Mahatma Gandhi University
MEGHALAYA
www.mgu.edu.in

SYLLABUS MANUAL

INFORMATION TECHNOLOGY PROGRAMME
### Master of Computer Application (MCA)

#### SEMESTER I

<table>
<thead>
<tr>
<th>CODE</th>
<th>SUBJECT</th>
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<tbody>
<tr>
<td>MCA11</td>
<td>Mathematics</td>
<td>4</td>
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<tr>
<td>MCA12</td>
<td>Data Structure</td>
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<tr>
<td>MCA13</td>
<td>Programming in C</td>
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<td>MCA14</td>
<td>Financial Accounting</td>
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<td>MCA15-L</td>
<td>C programming Lab</td>
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#### SEMESTER II

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<td>MCA22</td>
<td>DBMS</td>
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<tr>
<td>MCA23</td>
<td>OOPS With C++</td>
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<td>MCA24</td>
<td>Computer Organization and Architecture</td>
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<td>MCA32</td>
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<td>MCA33</td>
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<td>MCA34</td>
<td>Unix and Shell Programming</td>
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<td>MCA42</td>
<td>Analysis and Design of Algorithm</td>
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<td>MCA43</td>
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<tr>
<td>MCA51</td>
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<tr>
<td>MCA52</td>
<td>Internet Programming and Web Designing</td>
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<tr>
<td>MCA53</td>
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<td>MCA54</td>
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**SEMESTER VI**

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<tr>
<td>MCA61</td>
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<td>MCA62</td>
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**Elective-1**

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<td>MCA54B</td>
<td>Mobile Computing and Communication</td>
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<tr>
<td>MCA54C</td>
<td>Simulation and Modeling</td>
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**Elective-2**

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<tr>
<td>MCA62B</td>
<td>Operations Research</td>
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<tr>
<td>MCA62C</td>
<td>Advanced Computer Architecture</td>
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**Elective-3**

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<tr>
<td>MCA63B</td>
<td>Artificial Intelligence</td>
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<tr>
<td>MCA63C</td>
<td>Network Management</td>
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Detailed Syllabus

SEMESTER -I
MCA11 --- Mathematics
UNIT I: Introduction to Business Mathematics.
UNIT II: Importance and Scope, Profit and Loss.
UNIT III: Simple and Compound Interest.
UNIT IV: Present Value, Annuities, Shares and Bonds,.
UNIT V: Basic Algebra Surds and Indices, Logarithms,.
UNIT VI: Linear and Quadratic Equations.
UNIT VII: Simultaneous Equations, Inequalities with Graphs, Arithmetic Progression (A.p.).
UNIT VIII: Geometric Progression (G.p.).
UNIT IX: Matrices and Determinants Matrices: Definition and Notations.
UNIT X: Special Types of Matrices, Matrix Operations, Determinants and Non-singularity Rank of a Matrix.
UNIT XI: Inverse of a Matrix.
UNIT XII: Solution of Equations (Unique Solution), Solution of Equations (Gauss-Elimination Method).
UNIT XIII: Calculus Theory of Sets, Relations and Functions.
UNIT XIV: Limits and Continuity, Differentiation.
UNIT XV: Maxima and Minima, Integration.

Reference Books:-

MCA12 --- Data Structures
UNIT I: Basic of Data Representation
Introduction, Abstract Data type, Fundamental and Derived Data type, Representation, Primitive Data Structure, Symbol Table, Recursion.
UNIT II: Introduction to Algorithm Design and Data Structure
Basic Model of Computation, Procedure for Problem solving, Algorithms, Design and Analysis of Algorithm, Top down and Bottom Up Approaches to Algorithm Design, Complexity of Algorithm.
UNIT III: Arrays
Definitions, Array, Index or Subscript, Dimensions of an Array, Memory Allocation to Arrays, Memory Allocation to One-dimensional Array, Memory Representation of Two Dimensional Arrays, Memory Allocation to Three Dimensional Array, Memory Allocation to Multidimensional Array, Static and Dynamic Variables.
UNIT IV: Arrays with Functions
Intro to functions, advantage of using functions, Calling functions using arrays, operation on arrays, String as an array of characters, pattern matching.
UNIT V: Application of Arrays
Addition and Subtraction of two matrix, Multiplication of two matrix, Transpose of a Matrix, Limitation of arrays.
UNIT VI: Intro to Pointers
Introduction to Pointer, Type Variables, Address of(&) and Dereferencing Operators(*), Pointers in C, Static and Dynamic Memory Allocation.

UNIT VII: Array and Pointers
Arrays of Pointers, Dynamic Representation of a Two-Dimensional Array.

UNIT VIII: Structures
Structure Definition, Arrays of Structures, Memory Allocation, Representation of Sparse Matrices.

UNIT IX: Linked Lists

UNIT X: Stacks

UNIT XI: Queue
Representation of Queue Implementation of Queues, Circular Queue Array-based Implementation, Linked List Implementation, Applications of Queues, Priority Queues.

UNIT XII: Trees
Introduction to Trees, N-ary Tree, Linked Tree Representation, Binary Tree Traversal, Searching a Binary Tree, Heap Tree, AVL Trees, Threaded Trees, Splay Trees, B-Trees, B+ Tree.

UNIT XIII: Searching and Sorting
Searching, Sequential and Binary Search, Indexed Search, Sorting.

UNIT XIV: Hashing
Hashing, Hashing Schemes, Hashing Functions, Hashing Collision.

UNIT XV: Graphs
Introduction, Graph Representation, Traversal Schemes, Spanning Tree, Applications of Graphs.

UNIT XVI: Garbage Collection And Compaction

Reference Books:
1. Purely functional data structures By Chris Okasaki.

MCA13 --- Programming in C
UNIT I: Origin and Introduction

UNIT II: Data Types, Variables and Constants
Data Types Variables, Constants Operators, Type Modifiers and Expressions Operators Type Modifiers.
UNIT III: Tokens, Expressions and Operators
Expressions Type Definitions Using ‘typedef’, Operators.

UNIT IV: Beginning with C program
Introduction to Input/Output Console I/O Functions Unformatted Console I/O Functions. A Simple C Program.

UNIT V: Control Constructs
Control Statements, Conditional Statements.

UNIT VI: Loops and Jumping statements

UNIT VII: Functions
Introduction to Functions, Function Declaration and Prototypes, Storage Classes Recursion in Function, call by value and call reference.

UNIT VIII: Arrays
Introduction to Arrays One Dimensional Array Strings Two Dimensional, Array Multi-dimensional Array.

UNIT IX: Pointers
Introduction to Pointers, Pointer Notation, Pointer Declaration and Initialization, Accessing Variable through Pointer, Pointer Expressions.

UNIT X: Pointer with array
Arrays of Pointers, Pointers and One Dimensional Arrays, Pointer to two dimensional array.

UNIT XI: Pointer with function
pointer use in function, use call by reference, pointer Declaration in prototype, Memory allocation.

UNIT XII: Structures

UNIT XIII: Unions
Union—Definition and Declaration, Accessing a Union Member, Initialization of a Union Variable, Use of User Defined Type Declarations.

UNIT XIV: Intro to Linked List
Dynamic Memory Allocation, Linked List, Basic List Operations.

UNIT XV: Introduction to File Handling in C
What is a File, Defining and Opening a File.

UNIT XVI: Reading and Writing in Files
Reading and writing Data, Sequential File, Functions for Random Access to Files, Processor and Header Files of ‘C’.

Reference Books:
3. Let Us C By Yashwant Kanitkar.

MCA14 --- Financial Accounting
UNIT II: Financial Statements and Their Nature, the Accounting Equation.
UNIT III: Recording in the Primary Books Introduction, Ground Rules of Journalisation, Journalisation, Types of Journals.
UNIT IV: Posting in Secondary Books Introduction, Types of Secondary Books, Posting Techniques in
the Ledger.
UNIT V: Bank Reconciliation Statement
Introduction, Purpose of Bank Reconciliation Statements, Causes of Difference.
UNIT VI: Trial Balance and Final Accounts
Introduction, Preparation of the Trial Balance, Errors and Their Rectification, Final Accounts.
UNIT VII: Accounting Standards in India
Introduction, Indian Accounting Standards.
UNIT VIII: Corporate Financial Statements—Part-I
UNIT IX: Directors’ Report, Significant Accounting Policies, Inventory Valuation.
UNIT X: Corporate Financial Statements—Part-II
Introduction, Managerial Remuneration, Depreciation Accounting.
UNIT XI: Provision for Taxation — Case Study: Horizon Ltd.
UNIT XII: Divisible Profits, Accounting Treatment of MODVAT, Prior period Adjustments.
UNIT XIV: Interpretation of Financial Statements, Quantitative Disclosures.
UNIT XV: Consolidated Financial Statements
Introduction, Legal Framework, Consolidated Financial Statements, Chain Holding.
UNIT XVI: Accounting for Amalgamations Legal Framework, Definitions, Purchase Consideration, Determination of Swap Ratio, Methods of Accounting for Amalgamations, Asset Buyouts (ABOs).
Reference Books:-

MCA15-L --- C Programming Lab
UNIT I: Origin and Introduction, Data Types, Variables and Constants, Tokens, Expressions and Operators, Beginning with C program.
UNIT II: Control Constructs with Loops, Functions, Arrays.
UNIT III: Pointers, Pointer with array.
UNIT IV: Structures, Union, File Handling in C.

MCA16-L --- Data Structure Lab
UNIT I: Sorting and Searching Techniques.
UNIT II: Stacks, Queues, Linked Lists algorithms.
UNIT IV: Graphs: WAP of Breadth First Search, Depth First Search.

SEMESTER-II
MCA21 --- Discrete Mathematics
UNIT I: Set Theory
Relations and functions: Set notations and description, subsets, basic set operations. Venn diagrams, laws of set theory, partition of sets, min sets, duality principle.
UNIT II: Relations
Basic definitions of relations and functions, graphics of relations, properties of relations; injective,
surjective and bijective functions, composition.

UNIT III: Combinations
permutations, combinations.

UNIT IV: Algebra Of Logic
Propositions and logic operations, truth tables and propositions generated by set, equivalence and implication laws of logic, mathematical system, and propositions over a universe.

UNIT V: Mathematical Induction
mathematical induction, quantifiers.

UNIT VI: Recursion and recurrence:
Recursion and recurrence: The many faces of recursion, recurrence, relations, and some common recurrence relations, generating functions.

UNIT VII: Graph Theory
Various types of graphics, simple and multigraphs, directed and undirected graphs, Eulerian and Hamiltonian graph, graph connectivity, traversals, graph optimizations, Graph coloring, trees, spanning trees, rooted trees, binary trees.

UNIT VIII: Linear and Quadratic Equations.

UNIT IX: Geometric Progression (G.p.).

UNIT X: Matrices
Matrices and Determinants Matrices: Definition and Notations.

UNIT XI: Matrices Operations
Special Types of Matrices, Matrix Operations, Determinants and Non-singularity Rank of a Matrix.

UNIT XII: Inverse of a Matrix.

UNIT XIII: Differentation.

UNIT XIV: Maxima and Minima, Integration.

UNIT XV: Simpson’s rule of Integration.

UNIT XVI: Arithmetic Progression (A.p.).

Reference Books:
2. Discrete Mathematics with Applications by Susanna S. Epp

MCA22 --- DBMS
UNIT I: Introduction to Databases
Database and its Hierarchies, History of Databases, Types of DBMS.

UNIT II: Database Environment

UNIT III: Data Models
Hierarchical DBMS, Network DBMS, Relational DBMS, OODB, Distributed DBMS.

UNIT IV: Database Architecture and Modeling
Conceptual, Physical and logical database Model, Schema, Role of DBA, Database Design.

UNIT V: Entity Relationship Model
Intro, E-R Model, Symbols of E-R Model, Super Class Sub Class Type, Specialization, Aggregation, Categorization.

UNIT VI: Normalization
Intro, Keys Relation Ship, Normalization(I,II,III), Boyce-Codd Normal Form, Fourth Normal Form (4NF).

UNIT VII: Relational Algebra
Intro to Relational Algebra, Relational Algebraic operations.
UNIT VIII: Relational Calculus
Tuple Relational Calculus, Domain Relational Calculus.

UNIT IX: SQL: Data Manipulation, Data Definition
Intro to SQL Language, SQL Database Objects, SQL Data Types, DDL, DML and TCL Commands.

UNIT X: SQL Queries
Retrieving Data, Inserting Data, Updating Data, Deleting Data, Aggregate Functions.

UNIT XI: Tables, Views
Creating Tables, Altering Tables, Views, Sequence, Index.

UNIT XII: Joins and Sub Queries
Joins, Correlated Nested Queries, Special Operators used in Nested Queries.

UNIT XIII: Cursor in SQL
Intro to Cursors, Implicit Cursors, Explicit Cursors, Handling cursors.

UNIT XIV: Embedded SQL and Commands
Intro to Embedded SQL, Sample Embedded SQL Programs, Grant Command, Revoke Command.

UNIT XV: Database Planning, Design And Administration

UNIT XVI: Database Security

Reference Books:
1. Database design for mere mortals. Hernandez.
2. Database management by Watson.

MCA23 --- OOPS with C++

UNIT I: Principles of Object Oriented Programming
Software Evolution, Procedure Oriented Programming, Object Oriented Programming Paradigm, Basics of OOPs, Benefits of OOPs.

UNIT II: Classes And Objects
Introduction, Class, Object, Nature of Class, Types of Relationships, "Kind of" Relationship, "Is a" Relationship, "Has a" Relationship/Part of Relationship, Classification of Classes, Abstraction.

UNIT III: Beginning with C++
A Simple C++ Program, an example with Class, Creating the Source File, Compiling and linking.

UNIT IV: Tokens and Expressions and Control statements
Tokens, Keywords, Identifiers, Basic, user, derived data types, control statements, Loops and Jumping Statements.

UNIT V: Arrays
Introduction, Arrays, Array Declaration, Important Points about Arrays, Multidimensional Arrays.

UNIT VI: Classes and Objects
Specifying a Class, Defining member Functions, Inline function, Nesting of member function, Static data members, static member functions, friend function.

UNIT VII: Constructors And Destructors
Introduction to Constructors, Destructors, Types of constructor, Dynamic Initialization of Objects.

UNIT VIII: Inheritance and Extending Classes
Introduction- Inheritance, Type of Inheritance, Virtual Base Classes, Abstract Classes.

UNIT IX: Pointers, Virtual Functions and Polymorphism
Introduction Pointers to Objects, This Pointer, Pointer to Derived Classes, Virtual Functions, Pure Virtual Functions, polymorphism, types of polymorphism.

**UNIT X: Operator Overloading And Type Conversion**
Defining operator overloading, overloading unary and Binary Operators, Overloading Binary Operators using Friend function.

**UNIT XI: Managing Console I/O Operations**
C++ Streams, Classes, Unformatted and Formatted Console I/O Operations.

**UNIT XII: File Handling**

**UNIT XIII: Templates**
Introduction, Class Templates, Function Templates, Member Function Templates, Overloading Templates.

**UNIT XIV: Exception Handling**
Introduction, Basics of Exception Handling, Throwing Mechanism, Catching Mechanism.

**UNIT XV: Manipulating Strings**
Introduction, Creating String Objects, Manipulating String objects, String Characteristics, Accessing Character in Strings.

**UNIT XVI: Introduction to Standard Template Library**

**Reference Books:**
1. Object Oriented Programming With C++ - E Balagurusamy.

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**MCA24 --- Computer Organization and Architecture**

**UNIT I: Introduction**

**UNIT II: Digital Logic Circuits**

**UNIT III: Map Simplification**
Product-of-Sums Simplification, Don’t Care Conditions.

**UNIT IV: Circuits and Flip Flops**
Combinational and Sequential Circuits, intro to Flip Flops, Types of Flip Flops.

**UNIT V: Digital Components**
Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters.

**UNIT VI: Data Representation**
Number System, Octal and Hexa Decimal Numbers, Decimal Representation, Complements, Fixed-Point Representation, Floating-Point Representation, Other Binary Codes.

**UNIT VII: Register Transfer and Microoperations**
Register Transfer Language, Bus and Memory Transfer, Airthmetic Microoperations, Logic Micro operations, Shift Micro operations.

**UNIT VIII: Programming the Basic Computer**
Introduction, Machine Language, assembly Language, The Assembler, Symbolic Program, Program
Loops.

UNIT IX: Central Processing Unit
Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Program Control, Program Interrupt.

UNIT X: Control Unit
Introduction, Control Memory, Microprogramming, Computer Configuration, Design of Control UNIT Overview of RISC/CISC.

UNIT XI: Pipeline and Vector Processing
Parallel Processing, pipelining, Arithmetic Pipeline, Instruction Pipeline.

UNIT XII: Memory Organization
Memory Hierarchy, Main Memory or Primary Memory, Design of Main Memory, Auxiliary Memory, Virtual Memory, Memory Management, Associative Memory.

UNIT XIII: Computer Arithmetic
Introduction, Addition and Subtraction, Multiplication Algorithm, Division Algorithm.

UNIT XIV: Input-Output Devices

UNIT XV: Hardware Interfacing Issues
Introduction, I/O Processing, Bus Interface, I/O versus Memory Bus, Data Transfer Techniques, Mode of Transfer, Software Routines, Direct Memory Access (DMA), Input-output Processor (IOP), CPU-IOP Communication, Channel.

UNIT XVI: Multiprocessors
Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Communication and Synchronization.

Reference Books:

MCA25-L --- DBMS LAB
UNIT I: Structure query Language, Joins and Sub Queries.
UNIT II: Embedded SQL and Commands.
UNIT III: Database Planning, Design And Administration.
UNIT IV: Database Security.

MCA26-L --- OOPS C++ Lab
UNIT I: Principles of Object Oriented Programming, Classes And Objects, Tokens and Expressions and Control statements.
UNIT II: Arrays, Constructors And Destructors.
UNIT III: Inheritance and Extending Classes, Introduction Pointers to Objects.
UNIT IV: Exception Handling, Manipulating Strings, File Handling.

Semester III
MCA31 --- Data Communications
UNIT I: Fundamentals of Data Communication
Introduction, Computerized Communication, Communication Systems, Signal and Data.
UNIT II: Transmission modes and Media
Simple modes, asynchronous and synchronous transmission, CRC, guided and unguided media, fiber optics communication.

UNIT III: Data Modulation
Introduction, concept of modulation, PCM, Ask, FSK, DPSK, Encoding Techniques, CODEC, Classification of modems, Modem protocols.

UNIT IV: Multi Channel Data Communication
Introduction, multiplexing, FDM, TDM, CDM, WDM, Access Techniques.

UNIT V: Networking Fundamentals
Define networking, switching techniques, datagram, virtual circuits, cell switching, connectionless and connection oriented communication, network topologies.

UNIT VI: OSI Model
Introduction, data communication concepts, data communication systems, networks network models, protocols and standards, introduction - open systems interconnection (OSI) reference model, layers in OSI model.

UNIT VII: TCP/IP
TCP/IP reference protocol, TCP/IP reference model, TCP/IP services and applications protocols.

UNIT VIII: Physical Layer and Media Data and Signals
Introduction, analog and digital signals, periodic analog signal, digital signal, transmission impairments, data rate limits, performance, physical media: transmission media, introduction, transmission concepts and terms, bounded media, unbounded media.

UNIT IX: The Data Link Layer
Introduction, data link layer design issues, error detection and correction, types of errors, elementary data link protocols, sliding window protocols, protocol verification, example data link protocols, point-to-point protocol (PPP), multiple access protocols.

UNIT X: Local Area Networks
Introduction - local area network (LAN), baseband versus broadband, IEEE standards for local area networks, IEEE 802.3 Ethernet technologies, LAN hardware, IEEE 802.4 token bus, IEEE 802.5 token ring, IEEE 802.11 distributed queue dual bus, connecting LANs and backbone networks, switching in networks, internetworking and routing.

UNIT XI: Extending LAN
Fiber optics extension, repeaters, bridges, routers, gateways, hubs, switches, switching hub, virtual LAN.

UNIT XII: Wide Area Network (WAN)
Introduction, using WAN and network services, routing concepts, communication protocols over wide area networks.

UNIT XIII: Data Transmission Networks
ISDN, ATM structure, narrowband ISDN, broadband ISDN, frame relay technology, cell relay.

UNIT XIV: Wireless Communications
Cellular radio, telephony (GSM), satellite communication system, VSAT.

UNIT XV: Security
Network security, firewall.

UNIT XVI: VPN and Cryptography
Intro to virtual private networks, cryptography.

Reference Books:
1. Data communications and networking by Behrouz A. Forouzan.
2. Data and computer communications by William Stallings.
MCA32 --- Advanced Computer Graphics

UNIT I: Survey of computer graphics
Computer aid - design, presentation Graphics, computer art, entertainment, education and training, visualization, image processing, graphical user interface;

UNIT II: Overview of graphics system
Video display device, Raster - scan Display, Rendom scan Display, Color CRT Monitors, Direct view storage - tube, Flat panel display, three dimensional viewing devices, stereoscopic and virtual reality system, Raster scan system video controller, Raster scan system Display controller, random - scan system, graphics Monitors and Workstation, input devices, hard copy devices Graphics software.

UNIT III: Output Primitives
Points and Lines, Line driving Algorithms, Loading the Frame Buffer, Line function, circle generating algorithm, Ellipse generating algorithm, other curve conic Section, Parallel curves algorithms, curve function, pixel addressing, Fill area Primitives, Fill area function.

UNIT IV: Attribute of output Primitives
Line Attribute, curve Attribute, color and Grayscale Levels, Area Fill attribute, Bundled Attribute Inquiry Function, Antialiasing.

UNIT V: Two - dimensional Geometric Transformation
Basic Transformation, Matrix Relation, Composition Transformation, other Transformation Reflection, transformation with coordinate system, Affine Transformation, transformation function.

UNIT VI: Two dimensional viewing
The viewing pipeline, view coordinate Reference frame, Window to view port coordinate, two dimensional viewing function, clipping operation, point Clipping, Line Clipping, Polygon clipping Curve clipping.

UNIT VII: Structure and hierarchical modeling
Structure concept, Editing Structure, Basic modeling concept, Hierarchical Modeling.

UNIT VIII: Graphical user Interface and Interactive input Method
User dialogue Window and icon, Input of graphical data, Input function, initial value for input Device Parameters, Interactive Picture Construction Technique, Virtual - Reality Environment.

UNIT IX: Three Dimensional Concept
Three dimension display concept, three dimensional graphics.

UNIT X: Three Dimensional object Representation
Polygon surfaces, curve line surfaces, quadric Surface, super quadric, Blobby Object, Spline Representation, cubic Spline interpolation method, b spline Curves and Surfaces, beta splines.

UNIT XI: Three dimensional Geometric and Modeling Transformation
Translation, Rotation, Acaling, Composite Transformation, Three Dimensional Transformation, Modling and coordination transformation.

UNIT XII: Three dimension viewing
Viewing Pipeline viewing Coordinates, Projection, View volumes and General, Clipping, hardware Implementation.

UNIT XIII: Three dimension Perspective
Hidden Surface, Lines and Bezier Curve, Geometric projections, Orthographic projections, Oblique projections, Perspective transformation.

UNIT XIV: Three dimension
Different concepts of back-face removal, back-face detection, painter's algorithm.

UNIT XV Intro to Multimedia
Multimedia and animation. Multimedia terms, multimedia hardware and hardware peripherals.

UNIT XVI: Multimedia - II
Tools in multimedia and multimedia building blocks.

**MCA33 --- Advanced Operating System**

UNIT I: Introduction to OS

UNIT II: Architecture of Operating System

UNIT III: Process Management
Process, Life cycle of Process, IPC, Context Switching, Process Scheduling, Basic Concept Of Threads
Types of Threads, Models of Thread Implementations, Traditional and Real-Time Signals, Clocks, Timers and Callouts, Thread Scheduling for Unix.

UNIT IV: CPU Scheduling
I/O Burst, CPU Burst, Schedulers (LONG TERM, SHORT TERM, MEDIUM TERM).

UNIT V: CPU Scheduling Algorithms
scheduling Algorithms, Multiple processor scheduling, static and dynamic scheduling, dynamic scheduling goals, performance issue, real time scheduling hard real-time scheduling.

UNIT VI: Memory Management
Intro to Memory, Types of Memory, Address Binding, Program Relocation, Protection, Sharing, Partitioning, Contiguous Storage Allocation, non-contiguous storage allocation.

UNIT VII: Paging and Segmentation
Define Paging and Segmentation, Difference between Paging and Segmentation.

UNIT VIII: Virtual Memory
Introduction, Swapping, Demand Paging, Page Fault, Page Replacement Algorithm.

UNIT IX: Process Synchronization
Racing problem, critical section problem, critical section algorithm.

UNIT X: Tools for Process Synchronization
Semaphores, interprocess communication, classical Synchronization problems.

UNIT XI: Monitors
Characteristics of monitors, algorithm-1,2, Message communication synchronization and Asynchronization communication, os role for IPC, log based recovery, checkpoints.

UNIT XII: Deadlocks
Introduction, system model, deadlock detection, Resource allocation graph, method of deadlock handling, Mutual Exclusion, Hold-and-Wait, No preemption, Circular wait, Deadlock Avoidance.

UNIT XIII: Deadlock Detection algorithm
Deadlock avoidance, RAG algorithm, Banker’s algorithm, deadlock recovery, other methods of deadlock recovery.

UNIT XIV: Device management
Introduction, types of allocating devices, dedicated devices, shared devices, virtual devices, device management technique, buffering and its use.

UNIT XV: Secondary Storage Structure
Introduction, Hard disk structure, Hard disk scheduling algorithm (FIFO, SSTF, SCAN, C-SCAN, LOOK, CLOCK).
RAID and its levels.

UNIT XVI: Information Management
A simple file system, file attributes, file access methods, file, SEquentail file access, Direct access, Indexed Sequential File, Directory Structure, Access paths, directory operations, File protection.
Reference Books:

MCA34 --- Unix and Shell Programming

UNIT I: Introduction To Unix
Over view of operating System, system calls, Architecture of Unix, Features of Unix,

UNIT II: Unix Commands
Unix Commands — PATH, man, echo, printf, script, passwd, unname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.Unix Utilities.,

UNIT III: Unix file system,
Introduction to unix file system, file handling utilities, security by file permissions, process utilities, disk utilities, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text processing utilities and backup utilities ,

UNIT IV: More Commands
Detailed commands to be covered are tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

UNIT V: The Vi Editor
Thre modes, Basic Navigation(h,j,k,l), moving to a specific line number(G), the repeat factor, the input mode commands(l,a,r,sand o),saving and quitting:w,:x and :q),text deletion(x and x).

UNIT VI: Introduction To Shells-I
Unix Session, The major shells, Bourne, C shell, Korn and Bash. The shell's interpretive cycle, Standard Streams.

UNIT VII: Shells-II
Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control,

UNIT VIII: Networking Tools

UNIT IX: The X-Window
The X Architecture-the reversed client-server mechanism, Role of the window manager,Common desktop Environment. Running programs remotely using xhost and telnet.

UNIT X: Filters
Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

UNIT XI: Awk

UNIT XII: Shell Programming
Shell script and execution methods. User’s initialization files(.profile and rc files etc). the dot command. Interactive execution and command line argument($1,$2 etc). the && and || operators. Conditional and test case and wild-cards.

UNIT XIII: Interactive C Shell And C Shell Programming
C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command

**UNIT XIV: Unix Internals**
Kernel basics, processes and files, system calls, user mode and kernel mode, the file system, disk architecture, block I/O, file system layout.

**UNIT XV: Administering File Systems**

**UNIT XVI: General System Administration**
The role and power of the system administrator, becoming super user (su), user administration. Understanding /etc/passwd and /etc/shadow.

**Reference Books:**
1. UNIX and Shell Programming by Richard F. Gilberg and Behrouz A. Forouzan.

**MCA35-L — UNIX Lab**
UNIT I: Introduction To Unix, Unix Commands.
UNIT II: Unix file system, More Commands.
UNIT III: The 5i Editor.
UNIT IV: Interactive C Shell And C Shell Programming.

**MCA36-L — Operating System Lab**
UNIT II: Filters, Awk, Shell Programming.
UNIT IV: General System Administration.

**SEMESTER IV**
**MCA41 — Advanced Software Engineering**
UNIT I: Introduction: The process, software products, emergence of software engineering, evolving role of software.
UNIT II: software Characteristics and application
software life cycle models, Software Characteristics, Applications, Software crisis.
UNIT III: Software project
Software project management: Project management concepts, software process and project metrics
Project planning, project size estimation metrics.
UNIT IV: Software estimation
project estimation Techniques, empirical estimation techniques, OCOMO- A Heuristic estimation
techniques, staffing level estimation.
UNIT V: Risk analysis
introduction team structures, staffing, risk analysis and management, project scheduling and tracking.
UNIT VI: Software requirement
Requirements Analysis and specification requirements engineering, system modeling and simulation.
Analysis principles modeling, partitioning Software.

UNIT VII: Software prototyping:
Prototyping methods and tools; Specification principles, Representation, the software requirements specification and reviews.

UNIT VIII: Software Analysis Modeling
Software Analysis Modeling: Data Modeling, Functional modeling and information flow: Data flow diagrams, Behavioral Modeling;

UNIT IX: The mechanics of structured analysis:
Creating entity/relationship diagram, data flow model, control flow model, the control and process specification; The data dictionary; Other classical analysis methods.

UNIT X: System Design:
Design concepts and principles: the design process: Design and software quality, design principles; Design concepts: Abstraction, refinement, modularity, software architecture, control hierarchy, structural partitioning, data structure, software procedure, information hiding;

UNIT XI: Effective modular design:
Functional independence, Cohesion, Coupling; Design Heuristics for effective modularity; The design model; Design documentation.

UNIT XII: Architectural Design
Architectural Design: Software architecture, Data Design: Data modeling, data structures, databases and the data warehouse, Analyzing alternative Architectural.

UNIT XIII: Architectural complexity
Designs, architectural complexity; Mapping requirements into a software architecture; Transform flow, Transaction flow; Transform mapping: Refining the architectural design.

UNIT XIV: Software coding
Coding guidelines, coding methodology, code verification techniques, programming practice, tools, documentation.

UNIT XV: Software Testing
Testing Basics, Test case Design, Testing Techniques, Test Plan, Activites during testing, software testing tools, debugging, software test report.

UNIT XVI: Software Reliability
Software Reliability, software errors and faults, software repairs and availability, software reliability models, limitations of Reliability models.

Reference Books:
2. Advanced Software Testing by Rex Black.

MCA42 --- Analysis and Design of Algorithm

UNIT I: Introduction Algorithm and Algorithmic
Definition of Algorithm, Definition of Algorithmic, Example of an Algorithm Problems and Instances, Characteristics of an Algorithm: Practical Tools and Algorithms First Algorithm Second Algorithm Third Algorithm.

UNIT II: Building Blocks of Algorithms,
Basic Actions and Instructions Control Mechanisms and Control Structures Procedure and Recursion, Outline of Algorithmics, Understanding the Problem Analyzing the Problem Capabilities of the Computer System.
UNIT III: Approximate vs Exact Solution,
Choice of Appropriate Data Structures Choice of Appropriate Design Technology Specification
Methods for Algorithms Proving Correctness of an Algorithm Analyzing an Algorithm Coding the
Algorithm Areas of Study of an Algorithm Performance.
UNIT IV: Algorithms Using CAD Technologies,
INTERNAL SORTING, Introduction Internal Sorting, Insertion Sort, Insertion Sort, Algorithm, Insertion Sort
Analysis Bubble Sort.
UNIT V: Bubble Sort Algorithm
Bubble Sort Analysis Priority Queues – Heaps Heap Sort Heapify Algorithm Heap Sort Algorithm
Analysis of Heapify Analysis of Heap Sort Quick Sort Divide and Conquer.
UNIT VI: Searching
Introduction Linear Search Binary Search Divide and Conquer, General Method, Binary Search,
Comparative Study of Linear and Binary Search, Application of Searching, GRAPHS Introduction,
Definition of Graph, Shortest Path Algorithms. SPANNING TREE Introduction Minimum Spanning
Tree The Greedy Method General Method Prim’s.
UNIT VII: String Matching
Introduction String Matching Naïve Approach The Naïve String-Matching Algorithm String Matching
– Finite Automaton KMP Algorithm String Matching.
UNIT VIII: KMP Flowchart
KMP Flowchart String Matching, KMP Scan Example String Matching – KMP Scan Algorithm String
Matching – KMP Algorithm Analysis String Matching with Finite Automata.
UNIT IX: Polynomials
Introduction, Polynomial, Overview of Polynomial, Polynomial Functions, Polynomial Equations,
UNIT X: Sparse Horner’s
Sparse Horner’s Method, Sparse Representation Lagrange’s Interpolation.
UNIT XI: Matrices
Method.MATRICES Introduction Matrices Properties Strassen’s Matrix Multiplication Conventional
Matrix Multiplication Inversion Solving Systems of Linear Equations.
UNIT XII: Dynamic Programming
Introduction Dynamic Programming Characteristics of Dynamic Programming Principle of Optimality
Dynamic Programming Approach to Solve Traveling Salesman The Traveling Salesman Problem
Knapsack Problem. The 0/1 Knapsack Problem Spanning Tree Problem.
UNIT XIII: Knapsack
Introduction, Knapsack, Knapsack Problem using Greedy Method, Job Sequencing, Job Sequence
with Deadlines, Traveling Salesman, Euclidean, TSP Traveling.
UNIT XIV: Salesman &Neighbour Algorithms
Salesman Algorithm, Nearest Neighbour Algorithm on TSP, Convex Hull Algorithm Applications, TSP
using the Branch and Bound Backtracking.
UNIT XV: Colouring Algorithm -II
Introduction, Graph Colouring, Vertex Colouring, Edge Colouring, Face Colouring, Four Colour
Theorem Graph, Coloring Algorithm, Finding all m-colorings of Graph, Generating a Next Color
,Queens.
UNIT XVI: Algorithm-III
The N-Queens Algorithm, AND/OR Graph, Game Tree, NP Hard Theory, NP Complete, Problem,
Approximation Algorithms, PRAM Algorithms.
Reference Books:
1. Introduction to the Design and Analysis of Algorithms by Anany Levitin.
2. Design and Analysis of Distributed Algorithms by Nicola Santoro.

MCA43 --- Advanced Java Programming

UNIT I: Overview of java
Introduction Character set, Tokens, Structure of a java program, Data types, Variable, Type casting, operator and operation, Classes interface and Array.

UNIT II: Event Handling
Event delegation Approach, Action Listener, Adjustment Listener, Mouse Listener and Mouse Motion Listener, Window Listener, Key Listener.

UNIT III: Java I/O Handling
I/O File Handling (Input Stream & Output Streams, File Input Stream & File Output Stream, Data I/P and O/P Streams, Buffered I/P and O/P Streams, File Class, Reader and Writer Streams, Random Access File.

UNIT IV: Applet
Applet fundamentals, steps to build applet, passing parameter to applets.

UNIT V: Graphics
Working with Graphics using graphic class, using color, using font, using Image.

UNIT VI: Java Awt
Java AWT package Containers (Component, Container, Panel, Window, Frame, Canvas), Basic User Interface components (Practicales, Buttons, Check Boxes, Radio Buttons, Choice, Text Fields, Text Areas, Scrollbars).

UNIT VII: Java Awt Layout Manager
Layouts (Flow Layout, Grid Layout, Border Layout, Card Layout). Introduction to swings.

UNIT VIII: Multithreading
Overview of Multithreading, The Thread control methods, Thread life cycle, Newly created threads, Main thread, Creating a Thread (Implementing Runnable Interface, Extending the Thread Class), Thread Synchronization, Writing Applets with Threads.

UNIT IX: Socket Programming

UNIT X: Java Database Connectivity (JDBC)
JDBC/ODBC bridge, Driver Manager Class, Java.SQL Package (Connection Interface, Statement Interface, Prepared Statement Interface, ResultSet Interface, ResultSetMetaData Interface), SQL Exception class.

UNIT XI: Remote Method Invocation
Tier Architecture, Distributed object technologies, Locating & loading Remote classes, Locating remote objects & providing references to them, Enabling remote method class.

UNIT XII: RMI Architecture

UNIT XIII: Servlets
Introduction to server side technology, Servlet life cycle, servlet API.

UNIT XIV: Servlets-II
Creating and Executing servlets, using GenericServlet Class, Using HttpServlet Class, the doGet() method, doPost() method.

UNIT XV: Servlets and JDBC.

UNIT XVI: JAVA BEANS, XML, & JSP.
Reference Books:
1. Core Java Advanced Features by Cay S. Horstmann and Gary Cornell.

MCA44 --- RDBMS
UNIT I: Data base system architecture, data independence, storage structures.
UNIT II: Data representation, indexing.
UNIT III: Relational data structure, relations, attributes, keys, embedded SQL.
UNIT IV: Relational Algebra, Query by example, relational calculus, normalization & normal forms.
UNIT V: Functional dependence, over view of security, integrity, recovery, backup, etc.
UNIT VI: SQL, Transact-SQL, PL SQL, SQL *PLUS.
UNIT VII: Managing Database and Queries: Creating, defining and modifying Table structure.
UNIT VIII: Transact-SQL PLUS and substitution of variables.
UNIT IX: Introduction to SQL Server and Oracle Server.
UNIT X: Indexes.
UNIT XI: Views.
UNIT XII: Packages.
UNIT XIII: Triggers And Stored Procedures.
UNIT XIV: Cursors.
UNIT XV: Control structure.
UNIT XVI: Error Handling.

Reference Books:

MCA45-L --- RDBMS Lab
UNIT I: Relational calculus, normalization & normal forms, functional dependence, over view of security, integrity, recovery, backup.
UNIT II: SQL, Transact-SQL, PL SQL, SQL *PLUS, Managing Database and Queries: Creating, defining and modifying Table structure, Transact-SQL PLUS and substitution of variables.
UNIT III: Introduction to SQL Server and Oracle Server.
UNIT IV: Create Indexes, Views, Packages Triggers And Stored Procedures, Cursors, Control structure.

MCA46-L --- Advanced Java Programming Lab
UNIT I: HTML to Servlet Applications, Applet to Servlet Communication.
UNIT II: Designing online applications with JSP, Creating JSP program using JavaBeans.
UNIT III: Working with Enterprise JavaBeans, Performing Java Database Connectivity.
UNIT IV: Creating Web services with RMI, Creating and Sending Email with Java, Building web applications.

SEMESTER-V
MCA51 --- Advanced Computer Network and Security
UNIT I: Introduction
Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, MAC protocols for high-speed LAN, MAN, and wireless LANs, (For example, FDDI, DQDB, HIPPI, Gigabit, Ethernet, Wireless Ethernet, etc.

UNIT II: Communication media
Fourier Analysis, Analog and Digital Data Transmission, Modulation And Demodulation.

UNIT III: Data Transmission
Data Transmission Basics, Transmission Mode, Interfacing, Multiplexing.

UNIT IV: Error Detection and Correction
Types of Error, Error Detection, Error Correction.

UNIT V: Data Compression
Lossless Compression Algorithms, Image Compression, Video compression, Audio compression.

UNIT VI: Data Link control and Protocol Concepts
Flow Control, Error Control, Asynchronous protocols, synchronous protocols, HDLC.

UNIT VII: Local Area Networks
Types of Networks and topology, FDDI, DQDB, LAN operating systems and protocols, Ethernet technologies.

UNIT VIII: Wide Area Networks
Wan Transmission methods, WAN carrier Types, WAN Transmission Equipment, WAN protocols.

UNIT IX: Integrated Services and Routing Protocols
ISDN services, ISDN topology, ISDN protocols, Frame Relay, ATM, Comparison of ATM, ISDN, Frame Relay.

UNIT X: Wireless LANs
WLAN Applications, Wireless LAN requirements, WLAN Architecture, WAP Services.

UNIT XI: Internetworking

UNIT XII: TCP Reliable Transport Service
Transport Protocols, The service TCP Provides, End to End service and Datagrams, UDP.

UNIT XIII: Fast Access Technologies
Fast access technologies (For example, ADSL, Cable Modem). IPv6: Why IPv6, basic protocol, extensions and options, support for QoS.

UNIT XIV: Routing

UNIT XV: Mobility in Networks.
Mobile IP. Security related issues. IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc. TCP extensions for high-speed networks, transaction-oriented, applications.

UNIT XVI: Network Security
Network security at various layers. Authentication header, Key distribution protocols. Digital signatures, digital certificates, distributed system taxonomy, service models, naming and binding remote, procedure calls (RPC), object brokers, distributed file system design distributed file system case studies, NFS, AFS, clock synchronization, distributed transactions, mutual exclusion, election algorithms, distributed shared memory and memory consistency models, distributed deadlocks.

Reference Books:
2. Security And Privacy In Advanced Networking Technologies by Borka Jerman-Blazic.

MCA52 --- Internet Programming and Web Designing
MCAS3 --- Data Warehousing and Data Mining
UNIT I: Introduction And Data Warehousing
Introduction, Data Warehouse, Multidimensional Data Model.
UNIT II: Data Warehouse Architecture
Data Warehouse Architecture, Implementation, Further Development, Data Warehousing to Data Mining.
UNIT III: Classifiers
Decision tree classifiers, Instance-based learners, Bayesian classifiers, Learning hyper planes, Meta learning, Classifier evaluation.
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UNIT IV: Data Preprocessing, Language,
Why Preprocessing, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation, Data Mining Primitives, Query Language.
UNIT V: Architectures
Graphical User Interfaces, Architectures.
UNIT VI: Concept Description
Concept Description, Data Generalization, Characterizations, Class Comparisons, Descriptive Statistical Measures.
UNIT VII: Association Rules
Association Rule Mining, Single-Dimensional Boolean Association Rules from Transactional Databases, Multi-Level Association Rules from Transaction Databases.
UNIT VIII: Classification And Clustering
Classification and Prediction, Issues, Decision Tree Induction, Bayesian Classification, Association Rule Based, Other Classification Methods, Prediction, Classifier Accuracy, Cluster Analysis, Types of data, Categorisation of methods, Partitioning methods, Outlier Analysis.
UNIT IX: Mining
Hidden Markov Models, ColPractglomerative Filtering, Association rule mining, Surprising item set mining, Temporal itemset mining.
UNIT X: Recent Trends
Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining.
UNIT XI: Mining Complex data objects
Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Data bases and mining Word Wide Web.
UNIT XII: Data Mining Primitives, Languages
Data mining primitives, Query language, Designing GUI based on a data mining query language.
UNIT XIII: System Architectures
Architectures of data mining systems .
UNIT XIV: Application and Trends in Data Mining:
Applications, Systems products and research prototypes, Additional themes in data mining, Trends in data mining .
UNIT XV: Data Design And Data Representation:
Principles of dimensional modeling, Dimensional modeling advanced topics, data extraction, transformation and loading, data quality.
UNIT XVI: Selection methods
Feature selection methods, Intrusion detection, Forecasting.
Reference Books:
1. The Data Warehouse Toolkit by Ralph Kimball.
2. The Data Warehouse Lifecycle Toolkit by Ralph Kimball, Margy Ross.

MCA54 --- Elective-1
MCA54A - Elective-1:1. --- Compiler Design

UNIT I: INTRODUCTION TO COMPILING
Compilers – Analysis of the source program.

UNIT II: Compiler
Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools.

UNIT III: Lexical Analysis
Lexical Analysis – Role of Lexical Analyzer.

UNIT IV: Buffering
Input Buffering – Specification of Tokens.

UNIT V: SYNTAX ANALYSIS
Role of the parser – Writing Grammars.

UNIT VI: SYNTAX ANALYSIS-II
Context-Free Grammars.

UNIT VII: Parsing

UNIT VIII: Parsing-II
LR Parsers – SLR Parser – Canonical LR Parser – LALR Parser.

UNIT IX: Intermediate Code Generation

UNIT X: Code Generation
Issues in the design of code generator – The target machine – Runtime Storage management.

UNIT XI: Basic Blocks and Flow Graphs
Basic Blocks and Flow Graphs – Next-use Information.

UNIT XII: Code generator

UNIT XIII: Code Optimization
Introduction – Principal Sources of Optimization – Optimization of basic Blocks.

UNIT XIV: Data Flow Analysis
Introduction to Global Data Flow Analysis.

UNIT XV: Run Time Environments
Runtime Environments – Source Language issues.

UNIT XVI: Storage Organization

Reference Books:
2. Engineering a Compiler by Keith Cooper and Linda Torczon.

MCA54B- Elective-1:2. --- Mobile Computing and Communication
UNIT I: Wireless Communication Fundamentals

**UNIT II: Modulations**
Modulations, Spread spectrum, MAC, SDMA, FDMA, TDMA, CDMA, Cellular Wireless Networks.

**UNIT III: Telecommunication Networks**

**UNIT IV: Broadcast Systems**
FAMA and DAMA, Broadcast Systems, DAB - DVB.

**UNIT V: Characteristics of radio propagation, Fading, Multipath propagation.**

**UNIT VI: Introduction to digital transmission**
Definition of bit-rate and signalling rate. Introduction to synchronous transmission. The need for pulse shaping, synchronisation and line-coding. Calculation of bit-error probabilities when the channel is affected by the addition of Gaussian noise.

**UNIT VII: Narrowband digital modulation**
The need for modulation. Binary and multi-level (M-ary) amplitude-shift keying (ASK), frequency-shift keying (FSK) and phase-shift keying (PSK).

**UNIT VIII: Wireless LAN**

**UNIT IX: Protocols supporting mobility**
Mobile network layer protocols such as mobile-IP, Dynamic Host Configuration Protocol (DHCP). Mobile transport layer protocols such as mobile-TCP, indirect-TCP.

**UNIT X: WAP**
Wireless Application Protocol (WAP).

**UNIT XI: MOBILE NETWORK LAYER**

**UNIT XII: Cellular Networks**
Channel allocation, multiple access, Location management, Handoffs.

**UNIT XIII: Wireless Networking**

**UNIT XIV: Ad-hoc networking Applications**
Mobility adaptations, disconnected operations, Data broadcasting.

**UNIT XV: Mobile agents.**

**UNIT XVI: Efficient computing**
Energy efficient computing, Impact of mobility on algorithms.

**Reference Books:**
2. Charging for Mobile All-IP Telecommunications by Dr. Yi-Bing Lin.

**MCA54C - Elective-1:3. --- Simulation and Modeling**

**UNIT I: Introduction**
Course Logistics, Definitions of Modeling and Simulation.

**UNIT II: Techniques**
When to apply these techniques.

**UNIT III: Applications**
Terminology & Components.
UNIT IV: Discrete vs. Continuous time.
UNIT V: Process flow in simulation study Simulation Examples.
UNIT VI: Queuing systems.
UNIT VII: Communications networks.
UNIT VIII: General Principles, Event-driven simulation.
UNIT IX: Queuing models
Characteristics, Performance Measures, Steady-State Behavior, Networks of Queues.
UNIT X: Random Number Generation
UNIT XI: World Views, List processing.
UNIT XII: Simulation software, History.
UNIT XIII: Selection process.
UNIT XIV: Simulation in High Level Language (C, C++, Pascal, Fortran).
UNIT XV: Simulation packages (MatPractical/Simulink), Interpreted vs. compiled simulators.

Reference Books:
1. Modeling and Simulation Fundamentals by John A. Sokolowski, Catherine M. Banks.

MCA55-L---Advanced Computer Network and Security Lab
UNIT I: Introduction, Communication media, Data Transmission.
UNIT II: Error Detection and Correction, Data Compression, Data Link control and Protocol Concepts.

MCA56-L---Web Designing/Internet Lab

Semester VI
MCA61 --- Advanced MIS and E-Commerce
UNIT I: Introduction To Information
UNIT II: Introduction to Business System
Introduction to Business System, Inventory Control, Inventory Control System, Manufacturing Plants, Accounting Sales Order Processing, Business Information System.
UNIT III: Information System,
Organization, Management And Strategy Introduction, UNIT Objectives.
UNIT IV: Organization and Information System
Organization and Information System, Organization, Principles of an Organization, Features of an Organization.
UNIT V: E-Commerce
Introduction, Definition of E-Commerce, History of E-Commerce.
UNIT VII: Electronic Commerce-Frame work
UNIT VIII: Types of E-Commerce

UNIT IX: E-Strategy
Information and Strategy, The virtual value chain, seven dimensions of ecommerce strategy, planning E-commerce project, E-commerce strategy and knowledge management, E-Business Strategy and Data Warehousing and Data Mining.

UNIT X: Customer –effective Web design
Requirements of Intelligent Websites, Website Goals and Objectives, planning the budget, analyzing website structure, fixed versus flexible webpage design, choosing a page size ,website development tools, design alternatives, outsourcing web design, testing and maintaining websites.

UNIT XI: EDI
Electronic Data Interchange (EDI) features, components.

UNIT XII: Electronic payment systems
Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT XIII: E-Commerce Marketing Concepts
Basic marketing concepts for internet marketing, Ecommerce marketing and branding strategies, Strengthening the customer relationship.

UNIT XIV: Mobile Commerce

UNIT XV: Consumer Search and Resource Discovery
Information search and Retrieval, Commerce Catalogues, Information Filtering.

UNIT XVI: Multimedia and Security

Reference Books:
1. E-Commerce 2010 by Kenneth Laudon and Carol Guerio Traver.
2. Electronic Commerce 2010 by Efraim Turban.

MCA62A --- Elective-2:1. --- Pattern Recognition
UNIT I: Introduction to Pattern Recognition
Statistical Pattern Recognition, Feature Selection, Syntactic Pattern Recognition, Segmentation Techniques.

UNIT II: Basics of Decision Theory
Classifiers, Discriminant Functions, Decision surfaces, Normal density and recognition, Discrete Features.

UNIT III: Parameter Estimated Methods
Maximum likelihood Estimation, Expectation maximization methods, Bayesian Estimation.
UNIT IV: Dimension Reduction Methods
Fisher Discriminant Analysis, Principal Component Analysis, Non-Parametric Techniques.

UNIT V: Linear Discrimination Functions
Support Vectors, Classifiers, Discrimination Functions, Perceptron.

UNIT VI: Non-Metric Methods
Introduction, Non-numeric data, Nominal Data, Decision trees.

UNIT VII: Non-Parametric Methods

UNIT VIII: Unsupervised Learning and Clustering
Introduction, Criterion, Functions for clustering, Algorithms for clustering, K means, Hierarchical and other methods, Cluster validation...

UNIT IX: Continued Un-Supervised Learning and Clustering
Introduction, Mixture Densities and identifiability, maximum likelihood estimates, application to normal mixtures, Data description and clustering- criteria functions.

UNIT X: Features
Preprocessing, Feature Selection and Primitive Extraction, Adaptive Classification, Fuzzy Grammar.

UNIT XI: Approaches
Fuzzy Mathematical Approach to Pattern Recognition, Classificatory Analysis.

UNIT XII: Analysis Scene
Analysis, Analytical Description of region Boundaries, Shape Description by Region Analysis.

UNIT XIII: Basic Problem Solving Methods
Forward v/s Backward, Knowledge Representation, Frame Problems.

UNIT XIV: Pattern Recognition Using Neural Classifiers
Introduction, Neural Network Structures for PR, Neural network based Pattern Associators, ART networks, Feed Forward Networks.

UNIT XV: Pattern Recognition Using Fuzzy Classifiers
Fuzzy and crisp Pattern Classifieds, Fuzzy Clustering, Selection of Primitives, Syntax Analysis, Syntactic Pattern.

UNIT XVI: Application Of Pattern Recognition.

Reference Books:
1. Pattern Recognition by William Gibson.

MCA62B - Elective-2:2. --- Operations Research
UNIT I: Introduction To Operational Research
System orientation, Use of interdisciplinary teams in OR, Necessity of OR in Business and Industry, Scope of OR in modern management, and Decision Making.

UNIT II: Overview of Operational Research
Formulation of O.R. models, Introduction to different techniques in OR, Simulation modeling.

UNIT III: Formulation
Identification of decision variables, Constructing Objective Functions and Constraints, Assumptions, Practical Examples.

UNIT IV: Quantitative Analysis
Nature and Scope – Quantitative Analysis as A frame work for Managerial Decisions; Analysing and Defining the Problem, Developing A Model, Selecting the Inputs, Coming Up With A Solution,
Quantifying the Model and the Solution, Putting the Model to Work, Relationship Between the Quantitative Specialist and the Manager.

UNIT V: Linear Programming
Formulation of L.P problems, Graphic Solutions, Simplex Methods & Duality, Emphasis will be on Formulation and Interpretation.

UNIT VI: Maximization and Graphic Methods
Introduction, Interpretation and Computation of Simplex Method, the Simplex solution to a Minimizing Method.

UNIT VII: Assignment Model
Definition and Application of Application of Assignment Model- Traveling Salesman Problem.

UNIT VIII: Queuing Theory:
Basic Elements of the Queuing Model, of the Poisson and Exponential Distributions, Queuing With Combined Arrivals and Departures, Queues With Priorities For Service, Tandem Or Series Queues, Queuing Decision Models.

UNIT IX: Transportation Methods
Definition and Application of the Transportation Model, Solution of the Transportation Problem.

UNIT X: Sequencing
Introduction, Optimal Solution for processing ‘n’ jobs through Two Machines.

UNIT XI: Game Theory
Introduction, Rules of Dominance, Algebraic Matrix and Arithmetic Methods, Mixed Strategies.

UNIT XII: P.E.R.T. & C.P.M.
Replacement Model: Drawing networks – identifying critical path – probability of completing the project within given time- project crashing – optimum cost and optimum duration.

UNIT XIII: Elementary Transport Problem
N. W corner rule, Vogets Approximation method(VAM), Assignment Problem.

UNIT XIV: Decision Theory
Pay off table, OpporUNITy Loss table, decision Trees for sequential decisions.

UNIT XV: Expected Value of Perfect Information and Sample information
Decision under certainty. Uncertainty and Risk.

UNIT XVI: Game Theory
INVENTORY control- EOQ, EOQ with price Breaks, ABC Analysis.

Reference Books:-

MCA62C - Elective-2:3. --- Advanced Computer Architecture
UNIT I: Fundamentals of Computer Design
Technology trends, cost reference and Reporting Performance, Quantitative Principles Of computer Design.

UNIT II: Instruction Set and Examples
Classifying Instruction Set, Memory Addressing, Type and Size of Operands.

UNIT III: Introduction to Advanced Architecture
UNIT IV: Basic Computer Design
Introduction, Common Registers, Main Memory, Instructions, Control Logic Gates, Timings, Interrupt, Interrupt cycle, flip-flops.

UNIT V: ILP Software approach
Compiler techniques- static branch protection - 5LIW approach - H.W support for more ILP at compile time- H.W verses S.W Solutions.

UNIT VI: Memory Hierarchy Design
Cache Performance and Virtual Memory, Protection and Examples of VM.

UNIT VII: Multiprocessors and Thread Level Parallelism
Symmetric shared memory Architecture, Distributed Shared Memory, Synchronization, Shared Memory.

UNIT VIII: Storage Systems
Types, Buses, RAID, Errors and Failures, Bench marking a Storage Device, Designing a I/O System.

UNIT IX: Inter Connection Networks and Clusters
Interconnection network media, Interconnection network media, Practical issues in interconnecting issues, Practical Issues in Interconnecting Networks.

UNIT X: Addressing Modes
Addressing Modes, Types of Addressing Modes.

UNIT XI: Central Processing Organization
Accumulator Control UNIT, Status Register, Arithmetic Logic UNIT, General Register Interrupt, To Convert Infix expression to postfix expression, Reverse Polish Notion.

UNIT XII: Input-Output Organization
Introduction, Peripheral Devices, Interface, Modes of Data Transfer, Priority Interrupt, DMA, I/O Processor.

UNIT XIII: Memory Organization
Introduction, Memory Hierarchy, Main Memory, Primary memory, Mapping Process, Memory management hardware, Protection, Associative Memory.

UNIT XIV: Data hazards
Data hazards, Basic concepts, Influence on Instruction Sets, Instruction Hazards.

UNIT XV: Number Systems
Implementation of fixed numbers and floating numbers, Addition and Subtraction, Multiplication And Division of floating Numbers, Half adder, Full adder.

UNIT XVI: Pipelining
Introduction, Overview, how it Works, Detailed Pipelining with the detailed Diagram.

Reference Books:-

MCA63A - Elective-3: Client Server Architecture
UNIT I: Client/Server Computing
DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.
UNIT II: Overview of C/S applications
components, classes, categories.

UNIT III: Overview of C/S computing
Dispelling the Myths, Obstacles- Upfront and hidden, open systems and standards, Standards setting organizations, factors of success.

UNIT IV: Client hardware and software
Client components and operating systems. What is GUI, Xwindow vs. windowing, database access. Application logic client software products: GUI environments, converting 32VII0/V2V0 screens, database access tools.

UNIT V: Client requirements
GUI design standards, Open GUI standards, Interface dependents, testing interfaces, development aides.

UNIT VI: Components of Client/Server application The client
services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA).

UNIT VII: Administrative details
Administrative details, Description of Client\Server Computing and Architecture, Client\Server Computing.

UNIT VIII: Partitioning Programs
Partitioning the programs in Client and Server Programs.

UNIT IX: Client/Server Architecture
Two and Three Tier Client\Server Architecture, Client and Server frameworks.

UNIT X: Systems

UNIT XI: Distributed File Systems
Introduction, Distributed File Systems, RDBMS, Distributed Programming.

UNIT XII: Layers
Introduction, Managing Client and Server Environment, types of layers.

UNIT XIII: Data Link Layer
Data Link Layer, Elementary data link protocols, Finite State Machines and Prtri nets.

UNIT XIV: Network Layer

UNIT XV: Session Layer
Session Layer, Presentation Layer, Case study, File Transfer Protocol, World Wide Memory.

UNIT XVI: Transport Layer
Transport Layer, Flow Control and buffering, Example System, Domain Name System, TCP connection.

Reference Books
1. Client/Server Architecture (J. Ranade Series on Computer Communications) by Alex Berson (Hardcover - Sep 1IXIX2).
2. Thin Clients: Web-Based Client/Server Architecture and Applications by Dawna Travis Dewire (Paperback - May 2VI, 1IXIXVIII).
MCA63B - Elective-3:2. --- Artificial Intelligence

UNIT I: Introduction to AI
Definition, Basic elements of AI, AI Application Areas, Introductory Concepts of AI- Clausal Form, Resolution, Unification, Inference Mechanisms.

UNIT II: AI Language AI
Operators, Data structures, Input & Output, Controlling Program Flow, Strings, and Recursion.

UNIT III: Problem Formulation and Search
Problem Characteristics, Production Systems, State Space Representation, Random Search, Search with Open List, Search tree and Search Graph.

UNIT IV: Problem Solving and Search
Introduction, Overview of Problem Search, Inference Engine, Pattern Matching, Conflict Knowledge.

UNIT V: Knowledge Based Systems
Knowledge representation, Acquisition, Organization and Manipulation of knowledge.

UNIT VI: Basic Components & architecture of Expert Systems
ES-Shells, Dealing With Uncertainty.

UNIT VII: Heuristic Search Techniques
Generate and Test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis.

UNIT VIII: Knowledge Representation
Knowledge Representation Issues, RePresentations and Mappings, Approaches to Knowledge, The frame Problem.

UNIT IX: Using Predicate Knowledge
Representing Instance and Isa Relationship, Computable Functions and Predicates, Resolutions, Natural Deduction.

UNIT X: Representation Knowledge Using Rules

UNIT XI: Symbolic Reasoning Under Uncertainty

UNIT XII: Statistical Reasoning
Probability and Baye’s thereom, Certainty factors and Rule Based Systems, Bayesian Networks, Dempsher theory, fuzzy logic.

UNIT XIII: Weak Slot and Filler Structures
Semantic Nets, Frames.

UNIT XIV: Strong Slot and Filler Structures
Conceptual Dependency, Scripts, CYC.

UNIT XV: Representation knowledge
Syntactic Semantic Spectrum of representation, Logic and Slot and Filler Structures, Other Representation Techniques, Summary of the Role of Knowledge.

UNIT XVI: Natural Language Processing
Syntactic Processing, Semantic Analysis, Morphological, Discourse and Pragmatic Processing.

Reference Books:


**MCA63C - Elective-3:3. --- Network Management**

**UNIT I: Basic Concepts of Networks**
Introduction, Standards And Organization, Components of Data Communications, Distributed Communications, Line Configurations.

**UNIT II: Data Communication and Network Management Overview**
Analogy of Telephone Network Management, Communications Protocols and Standards, Case Histories on Networking and Management, Network Management Functions, Network and System Management.

**UNIT III: Basic Foundations: Standards, Models, and Language**

**UNIT IV: SNMP Network Management**

**UNIT V: SNMP Management: SNMP52**
Major Changes in SNMP52, SNMP52 System Architecture, SNMP52 Structure of Management Information, SNMP52 Management Information Base, SNMP52 Protocol.

**UNIT VI: SNMP Management: SNMP53**

**UNIT VII: SNMP Management: RMON**
Remote Monitoring, RMON SMI and MIB, RMON1, RMON2, A Case Study on Internet Traffic.

**UNIT VIII: Some Current Network Management Topics**
Web-Based Management, XML-Based Network Management, Distributed Network Management, Reliable & Fault Tolerant Network Management, Other topics.

**UNIT IX: Projects Presentations**
More details will be posted on the course web site about the projects.

**UNIT X: Layers**

**UNIT XI: Digital Transmission Interfaces and Modems**
Types of Data: Digital Data, Analog Data., Data Transmission: Difference between digital data and analog data transmission, Digital to Analog conversion, Interfaces and Modems: DTC-DCE Interface.

**UNIT XII: Modem**
Analog Modem, Digital Modem, Asynchronous Modems, Cable Modem.

**UNIT XIII: Transmission Media and Introduction to Signals**
Noise absorption, Radiation, Attenuation, Bandwidth, Guided and Unguided media, Comparison of media, Analog and Digital Signals, Periodic and Aperiodic Signals, Time and Frequency domains, Composite signals.

**UNIT XIV: LANS and MANS**
Local area network: Advantages, disadvantage, characteristics, Metropolitan area network, IEEE
UNIT XV: Switching and Point to Point Protocols
What is switched network? Circuit Switching, Packet switching, Message switching, What is remote access.

UNIT XVI: RAS
States, Point to Point layers, Link control protocol, Authentication, Network control protocol.

Reference Books:
1. Network Management Fundamentals by Alexander Clemm (Paperback - Dec 1, 2006).

MCA64 --- Project.