<table>
<thead>
<tr>
<th>Paper Code</th>
<th>Paper Title</th>
<th>Paper Type</th>
<th>Credit</th>
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<tbody>
<tr>
<td>MCA-101</td>
<td>Computer Architecture</td>
<td>Non-Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-102</td>
<td>Discrete Structures</td>
<td>Foundation-Compulsory</td>
<td>06</td>
</tr>
<tr>
<td>MCA-103</td>
<td>Object Oriented Programming &amp; C++</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-104</td>
<td>Computer Based Numerical &amp; Statistical Techniques</td>
<td>Core</td>
<td>03</td>
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<tr>
<td>MCA-105</td>
<td>Programming Lab-I</td>
<td>Core</td>
<td>03</td>
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<tr>
<td>MPDC-105</td>
<td>Remedial Language Course **</td>
<td>Foundation-Elective</td>
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Total Semester Credit: 24

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<tr>
<th>Paper Code</th>
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<tbody>
<tr>
<td>MCA-201</td>
<td>Graph Theory and Combinatorics</td>
<td>Core</td>
<td>06</td>
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<tr>
<td>MCA-202</td>
<td>System Programming</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-203</td>
<td>Data Structure</td>
<td>Foundation-Compulsory</td>
<td>06</td>
</tr>
<tr>
<td>MCA-204</td>
<td>Computer Based Optimization Techniques</td>
<td>Non-Core</td>
<td>03</td>
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<tr>
<td>MCA-205</td>
<td>Programming Lab-II</td>
<td>Core</td>
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<tr>
<td>MPDC-205</td>
<td>Moral Studies **</td>
<td>Foundation-Compulsory</td>
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# SECOND YEAR

## 3rd Semester

<table>
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<tr>
<th>Paper Code</th>
<th>Paper Title</th>
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<tbody>
<tr>
<td>MCA-301</td>
<td>Operating System</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-302</td>
<td>Analysis and Design of Algorithm</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-303</td>
<td>Software Engineering</td>
<td>Non- Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-304</td>
<td>Internet and Java Programming</td>
<td>Foundation- Compulsory</td>
<td>03</td>
</tr>
<tr>
<td>MCA-305</td>
<td>Programming Lab III</td>
<td>Core</td>
<td>03</td>
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<tr>
<td>MPDC-305</td>
<td>Community Service **</td>
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Total Semester Credit: 24

## 4th Semester

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<th>Paper Code</th>
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<tbody>
<tr>
<td>MCA-401</td>
<td>Data Base Management System</td>
<td>Core</td>
<td>06</td>
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<tr>
<td>MCA-402</td>
<td>Compiler Design</td>
<td>Non- Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-403</td>
<td>Data Communication &amp; Computer Network</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-404</td>
<td>Elective Paper-I</td>
<td>Elective</td>
<td>03</td>
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<tr>
<td>MCA-405</td>
<td>Programming Lab IV</td>
<td>Core</td>
<td>03</td>
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<tr>
<td>MPDC-405</td>
<td>Ambedkar Studies **</td>
<td>Foundation- Compulsory</td>
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Total Semester Credit: 24
THIRD YEAR

5th Semester

<table>
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<tr>
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<tbody>
<tr>
<td>MCA-501</td>
<td>Artificial Intelligence</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-502</td>
<td>Computer Graphics</td>
<td>Core</td>
<td>06</td>
</tr>
<tr>
<td>MCA-503</td>
<td>Elective Paper II</td>
<td>Elective</td>
<td>06</td>
</tr>
<tr>
<td>MCA-504</td>
<td>Elective Paper III</td>
<td>Elective</td>
<td>03</td>
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<tr>
<td>MCA-505</td>
<td>Programming Lab V</td>
<td>Core</td>
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Total Semester Credit: 24

6th Semester

<table>
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<tr>
<th>Paper Code</th>
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<tbody>
<tr>
<td>MCA-601</td>
<td>Industrial Training and Project</td>
<td>Core</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>(I) Internal assessment</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(II) External Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Dissertation &amp; Viva-voce examination)</td>
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</table>

The weightage of internal and external assessment will be in the ratio of 30% and 70%

**Internal assessment will be done as follows**

There will be three components having equal weightage

i) SRS / Synopsis

ii) Design of Project

iii) Project report

Each student will have to submit relevant documents for each of the above components to his/her supervisor/guide through email/physical presence and evaluation of the same will be done by the concerned supervisor/guide.
Total Credit of all Semesters- 144

