

PROPOSED COURSE STRUCTURE & SYLLABUS

for
Master of Computer Application (MCA)

(Six Semester Course)



राष्ट्रीय प्रौद्योगिकी संस्थान अगर्तला
National Institute of Technology Agartala
Department of Computer Science and Engineering
Agartala, Jirania– 799046

Course Structure

Subject Category	Number	Credits
Total Departmental Core subjects including laboratories	29	98
Total Departmental Elective subjects	02	08
Total Subjects from Basic Science	03	12
Total Subjects from Humanities	02	6
Project	02	12
Grand Viva	01	04
Summer Training	02	---
Total	41	140

Subject Codes:

MCA	SEMESTER	TYPE=C/E/H/M/L/P/V	SERIAL NUMBER
-----	----------	--------------------	---------------

C= Departmental Core, E=Departmental Elective, H=Humanities, M=Mathematics, L=Laboratory/Practical, P=Project, V=Viva

Credit Composition:

L	T	P/S
---	---	-----

where L=Lecture, T=Tutorial, P=Practical, S=Seminar

Course Structure for Master of Computer Application (MCA)

(Effective for batches admitted from 2016-2017)

MCA SEMESTER I

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA01C01	DATA AND FILE STRUCTURE	3	1	0	4
MCA01C02	DIGITAL CIRCUIT AND LOGIC DESIGN	3	1	0	4
MCA01C03	DISCRETE MATHEMATICAL STRUCTURE	3	1	0	4
MCA01H01	PRINCIPLES OF MANAGEMENT AND PRACTICES	3	0	0	3
MCA01C04	WEB TECHNOLOGY	3	1	0	4
MCA01L01	DATA STRUCTURE LABORATORY	0	0	6	3
MCA01L02	WEB TECHNOLOGY LABORATORY	0	0	6	3
	TOTAL				25

Total: Lectures = 15; Tutorials = 4; Practical= 12

Total Credits= 25

MCA SEMESTER II

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA02C05	COMPUTER ORGANIZATION AND ARCHITECTURE	4	0	0	4
MCA02C06	DATA BASE MANAGEMENT SYSTEM	3	1	0	4
MCA02C07	GRAPH THEORY AND COMBINATORICS	3	1	0	4
MCA02M01	MATHEMATICAL FOUNDATIONS	3	1	0	4
MCA02C08	OBJECT ORIENTED PROGRAMMING	3	1	0	4
MCA02L03	DATA BASE MANAGEMENT SYSTEM LABORATORY	0	0	6	3
MCA02L04	OBJECT ORIENTED PROGRAMMING LABORATORY	0	0	6	3
	TOTAL				26

Total: Lectures = 16; Tutorials = 4; Practical= 12

Total Credits= 26

MCA SEMESTER III

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA03H02	COMMUNICATIVE ENGLISH AND TECHNICAL WRITING	0	2	1	3
MCA03C10	DATA MINING AND DATA WAREHOUSING	4	0	0	4
MCA03C11	DESIGN AND ANALYSIS OF ALGORITHM	3	1	0	4
MCA03M02	NUMERICAL METHODS	3	1	0	4
MCA03C12	SOFTWARE ENGINEERING	4	0	0	4
MCA03L05	DESIGN AND ANALYSIS OF ALGORITHM LABORATORY	0	0	6	3
MCA03L06	SOFTWARE ENGINEERING LABORATORY	0	0	6	3
	TOTAL				25

Total: Lectures = 14; Tutorials = 4; Practical= 13
Total Credits= 25

MCA SEMESTER IV

COURSE CODE	COURSE NAME	L	T	P/S	Credits
MCA04C13	COMPUTER NETWORK	3	1	0	4
MCA04C14	FORMAL LANGUAGE AND AUTOMATA THEORY	3	1	0	4
MCA04C15	MANAGEMENT INFORMATION SYSTEM	4	0	0	4
MCA04C16	OPERATING SYSTEM	3	1	0	4
MCA04M03	OPERATIONAL RESEARCH	3	1	0	4
MCA04L07	COMPUTER NETWORK LABORATORY	0	0	6	3
MCA04L08	OPERATING SYSTEM LABORATORY	0	0	6	3
	TOTAL				26

Total: Lectures = 16; Tutorials = 4; Practical= 12
Total Credits= 26

MCA SEMESTER V

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA05C17	ARTIFICIAL INTELLIGENCE	3	1	0	4
MCA05C18	COMPILER DESIGN	3	1	0	4
	ELECTIVE – I	4	0	0	4
	ELECTIVE – II	4	0	0	4
MCA05L09	ARTIFICIAL INTELLIGENCE LABORATORY	0	0	6	3
MCA05L10	COMPILER DESIGN LABORATORY	0	0	6	3
MCA05P01	MINI PROJECT	0	0	2	2
	TOTAL				24

Total: Lectures = 14; Tutorials = 2; Practical= 12 , Project=02
Total Credits= 24

List of Elective Subjects for Semester V

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA05E01	DIGITAL IMAGE PROCESSING	4	0	0	4
MCA05E02	E - COMMERCE	4	0	0	4
MCA05E03	INTRODUCTION TO CRYPTOGRAPHY	4	0	0	4
MCA05E04	MOBILE COMPUTING	4	0	0	4
MCA05E05	MULTIMEDIA TECHNOLOGY	4	0	0	4
MCA05E06	WIRELESS COMMUNICATION NETWORK	4	0	0	4

MCA SEMESTER VI

COURSE CODE	COURSE NAME	L	T	P	Credits
MCA06P02	MAJOR PROJECT	0	0	10	10
MCA06V01	COMPREHENSIVE VIVA	0	0	0	4
	TOTAL				14

Total: Lectures = 0; Tutorials = 0; Practical = 10
Total Credits= 14

DETAIL SYLLABUS

for

**Master of Computer Application
(MCA)**

FIRST SEMESTER

DATA AND FILE STRUCTURES	MCA01C01
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction to Data Structures and Algorithms: Basic Terminologies, Classification of Data Structures, Abstract Data Type, Algorithms, Different Approaches to Designing an Algorithm, Time and Space Complexity.

Arrays: Introduction, Declaration of Arrays, Accessing Elements of An Array, Sorting Values in Array, Operations on Array, Passing Arrays to Functions, Pointers and Arrays, 1-D Array, 2-D Array, Multi-D Array, Sparse Matrices, Applications of Arrays.

Strings: Introduction, Reading String, Writing String, Operations on Strings, Arrays of Strings, Pointers and Strings.

Structures and Unions: Declaration of Structures, Initialization of Structures, Typedef, Nested Structures, Arrays of Structures, Structures and Functions, Self-referential Structures, Arrays of Union Variables, Union Inside Structures.

UNIT II

Linked Lists: Introduction, Singly Linked Lists, Circular Linked Lists, Doubly Linked Lists, Circular Doubly Linked Lists, Header Linked Lists, Multi-linked Lists, Operations of different Linked Lists, Application of Linked List, Polynomial Representation.

Stacks: Introduction, Array Representation, Operations on a Stack, Linked List Representation of Stack, Operations on a Linked Stack, Multiple Stacks, Applications of Stacks.

Queues: Introduction, Array Representation of Queues, Linked Representation of Queues, Types of Queues, Applications of Queues.

UNIT III

Trees: Introduction, Types of Trees, Creating a Binary Tree from a General Tree, Traversing a Binary Tree, Huffman's Tree, Application of Trees.

Efficient Binary Trees: Binary Search Trees, Operations on Binary Search Trees, Threaded Binary Trees, AVL Trees, Red-Black Trees, Splay Trees.

Multi-way Search Trees: Introduction to M-way Search Trees, B Trees: Operations and Applications, B+ Trees: Operations and Applications, 2-3 Trees and Operations on it, Trie.

UNIT IV

Heaps: Binary Heaps: Operations and Applications, Binomial Heaps, Fibonacci Heaps, Application of Heaps.

Graphs: Introduction, Graph Terminologies, Directed Graph, Bi-connected Components, Representation of Graphs, Graph Traversal Algorithms, Topological Sorting, Shortest Path Algorithms, Applications of Graphs.

