, Mining descriptive statistical measures in large data bases.

Mining Association Rules in large databases: Association rule mining, single dimensional Bookan association rules from Transactional DBS, Multi level association rules from transaction DBS, multidimensional association rules from relational DBS and DWS, Correlation analysis, Constraint based association mining.

**Unit-IV**

Classification and Prediction: Classification by decision tree induction, Back propagation, Bayesian classification, classification based in association rules, Prediction, classifier accuracy, Cluster analysis, partitioning and hierarchical methods, Denrity based methods, Grid based methods, web mining, Temporal and spatial data mining.
Suggested Readings:

1. W.H.Inmon: Building Data Ware House, John Wiley & Sons.
2. S. Anahory and D.Murray: Data warehousing, Pearson Education, ASIA.
3. Jiawei Han & Micheline Kamber: Data Mining - Concepts & Techniques, Harcourt India PVT Ltd. (Morgan Kaufmann Publishers).
4. Michall Corey, M.Abbey, I Azramson & Ben Taub: Oracle 8i Building Data Ware Housing, TMH.
5. I.H. Whiffen: Data Mining, Practical Machine Cearing tools & techniques with Java (Morgan Kanffmen)
6. Sima Yazdanri & Shirky S. Wong: Data Ware Housing with oracle.
8. IBM An Introduction to Building the Data Warehouse, PHI Publication.
12. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-403: SOFTWARE ENGINEERING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Software Project Management: Management activities, Project planning, Project scheduling, Risk management and activities.

Unit-II

Software Requirements Engineering: Requirements Engineering Processes, Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.


Unit-III


Software Testing, Software Reliability, Software Safety, Defect testing, Debugging Tools.
Unit-IV


Suggested Readings:

1. Pressman: Software Engineering, TMH.
5. Ghezzi, Carlo: Fundaments of Software Engineering, PHI.
10. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-404: ADVANCED DATABASE SYSTEMS

Max. Marks: 80

Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

The Extended Entity Relationship Model and Object Model: The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Object-Oriented Databases: Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS.

Unit-II

Object Relational and Extended Relational Databases: Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; Advance Querying and Information Retrieval Decision Support Systems, Information Retrieval Systems Data Analysis and OLAP, Data Mining.

Unit-III

Parallel and Distributed Databases and Client-Server Architecture: 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 interfaces to the Web, Overview of XML; XML applications; The semi structured data model, Implementation issues. Enhanced Data Models for Advanced Applications: Active database concepts. Temporal database concepts; Spatial databases, Concepts and architecture; Deductive databases and Query processing; Mobile databases, Geographic information systems, Multimedia databases.

Suggested Readings:

1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education
4. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-405: VISUAL LANGUAGES PROGRAMMING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Client Server Basics: Discover Client-Server and Other Computing Architectures, Understand File Server Versus Client-Server Database Deployment, Learn About the Two Tier Versus Three Tire Client-Server Model.


VB Advance Controls: Events, Menu bar, Popup Menus, Tool bar, Message Box, Input Box, Built-in Dialog Boxes, Creating MDI, Working with Menus.

Unit-II


Visual Basic and databases: Understanding the Data Controls And Bound Controls, Introduction to Data Form Wizard, Introduce DAO, Working With Recordsets, Record Pointer, Filters, Indexes, Sorts And Manipulation of Records

Unit-III

Remote And ActiveX Data Objects: Working With ODBC, Remote Data Objects And Remote data Control, Introducing ADO, ADO Data Control, Using DataGrid Control And ActiveX Data Objects .

ActiveX Controls, Extending ActiveX Controls And Classes: Creating, Testing, Compiling, Enhancing And User Drawn ActiveX Controls, Using ActiveX Control Interface Wizard And Property Pages Wizard, Introducing Ambient, Extender Objects, Creating Property Pages, Building Class Modules, ActiveX DLL

Unit-IV

Client-Server Development Tools: COM, Services Models, Development Tools Included with VB 6, Working With Source Safe Projects Reports And Packaging: Data Reports And Crystal Reports, Packaging A Standard EXE Project.

VB And Internet: Introduction to VBScript, Tools used with VBScript and VBScript Languages, Introduction to Active Server Pages, ASP Objects.

Suggested Readings :

2. Holzner Steven: Visual Basic Programming, IDG Books India Ltd.  
4. Visual Basic 6 Client/Server How-To  
5. Using Visual Basic 6  
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-501: ADVANCED TECHNOLOGY

Max. Marks: 80  
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Basic of the .net framework: .net architecture, managed code, assemblies, CLR, execution of assemblies code, IL, JIT, .NET framework class library, common type system, common language specification, interoperability with unmanaged code.

Unit-II

Introduction to VB.Net and C#:  

VB.Net: Net features, Data Types
C#: Data Types, Operators, Garbage Collection, Jagged Array, Collection (Array list, Hash table), Indexer(One Dimension) and property, Delegates and events (Multicasting, Multicasting Event), Exception Handling.

Unit-III

ADO.Net & Object Oriented Concepts (Using VB.Net or C#): Basic window control, Architecture of ADO.Net, Comparison with ADO, .Net Data provider, Data Adapter, Data Set, Data Row, Data Column, Data Relation, command, Data Reader, Data Grid Constructor, Destructor, Abstraction, interface, polymorphism (Over loading and over ridding)

Unit-IV

ASP.Net : Anatomy of ASP.NET Page, Server Controls : label, dropdown list box, validation controls, list box, text box, radio button, check box, State Management: session, caching, Authentication (window,.Net Passport, Forms Based), Authorization, web services, Advance Grid Manipulation.

