

MCA  
CURRICULUM  
AND  
SYLLABUS

**Semester I**

<b>Code No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MCA301	<a href="#">Fundamentals of Computer Science</a>	3	0	0	3
MCA302	<a href="#">Data Structures</a>	3	0	0	3
MCA303	<a href="#">Mathematical Foundations of Computer Science</a>	3	1	0	4
MCA304	<a href="#">Accounting and Financial Management</a>	3	0	0	3
MCA305	<a href="#">Introduction to C programming</a>	3	0	0	3
MCA381	<a href="#">Data Structures Laboratory (using C)</a>	0	0	6	4
	<b>Total</b>	<b>15</b>	<b>1</b>	<b>6</b>	<b>20</b>

**Semester II**

<b>Code No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MCA306	<a href="#">Object Oriented Programming</a>	3	0	0	3
MCA307	<a href="#">Design and Analysis of Algorithms</a>	3	1	0	4
MCA308	<a href="#">Database Management Systems</a>	3	0	0	3
MCA309	<a href="#">Operating Systems</a>	3	0	0	3
MCA310	<a href="#">Resource Management Techniques</a>	3	0	0	3
MCA382	<a href="#">Object Oriented Programming Laboratory</a>	0	0	3	2
MCA383	<a href="#">RDBMS Laboratory</a>	0	0	3	2
	<b>Total</b>	<b>15</b>	<b>1</b>	<b>6</b>	<b>20</b>

**Semester III**

<b>Code No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MCA401	<a href="#">Internet Programming</a>	3	1	0	4
MCA402	<a href="#">Software Engineering</a>	3	0	0	3
MCA403	<a href="#">Computer Networks</a>	3	0	0	3
HSS***	Communication skills – I (English / German / French)	2	0	0	2
MCA***	Elective I	3	0	0	3
MCA***	Elective II	3	0	0	3
MCA481	<a href="#">Software Engineering Laboratory</a>	0	0	3	2
MCA482	<a href="#">Internet Programming Laboratory</a>	0	0	3	2
	<b>Total</b>	<b>17</b>	<b>1</b>	<b>6</b>	<b>22</b>

**Semester IV**

<b>Code No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MCA404	<a href="#">UNIX and Network Programming</a>	3	1	0	4
MCA405	<a href="#">Software Quality Management</a>	3	0	0	3
MCA406	<a href="#">Visual Programming</a>	3	1	0	4
HSS***	Communication skills - II (English / German / French)	2	0	0	2
MCA***	Elective III	3	0	0	3
MCA***	Elective IV	3	0	0	3

MCA483	<a href="#">Visual Programming Laboratory</a>	0	0	3	2
MCA484	<a href="#">Unix and Network Programming Laboratory</a>	0	0	3	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>6</b>	<b>23</b>

**Semester V**

Code No.	Subject	L	T	P	C
MCA501	<a href="#">Middle-Ware Technologies</a>	3	1	0	4
MCA502	<a href="#">Computer Graphics and Multimedia Applications</a>	3	0	0	3
MCA***	Elective V	3	0	0	3
MCA***	Elective VI	3	0	0	3
MCA581	<a href="#">Graphics Laboratory</a>	0	0	3	2
MCA582	<a href="#">Middleware Laboratory</a>	0	0	3	2
MCA598	Mini Project	0	0	6	4
	<b>Total</b>	<b>12</b>	<b>1</b>	<b>12</b>	<b>21</b>

**Semester VI**

Code No.	Subject	L	T	P	C
MCA599	Project Work	0	0	22	12

**Total Credit (from 1<sup>st</sup> semester to 6<sup>th</sup> semester = 118)**

**List of Electives for MCA**

<b>S. No.</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MCA607	<a href="#">Microprocessors and its applications</a>	3	0	0	3
MCA608	<a href="#">System Software</a>	3	0	0	3
MCA609	<a href="#">Advanced Databases</a>	3	0	0	3
MCA610	<a href="#">Distributed Computing</a>	3	0	0	3
MCA611	<a href="#">Data Mining and Data Warehousing</a>	3	0	0	3
MCA612	<a href="#">Artificial Intelligence and Expert Systems</a>	3	0	0	3
MCA613	<a href="#">Neural Networks</a>	3	0	0	3
MCA614	<a href="#">Embedded Systems</a>	3	0	0	3
MCA615	<a href="#">Mobile Computing</a>	3	0	0	3
MCA616	<a href="#">Computer Security</a>	3	0	0	3
MCA617	<a href="#">TCP / IP Protocol Suite</a>	3	0	0	3
MCA618	<a href="#">Component based Technology</a>	3	0	0	3
MCA619	<a href="#">Computer Animation</a>	3	0	0	3
MCA620	<a href="#">Digital Image Processing</a>	3	0	0	3
MCA621	<a href="#">Agent Based Intelligent System</a>	3	0	0	3
MCA622	<a href="#">Software Agents</a>	3	0	0	3
MCA623	<a href="#">Natural Language Processing</a>	3	0	0	3
MCA624	<a href="#">Object Oriented Analysis and Design</a>	3	0	0	3
MCA625	<a href="#">Compiler Design</a>	3	0	0	3
MCA703	<a href="#">Electronic Commerce</a>	3	0	0	3
MCA704	<a href="#">Management Information Systems</a>	3	0	0	3
MCA705	<a href="#">Enterprise Resource Planning</a>	3	0	0	3
MCA706	<a href="#">Managerial Economics</a>	3	0	0	3
MCA707	<a href="#">Human Resources Management</a>	3	0	0	3
MCA708	<a href="#">Supply Chain Management</a>	3	0	0	3

MCA709	<a href="#">Health Care Systems</a>	3	0	0	3
MCA710	<a href="#">Numerical and Statistical Methods</a>	3	0	0	3
HSS018	Communication Skills	3	0	0	3
HSS031	English Advance Level	3	0	0	3
HSS026	German – I	3	0	0	3
HSS027	German – II	3	0	0	3
HSS028	French – I	3	0	0	3
HSS029	French – II	3	0	0	3

**SEMESTER I**

<b>MCA301</b>	<b>FUNDAMENTALS OF COMPUTER SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COMPUTER BASICS**

Basic structure of computer and its working – Algorithms - Computer generations and classifications - Binary arithmetic.

**HARDWARE**

Components of a computer - Digital Logic - Computer Architecture.

**SOFTWARE AND COMPUTER GRAPHICS**

Programming languages – Need, Assembly language, High level programming languages - Computer graphics – Applications, Display technologies, Display devices, Random scan display processing unit, Display generator, Display processing for direct view storage, Raster scan display processing unit, Input devices for interactive graphics, Programmer model o interactive graphics systems.

**OPERATING SYSTEMS**

Types – Batch, Multiprogramming, Time Sharing, Real time, Personal Computer operating systems - Unix and micro kernel based operating system – On line operating system.

**COMPUTERS AND COMMUNICATIONS**

Communication - Characteristics, Types of networks, Need for networks, Channel allocation, Physical communication media, Network topologies, Communication protocols, LAN, Interconnecting networks, TCP/IP.

**TEXT BOOK**

1. Rajaram, V., Fundamentals of Computers, 3<sup>rd</sup> Edition, Prentice Hall of India Pvt. Ltd., 2000.

**REFERENCES**

1. Goldschlager, L., Lister, A., Computer Science - A Modern Introduction , Prentice Hall, 1988.
2. Rajaraman, V., and Rajaraman, R., Introduction to Computers, PHI, 1989.

<b>MCA302</b>	<b>DATA STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**GENERAL CONCEPTS**

Data types, ADT, Data structures – Recursion – Polish notation – Sets – The disjoint set ADT.

**LINEAR DATA STRUCTURES**

Arrays – Definition, Properties, Types, Operations, Representation, Applications - Stacks – Definition, Properties, Operations, Representation, Applications – Queues - Definition, Properties, Operations, Representation, Applications - Circular queues - Definition, Properties, Operations, Representation, Applications - Linked lists - Definition, Properties, Types, Operations, Representation, Applications.

**NON LINEAR DATA STRUCTURES**

Trees –Definition, Properties, Types, Operations, Representation, Applications - Binary trees - Definition, Properties, Types, Operations, Representation, Applications – Binary tree Traversals – Expression trees – Conversion of general tree to binary tree – Threaded binary trees - Binary search tree - Definition, Properties, Operations, Representation, Applications – Priority queues and heaps - Definition, Properties, Operations, Representation, Applications – Graphs - Definition, Properties, Types, Operations, Representation, Applications – Graph Traversals - Topological sort.

**SORTING AND SEARCHING TECHNIQUES**

Types Of sorting - Internal sorting – Bubble sort, Selection sort, Insertion sort, Heap sort, Shell sort, Quick sort, Merge sort - External sorting – Multiway merge – Searching - Linear search, Binary search, B Trees – B+ Trees - Hashing.

**ADVANCED DATA STRUCTURES**

AVL trees – Splay trees – Deterministic skip tests – Treaps – k - d trees – Pairing heaps.

**TEXT BOOK**

1. Mark Allen Weiss, Data structures and Algorithm Analysis in C, 2<sup>nd</sup> Edition, Pearson Education, 2002.

**REFERENCES**

1. Langsam, Augenstein, Tenenbaum, Data structures using C and C++, 2<sup>nd</sup> Edition, Prentice Hall, 2002.
2. Aho, Hopcroft, Ullman, Data Structures and Algorithms, Addison Wesley, 2004.

<b>MCA303</b>	<b>MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**SET THEORY**

Introduction to set theory – Sets and subsets – Operations on sets – Sequences – Characteristic functions – Introduction to logic propositions and logic operations – Methods of proof – Mathematical induction – Counting – Permutations and combinations – Pigeonhole principle.

**GRAPHS**

Graphs – Undirected trees – Minimal spanning trees – Euler paths and circuits – Hamiltonian paths and circuits – Transport networks.

**ALGEBRAIC STRUCTURES**

Semigroups and Monoids - Definitions and examples – Groups – Subgroups – Homomorphisms – Cosets and Lagrange's Theorem – Normal - Subgroups – Rings and fields - Definitions and examples.

**ORDER RELATIONS AND STRUCTURES**

Partially ordered sets – External elements of partially ordered sets – Lattices – Finite boolean algebra – Functions of boolean algebra – Circuit designs.

**MODELING COMPUTATION AND LANGUAGES**

Finite state machines – Deterministic and Non -Deterministic finite state machines – Turing machines - Formal languages – Classes of grammars – Type\_0 – Context sensitive – Context – Free – Regular grammars – Ambiguity.