UNIT V

Searching and Sorting: Introduction to Searching, Linear Search, Binary Search, Interpolation Search, Jump Search, Introduction to Sorting, Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Radix Sort, Heap Sort, Shell Sort, Tree Sort, Comparison of Sorting Algorithms, Internal and External Sorting.

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions, Collisions, Pros and Cons of Hashing, Applications of Hashing.

Files and Their Organization: Introduction, Data Hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing.

RECOMMENDED BOOKS

1. S. Lipschutz, "Data Structure" , Schaum's Outline Series, TataMcGraw-Hill.
2. Tannenbaum, "Data Structures", PHI.
3. R.L. Kruse, B.P. Leary, C.L. Tondo, "Data structure and program design in C" , PHI.
4. Horowitz and Sahani, "Fundamentals of Data structures", Galgotia publications.
5. R. Thareja, "Data Structures using C", Oxford.
6. T. Cormen, C. Leiserson, R. Rivest, C. Stein, 'Introduction to Algorithms', Prentice-Hall India.

DIGITAL CIRCUIT AND LOGIC DESIGN	MCA01C02
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Number System & Codes:

Number Systems: Binary, Decimal, Octal and Hexadecimal, Number Base conversion Complements, Binary Codes, Binary Logic.

Boolean Algebra & Logic Gates:

Basic Definitions: Axiomatic definition of Boolean algebra, basic theorems and properties of Boolean algebra, Boolean functions, canonical & standard forms, Digital logic Families: Operation, characteristics of digital logic family.

The Karnaugh map method, The tabulation method or Quine McCluskey Method, Determination of prime implicants, selection of prime-implicants.

UNIT II

Combinational Logic UNITS and their applications:

Arithmetic UNITS- adders, Subtractors, Comparators and ALU, Design examples.

Decoders, Three-State Buffers. Encoders, Multiplexer, Demultiplexer, Exclusive OR Gates and Parity Generator and Checker, Documentation Standards, Circuit Timing. Combinational PLDs; PLAs; PALs; GALs; Bipolar PLD Circuits.

UNIT III

Synchronous Sequential Logic:

Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop;

Timing hazards and races; Analysis of state machines using D flip-flops and JK flipflops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization; Design examples.

Asynchronous Sequential Logic:

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards, Counters, Shift Registers, Iterative versus Sequential Circuits, Synchronous Design Methodology.

UNIT IV

Memory and Programmable Logic:

Memory: Read-Only Memory, Read/Write Memory, Static RAM, Dynamic RAM.

Programmable Logic Devices: PLAs, PALs and their applications; Sequential PLDs and their applications; State machine design with sequential PLDs; Introduction to field programmable gate arrays (FPGAs).

Digital Integrated Circuits:

Introduction to digital logic families, RTL and DTL circuits, integrated injection –logic, transistor logic, and emitter coupled, Metal Oxide Semiconductor, complementary MOS.

Study to different types of analog to digital & digital to analog converters and their resolution, conversion time, sensitivity, accuracy and other parameters.

RECOMMENDED BOOKS

1. Digital Logic and Computer Design by M. Morris Mano, Prentice Hall of India
2. Digital Electronics Principles by D.P. Malvino and Leach, McGraw Hill Inc.
3. Digital Electronic Circuits by T.C. Bartee, McGraw Hill Inc.
4. Digital Design Principles and Practices by John F Wakerly, Pearson Education.
5. Modern Digital Electronics by R. P. Jain, McGraw Hill Education.

DISCRETE MATHEMATICAL STRUCTURES	MCA01C03
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Sets, relations, and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions, their compositions and inverses. Arbitrary union, intersection and product. Propositional Logic: Syntax and semantics, proof systems, satisfiability, validity, soundness, completeness, deduction theorem, etc. Decision problems of propositional logic.

UNIT II

Introduction to first order logic and first order theory, set theory, axiom of choice. Size of a set : Finite and infinite sets, countable and uncountable, Cantor's diagonal argument and power set theorem, non-computability of all number theoretic; functions. Partially ordered sets: Complete partial ordering, chain, lattice. Complete, distributive, modular, and complemented lattices. Boolean and pseudo Boolean lattices. Different sublattices, monotone map and morphisms, quotient structures, filters. Tarski's fixed point's theorem.

UNIT III

Algebraic Structures: Algebraic structures with one binary operation, semigroup, monoid and group. Congruence relation and quotient structures. Morphisms. Free and cyclic monoids and groups. Permutation group. Substructures, normal subgroup. Error correcting code. Algebraic structures with two binary operations- ring, integral domain, and field. Boolean algebra and Boolean ring.

UNIT IV

Introduction to Counting: Basic counting techniques, inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating function. Introduction to Graph: Graphs and their basic properties, degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, graph colouring, planar graph, trees.

RECOMMENDED BOOKS

1. C L Lieu, "Elements of Discrete Mathematics"
2. B. Kolman, R. Busby, R. C. Ross, "Discrete Mathematics", Pearson
3. R. L. Graham, D. E. Knuth, and O. Patashnik, Concrete Mathematics, 2nd Ed, AddisonWesley, 1994.
4. Liptschutz, Seymour, " Discrete Mathematics", McGraw Hill.
5. Tremblay and Sorenson, Discrete Mathematical Structures, McGraw-Hill.

PRINCIPLES OF MANAGEMENT AND PRACTICES	MCA01H01
L T P 3 - 0 - 0 : 3 Credits	Prerequisites: None

UNIT I

Concept of Management: Management as profession, Approaches to managerial Thought, Evaluation of Modern Management thought, Approaches to managerial analysis, Process of Management Coordination as Essence of management.

UNIT II

Planning – steps, long – term and short- term planning, objective setting, Management by objectives, Decision Making, Rationality in Decision Making , Effective Decisions, Creativity, Policy Sources and Formulation, Elements of Planning- Programming Policy, Strategy.

UNIT III

Organising- organization theory-Classical, Neoclassical and Modern Theories and Organisation Structure. Designing of Basic Structure, Departmentation , Span of Management. Delegation of Authority, Centralisation and Decentralisation of Authority, Relationships, Line and Staff Authority Conflict and Cooperation, Committees in Organisations, Modern Organisational Designs – Project Matrix and free – form, structures.

UNIT IV

Staffing-outlining the importance of staffing, Discussion on the steps of staffing, Directing and Control – Elements of directing – Communication process, Media, Barriers to Communication, Effective Communication, Human aspect in control, Management Audit, Social Audit.

RECOMMENDED BOOKS

1. Practices and principles of Management - Koontz and Weihrich.
2. Management – Stephen Robbins.

WEB TECHNOLOGY	MCA01C04
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Internet Principles and Components:

History of the Internet and World Wide Web, HTML, protocols - HTTP, SMTP, POP3, MIME, IMAP. Domain Name Server, Web Browsers and Web Servers, Dynamic HTML.,

UNIT II

Client Side and Server Side Programming: Introduction to JAVA Scripts and VB Scripts, Object Based Scripting for the web Server Pages, Session and Application management, Session tracking and cookies, Access a database from web page, Developing N-tier web application.

UNIT III

XML and ActiveX: Anatomy of xml document - XML markup-working with elements and attributes creating valid documents-xml objects and DOM. ActiveX controls: OLE and ActiveX -ActiveX Documents, Server side Active-X Components, ActiveX DLL and ActiveX Exe.

UNIT IV

Multimedia and Web Application: Multimedia in web design, Audio and video speech synthesis and recognition, Electronic Commerce, E-Business Model – E-Marketing, Online Payments and Security – N-tier Architecture. Search and Design: Working of search engines -optimization-Search interface.

UNIT V

Web Services: Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services. Ajax – Improving web page performance using Ajax, Programming in Ajax.

RECOMMENDED BOOKS

1. Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
2. Deitel, Deitel& Nieto, Internet and Worldwide Web - How to Program, PHI.
3. Bai and Ekedhi, The Web Warrior Guide to Web Programming.

DATA AND FILE STRUCTURE LAB	MCA01L01
L T P 0-0-6 : 3 Credits	Prerequisites: None

Exercises to implement various data structure and algorithms using C or C ++.

