Harcourt Butler Technological Institute Kanpur  
Study and Evaluation Scheme  
MCA (Master of Computer Applications)  

YEAR - I, SEMESTER - I  

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Code</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>Evaluation Scheme</th>
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<td>3</td>
<td>ICA-101</td>
<td>Computer Concepts &amp; Programming in C</td>
<td>3 1 0 30 20 50</td>
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<td>4</td>
<td>IMA-102</td>
<td>Discrete Structures</td>
<td>3 1 0 30 20 50</td>
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<td>5</td>
<td>ICA-102</td>
<td>Computer Organization</td>
<td>3 1 0 30 20 50</td>
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PRACTICALS  
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 |

Total | 15 5 6 | - | - | - | 1000 |

YEAR - I, SEMESTER - II  

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PRACTICALS  
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

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<td>Internet &amp; Web Technology</td>
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### YEAR - II SEMESTER - IV

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#### PRACTICALS

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### YEAR - III SEMESTER - VI

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#### List of Elective - I

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

#### List of Elective-III

1. Data Warehousing & Mining (HCA-611)
2. Client Server & Computing (HCA-612)
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**List of Elective-II**

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<td>Cryptography &amp; Network Security (HCA-522)</td>
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First Year

Master of Computer Applications

(Effective from the session 2010-11)

CONCEPTS OF COMPUTER & PROGRAMMING IN ‘C’ (ICA-101/201)

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:

3. Peter Norton’s, “Introduction to Computers”, TMH
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)

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)


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:

PROGRAMMING LAB (ICA-151)

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:
    \[ n - \frac{n\times2}{2!} + \frac{n\times3}{3!} - \frac{n\times4}{4!} + \ldots \]

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.
Unit - I


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


UNIT - II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular 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

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


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:


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, Thrasing, 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.

Text and Reference Books:


DATA STRUCTURES LAB (ICA – 251)

L T P
0 0 3

Write Program in C or C++ for following:

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


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.


Text and Reference Books:

5. Alexis, Leon and Mathews Leon, “Fundamental of Software Engineering”, Vikas

HCA-302
DESIGN AND ANALYSIS OF ALGORITHM

L T P
3 1 0

Unit-I
Introduction:

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


References

2. Coremen Leiserson etal, “Introduction to Algorithms”, PHI
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


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

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


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


Unit V

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

Text and Reference Book:

2. Sharma &Sharma, “Developing E-Commerce Sites”, Addison Wesley
   DON Box, “Essential COM”, Addison Wesley.
5. Greg Buczek, “ASP Developer’s Guide”, TMH.

HCA - 351

DBMS LAB

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The programme to be implemented using SQL

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

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


Text and Reference Books

1. O Brian, “Management Information System”, TMH
2. Gordon B. Davis & Margrethe H. Olson, “Management Information System”, TMH.
5. Jawadekar, “Management Information System”, TMH.

HCA-401
JAVA PROGRAMMING

L T P
Unit I


Unit-II

Java Servelets: Servelet life Cycle, HTTP Servelet Class, Request Interface, Response Interface, Session Tracking (Cookies VRL), Database Connectivity from Servelet, Interservelet Communication, Handling Servelet, Servelet Collaboration, JDBC,

Unit-III

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

Unit-IV

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


Unit-V


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

HCA-403

Computer Graphics and Animation

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Unit-I


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.


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


Text and References Books:


HCA-404

FUNDAMENTALS OF E-COMMERCE

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Unit 1


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

**Unit III**


**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:**

2. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
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


Unit-V


**Text and Reference Books:**

3. Comer, “Computer Networks & Internet”, PHI.
4. Comer, “Internetworking with TCP/IP”, PHI
5. Forouzand, “Data Communication and Networking”, TMH
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.
9. Write a program in java to read data from disk file.

**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

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.


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

UNIT-IV

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:

5. Mark Priestley: Practical Object-Oriented Design with UML, TATA Mc-GrawHill

HCA-511

COMPILER DESIGN

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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


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:


HCA-512

SIMULATION AND MODELLING

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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:

2. Narsingh Deo, “System Simulation with digital computer”, PHI
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


Text and Reference Books:

HCA-514
INFORMATION SECURITY AND CYBER LAWS

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Unit-I

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:

4. Dr. Sundeep Oberoi - E-Security and you.

HCA-502

DOT NET FRAMEWORK AND C#

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Unit-I


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


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:

2. Shildt, “C#: The Complete Reference”, TMH
6. Balagurusamy, “Programming with C#”, TMH

MCA-503
ADVANCE DATABASE MANAGEMENT SYSTEMS

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Unit-I

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:**


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.
HCA-521
ERP SYSTEMS

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


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:

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

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


Text and Reference Books:


HCA-523
REAL TIME SYSTEMS

UNIT-I: Introduction


UNIT-II: Real Time Scheduling


UNIT-III: Resources Access Control

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


Text and Reference Books:


HCA-524
MOBILE COMPUTING

UNIT-I

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:

HCA-551
Object Oriented System Lab

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

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

UNIT-I: Introduction and Software Project Planning

UNIT-II: Project Organization and Scheduling

UNIT-III: Project Monitoring and Control

UNIT-IV: Software Quality Assurance and Testing

UNIT-V: Project Management and Project Management Tools

Text and Reference Books:

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.
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

HCA-612

CLIENT SERVER COMPUTING

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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.


**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:**

6. Dawna Travis Dewire, “Client/Server Computing”, TMH
7. Majumdar & Bhattacharya, “Database management System”, TMH
HCA-613
ARTIFICIAL INTELLIGENCE

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


UNIT-III: Knowledge Representation and Reasoning


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

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

**Text and Reference Books:**

8. D. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, PHI.

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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: