

# Harcourt Butler Technological Institute Kanpur

## Study and Evaluation Scheme

### MCA (Master of Computer Applications)

#### YEAR - I, SEMESTER - I

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	IHU-103	Professional Communication	3	1	0	30	20	50	100	150
2	IHU-104	Accounting & Financial Management	3	1	0	30	20	50	100	150
3	ICA-101	Computer Concepts & Programming in C	3	1	0	30	20	50	100	150
4	IMA-102	Discrete Structures	3	1	0	30	20	50	100	150
5	ICA-102	Computer Organization	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	ICA-151	Programming Lab	0	0	3	30	20	50	50	100
7	IHU-153	Language Lab	0	0	3	30	20	50	50	100
8	IGP-101	General Proficiency						50		50
		<b>Total</b>	15	5	6	-	-	-	-	1000
<b>YEAR - I, SEMESTER - II</b>										
S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
			L	T	P	CT	TA	Total		
1	ICE-203	Environmental Science & Ethics	3	1	0	30	20	50	100	150
2	IMA-202	Computer Based Numerical & Statistical Techniques	3	1	0	30	20	50	100	150
3	ICA-201	Data Structures Using C	3	1	0	30	20	50	100	150
4	IHU-202	Organizational Structure & Human Resource Management	3	1	0	30	20	50	100	150
5	ICA-203	Operating Systems	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	ICA-251	Data Structures Lab	0	0	3	30	20	50	50	100
7	IMA-252	Numerical & Statistical	0	0	3	30	20	50	50	100

		Techniques Lab								
8	IGP-201	General Proficiency						50		50
		<b>Total</b>	15	5	6	-	-	-	-	1000

### YEAR - II SEMESTER - III

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM.			ESE	SUBJECT TOTAL
						CT	TA	Total		
1	HCA-301	Software Engineering	3	1	0	30	20	50	100	150
2	HCA-302	Design and Analysis of Algorithms	3	1	0	30	20	50	100	150
3	HCA-303	Database Management Systems	3	1	0	30	20	50	100	150
4	HCA-304	Internet & Web Technology	3	1	0	30	20	50	100	150
5	HCA-305	Computer Based Optimization Techniques	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	HCA-351	DBMS Lab	0	0	3	30	20	50	50	100
7	HCA-352	Web Technology Lab	0	0	3	30	20	50	50	100
8	HGP-301	General Proficiency						50		50
		<b>Total</b>	15	5	6	-	-	-	-	1000

### YEAR - II SEMESTER - IV

S.No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
			L	T	P	SESSIONAL EXAM.			ESE	SUBJECT TOTAL
						CT	TA	Total		
1	HCA-401	Java Programming	3	1	0	30	20	50	100	150
2	HCA-401	Management Information Systems	3	1	0	30	20	50	100	150
3	HCA-403	Computer Graphics and Animation	3	1	0	30	20	50	100	150
4	HCA-404	Fundamentals of E-Commerce	3	1	0	30	20	50	100	150
5	HCA-405	Computer Networks	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	HCA-451	Java Programming Lab	0	0	3	30	20	50	50	100
7	HCA-452	Mini Project	0	0	3	30	20	50	50	100
8	GP-401	General Proficiency						50		50
		<b>Total</b>	15	5	6	-	-	-	-	1000

**YEAR - III SEMESTER - V**

S.No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM.			ESE	SUBJECT TOTAL
L	T	P	CT	TA	Total					
1	HCA-501	Object Oriented Systems Modeling	3	1	0	30	20	50	100	150
2	HCA-511 to HCA-514	Elective-I	3	1	0	30	20	50	100	150
3	HCA-502	Dot Net Framework & C#	3	1	0	30	20	50	100	150
4	HCA-503	Advance Database Management Systems	3	1	0	30	20	50	100	150
5	HCA-521 to HCA-524	Elective-II	3	1	0	30	20	50	100	150
<b>PRACTICALS</b>										
6	HCA-551	Object Oriented System Lab	0	0	3	30	20	50	50	100
7	HCA-552	Dot Net Lab	0	0	3	30	20	50	50	100
8	HGP-501	General Proficiency						50		50
<b>Total</b>			15	5	6	-	-	-	-	1000

**YEAR - III SEMESTER - VI**

S.No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				
						SESSIONAL EXAM			ESE	SUBJECT TOTAL
L	T	P	CT	TA	Total					
1	HCA-601	Software Project Management	3	1	0	30	20	50	100	150
2	HCA-611 to HCA-614	Elective -III	3	1	0	30	20	50	100	150
3	HCA-651	Project	0	0	6		250	400		650
4	HGP-601	General Proficiency						50		50
<b>Total</b>			6	2	6	-	-	-	-	1000

**List of Elective - I**

- 1 Compiler Design (HCA-511)  
Simulation & Modelling (HCA-512)
- 2

**List of Elective-III**

- 1 Data Warehousing & Mining (HCA-611)
- 2 Client Server & Computing (HCA-612)

- |   |                              |   |                                   |
|---|------------------------------|---|-----------------------------------|
| 3 | Software Testing (HCA-513)   | 3 | Artificial Intelligence (HCA-613) |
|   | Information Security & Cyber |   | Neural Networks (HCA-             |
| 4 | Laws (HCA-514).              | 4 | 614)                              |

**List of Elective-II**

- 1 ERP Systems (HCA-521).
- 2 Cryptography & Network Security (HCA-522)
- 3 Real Time Systems (HCA-523)
- 4 Mobile Computing (HCA-524)

# First Year

## Master of Computer Applications

(Effective from the session 2010-11)

### CONCEPTS OF COMPUTER & PROGRAMMING IN 'C' (ICA-101/201)

L T P

3 1 0

#### Unit – I

**Introduction To Computers:** Computer hardware Components, peripherals and their functions, Number Systems and conversion methods, Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming Environment, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic.

#### Unit – II

**Basic operating System Concepts:** Introduction of MS-DOS, WINDOWS, and LINUX Operating Systems, Functional Knowledge of these operating systems. Introduction of Basic Commands of LINUX and Editors, Managing Files and Directories in LINUX. Programming Environment in LINUX, Writing and executing programs in LINUX.

#### Unit – III

**Programming in C:** History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

#### Unit – IV

**Operators:** Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

**Control statements:** if-else, switch, break, and continue, the comma operator, goto statement.

**Loops:** for, while, do-while. **Functions:** built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions, Multi file programs. **Arrays:** linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

## **Unit – V**

**Structure and Union:** definition and differences, self-referential structure. **Pointers:** value at (\*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers. **File Handling in C:** opening and closing a data file, creating a data file, read and write functions, unformatted data files.

### ***Text and References Books:***

1. Kernighan, Ritchie, "The C Programming Language", PHI
2. V. Rajaraman, "Fundamentals of Computers", PHI
3. Peter Norton's, "Introduction to Computers", TMH
4. Gottfried, "Programming in C", Schaum's Series, Tata McGraw Hill
5. Yashwant Kanitkar, "Working with C", BPB
6. E. Balagurusamy, "Programming in ANSI C", TMH

## **COMPUTER ORGANIZATION (ICA-102)**

**L T P**

**3 1 0**

### **Unit-I (Representation of Information and Basic Building Blocks)**

Introduction to Computer, Computer hardware generation, Number System: Binary, Octal, Hexadecimal, Character Codes (BCD, ASCII, EBCDIC), Logic gates, Boolean Algebra, K-map simplification, Half Adder, Full Adder, Subtractor, Decoder, Encoders, Multiplexer, Demultiplexer, Carry lookahead adder, Combinational logic Design, Flip-Flops, Registers, Counters (synchronous & asynchronous), ALU, Micro-Operation.

ALU- chip, Faster Algorithm and Implementation (multiplication & Division)

### **Unit-II (Basic Organization)**

Von Neumann Architecture, Operational flow chart (Fetch, Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes, Instruction formats, data transfer & Manipulation, I/O Organization, Bus Architecture, Programming Registers

### **Unit-III (Memory Organization)**

Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

### **Unit-IV (I/O Organization)**

Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

### **Unit-V (Processor Organization)**

Basic Concept of 8-bit micro Processor (8085) and 16-bit Micro Processor (8086), Assembly Instruction Set, Assembly language program of (8086): Addition of two numbers, Subtraction, Block Transfer, find greatest number, Table search, Numeric Manipulation, Introductory Concept of pipeline, Flynn's and Feng's Classification, Parallel Architectural classification, Concept of Pipelining and Multi-Core.

### **Text and Reference Books:**

1. William Stalling, "Computer Organization & Architecture", Pearson education Asia

2. Mano Morris, "Computer System Architecture", PHI
3. Zaky & Hamacher, "Computer Organization", McGraw Hill
4. B. Ram, "Computer Fundamental Architecture & Organization", New Age
5. Tannenbaum, "Structured Computer Organization", PHI.

### **PROGRAMMING LAB (ICA-151)**

**L T P**

**0 0 3**

1. Write C program to find largest of three integers.
2. Write C program to check whether the given string is palindrome or not.
3. Write C program to find whether the given integer is
  - (i). a prime number
  - (ii). an Armstrong number.
4. Write C program for Pascal triangle.
5. Write C program to find sum and average of n integer using linear array.
6. Write C program to perform addition, multiplication, transpose on matrices.
7. Write C program to find fibonacci series of iterative method using user-defined function.
8. Write C program to find factorial of n by recursion using user-defined functions.
9. Write C program to perform following operations by using user defined functions:
  - (i) Concatenation



- (ii) Reverse
  - (iii) String Matching
10. Write C program to find sum of n terms of series:  
 $n - n*2/2! + n*3/3! - n*4/4! + \dots$
11. Write C program to interchange two values using
- (i). Call by value.
  - (ii). Call by reference.
12. Write C program to sort the list of integers using dynamic memory allocation.
13. Write C program to display the mark sheet of a student using structure.
14. Write C program to perform following operations on data files:
- (i) read from data file.
  - (ii) write to data file.
15. Write C program to copy the content of one file to another file using command line argument.

## DATA STRUCTURES USING C (ICA-201)

L T P

3 1 0

### Unit - I

**Introduction:** Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.

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

**Stacks:** Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack, Applications of recursion in problems like Tower of Hanoi.

### UNIT - II

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

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

### UNIT – III

**Trees:** Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

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

#### **UNIT – IV**

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

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

#### **UNIT - V**

**Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

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

#### **Text and Reference Books:**

1. A. S. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
3. R. Kruse et. al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
4. K Loudon, "Mastering Algorithms with C", Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", Jhon Wiley & Sons, Inc.

#### **OPERATING SYSTEM (ICA-203)**

**L T P**

**3 1 0**

## **Unit-I**

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

## **Unit-II**

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

## **Unit-III**

**Process Synchronization and Deadlocks:** The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

## **Unit-IV**

**Memory Management:** Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation with paging in MULTICS and Intel 386, Virtual Memory, Demand paging and its performance, Page replacement algorithms, Allocation of frames, Thrashing, Page Size and other considerations, Demand segmentation.

## **Unit-V**

**File System and I/O Management:** File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Disk structure, disk scheduling methods, Disk management, Swap-Space management, Disk reliability.

**Security Issues:** Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

***Text and Reference Books:***

1. Abraham Siberschatz and Peter Baer Galvin, "Operating System Concepts", Fifth Edition, Addison-Wesley
2. Milan Milankovic, "Operating Systems, Concepts and Design", McGraw-Hill.

**DATA STRUCTURES LAB (ICA – 251)**

**L T P**

**0 0 3**

**Write Program in C or C++ for following:**

1. Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
2. Searching programs: Linear Search, Binary Search.
3. Array implementation of Stack, Queue, Circular Queue, Linked List.
4. Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
5. Implementation of Binary tree.

6. Program for Tree Traversals (preorder, inorder, postorder).
7. Program for graph traversal (BFS, DFS).
8. Program for minimum cost spanning tree, shortest path.

**Second Year**  
**Master of Computer Applications**  
**(Effective from the session 2010-11)**

HCA-301

**SOFTWARE ENGINEERING**

**L T P**

**3 1 0**

**Unit-I Introduction:** Introduction to software engineering, Importance of software, The evolving role of software, Software Characteristics, Software Components, Software Applications, Software Crisis, Software engineering problems, Software Development Life Cycle, Software Process.

**Unit-II Software Requirement Specification:** Analysis Principles, Water Fall Model, The Incremental Model, Prototyping, Spiral Model, Role of management in software development, Role of Metrics and Measurement, Problem Analysis, Requirement specification, Monitoring and Control.

**Software-Design:** Design principles, problem partitioning, abstraction, top down and bottom up-design, Structured approach, functional versus object oriented approach, design specifications and verification, Monitoring and control, Cohesiveness, coupling, Forth generation techniques, Functional independence, Software Architecture, Transaction and Transform Mapping, Component – level Design, Forth Generation Techniques

**Unit-III Coding:** Top-Down and Bottom –Up programming, structured programming, information hiding, programming style and internal documentation.

**Testing:** Testing principles, Levels of testing, functional testing, structural testing, test plane, test case specification, reliability assessment, software testing strategies, Verification & validation, Unit testing, Integration Testing, Alpha & Beta testing, system testing and debugging.

**Unit-IV Software Project Management:** The Management spectrum- (The people, the product, the process, the project), cost estimation, project scheduling, staffing, software configuration management, Structured Vs. Unstructured maintenance, quality assurance, project monitoring, risk management.

**Unit-V Software Reliability & Quality Assurance:** Reliability issues, Reliability metrics, Reliability growth modeling, Software quality, ISO 9000 certification for software industry, SEI capability maturity model, comparison between ISO & SEI CMM.

**CASE (Computer Aided Software Engineering):** CASE and its Scope, CASE support in software life cycle, documentation, project management, internal interface, Reverse Software Engineering, Architecture of CASE environment.

***Text and Reference Books:***

1. Pressman, Roger S., "Software Engineering: A Practitioner's Approach Ed. Boston: McGraw Hill, 2001
2. Jalote, Pankaj, "Software Engineering Ed.2", New Delhi: Narosa 2002
3. Schaum's Series, "Software Engineering", TMH
4. Ghezzi, Carlo and Others, "Fundamentals of Software Engineering", PHI
5. Alexis, Leon and Mathews Leon, "Fundamental of Software Engineering", Vikas
6. Sommerville, Ian, "Software Engineering", AWL, 2000
7. Fairly, "Software Engineering", New Delhi: TMH
8. Pfleerger, S, "Software Engineering", Macmillan, 1987

**HCA-302**

**DESIGN AND ANALYSIS OF ALGORITHM**

**L T P**

**3 1 0**

**Unit-I**

**Introduction:**



Algorithms, Analysis of Algorithms, Design of Algorithms, and Complexity of Algorithms, Asymptotic Notations, Growth of function, Recurrences Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort Medians and order statistics

## **Unit-II**

**Elementary Data Structure:** Stacks, Queues, Linked list, Binary Search Tree, Hash Table

**Advanced Data Structure:** Red Black Trees, Splay Trees, Augmenting Data Structure Binomial Heap, BTree, Fibonacci Heap, and Data Structure for Disjoint Sets

Union-find Algorithm, Dictionaries and priority Queues, mergeable heaps, concatenable queues

## **Unit-III**

**Advanced Design and Analysis Techniques:** Dynamic programming, Greedy Algorithm, Backtracking, Branch-and-Bound, Amortized Analysis

## **Unit-IV**

**Graph Algorithms:** Elementary Graph Algorithms, Breadth First Search, Depth First Search, Minimum Spanning Tree, Kruskal's Algorithms, Prim's Algorithms, Single Source Shortest Path, All pair Shortest Path, Maximum flow and Traveling Salesman Problem

## **Unit –V**

Randomized Algorithms, String Matching, NP-Hard and NP-Completeness Approximation Algorithms, Sorting Network, Matrix Operations, Polynomials & the FFT, Number Theoretic Algorithms, Computational Geometry

## **References**

1. Horowitz Sahani, "Fundamentals of Computer Algorithms", Galgotia
2. Cormen Leiserson et al, "Introduction to Algorithms", PHI
3. Brassard Bratley, "Fundamental of Algorithms", PHI
4. M T Goodrich et al, "Algorithms Design", John Wiley
5. A V Aho et al, "The Design and analysis of Algorithms", Pearson Education

HCA-303

**DATABASE MANAGEMENT SYSTEM**

L T P

3 1 0

**Unit- I**

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

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

**Unit- II**

**Relational data Model and Language:** Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

**Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.

**Unit- III**

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

**Unit- IV**

**Transaction Processing Concepts:** Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

**Unit- V**

**Concurrency Control Techniques:** File Organization and Accessing, Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based

protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

### **Text and Reference Books**

1. Date C J, "An Introduction To Database System", Addison Wesley
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill
3. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley
4. Paul Beynon Davies, "Database Systems", Palgrave Macmillan
5. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
6. Majumdar & Bhattacharya, "Database Management System", TMH
7. Ramakrishnan, Gehrke, "Database Management System", McGraw Hill
8. Bharti P.K, "An introduction to Database Systems", JPNP

## **HCA-304**

### **INTERNET & WEB TECHNOLOGY**

**L T P**

**3 1 0**

#### **Unit-1**

**Internet:** Internet, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure e-Mail, Voice and Video Conferencing.

#### **Unit- II**

History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics. Communication Issues, Multi-departmental & Large scale Websites, Technological advances and Impact on Web Teams.

#### **Unit-III**

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML.

JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

#### **Unit IV**

XML: Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage.

#### **Unit V**

Common Gateway Interface (CGI), PERL, RMI, COM/DCOM, VBScript, Active Server Pages (ASP).

#### ***Text and Reference Book:***

1. Burdman, "Collaborative Web Development", Addison Wesley.
2. Sharma & Sharma, "Developing E-Commerce Sites", Addison Wesley
3. Ivan Bayross, "Web Technologies Part II", BPB Publications.
4. Shishir Gundavarma, "CGI Programming on the World Wide Web", O'Reilly & Associate.  
DON Box, "Essential COM", Addison Wesley.
5. Greg Buczek, "ASP Developer's Guide", TMH.

**HCA - 351**

**DBMS LAB**

**L T P**

**0 0 3**

The programme to be implemented using SQL

1. Create Table, SQL for Insertion, Deletion, Update and Retrieval using aggregating functions.
2. Write Programs in PL/SQL, Understanding the concept of Cursors.
3. Write Program for Join, Union & intersection etc.
4. Creating Views, Writing Assertions, Triggers.
5. Creating Forms, Reports etc.
6. Writing codes for generating read and update operator in a transaction using different situations.
7. Implement of 2PL concerning central algorithm.
8. Developing code for understanding of distributed transaction processing.

9. Students are advised to use Developer 2000 Oracle 8+ version for above experiments.

However, depending on the availability of Software's students may use power builder/SQL Server/DB2 etc. for implementation?

### **HCA-352**

#### **Web Technology Lab**

**L T P**

**0 0 3**

1. Design a HTML page to display your CV
2. Design a HTML form to reserve a railway ticket.
3. Write a Java Script program that finds the greatest common divisor of two numbers.
4. In the form mentioned in problem 2 to reserve a railway ticket add the following validations using java script.
  - From city and To city are two different cities.
  - Age of passengers should not be greater than 150.
  - Name of the passenger should be a string of a maximum length 20.
5. Write a program for illustrating client/server side scripting with help of ASP.
6. Write a piece of code in XML for creating DTD, which specifies set of rules.
7. Create style sheet in CSS/XSL and display the document in Internet Explorer.

### **HCA-402**

#### **MANAGEMENT INFORMATION SYSTEM**

**L T P**

**3 1 0**

**Unit 1: Foundation of Information Systems:** Introduction to information system in business, fundamentals of information systems, solving business problems with information systems, Types of information systems, Effectiveness and efficiency criteria in information system.

**Unit 2: An overview of Management Information Systems:** Definition of a management information system, MIS versus Data processing, MIS & Decision Support Systems, MIS & Information Resources Management, End user computing, Structure of a Management information system.

**Unit 3: Concepts of planning & control:** Concept of organizational planning, The Planning Process, Computational support for planning, Characteristics of control process, The nature of control in an organization, CASE Tools, Information Requirements, Project Feasibility, Decision Analysis.

**Unit 4: Business applications of information technology:** Internet & electronic commerce, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information System for Managerial Decision Support, Information System for Strategic Advantage, Automated System Development, Selection of Hardware/Software.

**Unit 5: Managing Information Technology:** Enterprise & global management, Security & Ethical challenges, Planning & Implementing changes.

**Advanced Concepts in Information Systems:** Enterprise Resource Planning, Supply Chain Management, Customer Relationship Management, and Procurement Management.

### ***Text and Reference Books***

1. O Brian, "Management Information System", TMH
2. Gordon B. Davis & Margrethe H. Olson, "Management Information System", TMH.
3. Brian, "Introduction to Information System", MCGRAW HILL.
4. Murdick, "Information System for Modern Management", PHI.
5. Jawadekar, " Management Information System", TMH.
6. Jain Sarika, "Information System", PPM
7. Davis, "Information System", Palgrave Macmillan

**HCA-401**

**JAVA PROGRAMMING**

**L T P**

**Unit- I**

Core Java: Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

**Unit-II**

Java Servlets: Servlet life Cycle, HTTP Servlet Class, Request Interface, Response Interface, Session Tracking (Cookies VRL), Database Connectivity from Servlet, Interservlet Communication, Handling Servlet, Servlet Collaboration, JDBC,

**Unit-III**

Java Server Pages: Overview of JSP,,Relation of Applets and Servlets with JSP, Scripting Elements, JSP Expressions, JSP Scriplets, JSP Declarations, Predefined Variables, Creating Custom JSP Tag Libraries, Using Nested Tags, Structuring Generated Servlet in JSP Pages, Including Files and Applets in JSP Documents, Integrating Servlet and JSP.

**Unit-IV**

Java Swing: Creating a Swing Applet and Application, Programming using Panes, Pluggable

Look and feel, Labels, Text fields, Buttons, Toggle buttons, Checkboxes, Radio Buttons, View ports, Scroll Panes, Scroll Bars, Lists, Combo box, Progress Bar, Menus and Toolbars, Layered Panes, Tabbed Panes, Split Panes, Layouts, Windows, Dialog Boxes, Inner frame.

**Unit-V**

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

***Text and Reference Books:***

1. Margaret Levine Young, "The Complete Reference Internet", TMH

2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. Dustin R. Callway, "Inside Servlets", Addison Wesley
5. Mark Wutica, "Java Enterprise Edition", QUE
6. Steven Holzner, "Java2 Black book", Dreamtech. Media

### **HCA-403**

### **Computer Graphics and Animation**

**L T P**

**3 1 0**

#### **Unit-I**

Line generation: Points and Lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Primitive devices, Display File Structure, Display control text, Line-drawing Algorithms: DDA Algorithm Bresenham's line Algorithm, Circle-generating Algorithm: Midpoint Circle of Algorithm, Polygon Filling Algorithm.

#### **Unit-II**

2-D Viewing and Clipping: Point Clipping, Line Clipping, Cohen-Sutherland Line Clippings, Cyrus-Beck Line Clipping Algorithm, Polygon Clipping: Sutherland Hodgman Algorithm.

Polygon: Polygon Representation, Entering polygons, Filling polygons. Segments: Segments table, Creating deleting and renaming segments, Visibility.

#### **Unit-III**

2-D and 3-D Transformations: Basic Transformations: Translation, Rotation, Scaling, Shear, Composite Transformations: Rotations about a point, Reflection about a line, Homogeneous Coordinate Systems, 3-D Transformations, 3-D geometry primitives, Viewing Transformation, Projections: Parallel Projection, Orthographic & Oblique Projections, Perspective Projections.