WEB TECHNOLOGY LAB	MCA01L02
L T P 0-0-6 : 3 Credits	Prerequisites: <i>None</i>

UNIT I

HTML:

HTML Tags, Forms & Frames, Java Script, Cascading Style Sheets, DHTML Web Design Tools.

UNIT II

Web Forms:

Form Validation with Validation Control, Advanced Control Programming, List a table of content and navigate within the pages, Request and Response object using HTML Form.

UNIT III

Database connectivity:

Database Connection, Data manipulation from front end, session management, query string, trigger, verification and validation.

UNIT IV

Web Services:

Error Handling, Form-Based Authentication, Windows-Based Authentication, XML basics, development of live application.

RECOMMENDED BOOKS

1. Web Programming - Building Intranet applications by Chris Bates, Wiley Publications,
2. Web Technology- Theory and Practice by Srinivasan , Pearson Publications,
3. Web Technologies by Uttam K. Roy, Oxford University Press

SECOND SEMESTER

COMPUTER ORGANIZATION AND ARCHITECTURE	MCA02C05
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Evolution of computer:-mechanical era, electronic computers, integrated circuits; processor architecture, system architecture. Instruction Sets:-instruction formats, instruction types, programming considerations.

UNIT II

Control Design: Instruction sequencing & instruction interpretation, Hardwired Control:- design methods, multiplier control UNIT, CPU control UNIT, Microprogrammed control:- micro instructions & their encoding. Memory: C.P.U memory interaction, memory array organization & technology, Memory hierarchies, main memory allocation, segment, pages & files. High speed memories, Interleaved memories, caches & associative memories, Cache coherence:-sequential and weak consistency, snoopy bus protocol and directory based.

UNIT III

Input/Output Organization: Addressing I/O devices, Data transfer synchronization, Interrupt handling, I/O channels, Computer peripherals & interfacing., Direct Memory Access, Examples of I/O Buses: PCI, SCSI, USB Pipelining Basics: Instruction and data pipelining, speedup, Definitions of pipeline hazards: structural, data, and control.

UNIT IV

Introduction to assembly language programming for 8085 and 8086, coding of simple programs.

RECOMMENDED BOOKS

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer Organization, McGraw-Hill, 5th Edition
2. J.P Hayes, Computer Architecture & Organisation, McGraw-Hill, 3rd Edition
3. Raj Kamal, Nicholas Carter, Computer architecture and organization, McGraw-Hill, 2nd Edition
William Stallings, Computer Organization and Architecture, Pearson Education, 9th Edition
4. John L. Hennessy, David A. Patterson, Computer Architecture: A Quantitative Approach, The Morgan Kaufmann Series, 5th Edition.

DATA BASE MANAGEMENT SYSTEM	MCA02C06
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

An Overview of Database: Database, Database System, BBMS Components, Data Independence, Data Abstraction, DDL, DML, Data Dictionary, Data Integration, Database Access Method, Characteristics of the Database Approach, Advantages of Using a DBMS, Implications of the Database Approach.

UNIT II

Database System Architecture: Data Models, Schemas, and Instances, DBMS Architecture, Data Independence, Database Languages and Interfaces, Database System Environment, Classification of Database Management Systems.

UNIT III

Data Model Using E-R Model & Object Model: High-Level Conceptual Data Models, Entity Types, Entity Sets, Attributes and Keys, Relationships, Relationship Types, Roles, and Structural Constraints, Weak Entity Types, Refining the E-R Design, ER Diagrams, Naming Conventions and Design Issues, Subclasses, Super Classes, Inheritance.

UNIT IV

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity and foreign keys, relational algebra operators: selection, projection, cross product, various types of joins, division, example queries, tuple relation calculus, domain relational calculus, converting the database specification in E/R notation to the relational schema.

UNIT V

Constraints, Views and SQL: Introduction, data definition in SQL, table, key and foreign key definitions, update behaviors. Querying in SQL - basic select-from-where block and its semantics, nested queries - correlated and uncorrelated, notion of aggregation, aggregation functions group by and having clauses, embedded SQL.

UNIT VI

Dependencies and Normalization: Functional Dependencies, Normal Forms based on Primary Keys: 1NF, 2 NF, 3 NF...., Boycee - Codd Normal Form, Normalization through Synthesis, Normalization using Join Dependency and definition of 5NF.

UNIT VII

Transaction management and Database Recovery: Transactions, Recovery Concepts, Transaction Recovery, ACID properties, serializability and concurrency control, System Recovery, Recovery Technique, Recovery in Multi Database Systems, Database Security Issues, Access Control for Multilevel Security, Data Encryption.

RECOMMENDED BOOKS

1. Fundamentals of Database Systems; By: Ramez Elmasri & Shamkant B. Navathe Pearson Education, LPE.
2. An Introduction to Database Systems; By: C J Date Pearson Education, LPE.
3. "Database System and Concepts", By: A Silberschatz, H Korth, S Sudarshan, McGraw-Hill,

GRAPH THEORY AND COMBINATORICS	MCA02C07
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction: Graphs and their applications, graph theoretic terms: incidence, degree, vertex, null graph, path, walk, connected and disconnected graphs, various operations on graphs, isomorphism, Euler's graphs, Hamiltonian graphs.

UNIT II

Trees and Fundamental circuits: Properties of trees, rooted trees, binary trees, counting trees, Cayley's theorem, spanning trees, fundamental circuits.

UNIT III

Connectivity: Vertex and edge connectivity, Menger's theorem, 1-Isomorphism and 2-isomorphism.

UNIT IV

Planer graphs: Planer graphs and their representation, dual graphs, detection of planarity, thickness and crossing.

UNIT V

Matrix representation: Different matrix and their representation in directed and undirected graphs.

UNIT VI

Coloring, matching and covering: Chromatic partitioning, Chromatic polynomial, bipartite graph, matching and Hall's theorem, Covering, four-color and five-colour theorem.

UNIT VII

Introduction to Counting: Basic counting techniques, principles of inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relation and generating functions.

RECOMMENDED BOOKS

1. Graphs, Networks and Algorithm: John Wiley and Sons.
2. F. Harary, "Graph Theory", Addison-Wesley,
3. Graph Theory with application to Computer Engineering and Computer Science; By-Deo.

MATHEMATICAL FOUNDATION	MCA02M01
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Linear Algebra: Vector algebra and calculus, Determinants, Matrices, Solution of linear algebraic equations, Cayley-Hamilton Theorem

UNIT II

Linear differential equations of second and higher order, partial differentiation and partial difference equations

UNIT III

Linear difference equations: The expected difference operator and solution using E-operator

UNIT IV

Statistics and Probability: Concept of mean, median, and mode, moments about mean, variance, skewness, kurtosis, Classical definition of probability, probability density functions, conditional and marginal probabilities, expectation, Bayes' theorem, Binomial, Poisson and Gaussian distributions, Hypothesis testing

RECOMMENDED BOOKS

1. Engineering Mathematics: Kryzig

OBJECT ORIENTED PROGRAMMING	MCA02C08
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes – polymorphism.Introduction to C++ – classes – access specifiers – function and data members – defaultarguments – function overloading – friend functions – const and volatile functions – staticmembers – Objects – pointers and objects – constant objects – nested classes – localclasses.

UNIT II

Constructors – default constructor – Parameterized constructors – Constructor withdynamic allocation – copy constructor – destructors – operator overloading –overloading through friend functions – overloading the assignment operator – typeconversion – explicit constructor.

UNIT III

Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and Unexpected functions – Uncaught exception.

UNIT IV

Inheritance – public, private, and protected derivations – multiple inheritance– virtualbase class – abstract class – composite objects Runtime polymorphism – virtualfunctions – pure virtual functions.

UNIT V

Streams and formatted I/O – I/O manipulators - file handling – random access – object serialization – namespaces - std namespace – ANSI String Objects – standard template library.