**TEXT BOOKS**

1. Kolman, B., Busby and Ross, S.C., Discrete Mathematical Structures, 5<sup>th</sup> Edition, Pearson Education, New Delhi, 2004.
2. Tremblay, J.P., and Manohar, R., Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw - Hill Publication Co. Ltd, New Delhi, 2004.

**REFERENCES**

1. Judith Gersting, L., Mathematical Structures for Computer Science, W.H.Freeman and Company, New York, 5<sup>th</sup> Edition, 2003.
2. Kenneth Rosen, H., Discrete Mathematics and its Applications, 5<sup>th</sup> Edition, Tata McGraw Hill 2003.
3. Ralph Grimaldi, P., Discrete and Combinatorial Mathematics, 4<sup>th</sup> Edition ,Pearson Education, New Delhi , 2002.
4. Venkatraman, M.K., Sridharan, N., and Chandrasekaran, N., Discrete Mathematics, The National Publishing Company, 2003.

<b>MCA304</b>	<b>ACCOUNTING AND FINANCIAL MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **FINANCIAL ACCOUNTING**

Meaning and scope of accounting – Principles – Concepts – Conventions - Accounting Standards - Final accounts - Trial balance - Trading account - Profit and loss account- Balance sheet - Accounting ratio analysis - Funds flow analysis - Cash flow analysis.

### **ACCOUNTING**

Meaning – Objectives - Elements of cost - Cost sheet - Marginal costing and cost volume Profit analysis - Break even analysis – Applications – Limitations - Standard costing and variance analysis – Material – Labor – Overhead – Sales - Profit Variances.

### **BUDGETS AND BUDGETING CONTROL**

Budgets and budgetary control – Meaning – Types - Sales budget - Production budget - Cost of production budget - Flexible budgeting - Cash budget - Master budget - Zero base budgeting - Computerized accounting.

### **INVESTMENT DECISION AND COST OF CAPITAL**

Objectives and functions of financial management – Risk - Return relationship - Time value of money concepts - Capital budgeting - Methods of appraisal - Cost of capital - Factors affecting cost of capital - Computation for each source of finance and weighted average cost of capital.

### **FINANCING DECISION AND WORKING CAPITAL MANAGEMENT**

Capital structure - Factors affecting capital structure - Dividend policy - Types of dividend Policy - Concepts of working capital - Working capital policies - Factors affecting working capital -

Estimation of working capital requirements.

### TEXT BOOKS

1. Maheswari, S. N., Financial and Management Accounting, Sultan Chand and Sons, 2003.
2. Pandey, I. M., Financial Management, 4<sup>th</sup> Reprint, Vikas Publications, 2002.

### REFERENCES

1. Iyengar, S.P., Cost and Management Accounting, Sultan Chand and Co.
2. Pandey, I.M., Elements of Management Accounting, Vikas Publishing House, 1993.

MCA305	INTRODUCTION TO C PROGRAMMING	L	T	P	C
		3	0	0	3

### INTRODUCTION

Variables - Data types – Operators – Expressions - Control flow – Statements and blocks, if else, Switch – Loops – While, for, do-while – Break, continue, goto, labels.

### FUNCTIONS AND PROGRAM STRUCTURE

Functions and Program structure – Basics, Functions returning non-integers, Scope, Types of variables, Block structure, Initialization, Recursion , The C Preprocessor.

### POINTERS AND ARRAYS

Pointer and Arrays – Pointers and addresses, Pointers and function arguments, pointers and arrays, Address arithmetic, Character pointers and functions, Pointer arrays, Pointers to pointers, Multidimensional arrays and pointers, Initialization of pointer arrays, Command line arguments, Pointers to functions, Complicated declarations.

**STRUCTURES AND UNIONS**

Basics, Structures and functions, Arrays of structures, Pointers to structures, Self referential structures, Typedef, Union, Bitfields.

**FILE HANDLING AND CONSOLE I/O**

File management and Console input and output – Functions for file management - Standard I/o, Formatted output, Formatted input, File access, Error handling, Line input and output, Miscellaneous functions.

**TEXT BOOK**

1. Brian Kernighan, W., Dennis Ritchie, M., The C Programming Language, 2<sup>nd</sup> Edition, Prentice Hall of India Pvt. Ltd., 2005.

**REFERENCES**

1. Herbert Schildt, The Complete Reference C, 4<sup>th</sup> Edition, Tata Mc - Graw Hill, 2000.
2. Yashwant Kanitkar, Let Us C, BPB Publications.

<b>MCA381</b>	<b>DATA STRUCTURES LABORATORY (Using C Language)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>6</b>	<b>4</b>

1. Representation of sparse matrix using array of structures, pointers.
2. Implementation of stack using array, pointer.
3. Implementation of queue using array, pointer.
4. Implementation of circular queue using array.
5. Implementation of singly, doubly and circularly linked lists.
6. Implementation of heap sort, quick sort, merge sort and topological sort.
7. Implementation of sequential search and binary search.
8. Implementation of binary tree traversals.
9. Implementation of binary search tree operations.
10. Implementation of graph traversals.

<b>SEMESTER II</b>
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<b>MCA306</b>	<b>OBJECT - ORIENTED PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OOP PARADIGM**

Programming paradigms - Procedural programming, Modularity, Exception handling, Data abstraction - User defined types - Concrete types, Abstract types, Virtual functions-Object oriented programming - Generic programming – Containers – Algorithms.

**INTRODUCTION TO C++**

Overview of C++ - Classes and objects - Friend functions, Friend classes, Inline function, Static members – Arrays – Pointers – References - Dynamic allocation.

**OVERLOADING**

Function overloading - Overloading constructor functions, Copy constructors, Default arguments - Operator overloading - Member operator overloading, Overloading new and delete.

**ADDITIONAL FEATURES**

Inheritance - Base class - Access control - Virtual functions - Pure virtual functions – Templates - Generic functions, Applying generic functions, Generic classes - Exception handling - C++ I/O Streams - File I/O – STL - Overview, Container classes, Lists, Maps, Algorithms using functions and objects, String class.

**DESIGN CONCEPTS**

Role of classes - Kinds of classes, Concrete types, Abstract types, Nodes, Changing interfaces, Object I/O, Actions, Interface Classes, Handles, Use Counts Applications frame works.

**TEXT BOOKS**

1. Bjarne Stroustrup, The C++ Programming Language, 3<sup>rd</sup> Edition, Addison - Wesley, 1997.
2. Herbert Schildt, The Complete Reference C++, 4<sup>th</sup> Edition, Tata McGraw Hill, 2002.

**REFERENCES**

1. Robert Lafore, Waite Groups OOP in Turbo C++, 3<sup>rd</sup> Edition, Addison Wesley, 2000.
2. Stanley Lippman, Jove Largie, C++ Primer, 3<sup>rd</sup> Edition, Addison Wesley, 1998.

MCA307	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	1	0	4

**INTRODUCTION TO ALGORITHM ANALYSIS TECHNIQUES**

Introduction – Algorithm, Algorithm specification, Performance analysis.

**DIVIDE AND CONQUER AND GREEDY TECHNIQUE**

Divide and conquer - General method, Binary search , Finding the maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication - Greedy technique - General method, Knapsack problem, Tree vertex splitting, Job sequencing with deadlines, Single source shortest paths.

**DYNAMIC PROGRAMMING**

Dynamic programming - General method, All pairs shortest path, Single source shortest path (General weights), Optimal binary search trees, 0/1 Knapsack problem, The traveling salesperson problem.

**BACKTRACKING AND BRANCH AND BOUND**

Backtracking - General method, 8-Queens problem, Sum of subsets, Graph coloring, Hamiltonian cycles – Branch and bound – General method , Knapsack problem, Traveling salesperson problem.

**NP PROBLEMS**

NP Problems - Introduction to P, NP, NP - Complete, NP - Hard problems, Definitions, Examples.

**TEXT BOOK.**

1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publishers pvt. Ltd., Reprint 2005.

**REFERENCES**

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education, Reprint 2006.
2. Aho, Hopcroft, Ullman , The Design and Analysis of Computer Algorithms, Pearson Education, Reprint 2004.

<b>MCA308</b>	<b>DATABASE MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**AN OVERVIEW OF DATABASE SYSTEMS**

Introduction – Database system applications, Database versus file systems, View of data, Data models, Database languages, Database users and administrators, Transaction management, Database system structure, Application architectures.

**DATA MODELS**

Entity – Relationship Model – Basic concepts, Constraints, Keys, Design issues, ER diagram, Weak entity sets, Extended ER features, Design of an ER database schema, Reduction of an ER schema to tables - Relational model - Structure of relational databases – The relational algebra – Extended relational algebra operations,

Modification of database, Tuple relational calculus, Domain relational calculus.

### **RELATIONAL DATABASES**

SQL – Background, Basic structure, Set operations, Aggregate functions, Null values, Nested subqueries, Views, Complex queries, Modification of the database, Joined relations, DDL, Embedded SQL, Dynamic SQL, QBE – Integrity and security – Domain constraints, Referential integrity, Assertions, Triggers - Relational database design – First normal form, Pitfalls in relational database design, Functional dependencies, Decomposition, Desirable properties of decomposition, BCNF, Third normal form, Fourth normal form.

### **INDEXING AND QUERYING**

Indexing and hashing – Basic concepts, Ordered indices, B+ tree index files, B tree index files – Static hashing, Dynamic hashing, Comparison of ordered indexing and hashing, Multiple key access - Query Processing – Overview, Measures of query cost, Selection operation, Sorting, Join operation - Query Optimization – Overview, Estimating statistics of expression results, Transformation of relational expressions, Choice of evaluation plans, Materialized views.

### **TRANSACTION, CONCURRENCY CONTROL AND RECOVERY MANAGEMENT**

Transactions – Transaction concept, Transaction state, Implementation of atomicity and durability, Concurrent executions, Serializability, Recoverability, Implementation of isolation, Transaction definition in SQL, Testing for serializability - Concurrency control – Lock based protocols, Timestamp based protocols, Validation based protocols, Multiple granularity, Multiversion schemes, Deadlock handling, Insert and delete operations, Weak levels of consistency, Concurrency in index structures - Recovery system – Failure classification, Storage structure, Recovery and atomicity, Log based recovery, Shadow

paging, Recovery with concurrent transactions, Buffer management, Failure with loss of nonvolatile storage, Advanced recovery techniques, Remote backup systems.

### TEXT BOOK

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 4<sup>th</sup> Edition, McGrawHill International Edition, 2002.

### REFERENCES

1. Date, C.J., An introduction to database systems, 7<sup>th</sup> Edition , Addison - Wesley.
2. Elmasri, R., Navathe, S.B., Fundamentals of database systems, 3<sup>rd</sup> Edition, Pearson Education.