Interaction: Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.

#### **Unit-IV**



Hidden Line and Surface: Back face removal algorithms, hidden line methods. Rendering and Illumination: Introduction to curve and Surfaces generation, Bezier, Hermite and B-spline algorithms and their comparisons.

#### **Unit-V**

Multimedia and Animation: Basic of Animation, Types of Animation, Simulating, Accelerations, Computer Animation Tools, Multimedia Applications, Concepts of Hypertext/Hypermedia, Images, Audio and Video, Multimedia Tools.

#### **Text and References Books:**

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Baker and Hearn, "Computer Graphics", PHI Publication.
3. Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
4. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
5. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

**HCA-404**

### **FUNDAMENTALS OF E-COMMERCE**

**L T P**

**3 1 0**

#### **Unit 1**

**Introduction:** Electronic Commerce - Technology and Prospects, Definition of E- Commerce, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind ECommerce, Advantages and Disadvantages, Architectural framework, Impact of E-commerce on business.

**Network Infrastructure for E- Commerce:** Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

#### **Unit II**

**Mobile Commerce:** Introduction, Wireless Application Protocol, WAP technology, Mobile Information device, Mobile Computing Applications.

### **Unit III**

**Web Security:** Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

### **Unit IV**

**Encryption:** Encryption techniques, Symmetric Encryption- Keys and data encryption standard, Triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Virtual Private Network.

### **Unit V**

**Electronic Payments:** Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

### ***Text and Reference Books:***

1. Ravi Kalakota, Andrew Winston, "Frontiers of Electronic Commerce", Addison Wesley.
2. Bajaj and Nag, "E-Commerce the cutting edge of Business", TMH
3. P. Loshin, John Vacca, "Electronic commerce", Firewall Media, New Delhi

**HCA-405**

**COMPUTER NETWORKS**

**Unit-I**

**Introductory Concepts:** Goals and Applications of Networks, Network structure and architecture, the OSI reference model, services, networks topology, Physical Layer- transmission, switching methods, Integrated services digital networks, terminal handling.

**Unit-II**

**Medium access sub layer:** Channel allocations, LAN protocols, ALOHA Protocols- Pure ALOHA, slotted ALOHA, Carrier Sense Multiple Access Protocols, CSMA with Collision Detection, Collision free Protocols, IEEE standards, FDDI, Data Link Layer- elementary data link protocols, sliding windows protocols, error handling, High Level Data Link Control

**Unit-III**

**Network Layer:** Point-to Point networks, Routing algorithms, Congestion control algorithms, Internetworking, TCP/IP packet, IP addresses, IPv6.

**Unit-IV**

**Transport Layer:** Design issues, connection management, TCP window Management, User Datagram Protocol, Transmission Control Protocol.

**Unit-V**

**Application Layer:** Network Security, DES, RSA algorithms, Domain Name System, Simple Network Management Protocol, Electronic mail, File Transfer Protocol, Hyper Text Transfer Protocol, Cryptography and compression Techniques.

***Text and Reference Books:***

1. A. S Tanenbaum, "Computer Networks, 3rd Edition", PHI
2. W. Stallings, "Data and Computer Communication", Macmillan Press
3. Comer, "Computer Networks & Internet", PHI.
4. Comer, "Internetworking with TCP/IP", PHI
5. Forouzan, "Data Communication and Networking", TMH

**HCA-451**

**Java Programming Lab**

**L T P**

**0 0 3**

1. Write a program in Java for illustrating, overloading, over riding and various forms of inheritance.
2. Write programs to create packages and multiple threads in Java.
3. Write programs in Java for event handling Mouse and Keyboard events.
4. Using Layout Manager create different applications.
5. Write programs in Java to create and manipulate Text Area, Canvas,
6. Scroll Bars, Frames and Menus using swing/AWT.
7. Using Java create Applets.
8. Use Java Language for Client Server Interaction with stream socket connections.
9. Write a program in java to read data from disk file.

**HCA-452**

**Mini Project**

**L T P**

**0 0 3**

**Mini Project:** Develop a web portal for the Institute.

# Final Year

## Master of Computer Applications

(Effective from the session 2010-11)

HCA-501

OBJECT ORIENTED SYSTEM MODELING

L T P

3 1 0

### UNIT – I

Object Oriented Design and Modeling: Object oriented fundamentals, Objects and Classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract Classes, Object-Oriented Design Process, importance of modeling, principles of modeling, OOAD Methods.

Introduction to UML: UML Terminology, conceptual model of the UML, Architecture, Software Development Life Cycle.

### UNIT - II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams.

### UNIT- III

Behavioral Modeling: Interactions and Interaction diagrams, Use Cases and Use Case Diagrams, Activity Diagrams. Events and Signals, State Machines, Nested State Diagrams, Processes and Threads, Time and Space, State Chart Diagrams. Advanced Dynamic Modeling Concepts.

### UNIT-IV

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams. Elementary Design Patterns, The MVC Architecture Pattern.

#### **UNIT – V**

Object-Oriented Programming Languages, Dominant features of C++, Java and C#. Object Oriented Database design, Modern Object technologies and web services.

Case Study: The Unified Library Application.

#### **Text and Reference Books:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide, Pearson Education.
2. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
3. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
4. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
5. Mark Priestley: Practical Object-Oriented Design with UML, TATA Mc-GrawHill
6. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

**HCA-511**

**COMPILER DESIGN**

**L T P**

**3 1 0**

#### **Unit-I**

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

#### **Unit-II**

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.

### **Unit-III**

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations, case statements.

### **Unit-IV**

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

### **Unit-V**

Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

### **Text and Reference Books:**

1. Aho, Sethi & Ullman, "Compiler Design", Addison Wesley.
2. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thomson Brooks Publication.
3. Allen I. Holub, "Compiler Design in C", PHI Publications.

**HCA-512**

**SIMULATION AND MODELLING**

**L T P**

**3 1 0**

### **Unit-I**

System definition and components, stochastic activities, continuous and discrete Systems, System modeling, types of models, static and dynamic physical models, Static and dynamic mathematical models, Full corporate model, types of system study.

#### **Unit-II**

System simulation, Why to simulate and when to simulate, Basic nature of simulation, technique of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem single-server queuing system and an inventory problem, Monte Carlo simulation, Distributed Lag models, Cobweb model.

#### **Unit-III**

Simulation of continuous systems, analog vs. digital simulation, simulation of water reservoir system, simulation of a servo system, simulation of an autopilot Discrete system Simulation, Fixed time-step vs. event-to-event model, generation of random numbers, Test for randomness, Generalization of non-uniformly distributed random numbers, Monte-Carlo computation vs. stochastic simulation.

#### **Unit-IV**

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, System Dynamics diagrams, Feedback in Socio-Economic systems, world model.

#### **Unit-V**

Simulation of PERT networks, Critical path computation, uncertainties in Activity duration, Resource allocation and consideration. Simulation software, Simulation languages, continuous and discrete simulation languages, Expression based languages, object-oriented simulation, general-purpose vs. application-oriented simulation packages, CSMP-III, MODSIM-III.

#### ***Text and Reference Books:***

1. Geoffrey Gordon, "System Simulation", PHI
2. Narsingh Deo, "System Simulation with digital computer", PHI
3. Averill M. Law, W. David Kelton, "Simulation Modeling and Analysis", TMH



**Unit-I: Introduction**

Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

**Unit-II: White Box and Black Box Testing**

White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

**Unit-III: Integration, System, and Acceptance Testing**

Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

**Unit-IV: Test Selection & Minimization for Regression Testing**

Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

**Unit-V: Test Management and Automation**

Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

**Text and Reference Books:**

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.

3. K. K. Aggarwal and Yogesh Singh, "Software Engineering", 3<sup>rd</sup> Edition, New Age International Publication.

**HCA-514**

**INFORMATION SECURITY AND CYBER LAWS**

**L T P**

**3 1 0**

**Unit-1**

Concept of Cyberspace & Netizens Technology, Law and Society Object & Scope of the Information Technology Act, 2000 Electronic Records, Electronic Governance and Electronic Commerce.

**Unit-II**

Jurisdiction under the IT Act-Territorial and Extra-Territorial Jurisdiction of the IT Act 2000

Concept of Digital Signatures and Cryptography, Digital Signature Certificate and Public Key Infrastructure, Authorities under the Act.

**Unit-III**

Nature and scope of computer crime, Types of Cyber crimes- Hacking, Tampering with Computer source documents, cyber pornography, cyber stalking, cyber terrorism, cyber squatting, Cyber contraventions Penalties under the Act, Investigation, Procedure for search & Seizure, Liability of Network Service Providers.

**Unit-IV**

Intellectual Property Right issues in Cyberspace, Concept of property in Cyberspace, Copyright and related issues, Issues relating to Trademarks and Domain names, Liability for Hyperlinking and Metatags, Domain Name Dispute Resolution Policy, Role of ICANN.

**Text and Reference Books:**

1. Rodney Ryder - Guide to Cyber Laws.
2. Mr. Vakul Sharma - Handbook of Cyber Laws.
3. Justice Yatindra Singh - Cyber Laws.
4. Dr. Sundeep Oberoi - E-Security and you.

**HCA-502****DOT NET FRAMEWORK AND C#****L T P****3 1 0****Unit-I**

**The .NET framework:** Introduction, Common Language Runtime, Common Type System, Common Language Specification, The Base Class Library, The .NET class library Intermediate language, Just-in-Time compilation, garbage collection, Application installation & Assemblies, Web Services, Unified classes.

**Unit-II**

C# Basics: Introduction, Data Types, Identifiers, variables & constants, C# statements, Object Oriented Concept, Object and Classes, Arrays and Strings, System Collections, Delegates and Events, Indexes Attributes, versioning.

**Unit-III**

C# Using Libraries: Namespace-System, Input Output, Multi-Threading, Networking and Sockets, Data Handling, Windows Forms, C# in Web application, Error Handling.

**Unit-IV**

Advanced Features Using C#: Web Services, Windows services, messaging, Reflection, COM and C#, Localization.

**Unit-V**

**Advanced Features Using C#:** Distributed Application in C#, XML and C#, Unsafe Mode,  
Graphical Device Interface with C#, Case Study (Messenger Application)

**Text and Reference Books:**

1. Shibi Panikkar and Kumar Sanjeev, "C# with .NET Frame Work", Firewall Media.
2. Shildt, "C#: The Complete Reference", TMH
3. Jeffrey Richter, "Applied Microsoft .Net Framework Programming", (Microsoft)
4. Fergal Grimes, "Microsoft .Net for Programmers", (SPD)
5. TonyBaer, Jan D. Narkiewicz, Kent Tegels, Chandu Thota, Neil Whitlow, "Understanding the .Net Framework", (SPD)
6. Balagurusamy, "Programming with C#", TMH

**MCA-503**

**ADVANCE DATABASE MANAGEMENT SYSTEMS**

**L T P**

**3 1 0**

**Unit-I**

Query Processing, Optimization & Database Tuning: Algorithms for Executing Query Operations. Heuristics For Query Optimizations, Estimations Of Query Processing Cost, Join Strategies For Parallel Processors, Database Workloads, Tuning Decisions, DBMS Benchmarks, Clustering & Indexing, Multiple Attribute Search Keys, Query Evaluation Plans, Pipelined Evaluations, System Catalogue In RDBMS.

**Unit-II**

Extended Relational Model & Object Oriented Database System: New Data Types, User Defined Abstract Data Types, Structured Types, Object Identity, Containment, Class Hierarchy, Logic Based Data Model, Data Log, Nested Relational Model and Expert Database System.

**Unit-III**

**Distributed Database System:**

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

#### **Unit-IV**

##### **Enhanced Data Model For Advanced Applications:**

Database Operating System, Introduction to Temporal Database Concepts, Spatial and Multimedia Databases, Data Mining, Active Database System, Deductive Databases, Database Machines, Web Databases, Advanced Transaction Models, Issues in Real Time Database Design.

#### **Unit-V**

##### **Introduction to Expert Database and Fuzzy Database System:**

**Expert DataBases:** Use of Rules of Deduction in Databases, Recursive Rules.

**Fuzzy DataBases:** Fuzzy Set & Fuzzy Logic, Use of Fuzzy Techniques to Define Inexact and Incomplete Databases.

##### **Text and Reference Books:**

1. Majumdar & Bhattacharya, "Database Management System", TMH.
2. Korth, Silbertz, Sudarshan, "Database Concepts", McGraw Hill.
3. Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
4. Date C J, "An Introduction to Database System", Addison Wesley.
5. Ramakrishnan Gehrke, "Database Management System", McGraw Hill.
6. Bernstein, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addison Wesley.
7. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

## HCA-521

### ERP SYSTEMS

L T P

3 1 0

#### Unit-I

Enterprise wide information system, Custom built and packaged approaches, Needs and Evolution of ERP Systems, Common myths and evolving realities, ERP and Related Technologies, Business Process Reengineering and Information Technology, Supply Chain Management, Relevance to Data Warehousing, Data Mining and OLAP, ERP Drivers, Decision support system.

#### Unit-II

ERP Domain, ERP Benefits classification, Present global and Indian market scenario, milestones and pitfalls, Forecast, Market players and profiles, Evaluation criterion for ERP product, ERP Life Cycle: Adoption decision, Acquisition, Implementation, Use & Maintenance, Evolution and Retirement phases, ERP Modules.

#### Unit- III

Framework for evaluating ERP acquisition, Analytical Hierarchy Processes (AHP), Applications of AHP in evaluating ERP, Selection of Weights, Role of consultants, vendors and users in ERP implementation; Implementation vendors evaluation criterion, ERP Implementation approaches and methodology, ERP implementation strategies, ERP Customization, ERP-A manufacturing Perspective.

#### Unit- IV

Critical success and failure factors for implementation, Model for improving ERP effectiveness, ROI of ERP implementation, Hidden costs, ERP success inhibitors and accelerators, Management concern for ERP success, Strategic Grid: Useful guidelines for ERP Implementations.

#### Unit- V

Technologies in ERP Systems and Extended ERP, Case Studies Development and Analysis of ERP Implementations in focusing the various issues discussed in above units through Soft System approaches or qualitative Analysis tools, Learning and Emerging Issues, ERP and E-Commerce.

#### Text and Reference Books:

1. Lexis Leon, "Enterprise Resource Planning", TMH
2. Brady, Manu, Wegner, " Enterprise Resource Planning", TMH

**HCA-522**

**CRYPTOGRAPHY AND NETWORK SECURITY**

**L T P**

**3 1 0**

**Unit-I**

Introduction to security attacks, services and mechanism, introduction to cryptography. Conventional Encryption: Conventional encryption model, classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers.

Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion, fiestal structure, data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.

**Unit-II**

Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, primality testing, Euclid's Algorithm, Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA, key management, Diffie-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.

**Unit-III**

Message Authentication and Hash Function: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA). Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.

**Unit-IV**

Authentication Applications: Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP), S/MIME.

## **Unit-V**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Web Security: Secure socket layer and transport layer security, secure electronic transaction (SET). System Security: Intruders, Viruses and related threats, firewall design principals, trusted systems.

### **Text and Reference Books:**

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Prentice Hall, New Jersey.
2. Johannes A. Buchmann, "Introduction to Cryptography", Springer-Verlag.
3. Bruce Schneier, "Applied Cryptography".

**HCA-523**

**REAL TIME SYSTEMS**

**LT P**

**3 1 0**

### **UNIT-I: Introduction**

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

### **UNIT-II: Real Time Scheduling**

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

### **UNIT-III: Resources Access Control**



Effect of Resource Contention and Resource Access Control (RAC), Nonpreemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic nPriority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

#### **UNIT-IV: Multiprocessor System Environment**

Multiprocessor and Distributed System Model, Multiprocessor Priority-Ceiling Protocol, Schedulability of Fixed-Priority End-to-End Periodic Tasks, Scheduling Algorithms for End-to-End Periodic Tasks, End-to-End Tasks in Heterogeneous Systems, Predictability and Validation of Dynamic Multiprocessor Systems, Scheduling of Tasks with Temporal Distance Constraints.

#### **UNIT-V: Real Time Communication**

Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols, Real Time Protocols, Communication in Multicomputer System, An Overview of Real Time Operating Systems.

#### **Text and Reference Books:**

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Real-Time Systems: Scheduling, Analysis, and Verification by Prof. Albert M. K. Cheng, John Wiley and Sons Publications.

**HCA-524**

**MOBILE COMPUTING**

**L T P**

**3 1 0**

#### **UNIT-I**

Introduction to Network Technologies and Cellular Communications: HIPERLAN: Protocol architecture, physical layer, Channel access control sub-layer, MAC sub-layer, Information bases and networking WLAN: Infrared vs. radio transmission, Infrastructure and ad hoc networks, IEEE 802.11. Bluetooth: User scenarios, Physical layer, MAC layer, Networking, Security, Link management GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New

data services. Mobile Computing (MC): Introduction to MC, novel applications, limitations, and architecture

## **UNIT-II**

(Wireless) Medium Access Control: Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

## **UNIT-III**

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

## **UNIT-IV**

Database Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

Data Dissemination: Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

## **UNIT-V**

Mobile Adhoc Networks (MANETs): Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

Protocols and Tools: Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

### **Text and Reference Book:**

1. Jochen Schiller, "Mobile Communications", Addison-Wesley. (Chapters 4, 7, 9, 10, 11), second edition, 2004.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028. (Chapters 11, 15, 17, 26 and 27)
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.

## **HCA-551**

### **Object Oriented System Lab**

**L T P**

**0 0 3**

Write programs in C/C++ for

1. Program illustrating overloading of various operators.
2. Program illustrating use of Friend, Inline, Static Member functions, default arguments.
3. Program illustrating use of destructor and various types of constructor.
4. Program illustrating various forms of Inheritance.
5. Program illustrating use of virtual functions, virtual Base Class.
6. Program illustrating how exception handling is done.
7. Program implementing various kinds of sorting algorithms, Search algorithms & Graph algorithms.

## **HCA-552**

### **Dot Net Framework & C# Lab**

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Write programs in C# illustrating

1. The use of sequence, conditional and iteration construct. Various operators like logical, arithmetical, relational, etc.
2. Overloading of various operators.
3. Use of Friend, Inline, and Static Member functions, default arguments.
4. Use of destructor and various types of constructor.
5. Various forms of Inheritance.
6. Use of virtual functions, virtual Base Class, delegates.
7. File operation.
8. Simple web application using ASP Net.
9. Use of Active X controls.

Note: Students are advised to develop a small project illustrating the handling of database and screens in order to fully understand the C#.

**HCA-601**

**SOFTWARE PROJECT MANAGEMENT**

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**UNIT-I: Introduction and Software Project Planning**

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

**UNIT-II: Project Organization and Scheduling**

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

**UNIT-III: Project Monitoring and Control**

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

**UNIT-IV: Software Quality Assurance and Testing**

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

**UNIT-V: Project Management and Project Management Tools**

Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

**Text and Reference Books:**

1. Software Project Management, M. Cotterell, Tata McGraw-Hill Publication.
2. Information Technology Project Management, Kathy Schwalbe, Vikas Pub. House.
3. Software Project Management, S. A. Kelkar, PHI Publication.

**HCA-611**

**DATA WAREHOUSING AND DATA MINING**

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**Unit-I**

Overview, Motivation (for Data Mining), Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. **Data Reduction**:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation.

**Unit-II**

**Concept Description**:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases–Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

**Unit-III**

### **Classification and Predictions:**

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

### **Cluster Analysis:**

Data types in cluster analysis, Categories of clustering methods, partitioning methods. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods-STING, CLIQUE. Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

### **Unit-IV**

**Data Warehousing:** Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

### **Unit-V**

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

### **Text and Reference Books:**

1. M. H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques", Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, 1/e " Pearson Education
4. Mallach, "Data Warehousing System", McGraw –Hill

**HCA-612**

**CLIENT SERVER COMPUTING**

**L T P**

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### **Unit I**

**Client/Server Computing:** DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing,

preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

## **Unit II**

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

The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

## **Unit III**

**Client/Server Network:** connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

## **Unit IV**

**Data Storage:** magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors.

**Client Server Systems Development:** Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues.

## **Unit V**

**Client/Server System Development:** Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training. The future of client server Computing, Enabling Technologies, The transformational system.

### **Text and Reference Books:**

5. Patrick Smith & Steave Guengerich, "Client / Server Computing", PHI
6. Dawna Travis Dewire, "Client/Server Computing", TMH
7. Majumdar & Bhattacharya, "Database management System", TMH
8. Korth, Silberchatz, Sudarshan, "Database Concepts", McGraw Hill
9. Elmasri, Navathe, S.B, "Fundamentals of Data Base System", Addison Wesley

**HCA-613**

**ARTIFICIAL INTELLIGENCE**

**L T P**

**3 1 0**

**UNIT-I: Introduction**

Introduction to Artificial Intelligence, Brief history, Various approaches to AI, Areas of application, Simulation of sophisticated & Intelligent Behavior in different area, Problem solving in games, natural language processing, automated reasoning, and visual perception, Knowledge and its role in AI, Heuristic algorithm versus solution guaranteed algorithms, Introduction to soft computing.

**UNIT-II: Searching in State Space**

Representing problems in state space, Informed versus uninformed search, Production System Model, Evaluation of the Production System, Depth First Search and Breadth First Search, Heuristics, Heuristic Search Techniques: Hill Climbing, Best First search, A\* Algorithm, Branch and Bound, Cryptarithmic Problem, Means End Analysis, AO\* Algorithm, Game Playing: MINMAX Search, Alpha-Beta Pruning, Heuristic Estimation.

**UNIT-III: Knowledge Representation and Reasoning**

Propositional Logic, First Order Predicate Logic, Graphs, Associative Network, Semantic Networks, Conceptual Dependencies, Frames, Scripts, Horn Clauses, Introductory Examples from PROLOG, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward & Backward Deduction, Inference System in Propositional and Predicate Logic, Reasoning under Uncertainty.

**UNIT-IV: Understanding Natural Languages.**

Various Approaches of NLP, Parsing techniques, Context free and transformational grammars, Transition nets, Augmented transition nets, Fillmore's grammars, Grammar free analyzers, Sentence generation, and translation, Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine Perception, Object Identification, Speech Recognition.

**UNIT-V: Expert Systems**

Architecture of Expert System, Representing and using domain knowledge, Expert System Shell, Explanation System, Knowledge Acquisition System, Case study of Existing Expert Systems like DENDRAL,



MYCIN, Development of a small Expert System using programming Languages and tools like LISP, PROLOG, JESS.

**Text and Reference Books:**

1. N. J. Nilsson, "Artificial Intelligence: A New Synthesis", Elsevier Publications.
2. Charnick, "Introduction to A.I.", Addison Wesley.
3. Rich & Knight, "Artificial Intelligence", McGraw-Hill Publication.
4. Winston, "LISP", Addison Wesley
5. Marcellous, "Expert System Programming", PHI
6. Elamie, "Artificial Intelligence", Academic Press
7. Lioyed, "Foundation of Logic Processing", Springer Verlag
8. D. W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.

**HCA-614**

**NEURAL NETWORKS**

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**Unit-I: Neurocomputing and Neuroscience**

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

**Unit-II: Data processing**

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

**Unit-III**

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

#### **Unit-IV**

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

#### **Unit-V**

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing, Complexity analysis of network models, Soft computing, Neuro-Fuzzy-genetic algorithm Integration.

#### **Text and Reference Books:**

1. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall 1998.
2. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall, 1994.