RECOMMENDED BOOKS

1. B. Trivedi, “Programming with ANSI C++”, Oxford University Press, 2007.
2. Ira Pohl, “Object Oriented Programming using C++”, Pearson Education, SecondEdition Reprint 2004..
3. S. B. Lippman, JoseeLajoie, Barbara E. Moo, “C++ Primer”, Fourth Edition, Pearson Education, 2005.
4. B. Stroustrup, “The C++ Programming language”, Third edition, Pearson Education,2004.

DATA BASE MANAGEMENT SYSTEM LAB	MCA02L03
L T P 3 - 0 - 0 : 6 Credits	Prerequisites: None

Implementation of various SQL queries programming for designing databases and accessing them for reasonably large applications.

OBJECT ORIENTED PROGRAMMING LAB	MCA02L04
L T P 0 - 0 - 6 : 3 Credits	Prerequisites: None

UNIT I

functions, functions with default arguments, Implementation of call by value, address, reference.

UNIT II

Simple classes for understanding objects, member functions & constructors, Classes with primitive data members, Classes with arrays as data members, Classes with pointers as data members, Classes with constant data members, Classes with static member functions.

UNIT III

Compile time polymorphism, Operator overloading, Function overloading ,Run time polymorphism , Inheritance, Virtual functions, Virtual base classes, Templates, file handling, Sequential access,Random access

UNIT IV

Simple java applications, Handling strings in JAVA, Simple package creation, Developing user defined packages in java interfaces, Threading, Handling predefined exceptions.

THIRD SEMESTER

COMMUNICATIVE ENGLISH AND TECHNICAL WRITING	MCA03H02
L T P 0 - 1- 2: 3 Credits	Prerequisites: None

[Syllabus to be specified by Humanities Department]

DATA MINING AND DATA WAREHOUSING	MCA03C10
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction to Data Warehousing:

Data Management; Benefits of Data Warehousing; Features of a Data Warehouse; Operational Databases vs Data Warehouses; The Information Flow Mechanism; Role of Metadata; Classification of Metadata; Data Warehouse Architecture; Different Types of Architecture; Data Marts, OLAP, OLTP;

UNIT II

Data Analysis:

Data Pre-Processing, Data Integration, Data Cleaning, Data Reduction, Data Transforming and Modeling

UNIT III

Data Mining Techniques:

Statistical Perspective on Data Mining; Similarity Measures, Decision Trees, Neural Networks, Genetic Algorithms.

Classification:

Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms, Neural Network-Based Algorithms, Rule-Based Algorithms, Combining Techniques.

Clustering:

Similarity and Distance Measures, Distance Based Clustering, Hierarchical Algorithms, Partitional Algorithms, Density Based Clustering.

UNIT IV

Advanced Techniques:

Introduction to Web Mining, Spatial Mining and Temporal Mining.

RECOMMENDED BOOKS

1. Paulraj Ponnian; Data Warehousing Fundamentals; John Wiley.
2. Paulraj Ponniah; Data Warehousing: Fundamentals for IT Professionals; Wiley India
3. J. Han and M. Kamber; Data Mining: Concepts and Techniques; Morgan Kaufman.
4. M.H. Dunham; Data Mining Introductory and Advanced Topics; Pearson Education.

DESIGN AND ANALYSIS OF ALGORITHM	MCA03C11
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Foundation: Asymptotic Notation: Big-oh, Big-omega, Theta, Little-oh, Little-omega, Complexity Analysis (Best, Worst and Average Case).

UNIT II

Algorithm Design and Analysis Techniques:

Divide and Conquer Method: Long Integer Multiplication, Strassen's matrix multiplication, Recurrences, Master method.

Greedy Method: Activity Selection Problem, Huffman Codes and Knapsack fractional.

Dynamic Programming Method: Knapsack 0 – 1, Matrix Chain Multiplication, Optimal Binary Search Tree and Longest Common Subsequence.

UNIT III

Graph Algorithms: Graph Representation.

Graph Traversal: Breadth First Search, Depth First Search.

Growing of a minimum spanning tree: Kruskal and Prim's algorithm.

Single Source Shortest Paths: Bellman Ford and Dijkstra's algorithm.

All Pairs Shortest Paths: Floyd Warshall algorithm.

Maximum Flow: Ford Fulkerson method.

UNIT IV

Miscellaneous Algorithms: Multithreaded algorithms, Polynomial Multiplication, Fast Fourier Transform, Extended Euclid Algorithm.

String Matching: Naïve's algorithm, Rabin Karp algorithm and string matching with finite automata. **Finding the convex hull:** Graham's Scan and Jarvi's March method, finding the closest pair of points.

UNIT V

Computational Complexity:

Backtracking: N Queen Problem, Sum of Subset, Graph Coloring, Hamiltonian Cycle Problem.

Branch & Bound: 15 – Puzzle Game, Assignment Problem, Travelling Salesman and Knapsack Problem.

NP Completeness: The classes P and NP, NP Hard and NP Complete Problems.

Approximation Algorithms: vertex-cover, travelling-salesman, set-covering, subset-sum Problem.

RECOMMENDED BOOKS

- 1) Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
- 2) Computer Algorithms by E. Horowitz, S. Sahni & S. Rajsekaran, Galgotia Publications (P) Ltd.
- 3) Fundamentals of Algorithmics by Brassard and Bratley, PHI
- 4) The Design and Analysis of Computer Algorithms by Alfred V. Aho, John E. Hopcroft and J. D. Ullman, Addison Wesley Publishing Company.

NUMERICAL METHODS	MCA03M02
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Solution of equations and Eigen value problems: Iterative method, Newton – Raphson method for single variable and for simultaneous equations with two variables. Solutions of a linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss – Seidel methods. Inverse of a matrix by Gauss – Jordan method. Eigen value of a matrix by Power and Jacobi methods.

UNIT II

Interpolation: Newton’s divided difference formulae, Lagrange’s and Hermite’s polynomials. Newton forward and backward difference formulae. Stirling’s and Bessel’s Central difference formulae.

UNIT III

Numerical Differentiation And Integration: Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson’s (both 1/3rd and 3/8th) rules. Two and Three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson’s rule.

UNIT IV

Topic-1: Initial Value Problems For Ordinary Differential Equations:

Single step Methods – Taylor Series, Euler and Modified Euler, Runge – Kutta method of order four for first and second order differential equations. Multistep Methods-Milne and Adam’s Bashforth predictor and corrector methods.

Topic-2: Boundary Value Problems For Ordinary And Partial Differential Equations: Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation (both implicit and explicit), One-dimensional wave equation and two-dimensional Laplace and Poisson equations.

RECOMMENDED BOOKS

1. Numerical Methods for Scientists and Engineers (Dover Books on Mathematics) by R. W. Hamming

SOFTWARE ENGINEERING	MCA03C12
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction: Evolving role of software, classification and characteristics of software, software applications, software crisis and myths, software vs. system engineering, different lifecycle models, and comparative study of various development models.

UNIT II

Software development steps: Feasibility study, functional and non-functional requirements. Requirement engineering process: specification, validation and management. Software design process: design principles, coupling vs cohesion, software architecture design methodologies, function oriented vs object oriented design, structured design methodology. Coding: coding principles and methodology, code verification and documentation.

UNIT III

Software project management: Principles of SPM, team Structure & scheduling, project planning, Total Quality Management (TQM), various cost estimation methods, COCOMO Model, WBS, configuration management, risk management, different project management tools.

UNIT IV

Software testing and quality management: Different types of testing, verification vs validation, system testing, debugging, black-box testing & white-box testing, control flow graphs – cyclomatic complexity. Software quality factors, quality assurance, quality standards: CMM, ISO, software reliability, software maintenance and reengineering.

UNIT V

Object oriented approach: Conventional vs. OO approaches in design and coding, architectural patterns, UML and different diagrams to represent OO approach, object oriented testing.

RECOMMENDED BOOKS:

1. Software Engineering: a Practitioner's Approach (3rd Edition) by Roger S Pressman, Tata McGraw Hill 1992.
2. Software Engineering-Principles and Practice by Jawadekar ,TataMcGraw Hill.
3. Fundamentals of Software Engineering, Ghezzi, P.H.I.
4. Fundamentals of Software Engineering, Rajib Mall, P.H.I.
5. Software Fundamentals, Daniel M. Hoffman & David M. Weiss, Addison Wesley.
6. A Discipline for Software Engineering, Watts S. Humphrey, Addison Wesley.
7. Software Engineering: Theory & Practice, Pfleeger, Addison Wesley.