MCA309	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

### AN OVERVIEW OF OPERATING SYSTEM AND ITS STRUCTURES

Introduction - Definition of OS, Mainframe system, Desktop systems, Multi processor system, Distributed, Clustered, Real time systems, Handheld systems, Operating system Structure, System components, Services, System calls, System programs, System design and implementation.

### PROCESS MANAGEMENT

Processes – Concepts, Process scheduling, Operations on processes, Cooperating processes, Inter process communication - CPU scheduling - Scheduling concepts, Criteria, Scheduling algorithms, Multiprocessor scheduling, Real time scheduling, Algorithm evaluation - Threads – Overview, Multithreading models, Threading issues.

### SYNCHRONIZATION AND DEADLOCKS

Process synchronization – Background, Critical section problem, Synchronization hardware, Semaphores, Classic problems of

synchronization, Critical regions, Monitors – Deadlocks - System model, Characterization, Methods of handling deadlocks, Deadlock prevention, avoidance, Detection and recovery from deadlocks.

### **STORAGE MANAGEMENT**

Memory management – Background, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with paging - Virtual memory – Background, Demand paging, Process creation, Page replacement, Allocation of frames, Thrashing - File system interface – File concept, Access methods, Directory structure, File sharing, Protection - File system implementation - File system structure, File system implementation, Directory implementation, Allocation methods, Free space management.

### **I/O AND FILE MANAGEMENT**

I/O Systems – Overview , I/O hardware - Mass storage structure - Disk structure, Disk scheduling, Disk management, Swap space management.

### **TEXT BOOK**

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne , Operating System Principles, 7<sup>th</sup> Edition, John Wiley and Sons (ASIA) Pvt. Ltd., 2005.

### **REFERENCE**

1. Milankovic, M., Operating System Concepts and Design, 2<sup>nd</sup> Edition, McGraw Hill, 1992.

<b>MCA310</b>	<b>RESOURCE MANAGEMENT TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **LINEAR PROGRAMMING PROBLEMS**

Graphical solution of linear programming problems - LP solution space in equation form - Simplex method - Artificial starting solution.

### **TRANSPORTATION AND ASSIGNMENT PROBLEMS**

Introduction to transportation and assignment problems - The transportation algorithm - The Assignment model.

### **NETWORK MODELS**

Minimal spanning tree algorithm - Shortest route problem - Maximal flow model.

### **DYNAMIC PROGRAMMING**

Elements of the dynamic programming model - Optimality principle - Examples of dynamic programming models and their solutions

### **QUEUING THEORY**

Single and multiple server Markovian queuing models – Steady state system size probabilities – Little’s formula – Customer impatience – Priority queues – M/G/1 queuing system – P - K formula.

### **TEXT BOOK**

1. Taha, H.A., Operations Research: An Introduction, 7<sup>th</sup> Edition, Pearson Education, 2004.

### **REFERENCES**

1. Natarajan, A.M., Balasubramani, P., Tamilarasi, A., Operations Research, Pearson Education, Asia, 2005.
2. Prem Kumar Gupta, Hira, D.S., Operations Research, 3<sup>rd</sup> Edition, Sultan Chand and Company Ltd, New Delhi, 2003.

<b>MCA382</b>	<b>OBJECT ORIENTED PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Programs using constructor and destructor.
2. Creation of Classes and uses of different types of functions.
3. Count the number of objects created for a class using static member function.
4. Programs using function overloading and operator overloading.
5. Programs using inheritance.
6. Programs using friend function.
7. Programs using virtual function.
8. Programs using exception handling.
9. Programs using files.
10. Programs using function templates.

<b>MCA383</b>	<b>RDBMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Programs for creation of database using SQL.
2. Programs for manipulation of database using SQL.
3. Programs for implementation of operations on Views using SQL.
4. Programs for implementation of various control structures using SQL.
5. Programs for implementation of functions using PL/SQL.
6. Programs for implementation of cursors using PL/SQL.
7. Programs for implementation of triggers using PL/SQL.
8. Programs for implementation of packages using PL/SQL.
9. Programs for implementation of procedures using PL/SQL.
10. Programs for creation of forms and reports using developer tools.

**SEMESTER III**

<b>MCA401</b>	<b>INTERNET PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**INTRODUCTION**

World wide web – History of the world wide web, World wide web consortium – HTML – Dynamic HTML – Object model and collections, Event model, Filters and transitions.

**JAVA SCRIPT**

Introduction – Simple program, Memory concepts, Arithmetic, Decision making - Equality and relational operators – Control statements – Control structures, Operators – Functions – Programmer defined functions, JavaScript global functions, Recursion – Arrays – References and reference parameters, Passing arrays to functions, Multidimensional arrays – Objects – Object types, Cookies.

**XML**

Introduction, Structuring data, XML namespaces, Document Type Definitions (DTDs) and Schemas, Document type definitions, W3C XML schema documents, XML vocabularies, Document Object Model (DOM), DOM methods, Simple API for XML (SAX), Extensible Style sheet Language (XSL), Simple Object Access Protocol (SOAP).

**PERL, CGI AND PHP**

Introduction, String processing and Regular expressions, Viewing client/server environment variables, Form processing and business logic, Verifying a username and password, Connecting to a database, Cookies, Operator precedence chart.

**JAVA PROGRAMMING**

Classes – Constructors, Garbage collection - Overloading methods – Overriding methods - Exception handling – Multithreading – Creating a Thread, Synchronization, Interthread Communication – Streams – Byte streams, Character streams.

**TEXT BOOKS**

1. Deitel, Deitel and Neito, INTERNET and WORLD WIDE WEB – How to program, Pearson Education Asia, 2001.
2. Norton, D., and Schildt, H., Java 2: The complete Reference, 5<sup>th</sup> Edition, Tata McGraw Hill, 2002.
3. Deitel and Deitel , XML How to Program, 3<sup>rd</sup> Edition, Pearson Education, 2001.

**REFERENCE**

1. Margaret Levine Young, Internet and WWW, 2<sup>nd</sup> Edition, Tata McGraw Hill, 2002.

<b>MCA402</b>	<b>SOFTWARE ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRODUCT AND PROCESS**

Introduction - Some definitions, Quality and productivity factors - The software process – A generic view of process, Process models.

**SYSTEM ANALYSIS AND DESIGN**

System engineering - Analysis concepts, Principles and analysis modeling - Requirements engineering, Building the analysis model - Design concepts and principles – Design engineering, Types of design, Modeling component - level design, User interface design.

**TESTING**

Testing strategies – A Strategic approach to software testing, Strategic issues, Test strategies for conventional and Object-Oriented

software, Validation testing, System testing - Testing tactics – Software testing fundamentals, Black-box and white-box testing, Basis path testing, Control structure testing, Object-Oriented testing methods, Testing for specialized environments, architectures and applications

### **MANAGING SOFTWARE PROJECTS**

Project management - Process and project metrics, Source code metrics - Project planning - Defining the problem, Estimation, Project scheduling, Risk management, Quality management , Change management.

### **CASE STUDY**

Case study – Perform system analysis, Estimation , Risk analysis and identify factors that affect the quality of software product for various real world business problems.

### **TEXT BOOK**

1. Roger Pressman, Software Engineering - A Practitioner's Approach, 6<sup>th</sup> Edition, Tata McGraw Hill.

### **REFERENCE**

1. Richard Fairley, Software Engineering Concepts , Tata McGraw Hill, 2005.

<b>MCA403</b>	<b>COMPUTER NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Building a network, Requirements, Network architecture, OSI, Internet, Direct link networks, Hardware building blocks, Framing, Error detection, Reliable transmission - Network fundamentals -

LAN technology, LAN architecture, Bus/Tree, Ring, Star, Ethernet, Token Rings, Wireless.

### **NETWORK LAYER**

Switching - Circuit switching, Packet switching, Switching and forwarding, Bridges and LAN switches, Cell switching, Internetworking, Routing, Global internet, Multicast.

### **TRANSPORT LAYER**

UDP, TCP, Remote procedure call, Remote procedure call, Congestion control and resource allocation, TCP congestion control, Congestion avoidance mechanisms.

### **NETWORK SECURITY AND APPLICATION LAYER**

Cryptographic Algorithms, DES, RSA, MD5, Security mechanisms, Firewalls, Name service, Traditional applications, SMTP, HTTP, Multimedia application – RTP – RTCP – SCTP.

### **NETWORK MANAGEMENT**

Introduction – Network monitoring, Network control - SNMPV I network management - Concepts – Information – Standard MIBS.

### **TEXT BOOK**

1. Larry Peterson, L., and Brule Davie, S., Computer Networks – A System Approach, 2<sup>nd</sup> Edition, MarGankangmann – Harcourt Asia, 2002.

### **REFERENCES**

1. William Stallings, SNMP, SNMP V2, SNMPV3, RMON 1 and 2, 3<sup>rd</sup> Edition , Addison Wesley, , 6<sup>th</sup> Indian Reprint 2002.
2. Kurose, J.F., and Ross, K.W., Computer Networking –A top–down approach featuring the internet, Addison Wesley, 2001.

3. William Stallings, Data and Computer Communication, 6<sup>th</sup> Edition, Pearson Education, 2002.
4. Andrew Tanenbaum, S., Computer Networks, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2001.

<b>MCA481</b>	<b>SOFTWARE ENGINEERING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Preparation of Project Management Plan.
2. Using any of the CASE tools, Practice requirement analysis and specification for different firms.
3. Case study of cost estimation models.
4. Practice object oriented design principles for implementation.
5. Practice function oriented design.
6. Practice creating software documentation for all the phases of software development life cycle with respect to any real time application.
7. Simulate tools for path testing principles.
8. Simulate tools for testing based on control structures.
9. Simulate tools that reflect black box testing concepts.
10. Simulate tools that reflect Integration testing concepts.

<b>MCA482</b>	<b>INTERNET PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Program to illustrate the use of overloading and overriding.
2. Program to implement the concepts of interfaces and packages.
3. Generate the program using exception handling mechanism.
4. Program to achieve inter - thread communication and deadlock avoidance.
5. Implementation of file operations.
6. Programs using applets.
7. Programs using JDBC.

8. Programs using JNI concepts.
9. Programs to illustrate the use of RMI.
10. Programs using servlets.

<b>SEMESTER IV</b>
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<b>MCA404</b>	<b>UNIX AND NETWORK PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **INTRODUCTION AND FILE SYSTEM**

Overview of UNIX OS - File I/O – File descriptors – File sharing - Files and directories – File types - File access permissions – File systems – Symbolic links - Standard I/O library – Streams and file objects – Buffering - System data files and information.

### **PROCESSES**

Environment of UNIX process – Process termination – Command line arguments - Process control – Signals – Threads.

### **INTERPROCESS COMMUNICATION**

Introduction - Message passing (SVR4) – Pipes – FIFO – Message queues - Synchronization (SVR4) – Mutexes – Condition variables – Read – Write locks – File locking – Record locking – Semaphores – Shared memory (SVR4).

### **SOCKETS**

Introduction – Transport layer – Socket introduction - TCP sockets – UDP sockets - Raw sockets.

### **APPLICATIONS**

Debugging techniques - TCP echo client server - UDP echo client server – Ping - Trace route - Client server applications like file transfer and chat.

**TEXT BOOKS**

1. Richard Stevens, W., Advanced programming in the UNIX environment, Addison Wesley, 1999.
2. Bill Fenner, W., Andrew Rudoff, Unix Network Programming Volume
3. 1, The Sockets Networking API , 3<sup>rd</sup> Edition, Pearson Education, Nov 2003.

**REFERENCE**

1. Meeta Gandhi, Tilak Shetty and Rajiv Shah , The 'C' Odyssey Unix – The open Boundless C, 1<sup>st</sup> Edition, BPB Publications, 1992.

<b>MCA405</b>	<b>SOFTWARE QUALITY MANAGEMENT</b>			
	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Introduction to software quality – Establishment of software quality program – Software quality assurance planning and management – Case study - Y2K.

**MODELS**

Software development process models – Reliability and projection models – Exponential reliability growth models – Quality management models.

**SOFTWARE QUALITY**

Software quality standards - Review and audits – Documentation and verification – Document audit verification.

**TESTING**

Test plan focus area – Testing for recoverability – Planning for trouble – Developing good test program – Case study - Testing real memory management.

**QUALITY ASSESSMENT**

In - process quality assessment - Software project assessment – Dos and Don'ts in software process improvements – Stages of software process improvement sequence.

**TEXT BOOKS**

1. Mordechai Ben - Menachem, Garry Marliss, S., Software Quality, Producing Practical Consistent Software, Vikas Publishing House, 2003.
2. Stephen Khan, H., Metrics and Models in Software Quality Engineering, Pearson Education, 2003.

**REFERENCE**

1. Loveland, Miller, Prewitt, Shannon, Software Testing Techniques, Charles River Media Inc., 2005.

<b>MCA406</b>	<b>VISUAL PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**WINDOWS PROGRAMMING**

Overview of windows programming - Data type, Resources, Window messages - GDI – Device Context - Keyboard and mouse messages – SDK tools.

**VISUAL BASIC PROGRAMMING**

Fundamentals - Graphics application controls - File system controls – Database controls – Database applications.

**VISUAL C++ PROGRAMMING**

Resources – Menus, Dialog boxes, Toolbar, Bitmap, Icon, Cursor – Components - Color and Font dialog boxes - Controls, Event handling.

**DOCUMENT VIEW ARCHITECTURE**

Framework classes – VC++ Components - Event handling – Message dispatch system - Menus – Accelerators - MDI, SDI documents, Splitter windows.

**ADVANCED CONCEPTS**

ActiveX and OLE - Database management with MS ODBC – DLL - COM.

**TEXT BOOKS**

1. Charles Petzold, Windows Programming, Microsoft Press, 1996.
2. David Kruglinski, J., George Shepherd and Scot Wingo, Programming Visual C++, Microsoft Press, 1999.

**REFERENCES**

1. Evangelos Petroustos, Mastering Visual Basic 6, 2<sup>nd</sup> Edition, Sybex Publication, 1998.
2. David Kruglinski, J., George Shepherd, Scott Wingo, Inside Visual C++, Microsoft Press, 1999.

<b>MCA483</b>	<b>VISUAL PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Programs using Application wizard.
2. SDI, MDI Drawing inside the view window, Device Context.
3. Program to handle Basic events.
4. The message map, saving the view's state, initializing a view class data member.
5. Programs using graphical devices interface objects.
6. Program to display modal and modeless dialogs.
7. Program using Static and dynamic controls.
8. Program using document – view architecture.
9. Programs with toolbars and status bars.
10. Program using SDI and MDI serialization.

11. Program to create dynamic link libraries using MFC.
12. Program to interface with database.

<b>MCA484</b>	<b>UNIX AND NETWORK PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Program Using basic network commands.
2. Program using system Calls.
3. Program to implement interprocess communication using pipes.
4. Program to perform interprocess communication using message queues.
5. Program to perform interprocess communication using shared memory.
6. Program to perform synchronization using semaphores.
7. Program to capture packets - Sniffer.
8. Program using TCP sockets ( Client and Server).
9. Programs using UDP Sockets ( Client and Server).
10. Program using class to download webpages.

#### SEMESTER V

<b>MCA501</b>	<b>MIDDLEWARE TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

#### **CLIENT/SERVER CONCEPTS**

Client – Server – File server – Database server – Group server – Object server – Web server – Client server building blocks – RPC – Messaging – Peer – to – Peer.

#### **EJB**

EJB fundamentals – EJB architecture – Deploying EJB components – Session Beans – Entity Beans – Building and deploying EJB.

**CORBA**

Object management group – Object management architecture – CORBA – OMG - Interface Definition language – ORB and Object interfaces – The Portable object adapter – Language Mapping – Interoperability – Typecode – Dynamic interfaces – Interface repository.

**COM**

Introduction – components – Interface – Query interface – Reference counting – Dynamic Linking.

**.NET**

Introduction - .NET objects – Using COM objects from .NET – Using .NET objects from COM – ASP .NET – State management – Process management.

**TEXT BOOKS**

1. Robert Orfali, Dan Harkey and Jeri Edwards , The essential Clinet / Server Survival Guide, 3<sup>rd</sup> Edition, Galgotia publications pvt. Ltd., 2002.
2. Ed Roman, Rima Patel, Sriganesh, Gerald Brose, Mastering Enterprise JAVA Beans, Wiley Dreamtech India, 2005.
3. Gerald Brose, Andreas Vogel and Keith Duddy, Java Programming with CORBA, Wiley Dreamtech India, 2005.

**REFERENCES**

1. Dale Rogerson, Inside COM , WB Publication, 2003.
2. David Platt, S., Introducing Microsoft .NET, 3<sup>rd</sup> Edition, PHI, 2003.

<b>MCA502</b>	<b>COMPUTER GRAPHICS AND MULTIMEDIA APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Introduction–Raster scan display – Random scan display – Graphics devices Graphics algorithms for line, circle and ellipse generation - Filling algorithms.

### **2-D CONCEPTS**

2D geometric transformations – 2D viewing.

### **3-D CONCEPTS**

Introduction to 3D concepts – 3D object representation – 3D modeling.

### **VIDEO AND ANIMATION**

Introduction – Media and data stream – Audio – Image and graphics – Video and animation.

### **DATA COMPRESSION AND MULTIMEDIA**

Data compression – Multimedia operating system – Multimedia communication system – Multimedia application.

### **TEXT BOOKS**

1. Donald Hearn, Pauline Baker, M., Computer Graphics , 3<sup>rd</sup> Edition, Eastern Economy Publication.
2. Raff Steinmetz, Klara Nahrstedt, Computing, Communication and Application – Multimedia, Pearson Education, 2004.

### **REFERENCES**

1. Simon J. Gibbs, Dionysios, Tsihristzis, C., Multimedia Programming, Addison Wesley, 1995.
2. John Villamil, Casanova, Leony Fernandez, Eliar, Multimedia Graphics, PHI, 1998.

<b>MCA581</b>	<b>GRAPHICS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Generating lines using line drawing algorithms.
2. Generating circles using circle generation algorithms .
3. Generating ellipse using ellipse generation algorithms.
4. Filling shapes using filling algorithms.
5. Scaling, rotating and translating an object in 2D.
6. Clipping a line using line clipping algorithm.
7. Clipping a polygon using polygon clipping algorithm.
8. Animation program.
9. Creating a presentation using a multimedia tool.
10. Animation and Morphing using multimedia tool.

<b>MCA582</b>	<b>MIDDLEWARE LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Creating Active-X control for File operations.
2. Creating a distributed application to download various files from various servers using RMI.
3. Creating a Java Bean to draw various graphical shapes and display it using BDK.
4. Creating a Java Bean to draw various graphical shapes and display it without using BDK.
5. Developing an Enterprise Java Bean application using session bean.
6. Developing an Enterprise Java Bean application using entity bean.
7. Developing a component for an application of your choice using COM.
8. Developing a component for an application of your choice using .NET.
9. Developing a component for retrieving information from message box using DCOM.

10. Develop a middleware component for an application of your choice using CORBA.

<b>MCA607</b>	<b>MICROPROCESSOR AND ITS APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION TO 8085 MICROPROCESSOR**

Evolution of the microprocessor - INTEL 8085 - Introduction, Register Architecture, Memory addressing, 8085 Addressing modes, 8085 Instruction set, Timing methods, 8085 Pins and signals, 8085 Instruction timing and execution, Interrupts, DMA, Serial port, 8085 Based system design.

### **INTRODUCTION TO 8086 MICROPROCESSOR**

Introduction - 8086 Architecture, 8086 Addressing modes, 8086 Instruction set - Data movement instructions, Arithmetic and logic instructions, Program control instructions.

### **8086 MICROPROCESSOR INTERFACING**

System design using 8086 - Basic system concepts, Bus cycle, Address and data bus concepts - Interfacing with memories - RAM, EPROM, DRAMs, Programmed I/O, 8086-Based microcomputer.

### **80386 AND PENTIUM MICROPROCESSORS**

Introduction to intel 80386 - Basic programming model, Memory organization, I/O space, 80386 Pins and signals, Bus transfer techniques, 80386 Modes – Introduction to intel pentium microprocessor - Block diagram and registers.

### **PERIPHERAL INTERFACING**

Keyboard display interface - Hex key and display interface to 8085, 8279 Keyboard display controller chip - Printer interface - LR 7040 printer interface using 8295 printer controller -CRT controller interface - CRT fundamentals, 8275 CRT controller, Coprocessors.

**TEXT BOOK**

1. Mohamed Rafiquzzaman, Introduction to Microprocessors and Microcomputer - Based System Design, CRC Press, 2<sup>nd</sup> Edition, 1995.

**REFERENCES**

1. Walter Triebel, A., Avtar Singh, The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware and Applications, Prentice Hall of India Pvt. Ltd., 2002.
2. Barry Brey, B., The INTEL microprocessors 8086/8088, 80186, 80286, 80386 and 80486 Architecture, Programming and Interfacing, Prentice Hall of India, 2001.

<b>MCA608</b>	<b>SYSTEM SOFTWARE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION AND ASSEMBLERS**

Introduction to system software and Machine architecture, SIC, Traditional machines, RISC machines, Basic assembler functions, Machine dependent and machine independent Assembler features, Assembler design options, Implementation examples.

**LINKERS AND LOADERS**

Basic loader functions, Machine dependent and machine independent assembler features, Loader design options, Implementation examples.

**MACROPROCESSORS**

Basic macro processor Functions, Machine independent macro processor features, Macro processor design options, Implementation examples.

**COMPILERS**

Basic compiler functions, Machine dependent and Machine independent compiler features, Compiler design options, Implementation examples.

**EDITORS AND DEBUGGING SYSTEMS**

DBMS – Text editors – Interactive debugging systems.

**TEXTBOOK**

1. Leland Beck, L., System Software : An Introduction to Systems Programming, 3<sup>rd</sup> Edition., Addison Wesley.

**REFERENCE**

1. Dhamdhare, Systems Programming and Operating Systems, McGraw-Hill Education, New Delhi, 2003.

<b>MCA609</b>	<b>ADVANCED DATABASES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECT ORIENTED DATABASES AND OBJECT RELATIONAL DATABASES**

Object oriented databases - Complex data types, Object-oriented data model, Object-oriented languages, Persistent programming languages – Object relational databases - Nested relations, Complex types, Inheritance, Reference types, Querying with complex types, Functions and procedures, Object-oriented versus object-relational .

**DISTRIBUTED DATABASES AND PARALLEL DATABASES**

Distributed databases - Homogeneous and heterogeneous databases, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control in distributed databases, Availability, Distributed query processing, Heterogeneous distributed databases, Directory systems – Parallel databases - I/O parallelism, Inter query parallelism, Intra query parallelism, Intra operation parallelism, Inter operation parallelism, Design of parallel systems.

**SPECIALIZED DATABASES**

Spatial databases and spatial, Geographic data - Representation of geometric information - Design databases, Geographic data, Spatial queries, Indexing of spatial data – Temporal and time series databases - Time in databases- Time specification in SQL, Temporal query language.

**OTHER DATABASES**

Multimedia databases – Multimedia data formats, Continuous media data, Similarity-based retrieval - Web databases – Web fundamentals, URL, HTML, Client side scripting and Applets, Web servers and sessions, Servlets, Server side scripting, Improving performance.

**CURRENT ISSUES**

Rules - Active and deductive databases - Security - Integrity - Consistency - Database Tuning optimization and Research issues.

**TEXT BOOKS**

1. Henry Korth, F., Abraham Silberchatz, Sudarshan, S., Database System Concepts, 4<sup>th</sup> Edition , Mc Graw Hill International Editions.
2. Elmasri, R., Navathe, S.B., Fundamentals of Database Systems , Addison Wesley, 2000.

**REFERENCES**

1. Gary Hanson,W., James Hanson, V., Database Management and Design, Prentice Hall of India Pvt. Ltd., 1999.
2. Alex Benson, Stephen Smith and Kurt Thearling, Building Data Mining Applications for CRM, Tata McGraw-Hill, 2000.
3. Stefano Ceri, Giuseppe Pelagatti, Distributed Databases: Principles and Systems , Mc Graw-Hill Computer Science Series.

<b>MCA610</b>	<b>DISTRIBUTED COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Characterization of distributed systems - Examples - Resource sharing and the web - Challenges - System models - Architectural and fundamental Models - Networking and internetworking - Types of networks - Network principles - Internet protocols .

### **PROCESSES AND DISTRIBUTED OBJECTS**

Interprocess communication - The API for the internet Protocols - External data representation and marshalling - Client-server communication - Group communication - Case study - Distributed objects and remote invocation - Communication between distributed objects - Remote procedure call - Events and notifications - Java RMI - Case study.

### **OPERATING SYSTEM ISSUES – I**

The OS layer - Protection - Processes and threads - Communication and invocation – OS architecture - Security - Overview - Cryptographic algorithms - Digital signatures - Cryptography pragmatics - Case studies - Distributed file Systems - File service architecture - Sun network file system - The Andrew file system.

### **OPERATING SYSTEM ISSUES – II**

Name services - Domain name system - Directory and discovery services - Global name service - X.500 Directory service - Clocks, Events and process states - Synchronizing physical clocks - Logical time and logical clocks - Global states - Distributed debugging - Distributed mutual exclusion – Elections – Multicast communication related problems.

### **DISTRIBUTED TRANSACTION PROCESSING**

Transactions - Nested transactions - Locks - Optimistic concurrency control - Timestamp ordering - Comparison - Flat and nested distributed transactions - Atomic commit protocols - Concurrency

control in distributed transactions - Distributed deadlocks - Transaction recovery - Overview of replication and distributed multimedia systems.

**TEXT BOOK**

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, 3<sup>rd</sup> Edition, Pearson Education, 2002.

**REFERENCES**

1. Sape Mullender, Distributed Systems, 2<sup>nd</sup> Edition, Addison Wesley, 1993.
2. Albert Fleishman Springer-Verlag, Distributed Systems - Software Design and Implementation, 1994.
3. Liu, M.L., Distributed Computing Principles and Applications, Pearson Education, 2004.
4. Andrew Tanenbaum , S., Maarten van Steen, Distributed Systems –Principles and Paradigms, Pearson Education, 2002.
5. Mugesh Singhal, Niranjan Shivaratri, G., Advanced Concepts in Operating Systems, Tata McGraw Hill Edition, 2001.

<b>MCA611</b>	<b>DATA MINING AND DATA WAREHOUSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Introduction to data mining and data warehousing – Relation to statistics, Databases and machine learning, Taxonomy of data mining tasks, Steps in data mining process, Overview of data mining techniques - Data warehousing – Design, Dimensional modeling, Metadata, Performance issues and indexing VLDB issues, Development life cycle, Merits .

**VISUALIZATION AND STATISTICAL PERSPECTIVE**

Visualization - Data preprocessing – Dimension reduction techniques, Data summarization methods - Data mining primitives,

Languages and system architectures - Characterization - Comparison - Mining association rules.

### **CLASSIFICATION PREDICTION AND CLUSTERING**

Predictive modeling - Classification – Prediction – Regression - Probabilistic and Deterministic Models - Cluster analysis.

### **MINING COMPLEX TYPES OF DATA**

Mining spatial and time-series data – Spatial data cube construction and spatial OLAP, Spatial association analysis, Spatial clustering methods, Spatial classification and spatial trend analysis, Mining raster databases – Mining Time series and Sequence data - Trend analysis, Similarity search in time-series analysis, Sequential pattern mining, Periodicity analysis.

### **APPLICATIONS AND CASE STUDY**

Applications of data mining and Data warehouses, Commercial data mining systems, Social impacts of Data mining - Case study.

### **TEXT BOOK**

1. Jiawei Han, Micheline Kamber, Data mining concepts and techniques, Morgan Kaufmann Publishers, 2001.

### **REFERENCE**

1. Ralph Kimball, The Data warehouse Life cycle toolkit, John Wiley and sons Inc., 1998.

<b>MCA612</b>	<b>ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **OVERVIEW**

Overview of AI – What is AI?, Importance of AI, Easy work in AI, AI and related files - Knowledge - General concepts, Definition and importance of knowledge, Knowledge based system, Representation of knowledge, Organization, Manipulation - Programming languages - AI programming language, Introduction to LISP, Basic list manipulation, Functions, Predicates and conditionals, I/O and local variables.

### **KNOWLEDGE REPRESENTATION**

Formalized symbolic logic – Introduction, Propositional logic, Syntax and semantics for FOPL, Properties of WFFS, Conversion to clausal form - Inconsistencies and uncertainties – Truth maintenance system, Default reasoning, Predicate completion and circumscription - Probabilistic reasoning – Introduction, Bayesian probabilistic reference, Possible world representation, Dempster\_sheifer theory - Structured knowledge – Associative networks frame structure, Conceptual dependency and scripts - Object oriented representations.

### **KNOWLEDGE ORGANIZATION AND MANIPULATION**

Search and control strategies – Preliminary concepts, Examples of search problems, Unformed blind search, Informed search - Matching techniques – Structures used in matching, Measurement for matching, Matching patterns, Partial matching, Fuzzy matching, RETE matching - Knowledge organization and management.

### **PERCEPTION, COMMUNICATION AND EXPERT SYSTEM**

Natural language processing – Introduction, Overview of linguistic, Grammars and languages, Basic parsing techniques, Semantic analysis and representation, Natural language generation - Pattern recognition – Visual image understanding – Expert systems architectures.

**KNOWLEDGE ACQUISITION**

General concepts – Introduction, Types of learning, General learning model - Machine learning – Perception, Checker playing, Genetic algorithm - Learning by induction –Analogical and explanation based learning.

**TEXT BOOK**

1. Dan Patterson W., Artificial Intelligence and Expert systems, PHI , 1998.

**REFERENCE**

1. Elaine Rich and Kevin Knight, Artificial Intelligence ,2<sup>nd</sup> Edition, Tata McGraw Hill, 2005.

<b>MCA613</b>	<b>NEURAL NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Elementary neurophysiology – ANS - From neurons to ANS, ANS simulation - Adaline and madaline - Review of signal processing, Adaline and ALC - Applications of adaptive signal processing, madaline, Simulating the adaline, Back propagation, BPN, Generalized delta rule , Applications, Simulator.

**BAM AND CPN**

Associative Memory Definitions – BAM, The Hopfield Memory, Simulating the BAM – Boltzmann machine, Simulator – The Counter propagation network – CPN building blocks, CPN data processing, CPN simulator.

**SOM AND NEOCOGNITRON**

Self-Organizing maps – SOM data processing, Applications, Simulating the SOM – ART network description, ART1, ART2 simulators - Spatiotemporal pattern classification - The formal avalanche, Architecture of STNS, Applications, Simulations –

Neocognitron – Architecture, Data processing , Performance of the neocognitron.

### **FUZZY SET THEORY**

Fuzzy Vs Crisp – Crisp Sets, Fuzzy Sets, Crisp relations, Fuzzy relations, Fuzzy sets, Crisp logic, Predicate logic, Fuzzy logic, Fuzzy rule based system , Defuzzification methods, Applications.

### **GENETIC ALGORITHMS**

Fundamentals – History of genetic algorithms, Basic concepts, Creation of offsprings, Working principle, Encoding, Fitness function, Reproduction, Genetic modeling - Inheritance operators - Cross over, Inversion and deletion, Mutation operators, Bitwise operators, Generation cycle, Convergence of genetic algorithms, Applications, Advances in GA.

### **TEXT BOOKS**

1. James Freeman, A., David Skapura, M., Neural Networks Algorithms, Applications and Programming Techniques, Pearson Education, Asia, 2001.
2. Rajasekaran, S., Vijayalakshmi Pai, G.A., Neural Networks Fuzzy Logic And Genetic Algorithms, 1<sup>st</sup> Edition, Prentice Hall of India.

### **REFERENCE**

1. Bart Kosko, Neural Networks and Fuzzy Systems, Prentice Hall India Pvt. Ltd., 2005.

<b>MCA614</b>	<b>EMBEDDED SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION TO EMBEDDED SYSTEMS**

Introduction - Definitions, Applications, Categories of embedded System – Characteristics of embedded System - Reliability, Performance, Power consumptions, Cost and Size, Limited user

interface, Software up gradation capability, Recent trends in embedded systems.

### **ARCHITECTURE OF EMBEDDED SYSTEMS**

Hardware architecture – Software architecture – Application software – Communication software – Process of generating executable image – Basic programming of embedded systems - Overview of embedded C - Memory management, Timing of programs, Device drivers, Code optimization.

### **PROGRAMMING EMBEDDED SYSTEMS**

Embedded program – Role of infinite loop, Compiling, linking and locating – Downloading and debugging – Emulators and simulators processor – External peripherals – Topper of memory – Memory testing – Flash memory.

### **REAL TIME OPERATING SYSTEM**

Real time operating systems - Real-Time and embedded system operating systems, Interrupt routines in RTOS environment - Handling of interrupt source call by the RTOSs , RTOS takes scheduling models, Interrupt latency and response time of the tasks as performance metrics, Performance metrics in scheduling model for periodic, sporadic and aperiodic tasks , List of basic actions in a preemptive scheduler and expected times taken at a processor, Fifteen-point strategy for synchronization between the processors, ISRs, OS functions and tasks and for resource management – Embedded Linux internals - Linux kernel for the device drivers and embedded system, OS security issues.

### **DESIGN CYCLE FOR EMBEDDED SYSTEM**

Case study of an embedded system for a smart card – Hardware – Software codesign in an embedded system - Embedded system project management - Embedded system design and codesign issues in system development process – Design cycle in the development phase for an embedded system – Users of target system or its

emulator and incircuit emulator (ICE) – Use of software tools for development of an embedded system – Use of scopes and logic analyses for system hardware tests – Issues in embedded system design.

### TEXT BOOK

1. Dr. Prasad, K. V. K. K., Embedded / Real Time Systems: Concepts, Design and Programming, Dreamtech Press, 2005.
2. Raj Kamal, Embedded systems – Architecture, Programming and Design, Tata McGraw-Hill, 2003.

### REFERENCES

1. David Simson, E., An Embedded Software Primer, Addison Wesley, 2001.
2. Frank Vahid and Tony Givargis, Embedded system design, John Wiley and Sons Inc., 2002.

<b>MCA615</b>	<b>MOBILE COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### WIRELESS TRANSMISSION

Introduction - Applications, Reference model - Wireless transmission - Signal propagation, Multiplexing, Modulation, Spread spectrum.

### MEDIUM ACCESS CONTROL

SDMA – FDMA – TDMA – Fixed TDMA, Classical Aloha, Slotted Aloha, CSMA, Demand assigned MA, PRMA, Reservation TDMA, MA with collision avoidance, Polling, ISMA– CDMA – Telecommunications system - GSM , DECT, TETRA, UMTS and IMT-2000.

**SATELLITE SYSTEMS**

Basics of satellite communication - GEO, LEO, MEO – Broadcast System - Overview of broadcasting, Digital audio broadcasting, Digital video broadcasting.

**WIRELESS NETWORKS**

IEEE 802.11 – Architecture, Protocol, MAC layer, Physical layer, 802.11b, 802.11a -HIPERLAN – HIPERLAN1,WATM, BRAN, HiperLAN2 – Bluetooth - Architecture, Radio layer, Base band layer, Link manager protocol, Security, SDP, Profiles.

**MOBILE LAYERS**

Mobile IP – Dynamic host configuration protocol – Mobile ad-hoc networks – WAP -Architecture, WAP, Wireless transport layer security, Wireless transaction protocol, Session protocol, Wireless markup language, WML script, Wireless telephony application, Push architecture, Push / Pull services.

**TEXT BOOK**

1. Jochen Schiller, Mobile Communication, 2<sup>nd</sup> Edition, Pearson Education, 2004.

**REFERENCE**

1. William Lee, C.Y., Mobile Communication Engineering, 2<sup>nd</sup> Edition, McGraw Hill.

<b>MCA616</b>	<b>COMPUTER SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Introduction – Conventional encryption - Classical and modern techniques, algorithms - Confidentiality using conventional encryption .

**CRYPTOGRAPHY**

Public key cryptography – Introduction to number theory – Message authentication.

**AUTHENTICATION**

MAC algorithms – Authentication protocols and applications.

**HASH FUNCTION**

Hash algorithms – MD5 - Secure hash algorithm - RIPEMD-160, HMAC - Digital Signatures - Authentication protocol, Digital signature standards - Authentication protocols and Applications - Kerberos – X.509 authentication service.

**SECURITY**

E-Mail Security – IP security – Web security intruders – Viruses – Worms – Firewalls.

**TEXT BOOK**

1. William Stallings , Cryptography and Network Security, 3<sup>rd</sup>Edition, Pearson Education, 2003.

**REFERENCE**

1. Charles PFleeger, Shari Lawrence PFleeger, Security in Computing, 3<sup>rd</sup> Edition, Pearson Education, 2004.

<b>MCA617</b>	<b>TCP / IP PROTOCOL SUITE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Introduction – OSI Model and TCP/IP protocol – Underlying technologies – IP addresses - classful and Classless Addressing.

**INTERNET PROTOCOL**

Delivery, Forwarding and routing of IP packets – ARP and RARP – IP – ICMP – IGMP.

**TRANSMISSION CONTROL PROTOCOL**

UDP – TCP – SCTP – Unicast Routing protocols - Multicasting and Multicast routing protocols.

**APPLICATION LAYER AND PROTOCOL**

Host configuration – DNS – Remote login - Telnet - File Transfer Protocols - Electronic Mail - SMTP, POP, IMAP – SNMP – WWW - HTTP.

**IP AND VPN**

Internet Protocol and Virtual Private Network – Internet Protocol over ATM Mobile, Internet Protocol (IPV6) – Virtual Private Network.

**TEXT BOOK**

1. Behrouz Forouzan, A., TCP / IP Protocol Suite, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2006.

**REFERENCE**

1. Douglas Comer, E., David Stevens, L., Internetworking with TCP/IP – Volume I, II and III, 2<sup>nd</sup> Edition, Prentice Hall of India Pvt. Ltd., 1994.

<b>MCA618</b>	<b>COMPONENT BASED TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Windows DNA – Designing multi tiered component architectures.

**COM**

Persistent storage - Monikers – Connectable objects – COM threading – COM and the registry – COM optimization, Inheritance and aggregation.

**DCOM**

Using DCOM with the NT Services – Marshalling – Security – Configuration and error handling.

**MTS**

MTS architecture and administration – MTS as a component manager – MTS as a transaction coordinator – MTS security – COM transaction integrator.

**MSMQ**

Programming Loosely Coupled Systems - MSMQ administration and architecture - Programming the MSMQ - Advanced MSMQ programming - Introducing COM+, Programming COM+ services.

**TEXT BOOK**

1. Randy Abernethy, COM / DCOM, Tech Media, 1999.

**REFERENCE**

1. Dale Rogerson, Inside COM, WB Publication, 2003.

<b>MCA619</b>	<b>COMPUTER ANIMATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Introducing web technologies – Structure of a page – Elements - Lists – Editing text – Links and navigation – Hyperlinks, Anchors and mailto Links – Defining a configuring a website.

**IMAGE HANDLING**

Displaying images – Optimizing and creating images – Creating image maps and navigation bars – Adding multimedia to a web page – Managing assets using the assets panel.

**PAGE LAYOUT AND TABLES**

Displaying data in tables – Designing page layout using tables – Using frames to display multiple web pages.

**HTML AND SCRIPTS**

Using Dynamic HTML and layers – Formatting web pages – Adding interactivity – Form creation – Scripts.

**MULTIMEDIA**

Creating clippings - Animations with sound effects - Adding audio or Video - Windows Media Player ActiveX Control - Agent control - Embedding VRML in a web page - Real Player ActiveX control - Graphics - Animations and Interaction.

**TEXT BOOKS**

1. Jon Duckett, Beginning Web Programming with HTML, XHTML, CSS and JavaScript, Wiley Dreamtech India, 2005.
2. Besty Bruce, Macromedia Dreamweaver'8, Pearson Education, 2006.

**REFERENCES**

1. James Mohles, L., Flash 5.0 Graphics, Animation and Interaction, Macromedia 2000.
2. Richard Schrand, Photoshop 6 Visual Jumpstrat, Adobe Press 2000.

<b>MCA620</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**DIGITAL IMAGE FUNDAMENTALS**

Image formation, Image transforms – Fourier transforms, Walsh, Hadamard, Discrete cosine, Hotelling transforms.

**IMAGE ENHANCEMENT AND RESTORATION**

Histogram modification techniques - Image smoothening - Image sharpening - Image restoration - Degradation model – Noise models - Spatial filtering – Frequency domain filtering.

**IMAGE COMPRESSION AND SEGMENTATION**

Compression Models - Elements of information theory - Error free compression - Image segmentation – Detection of discontinuities - Edge linking and boundary detection - Thresholding – Region based segmentation - Morphology.

**REPRESENTATION AND DESCRIPTION**

Representation schemes - Boundary descriptors - Regional descriptors - Relational descriptors.

**OBJECT RECOGNITION AND INTERPRETATION**

Patterns and pattern classes - Decision - Theoretic methods - Structural methods.

**TEXT BOOK**

1. Gonzalez, R.C., Woods, R.E., Digital Image Processing, 2<sup>nd</sup> Edition, Pearson Education ,2002.

**REFERENCES**

1. Anil Jain, K., Fundamentals of Digital image Processing, Prentice Hall of India, 1989.
2. Sid Ahmed, Image Processing, McGraw Hill, New York, 1995.

<b>MCA621</b>	<b>AGENT BASED INTELLIGENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Definitions - Foundations - History - Intelligent Agents - Problem solving - Searching - heuristics - Constraint satisfaction problems - Game playing.

### **KNOWLEDGE REPRESENTATION AND REASONING**

Logical agents - First order logic - First order inference – Unification – Chaining - Resolution strategies - Knowledge representation – Objects - Actions - Events.

### **PLANNING AGENTS**

Planning problem - State space search - Partial order planning – Graphs - Nondeterministic Domains - Conditional planning - Continuous planning - Multi agent planning.

### **AGENTS AND UNCERTAINTY**

Acting under uncertainty – Probability notation - Bayes rule and use - Bayesian networks -Other Approaches - Time and uncertainty - Temporal models - Utility theory - Decision network – Complex decisions.

### **HIGHER LEVEL AGENTS**

Knowledge in Learning - Relevance information - Statistical learning methods -Reinforcement learning – Communication - Formal grammar - Augmented grammars - Future of AI.

### **TEXT BOOK**

1. Stuart Russell and Peter Norvig, Artificial Intelligence - A Modern Approach, 2<sup>nd</sup> Edition, Prentice Hall, 2002.

**REFERENCES**

1. Michael Wooldridge, An Introduction to Multi Agent System, John Wiley, 2002.
2. Patrick Henry Winston, Artificial Intelligence, 3<sup>rd</sup> Edition, AW, 1999.
3. Nils Nilsson, J., Principles of Artificial Intelligence, Narosa Publishing House, 1992.

<b>MCA622</b>	<b>SOFTWARE AGENTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**AGENT AND USER EXPERIENCE**

Interacting with agents - Agent from direct manipulation to delegation - Interface agent metaphor with character - Designing agents - Direct manipulation versus agent path to predictable.

**AGENTS FOR LEARNING IN INTELLIGENT ASSISTANCE**

Agents for information sharing and coordination - Agents that reduce work information Overhead - Agents without programming language - Life like computer character - S/W agents for cooperative learning - Architecture of intelligent agents.

**AGENT COMMUNICATION AND COLLABORATION**

Overview of agent oriented programming - Agent communication language - Agent based framework of interoperability.

**AGENT ARCHITECTURE**

Agents for information gathering - Open agent architecture - Communicative action for artificial agent.

**MOBILE AGENTS**

Mobile agent paradigm - Mobile agent concepts - Mobile agent technology - Case study - Tele script, Agent tel.

**TEXT BOOKS**

1. Jeffrey Bradshaw, M., Software Agents, MIT Press, 2000.
2. William Cockayne, R., Michael Zyda, Mobile Agents, Prentice Hall, 1998.

**REFERENCES**

1. Russel and Norvig, Artificial Intelligence: A Modern Approach, 2<sup>nd</sup> Edition, Prentice Hall 2002.
2. Joseph Bigus, P., and Jennifer Bigus, Constructing Intelligent agents with Java: A Programmer's Guide to Smarter Applications, Wiley, 1997.

<b>MCA623</b>	<b>NATURAL LANGUAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Speech and language processing – Ambiguity – Models and algorithms – Language – Thought – Understanding – Brief history – Regular expressions – Automata – Morphology and finite state transducers – Computational phonology and text-to-speech.

**PROBABILISTIC MODELS AND SPEECH RECOGNITION**

Spelling - Bayesian method – Weighted automata – N-grams – Smoothing – Entropy – HMMs and speech recognition – Speech recognition architecture – Hidden Markov models – Decoding – Acoustic processing – Speech recognizer – Speech synthesis.

**SYNTAX**

Word classes and part-of-speech tagging – Tag sets – Transformation based tagging – Context free rules and trees – The noun phrase – Co-ordination – Verb phrase – Finite state and context free grammars – Parsing with context free grammars.

**UNIFICATION AND PROBABILISTIC PARSING**

Features – Implementing unification – Unification constraints – Probabilistic context free grammars – Problems – Lexicalized context free grammars – Dependency grammars – Human parsing – Language and complexity.

**SEMANTICS**

Representing meaning – First order predicate calculus – Semantic analysis – Attachments – Idioms – Compositionality – Robust semantic analysis – Lexical semantics – Selectional restrictions – Machine learning approaches – Dictionary based approaches – Information retrieval.

**TEXT BOOK**

1. Daniel Jurafsky and James Martin, H., Speech and Language Processing, Pearson Education, 2002.

**REFERENCES**

1. Michael Berry, W., Survey of Text Mining: Clustering, Classification and Retrieval Systems, Springer Verililag, 2003.
2. James Allen, Natural Language Understanding, Benjamin Cummings Publishing Co., 1995.

<b>MCA624</b>	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Basics – Object oriented philosophy, Object state, Behavior, Methods, Encapsulation and Information hiding, Associations, Aggregation, Meta classes, Identity, Dynamic binding - Object Oriented System Development Life Cycle.

**METHODOLOGY AND UML**

Methodology- Rumbaugh, Booch, Jacobson methodology, Patterns, Frameworks , Unified approach – Introduction to UML – UML

diagrams , Class diagrams , Use case diagrams, Static and dynamic Models , Model organization , Extensibility.

### **OBJECT ORIENTED ANALYSIS**

Object analysis – Business object analysis, Use case driven approach, Use case model, Documentation – Classification – Identifying object relationship, Attributes, Methods, Super and sub class, Object responsibility.

### **OBJECT ORIENTED DESIGN**

OO design process – Design axioms and Corollaries, Design classes, Class visibility, Refining attributes, Methods and protocols, Object storage and interoperability – Databases – Object relational systems – Designing interface objects – Macro and micro level processes, The purpose of a view layer interface.

### **SOFTWARE QUALITY**

Quality assurance - Testing strategies, Object orientation testing, Test cases, Test plan, Debugging principles – Testing – Usability testing, Satisfaction testing.

### **TEXT BOOK**

1. Ali Bahrami, Object Oriented System Development, McGraw Hill International Edition, 1999.

### **REFENENCES**

1. Craig Larman, Applying UML and Patterns, 2<sup>nd</sup> Edition, Pearson Education, 2002.
2. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Addison Wesley, 1999.

<b>MCA625</b>	<b>COMPILER DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION**

Compiler structure – Analysis – Synthesis model of compilation, Various phases of a compiler, Tool based approach to compiler construction.

### **LEXICAL ANALYSIS**

Interface with input, Parser and symbol table, Token, Lexeme and patterns, Difficulties in lexical analysis, Error reporting and implementation, Regular definition, Transition diagrams , LEX.

### **SYNTAX ANALYSIS**

Context free grammars, Ambiguity, Associativity, Precedence, Top down parsing, Recursive descent parsing, Transformation on the grammars, Predictive parsing, Bottom up parsing, Operator precedence grammars, LR parsers (SLR, LALR, LR), YACC.

### **INTERMEDIATE CODE GENERATION**

Intermediate code generation, Intermediate representations, Translation of declarations, Assignments, Intermediate Code generation for control flow, Boolean expressions, Procedure calls, Implementation issues.

### **CODE GENERATION**

Code generation and instruction selection – Issues, Basic blocks and flow graphs, Register allocation, Code generation – DAG representation of programs – Code generation from dags, Peep hole optimization, Code generators, Specifications of machine – Code optimization, Source of optimizations, Optimization of basic blocks, Loops, Global dataflow analysis, Solution to iterative dataflow equations – Code improving transformations – Dealing with aliases, Data flow analysis of structured flow graphs.

**TEXT BOOK**

1. Aho, A.V., Ravi Sethi, Ullman, J.D., Compilers - Principles, Techniques and Tools, Addison-Wesley, 2006.

**REFERENCES**

1. Kenneth Loudon, C., Compiler Construction Principles and Practice, Vikas publishing House, 2003.
2. Allen Holub, I., Compiler Design in C, Prentice Hall of India, 2001.
3. Aho, V., and Ullman, J.D., Theory of Parsing, Translation and Compiling (Vol 1: Parsing and Vol 2: Compiling), Prentice Hall, 1973.
4. Steven Muchnick, S., Advanced Compiler Design and Implementation, Morgan Kaufmann, 1997.

<b>MCA703</b>	<b>ELECTRONIC COMMERCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION AND INFRASTRUCTURE**

What is E-commerce, Internet and WWW - Economic forces and E-COM – Value chains in E-Com – Technology overview – Packet switched networks – Markup languages and web – Web clients and servers – Internets – Intranets – Extranets.

**WEB BASED TOOLS AND E-COM SOFTWARE**

Webserver hardware and performance Evaluation – Web server Software feature sets – Webserver softwares and tools – Other webserver tools – What kind of software solution do you need – Marketing Smarts – Hosting services – Basic Packages, Midrange packages.

**SECURITY THREATS AND IMPLEMENTING SECURITY**

Security overview – Intellectual property threats – E-Com threats – CERT, Protecting E-Com Assets – Protecting intellectual property –

Protecting client computers – Protecting E-COM Channels – Protecting commerce server.

**E- PAYMENTS**

E-Cash – Electronic wallets – Smart cards – Credit and charge cards – Case studies.

**STRATEGIES FOR MARKETING, PURCHASING-SALES AND SUPPORT ACTIVITIES**

Creating an effective presence – Identifying and reaching customers – Creating and Maintaining brands on the web – Business models for selling on the web – Purchasing – Logistics and support Activities – Electronic data interchange – Supply chain management – Software for purchasing logistics and support activities.

**TEXT BOOK**

1. Gary Scheider, P., James Perry, T., Thomas, E-Commerce, Course Technology, 2000.

**REFERENCES**

1. Pete Loshin, Electronic Commerce, 4<sup>th</sup> Edition, Firewall Media.
2. Greenstein , Electronic Commerce, Tata McGraw Hill Pvt. Ltd., 2000.

<b>MCA704</b>	<b>MANAGEMENT INFORMATION SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**SYSTEM CONCEPTS**

Definition – Computer based user machine system – Integrated system – Need for a database – Utilization of models – Evolution – Subsystems – Organizational subsystems – Activities subsystems.

**ORGANIZATIONAL STRUCTURE**

Basic model – Hierarchical – Specialization – Formalization – Centralization – Modifications of basic organizational structure – Project organization – Lateral relations – Matrix organization – Organizational culture and power organizational change.

**STRUCTURE OF MIS**

Operating elements – Physical components – Processing functions – Outputs – MIS support for decision making – Structured programmable decisions – Unstructured non-programmable decisions – MIS structure based on management activity and organizational functions – Synthesis of MIS structure.

**SYSTEM SUPPORT**

Data representation – Communication network – Distributed systems – Logical data concepts – Physical storage devices – File organizations – Data base organization – Transaction processing.

**DEVELOPMENT AND MANAGEMENT**

A contingency approach to choosing an application – Developing strategy – Lifecycle definition stage – Lifecycle development stage – Lifecycle installation and operation stage – Project management .

**TEXT BOOK**

1. Gordon Davis, B., Margrethe Olson, H., Management Information Systems: Conceptual foundations, Structure and development, 2<sup>nd</sup> Edition, Tata McGraw Hill International book company, 2000.

**REFERENCES**

1. Wainright Martin, E., Carol Brown, V., Daniel DeHayes, W., Jeffrey Hoffer, A., William Perkins, C., Managing Information Technology, 3<sup>rd</sup> Edition , Prentice Hall International Edition, 1999.

<b>MCA705</b>	<b>ENTERPRISE RESOURCE PLANNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION TO ERP**

Integrated management information seamless integration – Supply chain management – Integrated data model – Benefits of ERP – Business engineering and ERP – Definition of Business engineering – Principle of business engineering – Business engineering with information technology.

### **BUSINESS MODELLING FOR ERP**

Building the business model – ERP implementation – An overview – Role of consultant, Vendors and users, Customization – Precautions – ERP post implementation options – ERP implementation technology – Guidelines for ERP implementation.

### **ERP AND THE COMPETITIVE ADVANTAGE**

ERP domain MPGPRO – IFS/Avalon – Industrial and financial systems – Baan IV SAP -Market dynamics and dynamic strategy.

### **COMMERCIAL ERP PACKAGE**

Description – Multi-Client Server solution – Open technology – User interface – Application integration.

### **ARCHITECTURE**

Basic architectural concepts – The System control interfaces – Services – Presentation interface – Database interface.

### **TEXT BOOK**

1. Vinod Kumar Garg and Venkita Krishnan, N.K., Enterprise Resource Planning – Concepts and Practice, PHI, 1998.

### **REFERENCE**

1. Jose Antonio Fernandz, The SAP R/3 Handbook, Tata McGraw Hill, 1998.

<b>MCA706</b>	<b>MANAGERIAL ECONOMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial economics – Meaning, Nature and scope – Managerial economics and Business decision making – Role of managerial economist – Fundamental concepts of managerial Economics - Demand analysis – Meaning, Determinants and types of demand – Elasticity of demand – Demand function – Demand curve – Estimation of the demand Function.

### **SUPPLY, PRODUCTION AND COST ANALYSIS**

Supply – Meaning and determinants – Supply function - Meaning of production – Production analysis - Long run and short run – Production functions – Isoquants - Expansion path – Cobb – Douglas function – Cost concepts – Cost – Output relationship – Long run and short run – Economies and diseconomies of scale – Cost functions – Estimation of cost function.

### **MARKET STRUCTURE AND PRICE DETERMINATION**

Market structure – Perfect competition – Monopoly – Monopolistic competition – Oligopoly – characteristics – Pricing of goods and services – Pricing and output decisions – Price discrimination – Price determinants – Profit maximization and free pricing – Methods of pricing – Differential pricing – Government intervention and pricing.

### **PROFIT AND INVESTMENT ANALYSIS**

Profit - Meaning and nature – Profit policies – Profit planning and forecasting – Cost volume profit analysis – Investment analysis – Meaning and Significance – Time value of money – Cash flow and measures of investment worth – Payback period criterion – Average rate of return criterion – Net present value criterion – Internal rate of return criterion – Profitability – Index criterion.

**MACROECONOMIC ISSUE**

National income – Concepts – Determination of national income - Business cycle – Inflation and deflation – Types of inflation – Causes of inflation - Balance of payments – Account - Assessing the balance of payments figures – Monetary and fiscal policies – Attitudes towards monetary policy – Problems of monetary policies – Nature of fiscal policy – Effectiveness of fiscal policy.

**TEXT BOOK**

1. Gupta, V.G.S., Managerial Economics, Tata McGraw Hill, 1990.

**REFERENCES**

1. Joel Dean, Managerial Economics, Prentice Hall India, 1987.
2. Evan Douglas J., Managerial Economics, Prentice Hall International, 1987.

<b>MCA707</b>	<b>HUMAN RESOURCE MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT**

Evolution of human resource management – The importance of the human factor – Objectives of human resource management – Role of human resource manager – Human resource policies.

**THE CONCEPT OF BEST FIT EMPLOYEE**

Importance of human resource planning – Forecasting human resource requirements – Internal and external sources – Selection process.

**TRAINING AND EXECUTIVE DEVELOPMENT**

Types of training methods – Purpose – Benefits – Resistance – Executive development programmes – Common practices – Benefits – Self development – Knowledge management.

**SUSTAINING EMPLOYEES INTEREST**

Compensation plans – Rewards – Motivation – Theories of motivation career management – Developing mentor – Protege relationships.

**PERFORMANCE EVALUATION AND CONTROL PROCESS**

Methods of performance evaluation – Feedback – Industry practices, Promotion, Demotion, Transfer and separation – Implications of job change – The Control process – Importance – Methods.

**TEXT BOOK**

1. Decenzo and Robbins, Human Resource Management, Wiley and Sons, Singapore, 1999.

**REFERENCE**

1. Watts Humphrey, S., Managing Technical People: Innovation, Teamwork, and the Software Process, Addison-Wesley, 1996.

<b>MCA708</b>	<b>SUPPLY CHAIN MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**BASIC CONCEPTS**

Introduction to supply chain management (SCM) – Concept of SCM – Components of SCM, An overview – Features of SCM – Strategic issues in SCM – Systems view – SCM current scenario – Value chain management and customer relations management.

**INTERFACES WITH OTHER DISCIPLINES**

Marketing and supply chain interface – Customer focus in SCM – Demand planning, Purchase planning – Make or buy decision – Indigenous and global sourcing – Development and management of suppliers – Legal aspects of buying – Cost management – Negotiating for purchasing/subcontracting – Purchase insurance – Evaluation of purchase performance (performance indices) –

Inventory management – Finance and supply chain interface, Financial impact of inventory.

### **MANUFACTURING AND WAREHOUSING**

Manufacturing scheduling – Manufacturing flow system – Work flow automation – Flexibility in manufacturing to achieve dynamic optimization – Material handling system design and decision, Warehousing and store keeping – Strategies of warehousing and storekeeping – Space management.

### **LOGISTICS MANAGEMENT**

Logistics management – Role of logistics in SCM – Integrated Logistics management – Transportation design and decision – Multi modalism – Third party logistics services and providers – Facilities management (port / airport ICD's) channels of distribution – Logistics and customer service.

### **INFORMATION TECHNOLOGY AND SCM**

Information technology and SCM – EDI, ERP, Internet and intranet, E-Commerce, Bar coding, Telecommunication network, Advanced planning system, Decision support models for Supply chain management, Artificial intelligence for SCM- Best practice in supply chain management – Organizational issues to implement SCM.

### **TEXT BOOK**

1. Sahay, B.S., Supply chain management for global competitiveness, Mac Millan India Limited, 2000.

### **REFERENCES**

1. Donald Bowersox, J., and David Closs, J., Logistical Management, Tata McGraw-Hill Editions, New Delhi, 2000.
2. David Simchi-Levi, Designing and managing the supply chain, Tata McGraw-Hill Editions, New Delhi, 2000.

<b>MCA709</b>	<b>HEALTH CARE SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **PLANNING AND DEVELOPING AN IT STRATEGY**

Introduction – Mission of IT in health care – Creating a system – Managing the IT strategic planning – Process – Strategies in consulting for the 21st century – Baylor health care – Clarian health care.

### **PREPARING FOR ORGANIZATIONAL CHANGE**

Informatics in health care – Managing organizational change – The role of ethics in IT decisions – Cases in redesign – Memorial Hermann healthcare system – Redesign and implementation of a multi facility – Clinical information system – UPMC health system.

### **TRANSFORMATION**

IT – Transition fundamentals in care transformation – The role of the CIO – Northwestern Memorial Hospital – Chicago – Patients first from the ground up, The Jewish Home and Hospital Life Care System, NYC.

### **PATIENT-CENTERED TECHNOLOGIES**

Patient outcomes of health care – Six sigma excellence – Electronic health record – Interviewing patients with a computer – Nursing administration – A growing role in systems development – Computer – Enhanced radiology – Information technology and the new culture of patient safety – A component based clinical information and electronic health record.

### **OUTLOOK ON FUTURE TECHNOLOGIES**

Technologies in progress – Evidence based medicine – Aligning process and technology – Clinical decision support systems – Quality information and care – Role for health information systems – Clinical practice – Connecting the community for better health.

**TEXT BOOK**

1. Ball, Marion, Weaver, Charlotte A., Kiel, Joan M., Healthcare Information Management Systems Cases, Strategies, and Solutions Series: Health Informatics, Springer Berlin Heidelberg, 3<sup>rd</sup> Edition, New York, 2004.

**REFERENCE**

1. Karen Wager, A., Frances Wickham Lee, John Glaser Jossey-Bass, P., Managing Health Care Information Systems: A Practical Approach for Health Care Executives, 2005.

<b>MCA710</b>	<b>NUMERICAL AND STATISTICAL METHODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**LINEAR SYSTEM OF EQUATIONS**

Solution of systems of equations – Solution of simultaneous linear equations, Gauss elimination methods, Gauss jordan methods, Jacobi and gauss seidal iterative methods.

**NUMERICAL DIFFERENTIATION AND INTEGRATION**

Interpolation - Differentiation and integration, Difference table, Newton's forward and backward interpolation, Lagrangian interpolation, Differentiation formulae, Trapezoidal and simpson rule gaussian, Quadrature.

**DIFFERENTIAL EQUATIONS**

Ordinary differential equations – Taylor series and euler methods, Runge-Kutta methods, Predictor-corrector method , Milne and adam bashforth methods, Error analysis.

**PROBABILITY DISTRIBUTIONS**

Probability axioms - Bayes theorem, Discrete random variables and continuous random variables, Density and distribution functions,

Joint and marginal distributions, Conditional distributions, Characteristic function, Moment generating function, Expectation.

### **SAMPLING DISTRIBUTIONS**

Small sample - t-test, F-test,  $\chi^2$ -test, ANOVA one way classification and two way classification.

### **TEXT BOOKS**

1. Gewal, B.S., Numerical methods in Engineering and Science, Khanna Publishers, 1994.
2. Irwin Miller, Marylees Miller, Mathematical Statistics with Applications, 7<sup>th</sup> Edition, Prentice Hall of India, 2004.

### **REFERENCES**

1. Natarajan, M., and Tamilarasi, A., Probability Random Processes and Queuing theory, 2<sup>nd</sup> Edition, New Age International Publishers, 2005.
2. Gupta, S.K., Numerical Methods for Engineers, New age International Publishers, 1995.