Suggested Readings:

5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-502: SOFTWARE TESTING & QUALITY ASSURANCE

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Software Testing and the related concepts: significance and potential; Testability and features of Test cases.

Software Testing techniques; WBT, BBT, Ticking Box testing; static analysis, symbolic testing, program mutation testing, input space , partitioning, functional program testing, data flow guided testing.

Unit-II

Software Testing Strategies: Approach, Issues; integration, incremental, System, alpha, Beta testing etc; Comparative evaluation of techniques: Testing tools; Dynamic analysis tools, test data generators, Debuggers, test drivers etc..

Technical Metrics for Software: Quality Factors, framework; Metrics for analysis, design, testing source code etc.

Unit-III

Object Oriented Testing: OOT strategies and issues, Test Case design, interface testing.

Software Quality Assurance: concept, importance and essence; FTR, structured walk through technique etc.
Unit-IV

SW Reliability, validation, Software Safety and Hazards Analysis; Features affecting software quality, SQA Plan.

Using project management software tools, Quality management, issue, standards and methods. ISO Quality models: ISO 9000 and SEI-CMM and their relevance.

Suggested Readings:

3. Pressman : Software Engineering, TMH.
5. Ghazzi, Carlo: Fundaments of Software Engineering, PHI.
9. Any other book(s) covering the contents of the paper in more depth.

Note : Latest and good books may be added from time to time.

MCA-503: WINDOWS PROGRAMING & VISUAL C++

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Introduction to Child Window Controls. Check boxes, Static control, Radio Buttons, Scroll bars, Advance Window Controls : Toolbars up down controls, Spin control, Progress bar, Tree view, Tab controls, Text and Font.

Unit-II

Working with Graphics, Consoles, Multitasking Process and Threads. Clipboard Drag and Drops, Advance features of Windows Programming GDI Metafiles, Sound API, DLL.

Unit-III

Unit-IV

Visual C++ And Database Management: MFC programming without View Document Architecture, Data Access Objects (DAO) versus Open Database Connectivity (ODBC), Database Building Overview, Building a Database Application using ODBC, Building a Database Application Using

Suggested Readings:

2. Herbett Schildts: Windows Programming, TMH.
3. Murray: VC++, TMH.
4. Steve Holzner: Introduction to VC++.
5. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

MCA-504: SOFT COMPUTING

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I

Introduction: Introduction to soft computing; introduction to biological and artificial neural network; introduction to fuzzy sets and fuzzy logic systems.


Unit-II

Artificial neural networks and applications: Different artificial neural network models; learning in artificial neural networks; neural network applications in control systems. Neural Nets and applications of Neural Network.

Unit-III

Fuzzy systems and applications: fuzzy sets; fuzzy reasoning; fuzzy inference systems; fuzzy control; fuzzy clustering; applications of fuzzy systems.

Neuro-fuzzy systems: neuro-fuzzy modeling; neuro-fuzzy control.

Unit-IV


Suggested Books:

Note: Latest and additional good books may be suggested and added from time to time.

MCA-505: COMPUTER SECURITY

Max. Marks: 80
Time: 3 Hrs.

Note: There shall be 8 questions in all, 2 from each Unit and carrying equal marks, and the candidate will be required to attempt 5 questions in all selecting at least one from each Unit.

Unit-I


Unit-II


Unit-III


Unit-IV


Protecting Programs and data, Information and the law, Rights of Employees and Employers, Software failures, Computer Crime, Praia, Ethical issues in Computer Security, Case studies of Ethics.

Suggested Readings:

3. Charlie Kaufman, Radia Perlman, Mike Speciner: Network Security, Private communication in a public world, PHI.
5. Bruce Schneier , Niels Ferguson: Practical Cryptography, Wiley Dreamtech India Pvt Ltd.
6. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time.

SOFT SKILS-I (MCA-108) & II (MCA-208)

To develop following skills by way of self-study, student seminars, workshops, Extension Lecturers, etc.

➢ Communication Skills
➢ Presentation Skills
➢ Behavioral Skills
➢ Active Listening
➢ Body Language
➢ Managerial Skills
➢ Group Working Culture Skills
➢ Giving and Receiving Feedback

• Head of the Department/Director/Principal shall assign the task of assessment of soft skills of students to Faculty Member(s) and each student will be evaluated on the basis of the soft skills and shall award marks out of 25 for each student as Internal Assessment.

MINI PROJECT - I (MCA-408) & II (MCA-508)

(GUIDELINES FOR MINI PROJECT)

• The aim of the Mini Project(s) is to lay a foundation for Major Project to be carried out by the student during 6th Semester of MCA Programme.
• Each student should carry out Mini Project(s) using the software development tools/languages/technologies that they have learnt and/or have studied during the concerned semester.
• It should be compulsorily done by the student in-house under the supervision of the staff(s) assigned by Head of the Department/Director/Principal.
• The Mini Project(s) will be assessed by the concerned supervisor(s) and shall award marks out of 25 for each student as Internal Assessment.