DESIGN AND ANALYSIS OF ALGORITHM LAB	MCA03L05
L T P 3 - 0 - 0 : 6 Credits	Prerequisites: None

UNIT I

Traversing a graph using BFS and DFS, Growing a minimum spanning tree using Kruskal's and Prim's algorithm, Bellman Ford and Dijkstra's algorithm.

UNIT II

Floyd Warshall algorithm, Ford Fulkerson method, Implement Activity Selection problem, Huffman Coding and Fractional Knapsack using Greedy Approach, Implement 0 – 1 Knapsack, Matrix – Chain, Optimal BST and Longest Common Subsequence using Dynamic Programming method.

UNIT III

Implement Activity Selection, 15 puzzle game, Travelling Salesperson Problem using Branch and Bound Technique, Implement 4 queen problem, sum – of – subset problem, graph coloring and Hamiltonian cycle problem using Backtracking method, Few programmes based on Approximation method.

SOFTWARE ENGINEERING LAB	MCA03L06
L T P 0 - 0 - 6 : 3 Credits	Prerequisites: None

UNIT I

Generating SRS document from a given set of requirements for a software to be developed., Make a comparative statement in between a number of Software Development Models with test scenarios.

UNIT II

Preparing SPMP document – Activity Network, Critical Path, Gantt chart, Preparing Decision Tree and Decision Table for a given set of requirements for a software to be developed.

UNIT III

Function Oriented Design – DFD, Structured chart representation of some sample software to be developed, Object Oriented Design – Studying UML with Rational Rose software and generating different types of UML diagrams and implement them with some programming language.

UNIT IV

Generating test report, Mini Project (group wise) to represent Software Engineering Methodologies.

FOURTH SEMESTER

COMPUTER NETWORK	MCA04C13
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

INTRODUCTION: Definition, History and development of computer networks, goals, applications and classification of computer networks. Some well-known networks, Protocols and standards.

NETWORK MODELS AND ARCHITECTURE: OSI Reference Model, Services and important functions of each layer, TCP/IP Model, Basic concepts of hubs, switches, gateways and routers, circuit, message and packet switching.

UNIT II

BRIEF REVIEW OF PHYSICAL AND DATA LINK LAYERS: Guided and Unguided media, Line Discipline, Flow control, Capacity utilization, Sliding Window, Stop & wait protocols, Error detection mechanism, VRC,LRC,CRC, Automatic Repeat Request(ARQ)- stop-and wait , go-back-n, selective repeat.

MEDIUM ACCESS CONTROL:ALOHA, Slotted ALOHA, CSMA, CSMA/CD, Ethernet, Token Ring, CSMA/CA

UNIT III

NETWORK LAYER: Need for Network layer, Connection-oriented and connectionless services, Addressing: Internet address, Internet Protocol, IPv6, ARP, DHCP, ICMP, Classful addressing, subnetting, supernetting, Classless Addressing, Routing techniques –Static versus Dynamic Routing, flooding, Routing algorithms: Distance vector and link-state routing, Inter-domain routing.

TRANSPORT LAYER: Congestion control algorithm, Connection establishment and termination, Flow control and Buffering, Basics of TCP and UDP, (UDP/TCP) Layering, Introduction to quality of service.

APPLICATION LAYER PROTOCOLS: Basics of Telnet, FTP, SMTP, POP, HTTP

UNIT IV

WIRELESS AND MOBILE NETWORKING: IEEE 802.11, BLUETOOTH, Overview of Ad-hoc networks, Cellular networks – GSM, CDMA.

RECOMMENDED BOOKS:

1. Data Communication and Networking, 4th Edition, McGraw-Hill, Behrouz Forouzan.
2. A.S. Tanenbaum, “Computer Networks”, 4th Ed., Pearson Education Asia (LPE), 2003.

3. L.L. Peterson and B.S. Davie, "Computer Networks: A Systems Approach", 2nd Ed., Morgan Kaufman, Harcourt Asia, 2000.
4. W. Stallings, "Data and Computer Communications", 6th Ed., Pearson Education Asia (LPE), 2000.
5. F. Halsall, "Data Communications, Computer Networks and Open Systems", 4th Ed., Pearson Education Asia (LPE), 1996.
6. L. Garcia and I. Widjaja, "Communication Networks: Fundamental Concepts and Key architectures", Tata-McGraw-Hill Ed., 2000.
7. J.F. Kurose and K.W. Ross, "Computer Networking: A Top-Down Approach Featuring the Internet", Pearson Education Asia (LPE), 2001.
8. L. Kleinrock, "Queuing Systems, Vol. 1: Theory", John Wiley, 1975.
9. Bertsekas and R. Gallagar, "Data Networks", 2nd Ed., PHI (EEE), 1988.
10. W. Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", 4th Ed.

FORMAL LANGUAGE AND AUTOMATA THEORY	MCA03C14
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Finite Automata-Deterministic, non-deterministic and equivalence - Equivalence of regular expressions and FA - Moore and Mealy machines.

UNIT II

Regular Languages-Pumping lemma of regular sets - MyhillNerode theorem - Minimization of finite automata - Chomsky hierarchy of languages.

UNIT III

Text-Free Language- Context-free grammar - Derivation trees - Ambiguity simplification - Normal forms - Applications.

UNIT IV

Pushdown Automata- Definitions - Context free languages - Construction of PDA for simple CFLs - Linear bounded automata.

UNIT V

Turing Machines-The Turing machine, programming techniques for Turing machine, extensions to the basic Turing machine, restricted Turing Machines, Turing machines and Computers, Undecidable Problem about Turing Machine, Post's Correspondence Problem.

RECOMMENDED BOOKS

1. Introduction To Automata Theory, Languages, And Computation by John E. Hopcroft, Rajeev Motwani , Jeffrey D. Ullman, Publisher: Pearson
2. Theory of Computer Science (Automata, Languages and Computation), K. L. P. Mishra and N. Chandrasekharan, PHI
3. Theory of Computation, VivekKulkarni, Oxford.

MANAGEMENT INFORMATION SYSTEMS	MCA04C15
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

An overview of MIS – Structure of a MIS – Hardware, Software and Communication technology for information systems – concepts of information.

UNIT II

Storage and retrieval of data – transaction processing – office automation and information processing - control functions – Decision making process – phases in the decision making process – Intelligence and design phases – concepts of decision making – Behavioral models of the decision maker/decision making.

UNIT III

System concepts – system concepts applied to management information systems – concepts of planning and control – Organizational structure and management concepts

UNIT IV

Decision support systems – support systems for planning, control and decision making – support systems for management of knowledge work – Information systems requirements – strategies for the determination of Information requirements.

UNIT V

Data base requirements – user interface requirements – developing and implementing application systems – Quality assurance and evaluation of Information systems – future developments and their organizational and social implications.

RECOMMENDED BOOKS

1. Gordon B. Davis, Margrethe H. Olson , “Management Information Systems – Conceptual foundations, Structure and Development “ , 2nd edition Mc-Graw Hill
2. James A. Senn , “Analysis & Design of Information System “ , Second edition, McGraw Hill.

OPERATING SYSTEM	MCA04C16
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT-I

Introduction: What is an Operating System, The need for Operating System, Evolution of Operating System ,Types of Operating System: batch, multi-programmed, time-sharing, real-time, distributed, parallel ,Goals of an Operating System, Operating System Architectures .

UNIT-II

PROCESSES MANAGEMENT:

Fundamentals of Process Management, Implicit/System and Non-implicit/User Process, Life cycle of a process, Process State and State Transitions, Suspended Process and Their State Transition, Process Control Block, Context Switching, Process Switching .

PROCESSES SCHEDULING:

Introduction, Scheduling types, Scheduling Levels, Pre-emptive & Non-preemptive Scheduling, Scheduling Algorithm-(FIFO, SJF, SRTN, SRRN, RR and Multilevel Queue).

UNIT- III

PROCESS COMMUNICATION AND SYNCHRONIZATION :

Introduction, Concurrent Process, Critical section, Algorithm Approach to CS Implementation –Two Process Solution, Dekker’s Solution , Peterson’s Solution ,Semaphore ,Solution of Producer –Consumer , Solution of Reader –writer Problem, Monitor.

DEADLOCKS:

Introduction, Definition of Deadlock , Modelling Of Deadlock, Conditions for Deadlock , Dealing With Deadlock, Deadlock Prevention, Deadlock Avoidance- Dijkstra’s Bankers Algorithm , Deadlock detection , Recovery from Deadlock, Starvation.

Thread:

Introduction , Threading issues, Thread Control Block , Types of Threads-User Threads, Kernel Threads, Hybrid Threads , Linux Threads, Java Threads.

UNIT-IV

MEMORY MANAGEMENT:

Introduction , logical vs. physical address space, Swapping, Contiguous memory allocation, Non - Contiguous memory allocation , Paging Concept , Page Table Structure , Segmentation.

VIRTUAL MEMORY:

Introduction , Need for Virtual Memory , Demand Paging, Page Replacement Algorithm-FIFO Page-replacement Algorithm , Optimal Page-replacement Algorithm, Least Recently Page-replacement Algorithm, Thrashing .

UNIT-V

I/O AND FILE SYSTEMS:

File concept, Access methods, Directory structure , File Attributes, File Operation, file system hierarchy, Types Of I/O , Input-Output Software, Kernel I/O Sub-System

DISK MANAGEMENT:

Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, C-SCAN), RAID Structure.

SECURITY:

Security Problem, User Authentication , Security Levels, Computer-Security Classifications .

RECOMMENDED BOOKS

1. Operating System Principles by Silberschatz A. and Peterson J. L., Wiley
2. Operating Systems by Dhamdhere, TMH
3. Operating Systems by NareshChauhan ,Oxford
4. Operating Systems by P.Balakrishna Prasad
5. Operating Systems by Stalling, Pearson

OPERATIONAL RESEARCH	MCA04M03
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

[Syllabus to be specified by Humanities Department]

COMPUTER NETWORK LAB	MCA04L07
L T P 0 - 0 - 6 : 3 Credits	Prerequisites: None

UNIT I

Study of TCP and UDP, Peer-to-Peer applications, Client-server programming, Looking up internet address, Implementation of ping programming, Socket program for UDP Echo Client and Echo Server.

UNIT II

Java multicast programming, Client server Communication using object stream, Client server Communication using byte stream, Implementation of CRC, Message passing using Message Window and Group Window.

UNIT III

Study and implementation of Stop & Wait protocol, Go Back N protocol, Selective Repeat protocol.

UNIT IV

Study and implementation of CSMA-CA protocol, CSMA-CD protocol, Pure Aloha protocol, Slotted Aloha protocol, Token Bus protocol, Token Ring protocol.

UNIT V

Study of network simulator NS2 and simulation using the NS2 package, Study the effect of different Routing protocols on network's performance through simulation.

RECOMMENDED BOOKS

1. Data Communication and Networking, 4th Edition, McGraw-Hill, BehrouzForouzan.
2. A.S. Tanenbaum, "Computer Networks", 4th Ed., Pearson Education Asia (LPE), 2003.
3. L.L. Peterson and B.S. Davie, "Computer Networks: A Systems Approach", 2nd Ed., Morgan Kaufman, Harcourt Asia, 2000.
4. W. Stallings, "Data and Computer Communications", 6th Ed., Pearson Education Asia (LPE), 2000.
5. F. Halsall, "Data Communications, Computer Networks and Open Systems", 4th Ed., Pearson Education Asia (LPE), 1996.

OPERATING SYSTEM LAB	MCA04L08
L T P 0 - 0 - 6 : 3 Credits	Prerequisites: None

UNIT I

(a) Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 7/8). (1 Lab session)

(b) Execute various UNIX system calls for (1 Lab session)

1. Process management
2. File management
3. Input / Output System calls

UNIT II

Implement CPU scheduling policies : (2-5 Lab sessions)

- (a) SJF
- (b) Priority
- (c) FCFS
- (d) Multi-level queue

IMPLEMENTATION DETAILS AND ASSUMPTIONS:

INPUT/s:

- (i) The number of processes/jobs in the system (computed through random functions in C)
- (ii) The CPU Burst (based on past history), priority (initially, compute through random function), arrival time of process.

UNIT III

Developing Application using Inter Process communication (using shared memory, pipes or message queues)

Implement the Producer – Consumer problem using semaphores (using UNIX system calls).

Implement some memory management schemes – I

Implement some memory management schemes – II

UNIT IV

Implement any file allocation technique (Linked, Indexed or Contiguous)

FIFTH SEMESTER

ARTIFICIAL INTELLIGENCE	MCA05C17
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction: Definition of Artificial Intelligence, Example Systems, Approaches to AI, Brief History; Intelligent Agents, Different Agent Architectures, Stimulus Response Agents, State Based Agents, Goal-Directed Agents, Utility-based Agents; Case Study: Internet Shopping Agent and Mars Rover.

UNIT II

Problem Solving Using Search: State Space Search, N Queens Problem, 8-Puzzle; Uninformed Search, DFS, BFS, Iterative Deepening Search, Bidirectional Search; Informed Search, Heuristic Function, A*, Greedy, Uniform Cost Search, IDA*; Case Study: Water-Jug Problem; Two Players Games - Two Players Search, Game Trees, Minimax Search, Heuristic Minimax Search, Heuristic Evaluation Function, Behaviour of Heuristic Evaluation Function; Case Study: Tic-Tac-Toe; Alpha Beta Search, Alpha Beta Pruning.

Constraint Satisfaction Problem: Different Types of Constraints, CSP, DSP, Forward Checking, Intelligent Backtracking.

UNIT III

Knowledge Representation and Logic: Propositional Logic, Interpret a Propositional Logic, Compound Proposition; Interface in Propositional Logic, First Order Logic; First Order Logic, Reasoning Using First Order Logic, Resolution in FOPL.

Rule Based System and Semantic Net: Rule Based System, Semantic Net, Reasoning in Semantic Net, Frames.

UNIT IV

Planning: Introduction to Planning Problems, Formulate Planning Problem, Casting Planning Problem, Search in Plan Space, Forward Search, Backward Search, Strips Planning, Partial Order Planning, Graph Plan Algorithm;

Probability and Fuzzy: Rule Based Expert System, Certainty Factor; Reasoning with Uncertainty, Bayes' Rule; Fuzzy Reasoning, Its Application.

UNIT V

Neural Networks: Learning Using Neural Networks-Introduction, Linear threshold UNIT of perceptron, representation power of perceptron, how to train a perceptron, Single layer perceptron network, multi-layer perceptron network, sigmoid UNIT; Probabilistic Learning.

Robotics: Introduction to Robotics, Robot Hardware, Robot perception, Planning a move, Robotic Software Architecture, Robot vision with Object Reconstruction.

RECOMMENDED BOOKS

1. Artificial Intelligence by E Rich and K Knight, McGraw-Hill.
2. Artificial Intelligence (3rd Ed) Russell Norvig, Pearson.
3. Introduction of Artificial Intelligence and expert systems by DW Patterson, PHI.
4. Artificial Intelligence a Modern Approach-Stuart Russell, Peter Norvig, PHI.
5. Artificial Intelligence and Soft Computing by A. Konar, CRC Press 2000.

COMPILER DESIGN	MCA05C18
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction:

Introduction to Compiler, Single and Multi Pass Compilers, Translators, Phases of Compilers, Compiler writing tools, Bootstrapping.

UNIT II

Lexical Analysis:

Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, lexemes and patterns, Regular expression, Finite automata from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer, Tool for lexical analyzer – LEX, Error reporting.

UNIT III

Syntax Analysis and Parsing Techniques:

Context free grammars, ambiguity, precedence, Bottom-up parsing and top down parsing, Top down parsing: elimination of left recursion, recursive descent parsing, Predictive parsing; Bottom Up Parsing: Operator precedence parsing, LR parsers, Construction of SLR, canonical LR and LALR parsing tables, the parser generator – YACC, error recovery in top down and bottom up parsing.

