Courses of Study

MCA
(Master of Computer Application)

Programme
# Department of Computer Applications

## Course Structure

### SEMESTER – I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Course Name</th>
<th>L-T-P</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MH31101</td>
<td>Discrete Mathematics</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>2.</td>
<td>CA31101</td>
<td>Computer Programming and Problem Solving</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>3.</td>
<td>CA31102</td>
<td>Computer Organization and Architecture</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>4.</td>
<td>CA31103</td>
<td>Optimization Techniques</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>5.</td>
<td>GE32101</td>
<td>Financial Management</td>
<td>3-1-0</td>
<td>4</td>
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<tr>
<td>6.</td>
<td>CA31201</td>
<td>Computer Programming Lab.</td>
<td>0-0-3</td>
<td>2</td>
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<tr>
<td>7.</td>
<td>CA31202</td>
<td>Optimization Techniques Lab.</td>
<td>0-0-3</td>
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<td><strong>TOTAL</strong></td>
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### SEMESTER – II

<table>
<thead>
<tr>
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<th>L-T-P</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>MH32102</td>
<td>Computer Oriented Numerical Techniques</td>
<td>3-1-0</td>
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<tr>
<td>2.</td>
<td>CA32104</td>
<td>Object Oriented Programming</td>
<td>3-1-0</td>
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<td>3.</td>
<td>CA32105</td>
<td>Data Structures</td>
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<td>4.</td>
<td>CA32106</td>
<td>Object Oriented Analysis and Design</td>
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<td>5.</td>
<td>CA32107</td>
<td>Operating System</td>
<td>3-1-0</td>
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<td>6.</td>
<td>CA32203</td>
<td>Numerical Computing Lab. Using OOP</td>
<td>0-0-3</td>
<td>2</td>
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<td>7.</td>
<td>CA32204</td>
<td>Data Structure Lab.</td>
<td>0-0-3</td>
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## SEMESTER – III

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>CA33108</td>
<td>Data Base Management Systems</td>
<td>3-1-0</td>
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<tr>
<td>2.</td>
<td>CA33109</td>
<td>Computer Communication and Networks</td>
<td>3-1-0</td>
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<td>3.</td>
<td>CA33110</td>
<td>Design and Analysis of Algorithms</td>
<td>3-1-0</td>
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<td>4.</td>
<td>CA33111</td>
<td>Interactive Computer Graphics and Multimedia</td>
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<td>5.</td>
<td>CA33112</td>
<td>Elective – I</td>
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<td>6.</td>
<td>CA33205</td>
<td>Data Base Management Lab.</td>
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<td>7.</td>
<td>CA33206</td>
<td>Computer Graphics and Multimedia Lab.</td>
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## SEMESTER – IV

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<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>CA34113</td>
<td>Software Engineering</td>
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<td>2.</td>
<td>CA34114</td>
<td>Artificial Intelligence</td>
<td>3-1-0</td>
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<td>3.</td>
<td>CA34115</td>
<td>Internet and Web Technology</td>
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<td>CA34115</td>
<td>Elective – II</td>
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<td>CA34116</td>
<td>Elective – III</td>
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<td>6.</td>
<td>CA34207</td>
<td>Web Technology Lab.</td>
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<td>7.</td>
<td>CA34208</td>
<td>Elective Lab.</td>
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### SEMESTER – V

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<tr>
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<tbody>
<tr>
<td>1.</td>
<td>GE35102</td>
<td>Organization Behavior and Management</td>
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<td>CA35117</td>
<td>Network Programming</td>
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<td>3.</td>
<td>CA35118</td>
<td>Decision Support System</td>
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<td>CA35119</td>
<td>Elective – IV</td>
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<td>CA35120</td>
<td>Elective – V</td>
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<td>CA35209</td>
<td>DSS and Network Programming Lab.</td>
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<td>7.</td>
<td>CA35301</td>
<td>Seminar/Colloquium/Comprehensive Viva</td>
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### SEMESTER – VI

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<tr>
<th>Sl. No</th>
<th>Subject Code</th>
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<tbody>
<tr>
<td>1.</td>
<td>CA36401</td>
<td>Thesis/Project</td>
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Total Credits of six semesters = 140
LIST OF ELECTIVES

1. System Analysis and Design
2. E-Commerce and E-Business
3. Information Storage and Management
4. Supply Chain Management
5. Managerial Economics
6. Data-ware Housing and Data Mining
7. ERP System
8. Client-Server Technology
9. Java Programming
10. Information Security
11. Systems Simulation and Modeling
12. Graph Theory and Network Flows
13. Parallel and Distributed Processing
14. Image Processing
15. Windows Application Programming
16. Microprocessors and their interfacing
17. Computer-Aided Design
18. Industrial Robotics and Automation
19. Soft Computing
20. Pattern Recognition
21. Advanced Computer Architecture
22. Advanced Database Management System
23. Neural Networks
24. Embedded System
25. Formal Language and Automata Theory
26. Computer Oriented Statistical Methods
27. Mathematical Logic and Logic Programming
28. Software Project Management
29. Software Reliability
30. Software Safety
31. Fault-Tolerant Computing
32. Bluetooth Technology
33. Multimedia Technology
34. Mobile Computing
35. Real Time Systems
36. Compiler Design
37. Unix and Shell Programming
38. Cluster and Grid Computing
SEMESTER – I

MH31101: Discrete Mathematics

Unit-I:
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.
Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Unit-II:
Combinatorics: Basic Counting Technique, Pigeon-hole Principle, Recurrence Relation, Generating function, Polya's Counting Theorem

Unit-III:
Introduction and Basic Concepts: Definition, Representation of graphs, Finite and infinite graphs, Directed graphs, Incidence and degree, Bipartite graph, Planar graphs, Matrix representation of graphs, Applications of graph in computer science.
Graphs: Simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, homomorphism and automorphism of graphs.
Trees and Fundamental Circuits: Definition, Properties of trees, Spanning trees, Fundamental circuits and cut-sets, Connectivity and separability, Minimal spanning tree and connected algorithms, Rooted and Binary trees, Applications of trees.

Unit-IV:
Tree: Definition, Rooted tree, properties of trees, binary search tree, tree traversal.
Shortest Path Problems: Shortest path algorithms, Generalized shortest path algorithms, Applications of shortest path problems.