Note:
1. Students of the programme can chose any other course equal or higher credits from any other department of the university in lieu of non-core and elective course under the CBCS programme. However, all of these courses are available to students of other departments under the CBCS programme.
2. Credit not to be counted for paper market as **

A) List of Electives for Semester IV (Elective-I):

1. Modeling & Simulation
2. Data Mining
3. Real Time System
4. Software Project Management
5. Electronic Commerce
6. Parallel Computing

B) List of Electives for Semester IV (Elective-II & III):

(i) Electives II (6 Credit)

1. Distributed Computing
2. Embedded Systems
3. Soft Computing
4. Digital Image Processing

(ii) Electives III (3 Credit)

1. Advance Database Management System
2. Neural Network
3. Natural Language Processing
4. Digital Signal Processing
5. Mobile Computing
MCA-101  Computer Architecture (3-1-0)  Credit-06

(Unit-I)
Introduction to Computer Organization, I/O Storage Devices, CPU Processor, Data Representation, Number System, Computer Arithmetic and Boolean Algebra, Generations of Computer, Introduction to Operating Systems, and system Software.

UNIT-II
Flowcharts & Algorithms, Programming Languages and Their Evolution, Level and Classification of Programming Language-Machine, Assembly & High Level Languages, Logic Families. DTL, TTL, ECL, NMOS, PMOS, CMOS

UNIT-III

UNIT-IV
Types of Memories, RAM, ROM PROM, EPROM, Cache Memory, Bubble Memory, Secondary Memory, Memory Devices & Properties, Instructions format & Addressing Techniques, I/O Organization, DMA, CPU organization, ALU Design, Control Unit & Processor Unit Organization.

Suggested Readings:
5. Tannenbaum, "Structured Computer Organization", PHI
6. V. Rajaraman, "Fundamentals of Computers", PHI
7. Peter Norton's, "Introduction to Computers", TMH
8. Hahn, "The Internet Complete Reference", TMH

MCA-102  Discrete Structure (3-1-0)  Credit-06

(Unit-I)
Relation: Type and Composition of relations, Pictorial Representation of Relations, Closures of Relations, Equivalence Relations, Partial Ordering Relation Posets, Hasse Diagrams.
Function: Type, Composition of Function, Recursively Defined Function.
Mathematical Induction: Pino's Axioms, Mathematical Induction, Discrete Numeric Functions and Generating Functions, Simple Recurrence Relation with Constant Coefficients, Linear Recurrence Relation without Constant Coefficient, Asymptotic Behavior of Functions.
UNIT-II
Algebraic Structure: Properties, Semi Group, Monoid Group, Abelian Group, Properties of Group, Sub-Group, Cyclic Group, Cosets, Permutation Groups, Homomorphism, Isomorphism and Automorphism of Groups.

UNIT-III
Introduction to defining Language, Kleene Closure, Arithmetic Expressions, Chomsky Hierarchy, Regular Expression, Generalized Transition Graph, Conversion of regular Expressin to finite Automata, NFA, DFA, Conversion of NFA TO DFA, Optimizing a DGA, FA with output: Moore Machine, Mealy Machine Conversions.

UNIT-IV

Suggested Readings
1. Lihtschutz, Seymour, "Discrete Mathematics", TMH
2. Trembely, J.P & R Manobar, "Discrete Mathematical Structure with Application to Computer Science", TMH.
5. Gersting, "Mathematical Structure for Computer Science", WH Freeman & Macmillam

MCA-103 Object Oriented Programming & C++(3-1-0) Credit-06
(Contact Hours: 45)

UNIT-I
Object & Classes, Links and Associations Generalization and Inheritance, Aggregation, Abstract Classes. A sample Object Model, Multiple Inheritance, Meta Data, Candidate Keys, Constraints.

UNIT-II

UNIT-III

UNIT-IV
Translating Object Oriented Design into an Implementation, OMT Methodologies, Examples and Case Studies to Demonstrate Methodology, Comparison of Methodology, SA/SD and JSD.
Suggested Readings:
2. Bjarne Stroustrup, “C++ Programming Language”, Addison Wesley

MCA-104 Computer Based Numerical & Statistical Techniques (2-1-0) Credit-03
(Contact Hours: 30)

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Measure of Central Tendency and Dispersion, Linearar Regression, Least Square Method, Rank Correlation Coefficient of Correlation Ratio, Concepts of Population and Sample Parameter & Statistic, Testing of Hypothesis, Chi Square F-t-test, Implementation of Methods in C++

Suggested Readings:
7. Francis Scheld, “Numerical Analysis”, TMH.

MCA-105 Programming Lab-I (0-0-4) Credit-03
(Contact Hours: 30)

Semester-II

MCA-201 Graph Theory and Combinatorics (3-1-0) Credit-06
(Contact Hours: 45)
UNIT-I
Counting principal, Permutation, Combination, Recurrence Relation, Solution of Recurrence Relation, Inclusion and Exclusion Principal, Introduction of Graph, Types of Graph, Self Loop, Parallel Edge, Adjacent Vertices, Degree, Isolated Vertex, Pendant Vertex, Sub Graph, Walk, Path, Circuit.

UNIT-II
Representation of Graph, Adjacency Matrix, Incidence Matrix, Path Matrix, Eular Graph, Hamiltonian Graph, Traveling Sales Man Problem, Connected Graph, Loosely Connected and Tightly Connected Graph

UNIT-III
Tree, Traversal in a Tree, Types of Tree, AVL Tree, Diameter, Centre, Eccentricity in the Tree, Binary Search Tree, Expression Tree, Spanning Tree, Minimum Cost Spanning Tree, Kruskal Algorithm, Prim’s Algorithm, Shortest Path, Dijkstra Algorithm, Path between All Vertex, Depth First Search, Breadth First Search.

UNIT-IV
Coloring of the Graph, Chromatic Number, Chromatic Polynomial, Planar Graph, Kurotowsky’s Two Non Planar Graph, Kurotowaskies Theorem, Dual Graph, Geometric Dual & Combinational Dual, Network Flow, Cut Set, Maximum Flow.

Suggested Readings:
1. Deo Narsingh, “Graph Theory with application to engineering and computer science”.
2. Tremblay and Manohar, “Discrete mathematical structure with application to computer”.

MCA-202 System Programming (3-1-0)
Credit-06
(Contact Hours: 45)

UNIT-I

UNIT-II
Translators, Interpreters, Brief Description of Different Phases of Computer, Loaders: A Two Pass Loaders Scheme, Relocating Scheme, Relocating Loader, Subroutine Linkage, Direct Linking Loader, Binders, Overlays, Types and Basic Functions of Operating Systems.

UNIT-III
Software Tool: Text Editors, Program Generators, Debug Monitors, Access to System Services, ROM, BIOS, Booting Process (DOS), Expanded memories introduction to Mouse, Keyboard & Screen Management.

UNIT-IV
Introduction to DOS Device Drivers: Types, Structure & Processing, Interrupt Types, Organization, Interrupt Hardware and Program Status Register (PSR), Interrupt Processing

Suggested Readings:
1. J.J. Donovan, “System Programming”, TMH
2. D.M. Dham Dhere, “Introduction to System Software”, TMH
5. Ray Dunstan, “Advanced MS DOS Programming”, BPB Publication

MCA-203 Data Structure (3-1-0) Credit-06
(Contact Hours: 45)

UNIT-I
Introduction to Data Structure, Types and operations, Algorithm, Way of Writing Algorithm, Complexity, Memory Allocation of all the data structure. Array, Operations in the Array, Merging of two list, Sorting and Searching - Bubble, Insertion, selection, Quick, Shell, Sorting Networks, Sorting on Disk Files, Search - Linear and Binary Search..

UNIT-II
Linked List- Single and Double linked list, Creation, Insertion and Deletion Operation, Polynomial Addition Using Linked List, Queue, Circular Queue, Priority Queue, Stack, Implementation using array and Linked list, Infix to Prefix Representation using Stack and Value of Infix Expression Using Stack, Hash table, Collision in Hash Table, Collision Resolution Technique.

UNIT-III
Trees: Linear Tree, Binary Tree and their Representation, Implementation recursively and iteratively, Searching, Traversal (in order, Preorder, Post order), Deletion from tree, Threaded Tree, AVL Tree, Forests, Practical Application.

UNIT-IV
Graph: Introduction of Graph, Memory representation of graph using array and linked list, Traversal in graph, Breadth first search and depth first search, Shortest Path Matrix of the graph, Applications of Graph, All implementation using C++.

Suggested Readings:
1. Hadley, G., “Linear Programming and Massachusetts”, Addison-Wesley

MCA-204 Computer Based Optimization Techniques (2-1-0) Credit-03
(Contact Hours: 30)

UNIT-I
Linear Programming-Graphical, Simplex, Two Phase & Big M Methods, Dual Linear Programming-Dual of a Problem, Dual Simplex Method.

UNIT-II
Transportation Methods- North West Corner, Least Cost, VAM Methods, Optimal Solution by Modi & Stepping Stone Method, Assignment Problem
UNIT-III
Queueing Theory, Inventory Control- EOQ, Price Break , Production Inventory Model, Lead Time, Inventory Control System, Inventory Models, Network Analysis-Time Estimation, PERT and CPM, Statistical Quality Control.

UNIT-IV
Game Theory, Integer and Dynamic Programming, Quadratic Programming, Goal Theory, Simulation and Forecasting Techniques, Implementation in C++

Suggested Readings:
1. Hadley, G., “Linear Programming and Massachusetts”, Addison-Wesley

MCA-205 Programming Lab-II (0-0-4) Credit-03 (Contact Hours: 30)

SECOND YEAR
Semester-III

MCA-301 Operating System(3-1-0) Credit-06 (Contact Hours: 45)

UNIT-I
Basic Concepts and Functions of Operating Systems, Types: Single and Multi User, Batch Processing, Real Time, Time Sharing, parallel and Distributed OS.

Memory Management – Objectives, Classification of Memory Management, Static and Dynamic Memories, allocation techniques, Compaction, Paging & Segmentation, Address Translation, Fragmentation in Each Case, Performance and Comparison.

UNIT-II
Virtual Memories- Aims and Methods of Implementation-static & dynamic, Demand Paging, Page Faults and System Performance, Page Replacement Algorithms, Prepaging, Comparisons.

UNIT-III

UNIT-IV
Process Synchronization: Concurrency, Critical Section and Its S/W, H/W and Semaphore Solution. Classical Examples on Semaphore,
UNIX case study- Overview –History, flavours and architecture, Unix File system, Basic Commands & Utilities, introduction to shell Programming, & System Calls.
Suggested Readings:

MCA-302 Analysis & Design of Algorithms (3-1-0)  Credit-06
(Contact Hours: 45)

UNIT-I

UNIT-II
Elementary Data Structure: Stacks, Queues, Linked List, Binary Search Tree, Hash Table.
Advanced Data Structure: Red Black Trees, Splay Trees, Augmenting Data Structure Binomial Heap, B Trees, Fibonacci Heap and Data Structure for Disjoint Sets Union-find Algorithm, Dictionaries and Priority Queues, Merge able Heaps, Concatenable queues.

UNIT-III
Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithm, Backtracking, Branch and Bound, Amortized Analysis.

UNIT-IV

Suggested Readings:
2. Coremen Leiserson et.al., “Introduction to Algorithms”, PHI

MCA-303 Software Engineering (3-1-0)  Credit-06
(Contact Hours: 45)

UNIT-I

UNIT-II

UNIT-III
Coding: Top-down and Bottom-Up Programming, Structured Programming, Information hiding, Programming style and internal documentation.
Software Project Management: The Management Spectrum(The people, the product, the process, the project), Cost estimation, Project Scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, Project monitoring risk management.

UNIT-IV
Software Reliability & Quality Assurance: Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 Certification for software industry. SEI Capability maturity model, Comparison between ISO &SEI CMM.

Suggested Readings:
5. Alexis, Leon and Mathews Leon, “Fundamental of Software Engineering”, Vikas

MCA-304 Internet and Java Programming (2-1-0) Credit-03
(Contact Hours: 30)

UNIT-I
Internet: Connecting to Internet Telephone, Cable, Satellite Connection, Choosing an ISP, Introduction to Internet Services, E-Mail Concepts, Sending and Receiving secure E-Mail, Voice and Video Conferencing.

UNIT-II
Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread Programming, I/O, Java Applet, String
UNIT-III

**Java Swing:** Creating a Swing Applet and Application, Programming using Panes, Pluggable Look and feel, Labels, Text fields, Buttons, Toggle Buttons, Check boxes, Radio Buttons, View Ports, Scroll Panes, Scroll Bars, Lists, Combo Box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner, Frame, JDBC: The connectivity Model, JDBC/ODBC Bridge, Java.sql Package, connectivity to remote database, navigating through multiple rows retrieved from a database.

UNIT-IV

**Java Beans:** Application Builder tools, The bean develop, kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java Beans (EJB), Introduction to RMI (Remote Method Invocation): A Single client-server application using RMI.

**Java Servlets:** Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servelets, HTTP Redirects, Cookies, Introduction to Java Server pages(JSP).

*Suggested Readings:*

1. John Zukowski, Mastering Java
2. Evangelos P., Mastering VB6
3. Deborah, S., Roy & Eric Roy, Mastering HTML
4. Deitel & Deitel, Java How to Program
5. A. Russel, Mastering ASP, BPB Publication
6. Ann Navarro, Mastering XML, BPB Publication
7. W.Boggs & M.Boggs, Mastering UML with Rational Rose, BPB Publication

MCA-305 Programming Lab III (0-0-4)  Credit-03

(Contact Hours: 30)

*Includes*

(i) Lab Practice on MCA-301/304 (ii) Seminar-on emerging & contemporary topics (2Hrs./Week)

Semester-IV

MCA-401 Data Base Management System (3-1-0)  Credit-06

(Contact Hours: 45)

UNIT-I

**Introduction:** An overview of database management system, Database system Vs File System, Database system concepts and architecture, Data models schema and instances, Data independence and Data base language and interfaces, Data Definitions Language, DML, Overall Database Structure.

**Data modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

UNIT-II

**Relational Data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints Domain constraints, relational algebra, relational calculus, tuple and domain calculus.
Introduction to SQL: Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, Views and Indexes, Queries and Sub Queries, Aggregate Functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL, PL/SQL, Triggers and Clusters.

UNIT-III
Data Base Design and Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, Inclusion dependencies, loss less join decompositions, normalization using FD, MVD and JDs, alternative approaches to database design.

UNIT-IV
Concurrency Control Techniques: Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multivesion schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation, Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

Suggested Readings:

1. Date C.J., “An Introduction to Database System”, Addision Wesley

MCA-402 Compiler Design (3-1-0) Credit-06
(Contact Hours: 45)

UNIT-I
Introduction of Compilers and Translators, Phases of comiler, Regular expressions, Finite State Machines, Push Down Machines and Their Application, tokens, Lexical analysis, Symbol Tables Organization, Introduction to Lexical Analyzer.

UNIT-II

UNIT-III

UNIT-IV
Code Optimization: Types, Local, Loop Optimization, basic blocks construction, Use of Data Flow Analysis in code optimization.

Code Generation: Features and Problems in Code Generation, Code Generation Through GETREG, DAG.

Suggested Readings:

1. Aho & Ulman, Principles of Compiler Design, Narosa Publication
4. Trembley & Sorenson, Compiler Writing, TMH
5. Allen I Holub, Compiler Design in C, PHI

MCA-403  Data Communication and Computer Networks (3-1-0)  Credit-06
(Contact Hours: 45)

UNIT-I

UNIT-II
Data Compression Shannonhatnly Theorem, Transmitter, Channel Noise, Amplitude Modulation, Frequency Modulation, Sampling, Pulse Modulation, PWM, PDM, PPM, PCM.
Compression & Codes, Scheme Coherent and Non Coherent Detector, Probability of Error.(Pre).
Performances Analysis and Compression, Error Detection and Correction Codes.

UNIT-III
Goals and Application of Networks, Networks Structure and architecture, the OSI reference model, services, networks topology, Physical Layer-transmission, switching methods, Integrated services digital networks, terminal handling.
Medium access sub layer: Channel allocations, LAN protocols, ALOHA Protocols-Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision free Protocols, IEEE Standards, FDDI, Data Link Layer-elementary data link protocols, sliding windows protocols, error handling, high Level Data Link Control.

UNIT-IV

Suggested Readings:

3. Comer, "Computer Networks & Internet", PHI
4. Comer, "Internetworking with TCP/IP", PHI
MCA-405 Programming Lab IV (0-0-4)  Credit-03

Includes: (i) LAB Practice on 401  (ii) Development of Mini Project (2 hrs/week)

THIRD YEAR
Semester-V

MCA-501 Artificial Intelligence (3-1-0)  Credit-06

UNIT-I
Artificial Intelligence: Definition, Historical Overview, Growth, Turing Test and Its Significance Branches of AI and Applications, Problem Solving, production system and Control Strategies.

UNIT-II

UNIT-III

UNIT-IV
Natural Language Processing: Grammar for Natural Languages, Parsing, Transition Nets (TN), ATN and RTN Parser, Lexicon, Sentence Generation.
Introduction to: Pattern Recognition, Planning, Machine Translation, Neural Nets and Machine Learning, Fuzzy Logic.

Suggested Readings:

1. Elaine, Rich & K. Knight, Artificial Intelligence, TMH Publication
2. N.J. Nilson, Principles of Artificial Intelligence, Narosa Publication
4. E. Charniak & D. McDermott, Introduction to AI, Addison Wesley
5. Avron Barr & Edward A, Feigenbaum the Handbook of Artificial Intelligence, Addision Wesley-Longman
7. Peter Jackson, Introduction to Experts System, Addison Wesley
8. Tau & Genzales, pattern Recognition Principles, Addison Wesley.
UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Shading, Transparency, Shadows, Textures Colors, CGS Modelling, Graphic Standards GKS, PHIGS, Animation Fundamentals-Control and Sequencing, Creating, Sealing and Saving Frames, Synchronising Frames, Audio-Video Editing, Implementation in C++.

Suggested Readings:

MCA-503  Elective (3-1-0)  Credit-06
(Contact Hours: 45)

MCA-504  Elective (2-1-0)  Credit-03
(Contact Hours: 30)

MCA-505  Software Lab V (0-0-4)  Credit-03
(Includes (i). Lab Practice on MCA-502
(Contact Hours: 30)

Semester VI

MCA-601  Industrial Training and Project

(I) Internal assessment
(II) External Assessment (Dissertation & Viva-voce examination

24 Credits

30% weightage

70% weightage

A) List of Electives for Semester IV (Elective-I):-
1. Modeling & Simulation
2. Data Mining
3. Real Time System
4. Software Project Management
5. Electronic Commerce
6. Parallel Computing

B) List of Electives for Semester IV (Elective-II & III):

(i) Electives II (6 Credit)

1. Distributed Computing
2. Embedded Systems
3. Soft Computing
4. Digital Image Processing

(ii) Electives III (3 Credit)

1. Advance Database Management System
2. Neural Network
3. Natural Language Processing
4. Digital Signal Processing
5. Mobile Computing

For Semester IV (Elective-I):

1. Modeling & Simulation (2-1-0) Credit 3 (Contact Hours: 30)

UNIT-I
System Definition and Components, Stochastic Activities, Continuous and Discrete Systems, System Modeling, Types of Model, Static and Dynamic Physical Models, Static and Dynamic Mathematical Models, Full Corporate Model, Types of System Study.

UNIT-II
System Simulation, Why to Simulate and When to Simulate, Basic Nature of Simulation, Technique of Simulation, Comparison of Simulation and Analytical Methods, Types of System Simulation, Real Time simulation, Hybrid Simulation, Simulation of Pure-Pursuit Problem Single-Server Queuing System and An Inventory Problem, Monte Carlo Simulation, Distributed Lag Models, Cobweb Model.

UNIT-III

UNIT-IV
World Model: Critical Path Computation, Uncertainties in Activity Duration, Resource Allocation Simulation Software, General Purpose vs Application-Oriented Simulation Packages

Suggested Readings:


2. Data Mining (2-1-0)

UNIT-I
The process of knowledge discovery in databases, predictive and descriptive data mining techniques, supervised and unsupervised learning techniques

UNIT-II
Introduction to DATA warehousing, Data-Mart, Client/Server Computing Model & Data Warehousing, On Line Analytical Processing (OLAP)

UNIT-III
- Techniques of Data Mining: Link analysis, Predictive Modeling, Database Segmentation, Decision Trees, Bayesian techniques in data mining, Nearest Neighbor & Clustering, Rule Introduction

UNIT-IV
Introduction to Multimedia Data-Mining, Mining the World Wide Web (Web Data-Mining), Search engines, Web query expansion, Mining Meta-Data, Data Visualization & Overall Perspective, Application of Data-Mining.

UNIT IV
Issues in Data Mining: Scalability and data management issues in data mining algorithms, privacy, social, ethical issues in KDD and data mining, pitfalls of KDD and data mining

Suggested Readings:
1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques (2nd ed.), Morgan Kaufmann, 2006.
2. Berson, “Data Warehousing, Data-Mining & OLAP”, TMH
5. Margaret H. Dunham, “Data-Mining, Introductory & Advance Topics”, Pearson Education

3. Real Time System (2-1-0)

UNIT-I

UNIT-II

UNIT-III

UNIT-IV

Suggested Readings:

4. Software Project Management (2-1-0)

UNIT-I
Introduction to Project Management, Importance of Software Project Management, Stages And Stakeholders of a Software Project, Elements of Software Project, Project Planning, Project Execution, Project and Product Life Cycles, Role of Project Manager, Project Management Framework, Software Tools for Project Management

UNIT-II
Importance of Integration Management And Scope Management, Project Plan Development, Plan Execution, Scope Management, Methods for Selecting Projects, Project Scheduling, Schedules And Activities, Sequencing And Scheduling Activity, Project Network Diagrams, Network Planning Models, Program Evaluation And Review Technique (Pert), Project Cost Management, Cocomo Model, Types of Cost Estimates

UNIT-III
Project Quality Management, Quality Assurance, Planning And Control on Projects, Quality of Information Technology Projects, Stages of Software Quality Management, Tools and Techniques for Quality Control, Project Human Resources Management, project Human Resources Management . Keys to managing, Organizational Planning, Issues In Project Staff Acquisition And Team Development

UNIT-IV

Suggested Readings:
5. ELECTRONIC COMMERCE  (2-1-0)

Unit I
Building Blocks of Electronic Commerce: Introduction, internet and networking technologies, Internet and network protocols, web server scalability, software technologies for building E-commerce applications, distributed objects, object request brokers, component technology, web services, web application architectures, BizTalk framework Compliant Server

Unit II
Security of E-commerce transactions: Review of cryptographic tools, authentication, signatures, observers, anonymity, privacy, traceability, key certification, management and escrow

Unit III

Unit IV
Global eCommerce and Law: Cyber law in India. Comparative evaluation of Cyber laws of certain countries.

Suggested Readings:

6. Parallel Computing  (2-1-0)

UNIT-I

UNIT-II
UNIT-III
Graph Algorithms: Mesh Algorithm for Transitive Closure, Connected Component, Shortest Path, Breadth First Search And Minimum spanning Tree. Mesh of Trees and its Applications Such as Matrix-Vectors Multiplication, Convolution And Integer Multiplication

UNIT-IV

Suggested Readings:

(B) List of Electives for V Semester (Elective II & III)

(i) Electives II (6 credit)

1. Distributed Computing (2-1-0)

UNIT-I

UNIT-II
Distributed Algorithms: Introduction To Distributed Algorithms, Synchronous and Partial Synchronous Models, Algorithms In General Synchronous Leader Election, Breadth First Search, Shortest Path, Randomized Algorithms

Unit-III

UNIT-IV

Suggested Readings:
2. AS Tanenbaum, Modern Operating System, PHI.

2. Embedded Systems (2-1-0)
UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Distributed Embedded Architectures, Protocol Design Issues, Wireless Network, Introduction to Embedded Multimedia and Telecommunication Application like Digital Camera, Digital TV, etc.

Suggested Readings:
1. Arnold Berger-Embedded System Design, TMH.

3. Soft Computing (2-1-0)
UNIT-I

UNIT-II

UNIT-III

UNIT-IV

Suggested Readings:

4. Digital Image Processing (2-1-0)
UNIT-I
Why Digital Images; The Digital Camera; Data Types And 2d Representation of Digital Images; Discrete Sampling Model; Quantisation; Noise Processes; Image Attributes Thresholding and Thresholding Algorithms; Performance Evaluation And ROC Analysis;
Connected Components Labeling; Region Growing And Region Adjacency Graph (RAG);
Split And Merge Algorithms; Grey Level Transformations; Histogram Equalization; Geometric Transformations; Affine Transformation; Polynomial Warps.

UNIT-II
Erode And Dilate As Max And Min Operators On Binary Images; Open, Close, Thinning And Other Transforms; Medial Axis Transform; Introduction To Grey- Level Morphology; Calculation Of Region Properties; Moment Features; Boundary Coding; Fourier Descriptors Line Descriptors From Boundary Coding And From Moments.

UNIT-III
Linear And Non-Linear Filtering Operations; Image Convolutions; Separable Convolutions Sub- Sampling And Interpolation As Convolution Operations; Alternative Approaches; Edge Enhancement By Differentiation; Effect of Noise, Edge Detection And Canny; Implementation; Edge Detector Performance Evaluation, Image Structure Tensor;
Relationship To Image Auto- Correlation; Characterisation And Harris Corner Detector.

UNIT-IV
Sub-Pixel Accuracy And Performance Evaluation; Representations of Colour In Digital Images; Colour Metrics; Pixel- Wise (Point) Operations; Colour Invariants And Finlayson Colour Contancy Algorithm similarity and Dissimilarity Matching Metrics; L2 Metric And Relationship To Cross- Correlation; Image Search And Multi-Resolution Algorithms, 2D Object Detection, Recognition, Location

Suggested Reading:
2. M.A. Ahmed, Image Processing, TMH.
3. Earl Gose, Richard, Johnsonbaugh, Pattern Recognition & Image Analysis, PHI.

(ii) Electives III (3 Credit)

1. Advance Database Management System (2-1-0)
UNIT-I
UNIT-II
Extended Relational Model & Object Oriented Database System: New Data Types, User Defined Abstract Data Model, Data Log, Nested Relational Model and Expert Database System.

Distributed Database System:
Structure of Distributed Database, Data Fragmentation, Data Model, Query Processing, Semi Join, Parallel & Pipeline Join, Distributed Query Processing In R* System, Concurrency Control in Distributed Database System, Recovery In Distributed Database System, Distributed Deadlock Detection And Resolution, Commit Protocols.

UNIT-III

UNIT-IV
Introduction to Expert Database And Fuzzy Database System:
Fuzzy Databases: Fuzzy Set & Fuzzy Logic, Use of Fuzzy Techniques to Define Inexact and Incomplete Databases.

Suggested Readings:
1. Majumda & Bhattacharya, “Database Management System”, TMH.

2. Neural Network (2-1-0)

UNIT-I
Introduction: Neural Network, Human Brain, Biological and Artificial Neurons, Model of Neuron Knowledge Representation, Artificial Intelligence and Neural Network, Network Architecture, Basic Approach of the working of ANN- Training, Learning and Generalization.

UNIT-II

UNIT-III

UNIT-IV
Associated Models: Hopfield Networks, Brain-In-A-Box Network, Boltzman

Suggested Readings:

5. Limin Fu, “Neural Networks in Computer Intelligence”, TMH.

3. Natural Language Processing (2-1-0)

UNIT-I
Introduction to Natural Language Understanding, Language as Knowledge Base Process, Basic Linguistics, Computers & Natural Language Understanding, Grammer & Parsing-Top Down Parsing, Bottom Up Parsing

UNIT-II
Transition Network Grammer, Grammer and Logic Programming, Semantic Interpretation-Semantic and Logical Form, Linking Syntax and Sememntics, Ambiguity Resolution

UNIT-III
Introduction to Semantic Grammer, Template Matching, Semantically Driven Parsing Techniques Context and World Knowledge, Knowledge Representation and Reasoning

UNIT-IV
Local Discourse Context and Reference, Discourse Structure and Understanding Using World Knowledge, Language Learning and Concept Learning

Suggested Readings:
1. James Allen, Natural Language Understanding, Pearson Education.
2. Rich & Knight, Artificial Intelligence, TMH.

4. Digital Signal Processing (2-1-0)

UNIT-I

UNIT-II
Fourier Integral, Energy Spectral Density, Fourier Transforms in the Limit, Fourier Transform Theorems and
Paris, System Analysis with Fourier Transform, Laplace Transform Theorems, Network Analysis using the
Laplace Transform.
Discrete Time signals and system- Review of sampled data System, Time Domain representation of Discrete
Time Signals, Frequency Domain Representation of Discrete Time Signals, Discrete Time Signal obtained by
sampling, Discrete Fourier

UNIT-III
Transform, Z- Transform- Definition and Examples, Inverse Z- Transform, Properties of the Z- Transform,
Introduction to Realization of Digital System- Block Diagram and Signal Flow Graph. Introduction to
Realization of an IIR and FIR systems, Discrete Fourier Transforms (DTF) and Fast Fourier Transform (FFT).

UNIT-IV
Design of Digital Filters: Introduction to Filters, A comparison of IIR and FIR Digital Filters. Design of IIR
Digital Filters- Impulse Invariant Transformation, Bilinear Transformation, Design of Digital Butterworth and
chebyshev Filters. Design of FIR Digital Filters- Windowing wing and Rectangular Window, Filter Designs
using windows, Frequency Sampling Techniques in various applications.

Suggested Readings:
3. Digital Signal Processing by Prokians, PHI.

5. Mobile Computing

Unit – I
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-
interface, channel structure, location management: HLR, VLR, hierarchical, handoffs, channel allocation in cellular systems.

Unit II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth,
Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting,
Mobile IP, WAP application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile
wireless networks, File system, Disconnected operations.

Unit IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile
computing environment, CDMA, GPRS.

References:
1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.