UNIT IV

Syntax Directed Translation & Type Checking :

Inherited attributes, dependency graph, Construction of syntax trees, bottom up and top down evaluation of attributes, S-attributed and L-attributed definitions.

Type Checking: Static vs. Dynamic Checking, Type expression, Type Checking, Type Equivalence, Type Conversion.

Symbol Tables: Structure of Symbol Table, Simple Symbol Table (Linear Table, Ordered List, Tree, Hash Table), Scoped Symbol Table (Nested Lexical Scoping, One Table per Scope, One Table for all Scopes).

UNIT V

Intermediate Code Generation:

Intermediate Language, Intermediate representation Technique, Three-address code, quadruples and triples, Translation of assignment statements, Boolean expressions, Control Flow, Case Statement, and Function Call.

UNIT VI

Runtime Environment:

Storage organization, activation tree, activation record, allocation strategies, Parameter passing, dynamic storage allocation.

UNIT VII

Code Generation & Code Optimization :

Factors affecting code generation, Basic Block, Code generation for tree, Register Allocation and assignment, DAG representation, Code generation using dynamic programming.

Code Optimization: Need for optimization, Optimization of Basic Blocks, Loops in flow graph, Optimizing transformation, Compile time evaluation, common sub-expression elimination, Dead code optimization, peep hole optimization, Local Optimization, Global Optimization, loops, global dataflow analysis, solution to iterative dataflow equations.

RECOMMENDED BOOKS

1. Compiler-Principles, Techniques and Tools by Alfred V.Aho, Ravi Sethi and J. D.Ullman, Addison Wesley.
2. Compiler Design by Santanu Chattopadhyay, PHI

DIGITAL IMAGE PROCESSING	MCA05E01
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Digital Image Fundamentals: Image Formation and types – Basic geometric transformations – Digital Image representation—Digital Image Processing operation.

UNIT II

Digital Image Transforms: Introduction –Need for transforms-Fourier transforms-2D DFT-FFT – Properties-Inverse Transforms-walsh transform-Hadamard Transform-Slant Transforms- Discrete Cosine Transform –KL Transform.

UNIT III

Image Compression: Image Compression Model-Compression Algorithm- Types of Redundancy Lossy and Lossless compression algorithm.

UNIT IV

Image Enhancement and Restoration: Histogram Modification Techniques – Image Smoothing – Image Sharpening – Image Restoration – Degradation Model – Noise Models – Spatial Filtering – Frequency Domain Filtering.

UNIT V

Image Segmentation and Recognition: Detection of Discontinuities – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphology operations. Pattern classification - Clustering and Matching - Knowledge representation and use for scene analysis and image understanding (2D and 3D) - Object recognition and identification – Case study of various applications.

RECOMMENDED BOOKS

1. Digital Image Processing – Gonzalez R. C., Woods R. E. (Addison-Wesley).
2. Fundamentals of Digital Image Processing – Jain A. K. (PHI).
3. Digital Image Processing and Analysis – Chanda B., Majumder D. D. (PHI).
4. Digital Image Processing- S.Sridhar (Oxford).

E-COMMERCE	MCA05E02
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction:

Defining e-commerce, early business interchange efforts, effect of internet and web in business, advantage and disadvantage of e-commerce.

UNIT II

Business Models for e-commerce:

Major key issues in business models, E-business models based on the relationship of transaction parties(B2C ,B2B, C2C, C2B), E-business models based on the relationship of transaction types, (brokerage, aggregator, advertising, subscription etc.)

UNIT III

Data interchange and security in e-commerce:

Electronic data interchange, EDI standard, e-mail based exchange of EDI, network and website security risks, security and e-mail, PEM, PGP, transaction security and data protection, Firewalls, encryption(secret key and public key cryptography), digital signatures, certificates, certifying authorities.

UNIT IV

e-Marketing :

Traditional marketing, aggregate metrics for e-business sites, online marketing, how should buyers pay online, advantages of online marketing, e-advertising, various means of advertising, e-branding, elements of branding, marketing strategies,

UNIT V

e-Payment systems:

Digital token-based e-payment systems, Secure electronic transaction protocol ,credit card as e-payment system, debit card as e-payment system, mobile payment system, smart card cash payment system, difference between credit card and smart card, electronic- cheque payment system, micropayment system, electronic cash(e-Cash), types of electronic money, digital wallet.

UNIT VI:

e- governance, IT act 2000, legal issues in e-Commerce, cyber law, cybercrime, e-Contracts, e-commerce patent, advertising regulation, e-commerce law of India.

RECOMMENDED BOOKS

1. E-commerce- an Indian Perspective- P.T. Joseph, S.J-5th Edition, PHI
2. Analysis and design of information systems-V. Rajaraman, PHI

INTRODUCTION TO CRYPTOGRAPHY	MCA05E03
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Basic Cryptography: - Classification of attacks, Evolution of Cipher Techniques, Symmetric and asymmetric key cryptography, Confusion and Diffusion.

Conventional Cryptography: - Substitution and Transposition ciphers. Cipher Implementation-P-Box, and Product Cipher, Fital structure, Block Ciphers-DES, AES, Meet in the Middle Attack, Triple DES and IDEA, Classical Techniques, Modern Techniques, Algorithms, Confidentiality Using Conventional Encryption.

UNIT II

Public-Key Encryption and Hash Functions:- Public-Key Cryptography ,Deffie -Hellman Cryptosystem , Man in the Middle Attack ,Message Authentication and Hash functions; Hash and MAC Algorithms,SHA-1 Algorithm, RSA and the Knapsack algorithm.

Authentication Protocols:-Authentication techniques based on Shared Secret Key, Key Distribution Centre, Kerberos, Public Key Encryption and Public Key certificates. Digital Signatures:-Secret Key Signatures. Public Key Signatures and DSS.

UNIT III

Network Security Practice: Authentication applications, Kerberos, X.509 Directory Authentication Service, Electronic Mail Security; S/MIME,IP Security Architecture, Combining Security Associations, Key Management, Web Security; Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction(SET), System Security: Intruders, Viruses and Related Threats, Types of Viruses, Trusted Systems.

UNIT IV

E-mail and Internet Security: PGP and PEM, Firewalls, Types of Firewalls, Firewall Configuration, Firewall Design Principles, Classical attacks on the Internet, IP Sec, IP Spoofing attacks.

RECOMMENDED BOOKS

1. William Stallings, Cryptography and Network Security, LPE Press.
2. A.Tanenbaum: Computer Networks, 3rd ed. Prentice Hall, 1996 (PHI 1997).
3. B. Schneider: Applied Cryptography, 2nd ed. Wiley, 1996.
4. C. Kaufman, R. Pearlman and M. Speciner: Network Security, Prentice Hall, 1995.
5. D. R. Stinson: Cryptography: Theory and Practice, CRC Press, 1995.
6. G. J. Simmons Ed.: Contemporary Cryptography, IEEE Press, 1991.
7. Behrouz A. Forouzen, Data Communication and Networking, TMH Press.

MOBILE COMPUTING	MCA05E04
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction:

Issues and Challenges in mobile computing, coping with uncertainties, resource poorness, bandwidth, etc. Cellular architecture, co-channel interference, frequency reuse, capacity increase by cell splitting. Evolution of mobile system: CDMA, FDMA, TDMA.

Introduction to Personal Communications Services (PCS):

PCS Architecture, Networks signalling.

UNIT II

Mobility Management:

Cellular architecture, Co-channel interference, Adjacent channel interference, Mobility-handoff, types of handoffs, Location management, HLR-VLR scheme, Hierarchical scheme, Predictive location management schemes, Mobile IP, Cellular IP, DHCP.

Mobile Transport Layer:

Indirect TCP, Snoop TCP, Mobile TCP

Mobile Ad Hoc Network and Routing Protocols:

Hidden and exposed terminal problems, Routing protocols: Destination sequenced distance vector algorithm, Cluster based gateway switch routing, Dynamic source routing, Ad hoc on-demand routing, Location aided routing, Zonal routing algorithm.

UNIT III

Global System for Mobile Communication (GSM) Overview:

GSM Architecture, Mobility management, Network signaling.

General Packet Radio Services (GPRS):

GPRS Architecture, GPRS Network Nodes.

UNIT IV

Mobile Data Communication:

WLANs (Wireless LANs), Bluetooth and IrDA technologies and standards.

Wireless Application Protocol (WAP):

The Mobile Internet standard, WAP Gateway and Protocols.

UNIT V

Third Generation (3G) Mobile Services:

Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Wireless Local Loop (WLL):

Introduction to WLL Architecture, wireless Local Loop Technologies.

Global Mobile Satellite Systems:

Case studies of the IRIDIUM and GLOBALSTAR systems.

UNIT VI

Building Mobile Application:

J2ME Technology, CLDC, Communications in MIDP.

RECOMMENDED BOOKS

1. J. Schiller, "Mobile Communications", Addison Wesley, 2000.
2. Yi-Bing Lin & Imrich Chlamtac, "Wireless and Mobile Networks Architectures", John Wiley & Sons, 2001.
3. Raj Pandya, "Mobile and Personal Communication systems and services", Prentice Hall of India, 2001.
4. U. Hansmann, "Principles of Mobile Computing", Wiley Dreamtech, 2004.

MULTIMEDIA TECHNOLOGY	MCA05E05
L T P 3 - 1 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction

[Definition, Evolution, Multimedia presentation and production, Characteristics of a multimedia presentation, Components and Structure, Hardware and Software Specifications, Digitization concepts, Application domains]; Visual Display Systems [Introduction, Cathode ray tube (CRT), Video adapter card and cable, Liquid crystal display (LCD), Plasma display panel (PDP), Comparison between CRT and LCD];

UNIT II

Text [Introduction, Types of text, ASCII codes, Unicode standards, Font, Insertion of text, OCR, File formats]; Image and Graphics [Introduction, Image types, Color and color models, Scanner, Digital camera, Interface standards, Specification of digital images, Color management systems, Device independent color models, Gamma and gamma correction, Image processing steps and software, File formats, Image output on monitor and printer];

UNIT III

Audio [Introduction, Nature of sound waves, Musical sound and noise, Tone and note, Psycho-acoustics and decibels, Microphone, Amplifier, Speakers, Digital audio specifications, Synthesizers, Musical Instrument Digital Interface (MIDI), Sound card, Audio processing steps and software, File formats];

UNIT IV

Video [Introduction, Video frames and frame rate, Analog video camera, Video signal formats, Television broadcasting standards, Digital video, Digital video standards, PC Video, Video processing steps and software, File formats]; Compression [Introduction, CODEC, Types of compression, Types of redundancies, Lossless compression techniques, Lossy compression techniques, Run length encoding, Huffman coding, Arithmetic coding, Lempel-Ziv-Welsh coding, Differential pulse code modulation, GIF standard, JPEG standard, H.261/H.263/ H.264, MPEG-1, MPEG-2, MPEG-4, MPEG-7, AMR, AAC];

UNIT V

CD-Technology [Working principles, CAV vs. CLV, Rated speed, Merits and Demerits, CD Formats, CD-DA, CD-ROM, CD-I, CD-ROM/XA, Photo-CD, Video-CD, CD-R, CD-RW, MO, DVD, CD vs.

DVD, DVD variants, UDF, DVD-Video, DVD-Audio, DVD-R, DVD-RW, DVD-RAM]; Multimedia Architecture and Transmission [Windows multimedia support, Windows API, Graphic libraries, DirectX, OpenGL, Distributed multimedia applications, Videoconference, Video on demand, Real time transport protocols, Streaming, Windows Media Framework, QuickTime Architecture, Ogg Framework, Temporal relationships, Synchronization];

UNIT VI

Multimedia Databases [Introduction, Limitations of textual descriptions of media, Content based storage and retrieval (CBSR), Image color, Image texture, Image shape, Audio speech and music discrimination, Video cut detection and shot identification, “low-level” vs. “high-level” features, Design and implementation of a prototype system]

RECOMMENDED BOOKS

1. Ranjan Parekh, “Principle of Multimedia”, Tata McGraw Hill, New Delhi, 2006. ISBN: 0-07-058833-3
2. Fred Halsall, "Multimedia Communications : Applications, Networks, Protocols and Standards", Pearson Education Ltd., 2001.
3. Francois Fluckiger, "Understanding Networked Multimedia : Applications and Technology", Prentice Hall, 1995.
4. Prabhat K Andleigh, Kiran Thakrar, "Multimedia System Design", Prentice Hall, 1996
5. Ralf Steinmetz, Klara Nahrstedt, "Multimedia Computing, Communications and Applications", Prentice Hall, 1995
6. Nalin Sharda, "Multimedia Information Networking", Prentice Hall, 1999, ISBN : 0132587734

WIRELESS COMMUNICATION NETWORK	MCA05E06
L T P 4 - 0 - 0 : 4 Credits	Prerequisites: None

UNIT I

Introduction to Wireless Networks, Different Generations of Wireless Networks. Characteristics of the Wireless Medium: Radio Propagation Mechanisms, Path Loss Modelling and Signal Coverage, Effect of Multipath and Doppler, Channel Measurement and Modelling Techniques.

UNIT II

Multiple Access Techniques: FDMA, TDMA, CDMA, OFDM, SDMA and their comparisons, Modulation Techniques – AM, FM, FSK, PSK, QPSK, QAM, 16QAM Mobile Data Networks: Introduction, Data Oriented CDPD Network, GPRS, EDGE and High Data Rates, SMS in GSM, Mobile Application Protocols

UNIT III

Network Planning: Introduction, Wireless Network Topologies, Cellular Topology, Cell Fundamentals, Signal to Interferences Ratio Calculations, Network Planning for CDMA Systems. Wireless Network Operations: Mobility Management, Radio Resources and Power Management

UNIT IV

Introduction to Wireless LAN, Overview of IEEE 802.11, Reference Architecture, PHY and MAC Layer, Wireless Home Networking, Technologies for Home Area Network (HAN), HIPERLAN. IEEE 802.15 WPAN, HomeRF, Bluetooth, Adhoc Networks, Introduction to 2.5 G and 3 G Networks.

RECOMMENDED BOOKS

1. Kaveh Pahlavan, Prashant Krishnamurthy “Principles of Wireless Networks”, PHI.
2. Dharma Prakash Agrawal, Qing- AnZeng, “Introduction to Wireless and Mobile Systems” CENGAGE Learning.
3. Sumit Kasera, Nishit Narang, A P Priyanka “2.5 G Mobile Networks: GPRS and EDGE”, TMH
4. Kamilo Feher “Wireless Digital Communications” , PHI
5. Jochen Schiller “ Mobile Communications”, PEARSON

ARTIFICIAL INTELLIGENCE LAB	MCA04L07
L T P 0- 0 - 6 :3 Credits	Prerequisites: None

Experiments based on the syllabus of the Subject ARTIFICIAL INTELLIGENCE With emphasis on problem solving by searching, Micro Mouse Exploration, Robot vision, Unmanned and Remotely Operated Vehicle, 3D reconstruction of objects

RECOMMENDED BOOKS

1. Artificial Intelligence by E Rich and K Knight, McGraw-Hill.
2. Artificial Intelligence (3rd Ed) Russell Norvig, Pearson.
3. Introduction of Artificial Intelligence and expert systems by DW Patterson, PHI.
4. Artificial Intelligence a Modern Approach-Stuart Russell, Peter Norvig, PHI.
5. Artificial Intelligence and Soft Computing by A. Konar, CRC Press 2000.

COMPILER DESIGN LAB	MCA05L
L T P 0 - 0 - 6 : 3 Credits	Prerequisites: <i>None</i>

UNIT I

Programmes on handling files, Programs on language, grammer, regular expression, NFA, DFA, strings.

UNIT II

Programs for lexical analyzer,

UNIT III

Programs on removing left recursion, finding FIRST, FOLLOW

UNIT IV

Programs on LL(1) parser, LALR Parser, canonical parser etc.