Unit-V:
Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.
Formal language & Automata: Grammars, Languages, regular expression, regular languages, phrase structure grammars, types of grammars, Chomsky’s hierarchy, finite state automata, finite state machine, deterministic finite automata, non-deterministic finite automata, conversions.

Text books
3. “Graph Theory With Applications to Engineering and Computer Science” Prentice Hall, Englewood Cliffs, 1974
Unit I
Programming language, introduction to Operating System, Write and Execute the first program, Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic.

Unit II
Introduction: Algorithms, Flow charts, Problem solving methods, Need for computer languages, Structure of a C program, Data type, Constants, Variables, Identifiers, Key words, Declarations, Expressions, Statements and Symbolic constants.
Input and Output: getchar, putchar, scanf, printf, gets, puts, functions, Pre-processor commands, Preparing and running a complete C program.
Operators and expressions: Arithmetic, unary, logical, bit-wise, assignment and conditional operators, Library functions.
Control statements: While, do-while, for statements, nested loops, if-else, switch, break, continue and goto statements, comma operator.

Unit III
Functions: Defining and accessing function, passing arguments, function prototypes, recursion, use of library functions, storage classes.
Arrays: Defining and processing an array, Passing array to a function, Multi dimensional arrays, String handling, Operations on strings.

Unit IV
Pointers: Declarations, Passing pointer to a function, Operations on pointers, Pointers and arrays, Arrays of pointers.
Structures and unions: Defining and processing a structure, Passing structure to a function, Pointers and structures, Unions, Dynamic memory allocation, defining and using stacks and linked lists.
File handling: Open, Close, Create, File operations, Unformatted data files, Command line arguments.
Fundamental notations: Primitive and composite data types, Times and space complexity of algorithms.

UNIT – V

Text book:
CA31102: Computer Organization and Architectures

Unit I:
Representation of information: Number systems, Integer and floating point representation, Character codes (ASCII, EBCDIC), Error detection & correction codes.
Basic building blocks: Boolean Algebra and logic gates, Combinational Circuits.

Unit II:

Unit III:
Central processing unit: Stack organization, Instruction formats, Addressing modes, Instruction types, Instruction cycle and execution cycle.

Unit IV:
Control unit: Hardwired control, Micro-programmed control, RISC, CISC, Pipelining in CPU design, Superscalar processors.

Unit V:
Memory system: Storage technologies, Memory array organization, Memory hierarchy, interleaving, cache and virtual memories and architectural aids to implement these.
Input-output devices and characteristics: Input-output processing, bus interface, data transfer techniques, I/O interrupts, channels.

Text Books:

Reference Books:
Unit I:
Liner Programming: Structure of linear programming model, advantages and limitations of linear programming, application areas of linear programming.

Mathematical Model of Linear Programming Problem: Examples on production, marketing, finance, agriculture and transportation

Unit II:
Graphical Solution Methods of Linear Programming problem: Examples on minimization and maximization linear programming problem, examples on mixed constraints linear programming

Special cases in Linear Programming: Alternative (or multiple) optimal solutions, unbound solution, infeasible solution

Unit III:
Simplex Method: Standard form of linear programming, simplex algorithm (maximization case), simplex algorithms (minimization case): Two phase method, big-M method.

Unbound solution, infeasible solution

Unit IV:
Duality in Linear Programming: Formulation of dual linear programming problem, advantages of duality, dual simplex algorithm

Sensitivity Analysis: Changes in objective function coefficient, changes in the availability of resources, changes in input-output coefficients.

Unit V:
Transportation Problem: Methods for finding initial solution: North-West corner method, least cost method, Vogel’s approximation method.

Test for Optimality: MODI method

Assignment Problem: Solution optimal solution, maximization case in assignment problem, travelling salesman problem.

Text Books:

References:
1. Hadley, G.,”Linear Programming, and Massachusetts”, Addison-Wesley
5. Swarup K etal, “Operation Research”, S. Chand
GE32101: Financial Management

Unit I:
Financial statements and ratio analysis: Balance sheet, profit and loss accounts, various types of ratios based on balance sheet, income statements and their usefulness.
Working capital management: Definition, need for working capital, sources and user of working capital, determination of appropriate level of working capital (Hedging principle), Inventory mode.

Unit II:
Cost and management accounting: Cost terminology, cost elements-labour, material, overhead, methods of distributing overhead, methods of costing-job and process costing.
Accounting for fixed assets and depreciation: Methods for calculating depreciation, accounting for depreciation, selecting methods for depreciation, intangible assets, financing engineering enterprises-shares, bonds, debentures etc.

Unit III:
Marginal costing: Nature, scope and importance, break-even analysis, its uses and limitations, construction of break-even chart, practical applications of marginal costing.
Standard costing: Nature and scope, computation and analysis of variances with reference to material cost, labour cost and overhead cost, interpretation of variances.
Uncertainty in economic studies: Risk & return concepts, expected return in a portfolio, portfolio risk, diversifiable and non-diversifiable risk, Markowitz model; the mean variance criterion, selection of optimal portfolio.

Unit IV:
Time value of money: Interest calculation, present value factor, annuities, capital recovery and sinking fund factors, perpetuities and capitalized value, gradient and geometric series of cash flow, continuous compounding, equivalence, capital recovery cost.

Unit V:
Project appraisal: project evaluation, social cost benefit analysis, bank guide lines, present worth method, annual equivalent amount method, alternatives having unequal live. Cost of capital, financial leverage and capital structure: component of cost of capital, cost of debt, cost of equity capital (Beta and dividend valuation model approach), weighted average cost of capital, economic value addition, financial leverage, EBIT-EPS analysis, optimal capital structure.

Text Books:
6) Ashish K. Bhattacharya- Essentials of Financial Accounting (PHI, New Delhi)
Write programming using C:

- Data types and variables, operators and expressions, evaluation of expressions
- Conditional operators, If-if else-if statement, nested if, iteration
- Repeat ion structure in C, modular programming, iteration function
- Recursion, Storage classes, arrays, structures, pointers, unions
- Searching, sorting, selection, linked list
- Searching sorting on strings, multidimensional arrays, operations on files
- Std. C library, Use of Std. C library.

Program development using C/C++

1. Simplex Methods
2. Duality Techniques
3. Transportation Problem
4. Assignment Problem
5. Integer Programming
6. Dynamic programming
7. Queuing Theory
SEMESTER - II

MH32102: Computer Oriented Numerical Techniques  

Unit-I:  
**Floating point Arithmetic:** Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation  
**Iterative Methods:** Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

Unit-II:  
**Simultaneous Linear Equations:** Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence

Unit-III:  
**Interpolation and approximation:** Finite Differences, Difference tables, Polynomial Interpolation: Newton’s forward and backward formula, Central Difference Formulae: Gauss forward and backward formula.  
**Interpolation with unequal intervals:** Langrange’s Interpolation, Newton Divided difference formula, Approximation of function by Chebyshev polynomial.

Unit-IV:  
**Numerical Differentiation and Integration:** Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson’s rules,  
**Solution of differential equations:** Euler’s Method, Taylor’s Method, Runge-Kutta methods, Predictor-corrector method.

Unit-V:  
**Curve fitting, Cubic Spline and Approximation:** Method of least squares, fitting of straight lines, polynomials, exponential curves etc

References:

7. Francis Scheld, “Numerical Analysis”, TMH  
Unit I
Introduction to C++: Tokens, Keywords, Identifiers, Variables, Data types, Operators in C++, Expressions and Implicit Conversions, Control Structures.
Functions in C++: The Main Function, Function Prototyping, Passing arguments to a function, Inline Functions, Default Arguments, Function Overloading, Friend and Virtual Functions, Storage Classes.

Unit II
Classes and Objects: Class Declaration, Defining Member Functions, Nesting of Member Functions, Private Member Functions, Arrays within a class, Creating Objects, Arrays of Objects, Objects as Function Arguments, Pointers to Members, Difference between Structures and Classes.
Constructors and Destructors: Constructors, Constructors with arguments, Multiple Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Destructors.

Unit III
Operator Overloading: Defining Operator Overloading, Overloading of Unary and Binary Operators, Manipulation of Strings Using Operators, Rules for Overloading Operators, Type Conversions.
Inheritance: Introduction, Base and Derived Classes, Different forms of Inheritance, Virtual Base Classes, Abstract Classes, Constructors in Inheritance, Overriding Base Class Members.

Unit IV
Virtual Functions and Polymorphism: Introduction, Pointers to objects, this Pointer, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions, Friend Functions.

Unit V
Templates and Exception Handling: Introduction, Class Templates, Function Templates, Member function Templates, Concept of Exception Handling, Different Types of Exception, Throwing Exception from a Function, Multiple Catch Statements.

Text Books:

Reference Books:
Unit - I
**Introduction**: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off

**Arrays**: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices, and Vectors.


Unit - II

**Queues**: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, De-queue, and Priority Queue.

**Linked list**: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Unit - III


**Searching and Hashing**: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Unit - IV

**Sorting**: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

**Binary Search Trees**: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit - V


**File Structures**: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

**Text Books**


**Reference Books**

2. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata
Unit I:  

Unit II:  
Concept of structured analysis, Tools of structured analysis- Data flow diagrams, Data dictionaries, Structured English, Decision Trees and Decision Tables.  
*System Design:* Process and stages of System Design, Logical and Physical Design, Process modelling with physical and logical DFD’s, System flow charts and structured charts, Data modelling with ERD’s.

Unit III:  
*Modular and Structured Design:* Modularization, Module specification, Module coupling and cohesion, Top-down and Bottom-up design. Testing and validation System quality control and assurance, Reviews and walkthroughs, Maintenance activities and issues, Audit trails and system security.

Unit IV:  

Unit V:  

Text Books

1. Systems Analysis and Design (Prentice Hall) –by Dr. Kenneth E Kendall, Julie E Kendall  

References

Unit-I:
Introduction: Definition and types of operating systems, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, system programs, Virtual machines.

Unit-II:
Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real-time scheduling and Algorithm evaluation.

Unit-III:

Unit-IV:

Unit-V:
Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security

References

3. Harvey M Deital, "Operating Systems", Addison Wesley
Experiments based on the course Object Oriented Systems to be done on C++/JAVA/UML/VISIO etc.

- implement floating point arithmetic operations i.e., addition, subtraction, multiplication and division.
- deduce errors involved in polynomial interpolation. Algebraic and transcendental equations using Bisection, Newton Raphson, Iterative, method of false position, rate of conversions of roots in tabular form for each of these methods.
- implement formulae by Bessels, Newton, Stirling, Langranges etc.
- implement method of least square curve fitting.
- Implement numerical differentiation.
- Implement numerical integration using Simpson's 1/3 and 3/8 rules, trapezoidal rule.
- show frequency chart, regression analysis, Linear square fit, and polynomial fit.

Write Program in C or C++ for following:

- Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
- Searching programs: Linear Search, Binary Search.
- Array implementation of Stack, Queue, Circular Queue, Linked List.
- Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
- Implementation of Binary tree.
- Program for Tree Traversals (preorder, inorder, postorder).
- Program for graph traversal (BFS, DFS).
- Program for minimum cost spanning tree, shortest path.
SEMESTER – III

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, Triggers.

Unit- III:
Data Base Design & 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:

Unit- V:
Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version 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.

References

1 Date C J, “An Introduction To Database System”, Addision Wesley
3 Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley
4 Paul Beynon Davies, “Database Systems”, Palgrave Macmillan
5 Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
6 Majumdar & Bhattacharya, “Database Management System”, TMH
Unit I:
Advantages of networks, structure of the communications network, point-to-point and multidrop circuits, data flow and physical circuits, network topologies, topologies and design goals, Hierarchical topology, horizontal topology (Bus), star topology, ring topology, mesh topology. The telephone network, switched and non-switched options, fundamentals of communications theory, channel speed and bit rate, voice communications and analog waveforms, bandwidth and the frequency spectrum, connecting the analog and digital worlds, digital worlds, digital signals, the modem, asynchronous and synchronous transmission.

Unit II:
Layered Protocols and the OSI model
Goals of Layered Protocols, networks design problems, communication between layers, introduction to standard organizations and the OSI model, standards organizations, Layers of OSI, OSI status. The Physical Layer: Digital communications, Data Link Layer Protocol, Error Correction and Detection techniques, Flow control
Switching and Routing in Networks

Unit III:
Polling/Selection Protocols
Character and bit protocols, binary synchronous control (BSC) HDLC, HDLC options, HDLC frame format, code transparency and synchronization, HDLC transmission process, HDLC subsets, SDLC, Protocol conversion.

Unit IV:
Wide area and local networks, connection oriented and connectionless networks, classification of communications protocols, time division multiple access (TDMA), time division multiplexing (TDM), carrier sense (Collision) systems, token passing, peer-to-peer priority systems, priority slot, carrier sense (Collision free) systems, token passing (Priority) systems.

Unit V:
Network Layer: Point-to Point networks, routing algorithms, congestion control algorithms, internetworking.
TCP/IP
TCP/IP and internetworking, example of TCP/IP operations, related protocols ports and sockets. The IP address structure, major features of IP, IP datagram. Major IP services. IP source routing, value of the transport layer, TCP, Major features of TCP, passive and active operation, the transmission control block (TCB), route discovery protocols, examples of route discovery protocols, application layer protocols.

Text Books:
**Unit-I:**
Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort
Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics

**Unit-II:**
Advanced Data Structure: Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, 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:**
Graph Algorithms: Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal’s Algorithms, Prim’s Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

**Unit-V:**
Dynamic Programming: Multistage graph problem, single-source and all pairs shortest paths, Traveling sales person problem, Longest common subsequence problem, matrix chain multiplication; Back Tracking: 8-queens problem, sum-of-subsets, graph colouring, Hamiltonian cycles; Branch-and-Bound: Least cost search, 15-puzzel problem;


**References:**
2. Fundamentals of Computer Algorithms by Horowitz and Sahani, Galgotia
3. Introduction to Algorithms by Thomas H Cormen Leiserson et al, PHI
5. Algorithm Design by Jon Kleinberg and Eva Tardos, Pearson Education
6. Fundamental of Algorithms by Brassard Bratley, PHI
7. Algorithms Design by M T Goodrich et al, John Wiley
8. The Design and analysis of Algorithms by A. V. Aho et. al., Pearson Education
Unit – I:
**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.

Unit – II:
**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III:
**Three Dimensional:** 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV:
**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces. **Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Unit – V:
**Concept of Multimedia:** Multimedia and interactivity, Multimedia technology (Sound & audio, image & graphics and animation & special effects, storage and access speed). Application Development. Multimedia Applications using UML.

**References:**
The programme to be implemented using SQL

1. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
2. Write Programs in PL/SQL, Understanding the concept of Cursors.
3. Write Program for Join, Union & intersection etc.
5. Creating Forms, Reports etc.
6. Writing codes for generating read and update operator in a transaction using different situations.
8. Developing code for understanding of distributed transaction processing. Students are advised to use Developer 2000 Oracle 8+ version for above experiments. However, depending on the availability of Software’s students may use power builder/SQL Server/DB2 etc. for implementation.

Program based on using C/C++

Line drawing, Circle generating, Mid-point circle generating
Parallel version of Line, Circle and Mid-point circle generating programme
Line clipping using Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Sutherland Hodgeman polygon clipping,
Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Back Face Detection algorithm, Depth buffer method,
Multimedia Application Development. Multimedia Applications using UML.
SEMESTER - IV

CA34113: Software Engineering

Unit-I:

Unit-II:

Unit-III:

Unit-IV:

Unit – V:

References:
4. Pankaj Jalote, Software Engineering, Wiley
Unit I:
Scope of AI: Games, theorem Proving, Natural language Processing; Vision & speech processing, Robotics, Expert Systems; AI techniques-Search, Knowledge, Abstraction.

Problem Solving: State space search, Control Strategies (Depth first search, Breadth first search, Production systems). Problem Characteristics (Decomposable, ignorable, recoverable, predictable).

Use of Heuristics: Hill climbing; Best first search; A* algorithm : Admissibility; AND/OR graph – AO*; Constraint satisfaction (Cryptarithmic, Waltz Line Labelling).

Game Playing: Minimax search; Alpha-Beta pruning.

Unit II:
Knowledge Representation: Predicate Logic (Well formed formulas, quantifiers, Prenex Normal Form, Skolemization, Unification, modus pones, Resolution refutation- various strategies).
Rule Based Systems: Forward reasoning: Conflict resolution; Backward reasoning: Use of No backtrack.
Structured Knowledge Representations: Semantic Net ; slots, inheritance; Frames-exceptions and defaults-attached predicates; Conceptual Dependency formalism. Object Oriented Representations.

Unit III:
Natural Language Processing: Syntactic analysis, Top down and bottom up parsing, Augmented Transition Networks, Semantic analysis, case grammars,


Learning: Concept of learning, Learning automation; The Genetic algorithm; Learning by induction; Neural Networks (Hopfield Networks; Perceptrons – Learning algorithm, Backpropagation Network, Boltzman Machine, Recurrent Networks).

Unit IV:
Planning: Components of Planning System; Plan Generation Algorithm (Forward State Propagation, Backward State Propagation, Nonlinear Planning using constraint posting).

Unit V:
AI Programming Languages:
PROLOG: Syntax; Procedural and Declarative meanings; Prolog unification mechanism; Anonymous variable, Lists; Use of fail, CUT, not.
LISP: Basic; Concepts; Eval Function; Functions and Variables; Scoping of LISP variables; Iteration and recursion. UML in Artificial Intelligence.

Test Books:
1. Artificial Intelligence (SIE), Kevin Knight, Elaine Rich, B. Nair, Mc-Graw Hill Publication
## Unit I: Internet
Internet: 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, protocols governing the web, web development strategies, Web applications, web project, web team.

## Unit II: Web Page Designing
**HTML:** list, table, images, frames, forms, CSS; **XML:** Document Type Definition (DTD), Namespaces, XML schemes, presenting and using XML, Entities, XSL, XML Parser, Applications, Integrating XML with other applications.

## Unit III: Scripting
Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script

## Unit IV: Server Site Programming
Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Application: data base action, development of java beans in JSP, introduction to COM/DCOM.

## Unit V: PHP (Hypertext Preprocessor)
Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC.

## References
3. Ramesh Bangia, “Internet and Web Design”, New Age International
4. Bhave, “Programming with Java”, Pearson Education
6. Deitel, “Java for programmers”, Pearson Education
1. Creation of HTML pages with frames, links, tables and other tags
2. Usage of internal and external CSS along with HTML pages
3. Creation of XML document for a specific domain
4. Writing DTD or XML schema for the domain specific XML document
5. Parsing an XML document using DOM
6. Client side Programming
   # programs of Java script & VB script of statements, functions, objects; event and event handling
   # Form Validation including text field, radio buttons, check boxes, list box and other controls.
7. Usage of ASP/JSP objects response, Request, Application, Session, Server, ADO etc
   # Writing online applications such as shopping, railway/air/bus ticket reservation system with set of ASP/JSP pages
   # Using sessions and cookies as part of the web application
8. Writing Servlet Program using HTTP Servlet
9. PHP of simple program, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC.
10. Any online application with database access
11. Sample web application development in the open source environment

**Project Distribution**

At the beginning of semester a list of project topic should be provided by concerned faulty. A group of 9-10 Students must select a topic of his choice. The student group is required to conduct rigorous study/survey on the subject under the supervision of the faculty member of the department, prepare a report and PowerPoint presentation. The demonstration of the project will be in presence of all the students of his class at the end of semester. The comments & criticism of the topic/subject will be discussed for the benefit of all the students. The evaluation will be carried out by the department based on the presentation.
SEMESTER - V

GE35102: Organizational Behaviour and Management

UNIT I:

UNIT II:

UNIT III:

UNIT IV:

UNIT V:

References:
2. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill)
Unit I:

Unit II:
Berkeley sockets: Overview. UNIX domain protocols, Socket addresses. Socket system calls, Reserved ports, Passing file descriptors, I/O asynchronous and Multiplexing, socket implementation.

Unit III:
Winsock programming: Using the windows socket. API Window sockets and blocking I/O. Other windows extensions. Network dependent DLL. Sending and receiving data over connections. Termination. TCP / IP, UDP Programming.

Unit IV:
Network Programming for Internet – Firewall, Router, Search engines, Crawlers, Indexing, Audio, Video, Data Transmission & storage.

Unit V:

Text Books:
Unit I

Unit II
*DSS: The Basic Concepts:* Components of DSS; data management, model management sub system; the user interface sub system; DSS hardware and software; classification of DSS and their support.

Unit III
*Modelling and Model Management:* Static and Dynamic Model; Optimization via mathematical programming; linear programming models; integer programming models; dynamic programming models; simulation; discrete event simulation; generation of random numbers; simulation process languages; heuristic programming; forecasting.

Unit IV
*Decision support system construction:* The system development life cycle; DSS development process and strategies; approaches to DSS construction; end user computing and user developed DSS; DSS generators; selection of a DSS generator and other software tools.
*Implementation and Evaluation of DSS:* Models of implementation; Implementation strategies; Evaluation.

Unit V
*Group DSS:* Fundamental of GDSS; the technology of GDSS; constructing of GDSS; commercial GDSS software.
*DSS: Through internet/intranet.*

**Text book:**

2. Decision Support Systems and Intelligent Systems, 6/e by Turban & Aronson, PHI Pvt. Ltd.

**Reference Books:**

Write Program in C/C++ for following:

- Implementation of the different types of sockets calls, socket implementation
- Active connection, passive connections,
- Internet programming, firewall, router, search engines, crawlers, audio-video data transmission
- Program for ping, time and date routine
- Remote logging, video conferencing

Guidelines & General Instruction:

The aim of the subject is to develop ability of a student to carry out literature survey & independent study of advanced subject/topic/matters in the field of Computer Science and Information technology. At the beginning of semester a list of colloquium topic should be displayed on the notice board by the department and/or on the institution web site. Every Student must select a topic of his choice. The student is required to conduct rigorous study/survey on the subject under the supervision of the faculty member of the department, prepare a report and present (PPT presentation along with hardcopy of project work) this in presence of all the students of his class at the end of semester. The comments & criticism of the topic/subject will be discussed for the benefit of all the students. The evaluation will be carried out by the department based on the presentation.
Semester – VI

CA36401: Thesis/Project  
L – T – P  
0 – 0 – 20

Guidelines & General Instruction:

Every student is required to carry out project work under the supervision of a faculty member of the department. However, a student may also opt to pursue his project work in a reputed industry/institution with the consent of Department/Institute. In such cases, the department must look into the suitability of the projects and assign one internal guide/supervisor. The internal supervisor shall monitor progress of the student continuously. A candidate is required to present the progress of the project work (at least twice) during the semester at an appropriate time decided by the Department. There will a final presentation of the project work at the end of the semester.
SYLLABUS OF ELECTIVES

System Analysis & Design

Unit I
*System Planning:* Data and fact gathering techniques, Feasibility analysis, Project selection plan and proposal, Prototyping, Cost-benefit analysis.

Unit II
*Information Requirement Analysis:* Concept of structured analysis, Tools of structured analysis-Data flow diagrams, Data dictionaries, Structured English, Decision Trees and Decision Tables.
*System Design:* Process and stages of System Design, Logical and Physical Design, Process modelling with physical and logical DFD’s, System flow charts and structured charts, Data modelling with ERD’s.

Unit III
*Modular and Structured Design:* Modularization, Module specification, Module coupling and cohesion, Top-down and Bottom-up design.
*Input / Output and Form design:* File and Database Design, User-interface design, Prototyping, Use of CASE tools, System documentation and their importance.

Unit IV
*System Implementation and Maintenance:* Test planning, Implementation planning and performance evaluation, Testing and validation, Performance and acceptance criteria, System quality control and assurance, Reviews and walkthroughs, Maintenance activities and issues, Audit trails and system security.

Unit V
*Analysis and Design in Object-oriented Platforms:* Introduction object modeling, Object oriented analysis and design through object modeling techniques, Dynamic modeling and functional modeling, Process of Object oriented design, Object oriented programming systems for implementation, Object oriented databases.

Text Books:

1. System Analysis And Design by Samarjeet Kaur, Sandhir Sharma, Publisher: Deep & Deep Publications Pvt.ltd
2. Systems Analysis & Design, Elias M Award, Publisher: Galgotia (2010)

Java Programming

Unit-I
*Internet:* 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

Unit-III
JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

Unit-IV

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

References:

1. Margaret Levine Young, “The Complete Reference Internet”, TMH
2. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
3. Balagurusamy E, “Programming in JAVA”, TMH
4. Dustin R. Callway, “Inside Servlets”, Addison Wesley

Java Programming Lab.

Write Programs on
Illustrating, overloading, over riding and various forms of inheritance. To create packages and multiple threads in Java. Event handling Mouse and Keyboard events. Using Layout Manager create different applications. Create and manipulate Text Area, Canvas, Scroll Bars, Frames and Menus using swing/AWT. Using Java create Applets. Programs or Client Server Interaction with stream socket connections. In java to read data from disk file.

Windows Applications Programming

UNIT – I:
Introduction of .NET Framework, Visual C#.NET, Fundamental programming concepts, including event-driven programming, classes, objects, properties, methods, and events.

UNIT – II:
Object-Oriented Programming in Visual C#.NET: Concepts of abstraction, encapsulation, instantiation, initialization, constructors, and destructors, Inheritance, polymorphism, and namespaces, Handling Errors and Exceptions, Forms and controls to create a user interface, Variables, Constants, Functions, Procedures, Arrays. Create and use classes,
UNIT – III:
Decision Structures and Loops, Events, Delegates: Forms Controls, Switch, If-else, Loops, Validating User Input, Delegates and Events

UNIT – IV:
Using ADO.NET: Use ADO.NET with a Windows Forms application to create, read, update, and delete records in Access and SQL Server databases.

UNIT – V:
Reports Generations: Visual Studio Reports, Crystal Reports, Deploying Applications

Text Book:
1. Mastering C# Database Programming, Jason Price

Reference book:

Information Security

UNIT-I:

UNIT-II:

UNIT-III:

UNIT-IV:

UNIT-V:

References:

7. IT Act 2000

Data Warehousing & Data Mining

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V

References:

1. Berson, “Data Warehousing, Data-Mining & OLAP”, TMH
Unit I
Introduction and Basic Concepts: Definition, Representation of graphs, Finite and infinite graphs, Directed graphs, Incidence and degree, Bipartite graph, Planar graphs, Matrix representation of graphs, Applications of graph in computer science.

Unit II
Trees and Fundamental Circuits: Definition, Properties of trees, Spanning trees, Fundamental circuits and cut-sets, Connectivity and separability, Minimal spanning tree and connected algorithms, Rooted and Binary trees, Applications of trees.

Unit III
Shortest Path Problems: Shortest path algorithms, Generalized shortest path algorithms, Applications of shortest path problems.

Unit IV

Unit V
Flow Graphs: Definition, Methods of solution, Path inversion, Application of flow graphs for system modeling.
Project management by network (PERT & CPM) techniques, Graphical evaluation and review techniques (GERT).

Text Books:
1. Narsingh Deo, “Graph Theory”, Prentice Hall of India Pvt. Ltd.

Reference Books:

Parallel and Distributed Processing

Unit I
Trends towards Parallel Processing, Type of Parallel Processing, Difference between Temporal and Data Parallelism.
Parallel Processing Mechanism: Multiplicity of functional units, Parallelism and pipelining within CPU, Overlapped CPU & I/O operation, Use of hierarchical memory; system, Balancing of subsystem bandwidths, Multiprogramming and Time sharing.
Parallel Processing Applications: Remote sensing Application, Numerical Weather forecasting.
Unit II

Unit III

Unit IV

Unit V

Text Books:

Reference Books:

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**Soft Computing**

Unit I

Unit II
Elements of Fuzzy logic system: Rules, Fuzzifier, Inference, Defuzzifier

Unit III
Mamdani Fuzzy Models, Sugeno Fuzzy Models, Applications of Fuzzy logic, Designing Fuzzy logic system.
Biological Neural Network.

Unit IV

Unit V

Text Books:

**Reference Book:**


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**Supply Chain Management**

**Unit I**

*Understanding the Supply Chain*: Definition of SCM, Types of SCM, Decision Phases in a Supply Chain, Process View of a Supply Chain, Examples of Supply Chains, IT applications in SCM, Importance of SCM for businesses.


**Unit II**

*Demand Forecasting in a Supply Chain*: Role of Forecasting in a Supply Chain, Characteristics of Forecasts, Components of a Forecast and Forecasting Methods, Basic Approach to Demand Forecasting, Time Series Forecasting Methods.

**Unit III**

*Planning and Managing Inventories in a Supply Chain*: Managing Economies of Scale in the Supply Chain (Cycle Inventory), Managing Uncertainty in the Supply Chain (Safety Inventory), Determining Optimal Level of Product Availability.

**Unit IV**

*Transportation in the Supply Chain*: Role of Transportation in the Supply Chain, Factors Affecting Transportation Decisions, Modes of Transportation and their Performance Characteristics, Routing and Scheduling in Transportation.


**Unit V**

*Information Technology and the Supply Chain*: Role of IT in the Supply Chain, Customer Relationship Management, Future of IT in the Supply Chain.


**Text Books:**

1. Supply Chain Management, 2/e, S. Chopra & P. Meindl, PHI/Pearson Education Pvt. Ltd.
2. Logistic & Supply Chain Management, 2/e, M. Christopher, Pearson Education Pvt. Ltd.
4. Supply Chain management, 5/e, Ballou, Pearson Education Pvt. Ltd.

**Reference Books:**
1. Introduction to Supply Chain Management, Handfield & Nichols, Jr., PHI Pvt. Ltd.

**Compiler Design**

**Unit I**
Introduction to Compiling and one pass compiler
Finite Automata & Lexical Analysis

**Unit II**
Syntax Analysis & Parsing Techniques
Automatic Construction of Efficient Parsers

**Unit III**
Syntax Directed Translation
Run Time Environment

**Unit IV**
Intermediate Code generation
Error Detection and Recovery

**Unit V**
Code Optimization
Code Generation
Compiler Design & Implementation Using UML

**Image Processing**

**Unit I**

**Unit II**
Fourier transforms. Extension to S-D, DCT, Walsh, Hadamard transforms.

**Unit III**
Enhancement and segmentation: Histogram modification, Smoothing, sharpening, Thresholding, Edge detection, Segmentation, Point and region dependent techniques.

**Unit IV**
Image encoding: Fidelity criteria, Transform compression, KL, Fourier, DCT, Spatial compression, Run length coding, Huffman and contour coding.

**Unit V**
Restoration : Models, Inverse filtering, Least squares filtering, Recursive filtering.
**UNIX & Shell Programming**

**Unit I**
*Overview of UNIX Architecture:* Kernel: Processes; Time sharing, Shell, Files and directories, Creation of a file, Inode numbers and filenames, File security, file systems, Peripheral devices as files.
*UNIX Editors and Basic UNIX commands:* ed editor, vi editor, Redirections, piping, tees, filters, UNIX utilities; grep, sed, awk, tr etc.

**Unit II**
*Introduction to Shell Scripts:* Bourne shell, C Shell, Shell variables, scripts, metacharacters and environment, 'if' and 'case' statements, For, while and until loops.
*Awk Programming:* Awk: pattern scanning and processing language, BEGIN and END patterns, Awk arithmetics and variables, Awk Built-in variable names and operators.

**Unit III**
*Introduction to Systems Administration:* The System Administration: the need and the role, Function of a System Administrator.

**Unit IV**
*System Calls and C Function Library:* UNIX system calls, C library function and math library, Standard I/O package, File handling, Command line parameters, UNIX-C interface, C files, Graphics.

**Unit V**
*Local Networking:* General concepts - NIFS, NIS - their functionalities, Berkeley and Arpa services - their functionalities and services, X terminals - windows Manager, XDM, Safety aspects in local networking.
*Global Networking:* Electronic Mail - domain concept mail feed configuration, uucp - configuration versions protocols - uucp front ends, uucp and electronic mail, News services.

**Client / Server Technology**

**Unit I**
Introduction to Client/Server Computing.

**Unit II**

**Unit III**

**Unit IV**

**Unit V**
Microprocessors & their Interfacing

Unit I
Microprocessor Architecture, Instruction Set, Assembly Language Programming.

Unit II
Interrupts and Timing Diagrams.

Unit III
Data Transfer Schemes.

Unit IV
General and Special Purpose I/O Interface Chips, Memory and I/O Interfacing.

Unit V
Typical Applications in Electric Drives, Instrumentation, Control and Power Systems. Introduction to PLC.

Computer Aided Design

Unit I

Unit II

Unit III

Unit IV
Constructing the Geometry, Transformations, Wire frame and Solid Modeling, CAD/CAM integration.

Unit V
CAD/CAM Implementation: Turnkey CAD/CAM Systems, Selection criteria, Evaluation of alternative systems, Future of CAD/CAM.

ERP Systems

UNIT - I

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III

UNIT - IV
ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees;

UNIT - V
ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

References:

E- Commerce & E- Business

Unit I

Unit II

Unit III
Price making methods, Applications.
Architectured Framework of EC, Consumer to Business electronic commerce, consumer oriented application, models from the consumers and merchant's perspective, STOREFRONT TECHNOLOGY , Virtual MALL except.

Unit IV
Business to Business EC
Virtual private networks, extranets, EDI,..
Electronic Payment systems, concerns for E-commerce growth, Methods and mechanism.

Unit V
Security Issue in Electronic commerce.
Legal Issue in Electronic Commerce.
Trackmarks, cyberspace and the Internet.
Digital signature law.
Current Research and future direction.
Industrial Robotics and Automation

Unit I
*Industrial Robotics:*
Robot Technology
Robot Anatomy, control systems, accuracy and repeatability, end effectors, sensors in Robotics.

Unit II
*Robot Programming:*
Types of programming, Lead through programming, Robot languages, off-line programming, workcell control.

Unit III
*Robot Applications:*
Characteristics of Robot applications, Robot cell Design, types at robot applications, Material handling application, processing operation Assembly and Inspection.

Unit IV
*Automation:*
Introduction, Hard automaton, Flexible automaton, Quality and automation.
Analyzers: Counters, Timers, Bar Code readers, Optical encoders.

Unit V
*Actuators:*
Cylinders, Solenoids, Relays,
Drives: Motors, kinematic linkages, Genevas, Walking Beams.
Machine Vision Systems: Image Scanning, lighting; digitization, windowing, thresholding, shape identification, Template matching, Edge detection, Roberts cross-operators.

Pattern Recognition

Unit I
What is Pattern Recognition? Applications ad Relation with other fields like Data Mining, Information Retrieval, etc.

Unit II
Linear Discriminant Functions and its Applications. Bayesian Decision Theory, Maximum-Likelihood and Bayesian Parameter Estimation.

Unit III
Component Analysis, E-M technique, Hidden Markov Model, Non-Parametric Techniques: Nearest Neighbour, K-NN.

Unit IV

Unit V
Neural Network Based Approaches, Fuzzy Logic Based Techniques, Support Vector Machine, Applications.
Unit I
Basic concepts: Introduction to Parallel processing, Parallel Processing terminology, Decomposition, Complexity, Throughput, Speedup, Measures, Data Dependence, Resource Dependence, Bernstein’s conditions, Levels of parallelism programs. Program flow-control Flow, Data Flow.


Unit II

Unit III

Unit IV

Unit V
Parallel & Distributed Programming: Parallel Programming Environments, Models, Synchronous Asynchronous Programming, Modula-2, Occam, FORTRAN, DAP FORTRAN, Actus, Data Flow Programming, VAL.

System Simulation and Modeling

Unit-I
System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

Unit-II
System simulation, why & when to simulate, nature and techniques 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
Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.
Unit-IV
System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

Unit-V
Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application oriented simulation packages, CSMP-III, MODSIM-III.

References

Advanced Database Management Systems

UNIT-I
Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II
Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III
Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

UNIT V
Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updation replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References
2. Ramakrishna and Gehrke,’ Database Management System,’ Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,’ Database System Implementation’ Pearson Education
4. Ceei and Pelagatti,’Distributed Database’, TMH
Artificial Intelligence

Unit-I

Unit-II

Unit-III
Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV
Machine Learning: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning,

Unit-V

References:
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India

Information Storage & Management

Unit-I:
Introduction to Storage Technology: Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

Unit-II:
Storage Systems Architecture: Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.
Unit-III: 

Unit-IV: Introduction to Information Availability
Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

Unit-V: Managing & Monitoring
Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

References

**Software Project Management**

UNIT-I:

UNIT-II:
**Project Organization and Scheduling:** Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
**Project Monitoring and Control:** Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:  

References:
2. Royce, Software Project Management, Pearson Education

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**Real Time Systems**

UNIT-I:  

UNIT-II:  
**Real Time Scheduling:** Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:  

UNIT-IV:  
**Real Time Communication:** Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:  
**Real Time Operating Systems and Databases:** Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

References:

**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, CDMA, GPRS.

**Unit - II**

**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.

**Unit – V**
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

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

**Neural Networks**

**Unit-I:**
Neurocomputing and Neuroscience Historical notes, human Brain, neuron Model, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

**Unit-II:**
Data processing Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

**Unit-III**
Multilayered network architecture, back propagation algorithm, heuristics for making BP algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.
Unit IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit V

References:
1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

Managerial Economics

Unit I
*The theory of Consumer behaviour*: The concept of utility, indifference curve analysis, demand analysis, the concept of elasticity.

*Supply analysis*: The law of supply, derivation of supply curve, the concept of reservation price.

Unit II
*The theory of production*: The production function (cobb-Douglas) law of production (laws of returns of scale, the law of variable proportions, equilibrium of the firm, choice of optimal combination of factors, choice of optimal expansion path).

Unit III
*The theory of costs*: Analysis of the concepts of costs, the traditional theory of cost (short-run costs, long-run cost- the envelope curve), modern theory of costs (short-run and long run costs, the L shaped scale curve), the analysis of economies of scale (real economies of scale, pecuniary economies of scale).

Unit IV
*Theory of the firm and market analysis*: Perfect competition (Assumptions, short-run and long-run equilibrium, dynamics changes and industry equilibrium), monopoly (definition, demand and revenue, costs, equilibrium of the monopolist, predictions in dynamic changes, the multiplant firm), price discrimination (assumptions, types of price discrimination, price discrimination and elasticity of demand), monopolistic competition (assumptions, product differentiation and the demand curve, equilibrium of the firm), classical oligopoly (assumptions, the ‘kinked demand model’ price leadership (collusive oligopoly).

Unit V
*Theory of pricing*: Full-cost pricing principle, average cost pricing principle.

*Theory of Distribution*: The marginal productivity theory, Rent-modern theory of rent, wages- meaning, determination of wages in competitive market, Monopsony in labour market, unions and wages, interest-time preference, the classical theory, the loanable funds theory, keynes liquidity preference theory, profits-meaning, different theories of profit.
Embedded Systems

Unit I
Introduction to embedded systems, architecture of embedded systems, specifications of embedded systems.

Unit II
Design methodologies, real time issues: modeling, specification, communication, scheduling, protocols etc.

Unit III
Hardware software partitioning, approaches to software and code generation.

Unit IV
Operating system issues, memory and low power issues.

Unit V
Validation approaches, distributed embedded systems.

Formal Language and Automata Theory

Unit I


Unit II
Regular expression and languages: Regular expressions, Language associated with regular expressions, Connection between regular expression and regular languages, Finite automata and regular expressions, Regular grammars, Equivalence between regular languages and regular grammars, Chomsky classification of languages, Proving languages not to be regular, Pumping lemma and its applications, Properties of regular languages, Minimization of automata.

Unit III
Context free grammars and languages: Context free grammars, Context free languages and derivation trees, Ambiguity in grammars and languages, Properties of context free languages, Normal forms of context free grammars, Pumping lemma for context free languages.

Unit IV
Pushdown automata: Basic definition, Language recognized by pushdown automaton, Pushdown automata and context free languages, Context free grammars for pushdown automata, Deterministic pushdown automata.

Unit V
Turing machines: Definition, Turing machine model, Representation of Turing machines, Design of Turing machines, Turing thesis, Non-deterministic Turing machines, Universal Turing machine, Turing machine and Type 0 grammars, Halting problems of Turing machine, Turing computability, The Chomsky hierarchy, Primitive recursive functions, Linear bounded automata and context sensitive languages, Decidable and undecidable problems, Post correspondence problem.
Fault Tolerant Computing

Unit I
Introduction to redundancy theory, limit theorems, decision theory in redundant systems.

Unit II

Unit III
Models of fault tolerant computer – case study of existing systems.

Unit IV
Software fault-tolerance: Fault tolerance versus fault intolerance, fault tolerance objectives; errors and their management strategies, implementation of error management strategies.

Unit V
Software fault tolerance techniques – Software defence, protective redundancy. Architectural support of fault-tolerance software protection mechanisms, recovery mechanisms.

Bluetooth Technology

Unit I
*Introduction to wireless technologies*: WAP services, Serial and Parallel Communication, Asynchronous and synchronous Communication, FDM, TDM, TFM, Spread Spectrum technology.

*Introduction to Bluetooth*: Specification, Core protocols, Cable replacement protocol

Unit II
*Bluetooth Radio*: Type of Antenna, Antenna Parameters, Frequency hoping.

Bluetooth Networking: Wireless networking, wireless network types, devices roles and states, adhoc network, scatternet.

Unit III
Connection establishment procedure, notable aspects of connection establishment, Mode of connection, Bluetooth security, Security architecture, Security level of services, Profile and usage model: Generic access profile (GAP), SDA, Serial port profile, Secondary Bluetooth profile.

Unit IV

Unit V
*Programming with Java*: Java Programming, J2ME architecture, Javax.bluetooth package Interface, classes, exceptions, Javax.obex Package: Interfaces, classes.

Text Book:
1. Bluetooth Technology by C. S. R. Prabhu and A. P. Reddi; PHI.
Multimedia Technology

Unit I
Introduction: Concept of Multimedia, Multimedia Applications, Hardware Software requirements, Multimedia products & its evaluation.

Unit II

Unit III
Animation. Introduction, Basic Terminology techniques, Motion Graphics 2D & 3D animation.

Unit IV

Unit V

Text Books:

Cluster & Grid Computing

Unit I

Unit II
Grids and Grid Technologies, Programming models and Parallelization Techniques.

Unit III
Standard application development tools and paradigms such as message-passing and parameter parallel programming.

Unit IV
Grid Security Infrastructure, Data Management.

Unit V
Applications Case Study: Molecular Modelling for Drug Design and Brain Activity Analysis, Resource management and scheduling, Setting up Grid, deployment of Grid software and tools, and application execution.

Text Books: