Dr. Babasaheb Ambedkar
Marathwada University, Aurangabad

Revised Syllabus of

M.Sc. (Computer Science)

With effective from
June 2009

CIRCULAR NO.ACADINP/COMP.SC/30 /2002

It is hereby notified for the information of all concerned that on the recommendations of the Ad-hoc board in computer Science and Academic Council the Management Council at its meeting held on 19-08-2000 has accepted the amendment to the ordinance 625 regarding Admission Eligibility Rules for admission to M.Sc (Computer Science) Course. The amended 0.625 is as follow:

0.625: Admission Eligibility Rules:

A candidate shall be admitted to the First Year for the Master of Science(Computer science) in the Faculty of Science, provided that he/she passes Computer Science as one of the Optional subjects at B.Sc. level B.E./Any Other Bachelor1s Degree in Computer Science of this University Or any Other University recognized as equivalent thereto with minimum of 50% of Marks (45% of Marks for Reserved Category).

In case of vacancies not filled due to non-availability of students with above mentioned criteria, the students with *B.Sc. Physics/Electronics/Mathematics* as one of the optional subjects may also be considered for the admission.

1. The degree of Master of Science (Computer Science) shall be conferred on the candidate who has perused a regular course of study consisting of *Four Semesters* and has appeared and passed the examination prescribed for the Master of Science (Computer Science) degree course in the faculty.

2. The College/Institute must have following faculties and non-teaching staff in the department.

   i. The Head/Coordinator should be full time and qualification should be as per the UGC rule and as per the University guidelines.

   ii. All teachers should be appointed as per the University procedure and the UGC guidelines.

   iii. One Lab Assistance and one Lab Attendant for each laboratory.

   iv. A clerk cum typist to assist the Head for maintenance of the office record/work

3. Scheme of Paper Setting:

   Each theory paper is of 50 marks and is divided in 2 sections. Duration of the theory examination will be of *three* hours. The entire syllabus of theory paper is divided in 5 units. There will be one question on each unit with internal or. The question paper should be set as follows:

   i. There should be two parts, Part A (10 marks) and Part B (40 marks).

   ii. *Part A should have 10 objective type questions/one line answer question/true-false/fill in the blank type question with one mark each.*

   iii. *Part B should have five questions with internal choice and should be from each unit of the syllabus. Each question of this part will have 8 marks and divided into two bits (a and b). Each bit carry 4 marks each. The objective of **bit a** will be to test students regarding theoretical concepts. The questions should not be of general type, like discuss, and explain as far as possible. **Bit b** questions should be problem oriented. The questions should be designed to test students on applied nature of theoretical concepts.*

iv.

Q.No.	Format	Marks
1.	Multiple Choice/Fill in the blank/Match the pair/ one line answer. 1) 2) • • 10)	1 x 10 = 10
2.	a) b)	2 x 4 =8
3.	a) b)	2 x 4 =8
4.	a) b)	2 x 4 =8
5.	a) b)	2 x 4 =8
6.	a) b)	2 x 4 =8
	Total	**50**

4. The duration of the practical examination will be of four hours. There should be at least one external examiner for each practical examination.

5. Students are required to maintain a well documented signed with date journals for each practical. In journals, students must write the dates on which the practical has been performed.

6. The students must keep a diary for projects and seminar. In diary they must record the progress of the project and seminar and be signed by the concerned teacher/guide time to time.

7. Project Report: Two typed and duly bound copies of project report shall be submitted at least 3 weeks before commencement of the Theory/Practical examination which ever commences earlier.

8. The following shall be the Scheme of instruction and examinations of theory papers.

M.Sc. – I Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
1	Object Oriented Programming Using C++	04	50	03
2	Advanced Operating System	04	50	03
3	Embedded System	04	50	03
4	Advanced DBMS	04	50	03
5	Practical-1 based on theory paper-1 and 2	08	50	04
6	Practical-2 based on theory paper-3 and 4	08	50	04
			300	

M.Sc. – II Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
7	Data Structures, Algorithms & Analysis	04	50	03
8	S/w Engineering & Testing	04	50	03
9	Advanced Computer Networks	04	50	03
10	Numerical Techniques & Discrete Mathematics Structure	04	50	03
11	Practical-3 based on theory paper-7 and -8	08	50	04
12	Practical-4 based on theory paper-9 and 10	08	50	04
			300	

M.Sc. – III Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
13	Programming in Java	04	50	03
14	Object Oriented Analysis and Design using UML	04	50	03
15	Computer Graphics	04	50	03
16	Elective-1 1.1) Digital Image Processing 1.2) Pattern recognition 1.3) Digital signal processing	04	50	03
17	Practical-5 based on theory paper-13 and 14	08	50	04
18	Practical-6based on theory paper-15 and 16	08	50	04
			300	

M.Sc. – IV Semester

Paper No.	Title of the Paper	Teaching Load per week (Hours)	Max. Marks	Examinations (Hours)
19	Artificial Intelligence	04	50	03
20	Complier Design	04	50	03
21	Internet Computing using ASP.NET	04	50	03
22	Elective-2 2.1 Biometrics. 2.2 Bioinformatics 2.3 Neural networks	04	50	03
23	Major Project	08	70	04
24	Seminar	03	30	04
			300	

M.Sc.- I Semester

Paper – 1: Object Oriented Programming using C++

Unit-I

An overview of object oriented programming, Drawbacks of procedural programming, Concepts of OOP: Class, Object, Data abstraction, Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing. An overview of C++ programming: basic programming construction, program statements, cout & cin, preprocessor directives.

Variables, Constants and its types. escape sequence characters, input/output with cin and cout, cascading, expressions, the #define directive, Manipulators: the endl and setw manipulator, type conversions

Data types, Primitive, Derived & User defined data types, Type modifiers (long, short, signed, unsigned).Operators: Arithmetic, Relational, Logical, Assignment, Ternary, Bitwise, Unary Operators.

Decision Making Statements : if, if-else statement, nested if-else, else if ladder, switch-case statement. Conditional statement.

Unit-II

Loops: The while loop, do-while loop, the for loop, for loop variations

Arrays: Introductions, defining and initializing arrays, accessing array elements, Single and multidimensional arrays. Character array, string variables, reading multiple lines, arrays of strings.

Structures: Specifying the structure, accessing structure members, array of structures, nested structures, structures and classes, enumerated data types.

Functions: Function declaration and definition,, Calling the Function, comparison with library functions, passing arguments to functions: passing variables, passing by value, passing structure variables, Returning values from functions, returning structure variables, reference arguments

Unit-III

Objects and classes: Classes and objects, specifying the class, C++ object as data types, Constructors and destructors, objects as functions arguments, overloaded constructors, return objects from functions, objects and memory, static class data, array of objects. Friend Functions.

Pointers: address and pointers, the address of operator & pointer variables, accessing the variable pointed to pointers and arrays, pointers and functions, passing simple variables and arrays, string as function arguments, copying the string functions, library string functions, arrays of pointers to strings, memory management: new and delete operator, pointers to objects, referring to members, an array of pointers to objects..

Overloaded functions, different numbers and kinds of arguments, Inline functions. Default arguments, Storage classes, auto, extern, static variables.

Unit-IV
Operator overloading: Overloading unary operators, the operator keyword, operator return values, overloading binary operators, concatenating strings, multiple overloading, comparison operators, arithmetic assignment operators.

Inheritance: Derived Class and Base Class, specifying the derived class, accessing base class members, the protected access specifier, derived class constructors, overriding member functions, class hierarchies, "abstract" base class, constructors and member functions, multilevel, multiple inheritance, member functions in multiple inheritance, ambiguity and multiple inheritance. Virtual base class, Function overriding, Virtual functions & dynamic binding. .

Unit-V
Files and Streams: Streams, the stream class hierarchy, stream classes, header files, string I/O, writing strings, reading strings, detecting end-of-file, character I/O, object I/O writing an object to disk, binary versus character files, reading an object from disk, the stream class, the open function, file pointers, specifying the position, specifying the offset the tellg function, closing files, redirection, IOS flags, redirecting input and output, command-line arguments, overloading the extraction and insertion operators.

References:
1. Object Oriented Programming In C + + Robert Lafore, Galgotia
2. The Annotated C + + Reference Manual, Manaret Ellis & Bjarne Strousstrup.
3. C + + Printer Plus, Stephen Parata, Galgotia

Other Reference Books:
1. An Introduction To The OOP (Only Chapter 6), K.V. Witt, Galgotia
2. Jamsa's 1001 C/C + + Tips, Kris Jamsa, Galgotia
3. A Treaties On Object Oriented Programming Using C + + - B. Chandra, Narosa Publishing House.

Paper 2 - Advanced Operating Systems

Unit-I:
Introduction: A brief description of its functional behavior & responsibilities as a resource manager and as an interface between hardware and user. Logical View and User View, Operating system need and services, Classification and Evolution and organization of OS, Hierarchical/Layered Organization of OS..

Processor Management: Process concept, Process Control Block, Process operations, Scheduling algorithms. Short terms and long term process scheduling policies, Scheduling criteria, multiple processor scheduling, scheduling Algorithm, FCFS, SJF, Priority and round robin scheduling, critical section, semaphores. Asynchronous parallel process, multithreading at system/user level, Inter process communication, Process Synchronization & Deadlock, Monitors, Deadlock prevention & avoidance, Deadlock Detection and deadlock Recovery

Unit-II:

Memory Management: Memory Management Techniques; Single partition allocation, multiple partition allocation, Swapping, paging and segmentation, segmented-paged memory management techniques; logical and physical address space; address mapping. Demand paging, Virtual memory, protection and address mapping hardware, page fault, Page replacement and page removal algorithms.

Unit-III:

Device Management and I/O Programming: Classification of device according to speed, Disk structure, disk scheduling, FCFS scheduling SSTF scheduling, access method and storage capacity; sharable and non sharable devices and their management; spooling concept of virtual device, I/O Processor; CPU-IOP parallel operation, CPU-IOP Communication; Device drivers; I/O Programming.

Unit-IV:

Information Management & File System: Information-an important system resource, stored and maintained in files. File organization and access methods, logical and physical file structure; physical file system realized with device management function; file allocation methods, linked and index allocation, logical file implemented on physical file system. File protection and security, Directory structure, single level, two level, tree structure, Free Space Management, Allocation Methods, Efficiency & Performance, Recovery, FAT32, & NTFS.

Unit-V:

Distributed & Network Operating Systems: Introduction to distributed systems, special functions supported by corresponding OS. Network OS; Remote login; remote file transfer. Distributed OS; Transparent migration of process & data; remote procedure call, Detection and recovery from failures. Distributed file system; mutual exclusion/synchronization using centralized and distributed approaches; concurrency control, majority protocols and time stamping; deadlock detection/prevention.

Case Studies: Single User System – MS-DOS, Multi User System – LIUNX/ Solaris 2.0, Network OS-Novell Netware.

References:
1. James L. Peterson & A. Silberschatz: Operating System Concepts; 2nd Edn., Addison Wesley, World Student Edition
2. Andrew S. Tenenbaum : Modern Operating Systems; Prentice Hall, India
3. Dietel H.M.: An Introduction To Operating Systems; Addison Wesley, World Student Edition
4. Systems Programming & Operating Systems, 2nd Edn., Tata Mc Graw Hill
6.. Operating System : Achyut Godbole
7. System Programming & OS : D.M. Dhamdhere
8. Operating System : Galvin
9. Michael Budnick L.,Et Al., LAN Operating Systems; New Riders Publishing, Carmel, Indiana.

Paper-3: Embedded System

Unit I:

Microcontrollers and Embedded Processors, overview of the 8051 family, Inside the 8051, Introduction to 8051 assembly programming, Assembling and running an 8051 program, the program counter and ROM space in the 8051, data types and directives, 8051 Flag bits and the PSW Register, 8051 Register Banks and stack.

Unit II:

Loop and Jump instructions, call instructions, time delay generation and calculation, pin description of 8051, I/O programming, Bit Manipulation, Immediate and register addressing modes, accessing memory using various addressing modes, Unsigned Addition and Subtraction, Unsigned Multiplication and division, signed number concepts and arithmetic operations.

Unit III:

Logic and compare instructions, rotate and swap instructions BCD and ASCII application programs, single-Bit Instruction programming, Single bit operations with CY, reading input pins vs. Port Latch, programming 8051 Timers, counter programming, Basics of serial communication, 8051 connection to RS232, 8051 Serial Communication programming

Unit IV:

Difference between RISC and CISC Architectures
PIC Controller (Study Example Microchip: PIC 16F877)
      i) Memory organization
      ii) I/O ports
      iii) Indirect Addressing, INDF and FSR Registers

Unit V:

Introduction to ARM & Thumb Processor
ARM Controller (Study Example AT91M42800A)
      i) Architectural Overview.
      ii) Memory Map.
      iii) Peripherals.
      iv) System Peripherals.
      v) User Peripherals.
      vi) Operating Modes

References:

1. 8051 Microcontroller & Embedded systems By Muhammad Ali Mazidi
2. PIC16F87X Data Sheet
3. AT91M42800A Data Sheet
4. 8051 Microcontroller by Kenneth Ayala
5. ARM Architecture Reference Manual Edited By David Seal.
6. Microcontroller, theory and application – Ajay Deshmukh.

Paper 4 - Advanced DBMS

Unit-I:

Overview of Database Concepts: Database and Need for DBMS , Characteristics of DBMS, Database Users, 3-tier architecture,(its advantages over 2-tier) Data Models, Views of data-schemes and instances, Independence, Data modeling using the Entity-Relationship approach, Entities, Relationships, Representation of entities, attributes, relationship, attributes, relationship set Generalization , aggregation:

Relational model: Traditional database models, Relational Model, Structure of relational DB and different types of keys, Expressing M:N relation, relational algebra, Codd's rules, Constraints, Relational database languages, SQL and embedded SQL, Data definition in SQL , Views and queries in SQL, database design including conceptual and logical design technique, Specifying constraints and indexes in SQL, Specifying constraints management systems Oracle, Ingres etc.

Unit-II:

Relational Database design: Functional dependencies, and Normalization Normal forms based on primary keys (1 NF, 2 NF, 3 NF, BCNF, 4 NF, 5 NF) Loss less joins and dependency preserving decomposition

Query Processing: Query Processing Stages, Query Interpretation, Equivalence of Expressions, Query Resource Utilization, Query Execution Statistics, Query Execution Plan, Estimation of Query Processing Cost, Table Scan, Sample Index Access, Fill Factor, Multiple Index Access, Methods for Joining Tables (Nested Loop, Merge Join, Hybrid Join, Multiple Join) Structure of a Query Optimizer,.

Unit-III:

Transaction Processing & Concurrency Control: Concept and definition of transaction, ACID properties, serializibility, Prioritization, states of transaction, Types of failure, desirable properties of transaction schedules and recoverability, serial usability of schedules, levels of transaction consistency, deadlocks, long duration transactions, transaction performance, transaction processing as implemented in contemporary database, management system. Concurrency Control, locking techniques, techniques based on time-stamp ordering, multiple granularity.

Crash Recovery: failure classification, recovery concepts, database backup, recovery concepts based on deferred update and on immediate update. Shadow paging, check points, on-line backup during database updates, crash recovery techniques.

Unit-IV:

Distributed Database: Homogeneous and Heterogeneous databases, Architecture and design of distributed databases, Distributed data storage, Data fragmentation with reasons, Degree of fragmentation, Correctness, rules of fragmentation, horizontal, vertical and hybrid fragmentation, Distributed query processing, recovery in distributed systems, commit protocols for distributed databases, multi-database system.

Client/Server database: Evolution of client concept, Client/Server environment, characterization of Client/Server computing. Functions of clients server , application partitioning, the two-layer and three-layer architectures, communication between clients and servers.

Unit-V:

Object Oriented Databases: Complex data types, Array & Multiset Types in SQL, Object Identity & Reference types in SQL, Implementing Object Relational features, Persistent of Objects, Object Identity & Pointers, Object Relation Database, Object Oriented Vs. Object Relational.

Integrity, Security: Need for Database Integrity, Integrity Constraints, Non-Procedural and Procedural Integrity Constraints Specifications in SQL, Introduction to Database Security issues, Authorization and Use.

References:
1. Fundamental of Database Systems by R. Elmasri; S. Navate; Benjamin Cummings;
2. Introduction to database systems   by C. J .Date
3. Database system concept   by Korth
4. Principles of Database Management   by James Martin
5. Relational database design for Micro computers Application by Prentice Hall (Jackson)
6. Database Management Systems   by Bipin Desai

Paper-5 : Practical based on Paper-1 and Paper-2.

List of Practical: OOP Using C++

1. Program to demonstrate encapsulation using of class.
2 Program to demonstrate use of array of objects
3 Program to demonstrate use of pointers
4 Program to demonstrate use of pointer to members of class
5 Program to demonstrate use of function overloading
6. Program to demonstrate inline function.
7 Program to demonstrate use of friend function
8. Program to demonstrate static data members & member functions of class.
9 Program to demonstrate use of different manipulations
10. Program to demonstrate objects as function arguments.
11. Program to demonstrate use of recursive function
12. Program to demonstrate use of constructor, constructor overloading & destructor
13. Program to demonstrate use of all types of Inheritance.
14. Program to demonstrate the virtual base class
15.. Program to demonstrate the constructors in derived class.
16. Program to demonstrate use of unary & binary operator overloading
17. Program to demonstrate use of polymorphism (virtual function)
18. Program for reading and writing operations on text file.
19. Program for read, write, append & modify operations on binary file.
20. Program to demonstrate command line arguments.

Practical for Operating System:
Following programs should be implemented in C++.
   1. Program for FCFS scheduling

2. Program for SJF Scheduling
3. Program for Priority scheduling
4. Program for Round Robin scheduling.
5. Program for pager replacement algorithms
6. Study of Network and Distributed OS.
7. Case study of Linux/ Novell Netware/Windows NT etc.
   (File handling Commands, Directory related commands, utility commands)

Paper-6 : Practical based on Paper-3 andPaper-4

List of Practical : Advanced DBMS
1. Creating database tables and using data types.
   • Create table, • Modify table, • Drop table
2. Practical Based on Data Manipulation.
   • Adding data with Insert, • Modify data with Update,
   • Deleting records with Delete
3. Practical Based on Implementing the Constraints.
   • NULL and NOT NULL, • Primary Key and Foreign Key Constraint
   • Unique, Check and Default Constraint
4. Practical for Retrieving Data Using following clauses.
   • Simple select clause, • Accessing specific data with Where, Ordered By,
     Distinct and Group By
5. Practical Based on Aggregate Functions.
   • AVG, • COUNT, • MAX, • MIN, • SUM, • CUBE
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time Functions.
8. Practical Based on implementing use of union, intersection, set difference.
9. Implement Nested Queries & JOIN operation.
10. Practical Based on performing different operations on a view.
12. Practical Based on implementing use of triggers, cursors & procedures.
13. Make a Database connectivity with front end tools like – VB, VC++,D2K.

List of experiments of Embedded System:

1. Simple assembly language program: Realization of Boolean expression using port.
2. Simple assembly language program: Running LEDs
3. Using Timer Couter for frequency measurement, by counting the number of pulses in fixed amount of time (e.g. 1 second)(Assembly Language Programm).
4. Using Timer/Counter for frequency measurement, by measuring the time period between two consecutive pulses (Assembly Language Program).
5. Write serial communication program in C. This program should:
b. Send a ASCII message to serial port (verify receipt of this message on a computer)
c. Then onwards, echo any character received (send characters from computer and verify receipt of echo).

6.. Study of minimum system based on ARM family micro-controller (e.g. LPC2104) and writing an Assembly Language Program for running LEDs.
7. Study of large system based on ARM family micro-controller, and writing C program to display a message on LCD.

M.Sc.-II Semester

Paper-7: Data Structures Algorithms & Analysis

Unit-I   Data structures basics, Mathematical/algorithmic notations & functions, Complexity of algorithms, String processing: storing strings, Linear arrays and their representation in memory, traversing linear arrays. Inserting & deleting operations, Multidimensional arrays, Record structures and their memory representation. Stacks and their array representation. Arithmetic expressions: Polish notation, Recursion. Tower of Hanoi problem.

Unit II   Queues. Representation of queue, Insert & delete operations on queue, Deques, Priority queues. Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation, Insertion deletion operations on linked lists. Header linked lists, Two-way linked lists. Circular linked list

Unit-III   Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms, Header nodes: threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffman's' algorithm. General trees.

Unit-IV   Graph theory, sequential representation of graphs, Linked representation, operations & traversing the graphs. graphs and its variants, breadth first search, depth first search. Greedy method, single source shortest path, minimum spanning trees, Prims' algorithm.

Unit-V   Sorting, Time and Space Complexity of sorting, Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing. Divide and conquer, binary search with its variants, Quick sort, Linear search and Binary search algorithms.

References:
1. Seymour Lipschutz: "Theory & Problems of Data Structures", Schaum's Outline Series (McGraw-Hill)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications. (TMH)
4. Kutty: Data Structures using C++ (PHI)
5. Bhagat Singh, Naps : Introduction to Data Structures (TMH)
6. E Horowitz and S. Sahani, Fundamentals of Computer Algorithm, Galgotia Publications, 1991.

7. Aho, Hopcroft and Ullman, The Design and Analysis of Algorithms, Addision-Wesley Publication, 2000
8. Simon Harison, James ross, Algorithms, Wiley India, 2006

Paper– 8:   Software Engineering and testing

Unit-I:
 S/w Engineering Fundamentals: Definition of Software, The birth of s/w engineering, s/w Product:, Software development paradigms, software Characteristics and Application. Software Development life cycle, water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques.
  Project Management: Concepts, Software Process and Project Metrics; Software Measurements; Software Projects Planning: Objectives, Scope and Resources. Software Project Estimating, Decomposition Techniques. Empirical Estimation Models: COCOMO Model, Software Equation. Project Scheduling and Tracking.

Unit-II:
  Software Requirements and Analysis: System Engineering, Product Engineering: Characteristics of a Good SRS, Requirement analysis, Principal, Software prototyping,, Specification and its review. Analysis modeling: data modeling, mechanics for structured analysis, system analysis tools and techniques, DFD, ER- Diagrams. Data Dictionary (DD),
  System Design: Design concept and principles and its elements, effective modular design, Cohesion & Coupling, Feature of modern graphics interface (GUI). Design Methods: data design, interface design guidelines, procedural design.

Unit-III:
  Software Quality Assurance: Definition of Quality and factors, QA, SQA, Software Quality Metrics, Process and Product Quality, The SEI Process Capability Maturity Model (CMM), ISO ,Six-Sigma. Software Quality Assurance, Need for SQA, SQA Activities, Building blocks of SQA, SQA Planning & Standards, Software Reliability, Reliability Measures.
  Introduction to Software Testing: Need of s/w testing, Error, fault and failure. s/w Testing fundamentals, Testing objectives, test information flows, Testing lifecycle, Test Cases – Test case designing (Concept & introduction should be covered here)

Unit-IV:
  Levels of Testing Unit Testing,   Integration Testing,   System Testing, Acceptance Testing, Alpha testing & Beta testing, Static vs. Dynamic testing, Manual vs. Automatic testing, Testers workbench, 11 steps of testing process (Only steps should be covered)
  Different types of Testing: Installation Testing, Usability testing, Regression testing, Performance testing, Load testing, stress testing, Security testing, Static & Dynamic testing, Static testing techniques, Review types : Informal Review, Technical or peer review, Walkthrough, Inspection, static analysis, Review meeting and reporting , Review guidelines & Review checklist, Data flow analysis, Control flow analysis, Cyclometric Analysis, Dynamic testing – need & Advantages

Unit-V:

   Black Box & White Box Testing (Test Case Design Techniques): *Functional Testing (Black Box)*, Equivalence partitioning, BVA, Decision table based testing, Cause-Effect graphing, Syntax testing (Concept & Test case generation only), *Structural Testing (White Box)*, Coverage testing, Statement coverage, Branch & decision coverage, Path coverage, Validation testing Activities, Low level testing, High level testing, Black box Vs. White Box

   Object Oriented Testing: Issues in OO testing, class testing, GUI testing, Object Oriented Integration & system testing.

   Computer Aided Software testing tools (CAST): Static Testing Tools, Dynamic Testing Tools, Characteristics of Modern Tools. e.g. WinRunner, LoadRunner, Rational ROBO.

Reference Book:

1. Software Engineering – A Practitioners Approach Roger S. Pressman, 3rd /4th Edition, Mcgraw Hill, International Education.
2. An Integrated Approach To S/w Engineering, Pankaj Jolote, 1st / 2nd Edition, Narosa.
3. Software Engineering – A Programming Approach, D. Belie I. Moray, J. Rough, PHI.
4. Software Testing Techniques, Barrios Bier, 2nd Edition, Van N Ostrand Reinhold.
5. Software Engineering Concepts-Richard Fairley, CDAC. Tata McGraw-Hill Series.
6. ISO-9000 Standards (Relevant To Software).
7. IEEE Standard For Software User Documentation, Std. 1063-1987.
8. Introducing Software Testing   by Louise Tamres (Pearson pub)
9. Effective Methods for software Testing   by William Perry
10. Software Testing in Real World   by Edward Kit
11. Software Testing Techniques   by Boris Beizer (Dreamtech pub)
12. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984.
13. Glenford Myers, "The Art of Software Testing", John Wiley & Sons Inc., New York.

Paper 9 - Advance Computer Networks

Unit-I:

   Introduction: Layered network architecture, review of ISO-OSI Model. Data communication techniques: Pulse Code Modulation, (PCM), Data modems, Multiplexing techniques-Frequency-Division, Time-Division Transmission Media – Wires, Cables, Radio, Links, Satellite Links, Fiber-Optic Links.

   Asynchronous Transfer Mode (ATM): Cells, Header and Cell Formats, Layers in ATM, Class 1,2,3,4 Traffic Random Access Data Networks, Concept of Random Access, Pure ALOHA: Throughput Characteristics Slotted ALOHA, throughputs for Finite and Infinite, Population S-ALOHAS. MARKOV Chain Model for S-ALOHA .

Unit-II:

   Local Area Networks (LANs): IEEE 802.4 and 802.5 Protocols, Performance of Ethernet and Token ring protocols, FDDI Protocol, Distributed Queue Dual Bus (DQDB) protocol.

Network Layer Protocols: Design issues: Virtual Circuits and Datagrams.

Routing Algorithms: Optimality Principle, Shortest Path Routing-Dijkstra, Bellman-Ford and Floyd-Warshall Algorithm.

Unit-III:

Data Link Protocols: Stop and Wait Protocols: Noise Free and Noisy Channels Performance and Efficiency, Verification of Protocols using Finite State Machine. HDLC Data Link Protocol. Integrated Services Digital Network: Interfaces, Devices, Channel Structure. Dead Locks and their avoidance, Network Layer in ATM, Internetworking: Bridges, Routers and Gateways, Internet Architecture and Addressing.

Transport Layer Protocols: Design issues: Quality of Services, Primitives Connection Management: Addressing, Connection Establishment and Releases, Use of Timers, Flow Control and Buffering, Multiplexing, Crash Recovery. Elements of TCP/IP Protocol: User Datagram Protocol Connection Management, Finite State Machine.

Session Layer Protocols: Dialog Management, Synchronization, OSI Session Primitives Connection Establishment.

Unit-IV:

Error Detection: Parity Check Codes, Cyclic Redundancy Codes.

Queuing Models: Data Traffic Characteristics: Poisson Process Birth-Death Process: Markov Chain Models M/M/1 Queues: Delay and Little's Formula M/M/S/K Queues: Average Queue Length, Delay and Waiting Time Blocking Probability. M/G/1 Queues, Imbedded Markov Chains, Poolaczek-Kinchin Transform Formula, Delay Formula Using Residual Service Time.

Unit-V:

Presentation and Application Layer Protocols: Presentation Concepts NMP-Abstract Syntax Notation-1 (ASN-1), Structure of Management, Management Information Base.

Cryptography: Substitution Transposition Ciphers, Data Encryption Standards (DES) Chaining, Breaking DAS, Public Key Cryptography and Authentication Protocols, Electronic Mail, World Wide Web.

References
1. A. S. Tanenbaum: Computer Networks, 2nd Edition., PHI
2. J.F. Hays: Modelling And Analysis Of Computer Communication Networks, Plenum Press
3. D. Bertsekas And R. Gallager: Data Network, 2nd Edition, PHI, India
4. D.E. Comer: Internetworking With TCP/IP, Vol. 1,2, PHI
5. G. E. Keiser: Local Area Networks, McGraw-Hill, International Edition
6. W. Stalling: Data And Computer Communication, Maxwell-,Macmillan, International Edition

Paper 10- Numerical Methods & Discrete Mathematical Structures

Unit-I:

Transcendental and polynomial equations. The roots of an equations; definitions and examples, intermediate value theorem and bisection method. The Regular-falsi method and examples, the secant method and examples, The Newton-Raphson Method and examples, choice of an iterative method and implementation.

System of linear algebraic equations: elements of matrix theory; algebra of matrices ,(basic operations) rank of a matrix and existence results for system of linear algebraic equation. Cramers role. The gauss elimination method for providing L-U decomposition of tranquilization method. The gauss –seidel iterative method, choice of the method and implementation.

Unit-II:

Numerical differentiation and integration: numerical differentiation: methods based on finite differences. Numerical Integration: The trapezoidal rule, the simpson's rule and gauss-lengendre integration method.

Numerical Solution of ordinary: differential equations. Ordinary differential equations of the first order basic concepts & various analytic methods (separable equation, equation educable to separable form, exact differential equation, integrating factors, linear first order differential equation). Reduction of higher order differential equations to the system of first order differential equations initial and boundary value problems: definitions and examples, Euler's method for solving the initial value problems, Rung-Kutta methods for the system of first order differential equations.

Unit-III:

Interpolation and approximation: Interpolation with equal intervals: finite difference tables, The Gregory Newton formula for forward & backward interpolation. Interpolation with unequal intervals: Newton's divided difference interpolation formula, language interpolation, the least square approximation

Unit-IV:

Desecrate structure: fundamentals set subsets and operations on sets; semi groups finite and infinite set, relation and properties of relations, equivalence relations.

Boolean Algebra, Posets and lattices: partial order relation, Poset, Lub, Gid, maximal and minimal elements of a posets. Def and examples of boolean algebra, lattices, distributive laws in lattices, complemented lattice's prepositional calculus, boolean functions , min and max, terms, simplification of boolean function with Karnaugh Map & Quine MC Cucky method.

Introduction to Combinatorices: Basic Thermos on permutations and combination, ordinary exponential generating functions recurrence equations.

Unit-V:

Graph And Algorithms: Basics definition of graphs, connectivity of graph, cut points , cycles, hamiltonian graph , different characterization of trees, bipartite graphs, algorithms on graphs, Breadth First Search and Depth First Search ,Dijkstra Algorithm for Shortest Path algorithms, Floyd's Algorithm for all Pairs of Shortest Paths, Kruskal's And Prim's Algorithm for Minimum Spanning Tree.

Finite State Machines and Languages: finite state machines, semigroups, machine languages and regular languages , simplification of machines.

References:

1. M.K. Jain, S.R.K. Lyengar And R.K. Jain, "Numerical Methods For Scientific And Engineering Computation"(1993), New Age Int (P) Ltd. ,New Delhi.

2. I.R.Miler, J.E. Freund And R. Johnson, "Probability & Statistical for Engineers" (1990), Prentice-Hall Of India, New Delhi.
3. S.D. Conte And C.De Boor "Elementary Numerical Analysis" Mc-Grew Hill Pub.
4. E. Kreyszing "Advanced Engineering Mathematics" Wileyeastern Ltd. (7th Edition),New Delhi.
5. P.L. Meyer "Introductory Probability And Statistical Applications ",Oxford And IBH Pvt. Ltd.   (Second Edition), New Delhi.
6. Korfhage R.R: Discrete Computational Structure-Academic Press.
7. Bernard Kolman & Robert C Busy: Discrete Mathematical Structure For Computer Science-PHII.

8. K.A.Ross &C.R.B. Wright: Discrete Mathematics- (PHI)
9. Narsingh Deo. Graph Theory With Application To Engineering And Computer Science- (PHI)
10. C.L.Liu :Elements Of Discrete Structure – McGraw Hill International Editors 1986.

<u>Paper-11: Practical based on Paper-7 and Paper-8</u>

Data Structure Algorithms and Analysis:

Implementation using C/C++/Java

1. Write an application to implement Tower of Hanoi Problem Algorithm.
2. Write an application to implement Abstract data type stack
3. Write an program to evaluate Post fix expression using stack
4. Write a program to implement Abstract data type queue.
5. Write a program to implement singly linked list that performs various operation such as insertion, deletion, searching a node in linear linked list.
6. Write a program to implement Preorder Traversal of a binary tree.
7. Write a Program to search a given element using Binary Search.
8. Write a Program to implement Selection Sort.
9. Write a Program to implement Merge Sort.
10. Write a Program to Perform insertion or search in a specified level of a stack implemented tree- structured symbol table.
11. Write a program to find minimum and maximum form a given array.

Software Testing:

At least 10 practical should be conducted on any s/w testing tool.

Paper-12: Practical based on Paper-9 and Paper-10

Advance Computer Networks:
   At least 10 practical should be conducted on above paper.
Numerical Methods & Discrete Mathematical Structures
   At least 10 practical should be conducted on various algorithms of numerical methods.

M.Sc. – III Semester

PAPER 13: Programming in JAVA

Unit-I:
   Introduction: History and features of Java, Difference between C, C++ & JAVA. JAVA and Internet, WWW, Web Browsers, java supports system, Java Environment. JDK, JVM, Byte code
   Java Programming Basics: Structure of Java program, JAVA tokens and Statements, Constants & Variables, Data types, Operators, Command line arguments.
   Java Statements & Arrays: if and switch statement. while, do-while and , for. Introduction to arrays, types of arrays, new operator, Strings. String class & its methods, Vectors.
   Classes & Objects: Specifying classes, Methods and fields, creating objects. Passing objects to methods, returning objects, static fields & methods. Constructors, Garbage collection, Overloading methods & constructors, this keyword.

Unit-II:
   Inheritances: Specifying sub class, types of inheritance, visibility control: public, private, protected, package. super keyword, Overriding methods, Dynamic method dispatch, Abstract methods and classes, final methods & classes,
   Packages & Interfaces : Introduction to packages, naming conventions, package statement, creating packages, import statement, accessing package, use of CLASSPATH, adding class to package, hiding classes. Interface, implementing interfaces, multiple interfaces.
   Multithreading: Creation threads, Extending Thread class, implements Runnable interface, stopping and blocking thread, Thread life cycle, thread priorities & Thread synchronization, using Thread methods.

Unit-III:
   Exception Handling: Managing errors, types of errors, exceptions, syntax of exception handling code. try, catch, throw, throws and finally statements, multiple catch & nested try statements.
   Java Input Output: Java I/O package, Byte/Character Stream, Buffered reader / writer, File reader / writer, File Sequential / Random. Reading numeric, character & strings data from keyboard.
   Applet programming: Applet Vs. Application, Creating applets, life cycle, local & remote applets. <APPLET> tag & its attributes, adding applet to HTML file, Running applet.

Unit-IV:

Abstract Windows Toolkit (AWT): Components and Graphics, Containers, Frames and Panels, Layout Managers, Border layout, Flow layout, Grid layout, Card layout, AWT components. Event delegation Model, Event source and handler, Event categories, Listeners, Interfaces, Controls such as text box, radio buttons, checkboxes, lists, choice, command buttons, text area etc.

JDBC: Java database connectivity, Types of JDBC drivers, Writing JDBC applications, Types of statement objects(Statement, PreparedStatement and CallableStatement), Types of resultset, Inserting and updating , records, JDBC and AWT,

Unit-V:

Networking with Java : Networking basics, Sockets, port., Internet addressing, java.net – networking classes and interfaces, Implementing TCP/IP based Server and Client

Servlets: Introduction Servlet API Overview, Writing and running Simple Servlet, Servlet Life cycle, Generic Servlet, HTTPServlet, ServletConfig, ServletContest, Writing Servlet to handle Get and Post methods.

Reference:-

1. Horstman Cay, Cornell Gary, Core JavaTM2, Vol.1&2, 7th edition, Pearson Education.

2. Herbert Schildt, The Complete Reference, seventh edition, [TMH]
3. Programming with JAVA – A Primer by E. Balguruswamy (TMH)

4. Steven Holzner, JAVA 2 Programming Black Book, Wiley India.

5. Ivor Horton, Beginning Java 2, JDK 5 Ed, Wiley India.
6. Java 2 from scratch by Steven Haines the – PHI

7. Java database Programming – Maithew Siple – THM
8. Instant Java John A. Few, Stephen G. Rew (Sun Microsystems)

9. Expeiments in JAVA   - S.A. Relsel Shy – AWL

Paper-14: Object Oriented Analysis and Design using UML

Unit-I:
Introduction:
Two views of software Developments: SSAD and OOAD, Why Object – Orientation? Object and classes, Abstraction and encapsulation, Methods and Message, Interfaces , Inheritance and Polymorphism, Access Control, The Business case for OO Developments.

Object Oriented Methodologies:
Object Oriented Design –Booch, Object Modeling Techniques- Rumbaugh, Object – Oriented Analysis – Coad- Yourdan, Object – Oriented Software Engineering – Ivar Jacbson,

Unit-II:
Unified Approach: Diagramming and Notational Techniques using the UML, UML Notation, {Analysis Diagramming Techniques.} == Introduction to all (ten)

Diagram, {Design Diagramming Techniques},Generalization / Specialization., Aggregation and composition, Association , Cardinality, Navigability, Icons , relationships and adornments.

Object-Oriented Systems Development Process:

Rational Unified Process, Four Major phases: Inception , Elaboration, Construction, Transition, Requirements Engineering: Problem analysis, Understanding Stockholders need, Type of requirements, Use-case Model : Writing Requirements

Unit-III:

Analysis:

Behavioral Analysis, Domain Analysis or   Business Object Analysis, Use-case Driven Object Oriented analysis : The UML approach., Develop use-case Model, Use-case Description, Documentation, Activity Diagram, Identify the classes., Introduction to different approaches for identifying classes, "Noun Phrase" approach OR ,"Conman Class Pattern" approach Or , "CRC" approach Or, Usecase Driven Approach.

Containment and Composition, Aggregation, Inheritance , SubTypes and IS-A Hierarchies, Association and Link Relationships.,Diagramming System Events.

Unit IV:

Design Phases:

Translating Analysis Concept into Design, Optimizing classes and Objects: The Multi-tiered Architecture View, ,Mapping System functions to objects., Object to Object Visibility, Collaboration Diagram, Sequential Diagram, Specification Class Diagram, Specifying Object Interfaces, Designing the Data Access layer, Design User Interface layer, Designing System Interfaces, Controls and Security.

Unit V:

Design Refinement

Designing for Extensibility, Design for reusability, Portioning class space, Checking Completeness and correctness.

Persistent Object and Database Issues:

The Cood Data Management Domain, Object Persistence, Object-oriented Database Management System, Object- Oriented verses Relational Database, Mapping object to Relational Data structure.

Testing: Introduction to Testing Strategies, Impact of Object Orientation on Testing. Testing Business Process, Design Matrix, Discovering reusable pattern.

References
1. Object Oriented Analysis and Design with Applications, Grady Booch., Benjamin / Cummings , 1994.
2. Object –Oriented Modeling and Design. – J Rumbaugh , M Blaha , W .Premerlani
3. Principles of Object- Oriented Software Development , Anton Eliens , Addison Wesley.
4. Object Oriented System Development - Ali Bahrami . McGRAW-HILL International Edition.
5. Object-Oriented Software Engineering – Ivar Jacobson Pearson Education INC
6. Applying UML And Pattern   - Craig Larman Pearson Education INC
7. UML Distilled   - Martin flowler Pearson Education INC

8. The Unified Modeling Language User Guide – Grade Booch, James Rumbaugh , Ivar Jacobson.   Pearson Education INC
9. The Unified Modeling Language Reference Guide – Grade Booch, James Rumbaugh , Ivar Jacobson.   Pearson Education INC
10. Design Object- Oriented Software - Rebecea Wrifs- Brock. Brian Wilkerson, Lauren Wiener ,
11. Object Oriented Analysis and Design – Bennett , Simon McGraw Hill.
12. Designing Flexible Object Oriented System with UML – Charless Richter Techmedia
13. Instant UML – Muller – Apress LP
14. UML Instant – Thomas A Pendar – Wiley Publication
15. UML in Nutshell

PAPER 15: Computer Graphics

Unit-I:

Introduction of computer Graphics and its applications, Overview of Graphics systems, Video display devices, Raster scan display, Raster scan systems, video controller, Raster scan display processor, Random scan display, random scan systems, color CRT monitor, Flat panel display, Interactive input devices, Logical classification of input devices, Keyboard, mouse, Trackball and spaceball, Joysticks, Image scanner, Light pens, Graphics software, Coordinates representations, Graphics functions.

Unit-II:

Line drawing algorithms, DDA, Bresenham's, Circle generating, Mid-point circle algorithm, Ellipse generating, Polynomials, Scan-line polygon fill, Boundary fill.

Unit-III:

Basic transformation's, Translation, Rotation, Scaling, Matrix representation's & homogeneous co-ordinates, Composite transformation's, Reflection, Two dimensional viewing, Two dimensional clipping, Line, Polygon, Curve, Text. 3D-transformation, Projection, Viewing, Clipping,.

Unit-IV

Spline representation, Cubic spline, Bezier curve, Bezier surfaces, Beta spline, B-spline surfaces, B-spline curve, Hidden surfaces, Hidden lines, Z-buffer.

Unit-V

Fractal's geometry Fractal generation procedure, Classification of Fractal, Fractal dimension, Fractal construction methods. Color models, XYZ, RGB, YIQ, CMY & HSV, Shading algorithms, Shading model, Illumination model, Gouraud shading, Phong shading**.**

References :-

1. Computer Graphics by M. Pauline Baker, Donald Hearn, 2nd Edition PHI..
2. Mathematical Element for Computer Graphics By. David F. Roger., J. Alan Adams, 2nd Edition, Tata McGHill.
3. Principles of Interactive Computer Graphics By. William. M. Newmann. 2nd Edition Mc. Graw Hill.

4. Procedural Element for Computer Graphics By. David F. Roger. Mc. Graw Hill.

5. Computer Graphics By A.P. Godse, 2nd Editio TPPublication,

6. Computer Graphics By V.K. Pachghare, 2nd Edition, Laxmi Publication
7. Multimedia by Gokul

PAPER 16:   (ELECTIVE-1)

Elective 1.1: Digital Image Processing

Unit-I:
Introduction to image processing, Two Dimensional Systems and Mathematical Preliminaries.

Unit-II:
Image Perception, Image Sampling and Quantization, Image Transforms, Image Representation by Stochastic Models.

Unit-III:
Image Enhancement, Image Filtering and Restoration.

Unit-IV
Image Analysis and Computer Vision.

Unit-V:
Image Reconstruction from Projections, Image Data Compression.

Reference:
1. Fundamentals of Digital Image Processing, A. K. Jain, Prentice Hall, (ISBN: 9780133361650) Oct 01, 1988
2. Digital Image Processing, 3rd Ed. Rafael C. Gonzalez, Richard E. Woods, Prentice Hall, ISBN 0-13-168728-x, 978-0-13-168728-8

Elective 1.2: Pattern Recognition

Unit-I:
3D Object Recognition: Inspirations and Lessons from Biological Vision, Range Sensing for Computer Vision, Feature Extraction for 3-D Model Building and Object Recognition.

Unit-II:
Three-Dimensional Surface Reconstruction: Theory and Implementation, CAD-Based Object Recognition in Range Images Using Pre-compiled Strategy Trees, Active 3D Object Models,

Unit-III:
Image Prediction for Computer Vision, Tools for 3D Object Location from Geometrical Features by Monocular Vision, Part-Based Modeling and Qualitative Recognition, Appearance-Based Vision and the Automatic Generation of Object Recognition Programs.

Unit-IV:
        Recognizing 3D Objects Using Constrained Search, Recognition of Superquadric Models in Dense Range Data, Recognition by Alignment, Representations and Algorithms for 3D Curved Object Recognition,

Unit-V:
        Structural Indexing: Efficient Three Dimensional Object Recognition, Building a 3-D World Model for Outdoor Scenes from Multiple Sensory Data, Understanding Object Configurations, Modal Descriptions for Modeling, Recognition, and Tracking, Function-Based Generic Recognition for Multiple Object Categories

Reference:

1.   Three-Dimensional Object Recognition Systems, Anil K. Jain, Patrick J. Flynn, P. J. Flynn, Elsevier Science Ltd, (ISBN: 9780444897978) Apr 01, 1993.

Elective 1.3: Digital Signal Processing
Unit-I:
        Introduction, Discrete-Time Signals and Systems, The *Z*-Transform and Its Application to the Analysis of LTI Systems,

Unit-II:
        Frequency Analysis of Signals and Systems, The Discrete Fourier Transform: Its Properties and Applications.

Unit-III:
        Efficient Computation of the DFT: Fast Fourier Transform Algorithms, Implementation of Discrete-Time Systems.

Unit-IV:
        Design of Digital Filters, Sampling and Reconstruction of Signals, Multirate Digital Signal Processing.

Unit-V:
        Linear Prediction and Optimum Linear Filters, Power Spectrum Estimation.

Reference:

1. Digital Signal Processing: Principles, Algorithms and Applications, 3/E, **John G. Proakis**, **Dimitris K Manolakis**, Prentice Hall, ISBN-10:0133737624, ISBN-13: 9780133737622

Paper-17: Practical based on Paper-13 and Paper-14

List of Practical: Programming in Java
1. Program that demonstrate use of Arrays.
2. Program to demonstrate constructors.
3. Program to demonstrate method overloading.
4. Program that demonstrate static fields and static methods of class.
5. Program that demonstrate inheritance and its types
6. Program to demonstrate use of method overriding.

7. Program to demonstrate the use of abstract method and abstract class.
8. Program that demonstrate String operations (String class methods)
9. Program that demonstrate package creation and use in program.
10. Program to demonstrate interface.
11. Program to handle exceptions in program (system generated & user defined exceptions)
12. Program that demonstrate multithreading. (Creating thread using Thread class and implementing Runnable interface)
13. Program for Thread synchronization.
14. Program using Byte Stream & Character Stream classes.
15. Program for reading input from keyboard.
16. Program that demonstrate Applet programming.
17. Program that demonstrate 2D shapes on frames.
18. Write a program that demonstrate use of various controls and Layouts
19. Program that demonstrate text and fonts.
20. Program that demonstrate event handling for various types of events.
21. Program to demonstrate JDBC (Inserting, displaying & updating records)
22. Program to demonstrate socket programming. (Client & Server)
23. Program to demonstrate Servlets.

OOAD:
At least 10 practical should be conducted on OOAD.

Paper-18: Practical based on Paper-15 and Paper-16

At least 10 practical should be conducted on each paper

M.Sc.-IV Semester

Paper 19: Artificial Intelligence (A.I.)

Unit-I:
Introduction: Games, theorem proving, natural language, processing, vision & speech processing, robotics, and expert systems AI, Techniques – search, knowledge, abstraction problems solving State Space Search,
Control Strategies: Depth First Search, Breadth First Search, and Production Systems.
Problem Characteristics: Decomposition, Ignoble, Recoverable, Predictable.
Unit-II:
Use of Heuristics: Hill climbing. Best First Search   A* Algorithm : Admissibility, AND/OR Graph- AO* Constraint Satisfaction : Cryptoairthmetic, Waltz Line Labeling.
Game Playing: Miming Search, Alpha-Beta Pruning.
Knowledge Representation: Predicate Logic, Well Formed Formulas, Quantifiers; Prenex Normal Form, Solemnization; unification, modus ponies; resolution refashion-various strategies.

Unit-III:

Rule Based Systems: Forward Reasoning: conflict resolution , backward reasoning: use of no backtrack structured knowledge representations : semantic net : slots , inheritance , frames-exceptions and defaults –attached predicates, conceptual dependency formalism.

Object Oriented Representations: Al Programming Languages: PROLOG , Syntax, Procedural and declarative meanings, prologue unification mechanism, anonymous variable, lists; use of fail, CUT, Not.

LISP: Basic Concepts, eval functions, functions and variables, scooping of LISP variables, iteration and recursion.

Unit-IV:

Handling Uncertanity: Probablistic Reasoning , Bays Net , Dempster Shaver Theory, use of Certainty Factors, Fuzzy Logic Nonmonotonic Reasoning, Dependency Directed Backtracking, Truth, Maintenance Systems.

Learning: Concept of Learning, Learning Automation; The Genetic Algorithm, Learning by Induction, Neural Networks, Hopfield Networks, Perceptions-Learning Algorithm, Backpropagation Network Boatsman Machine, Recurrent Networks. Planning: Components of Planning System , Plan Generation Algorithms, Forward State Propagation, Backward State Propagation , Non-Linear Planning Using Constraint Posting .

Unit-V:

Expert Systems: Need & Justification for Expert Systems- Cognitive Problems, Expert System Architecture , Rule Based Systems, Non Production System, Knowledge Acquisition, Case Studies: Mycin, R1.

Natural Language Processing: Syntactic Analysis, Top Down and Bottom Up Parsing; Augmented Transition Networks, Semantic Analysis, Case Grammars.

References:

1. Artificial Intelligence   - E. Rich & K. Knight, Tata MC-Graw Hill
2. Introduction To Al And Expert Systems –D.W . Paterson ., Paretic Hall Of India
3. Introduction To Expert Systems   - Peter Jackson, Addison Wesley Pub. Company.
4. A. I. and Engineering Approach - R.J. Schalkoff. MC-Graw Hill Ed.
5. Principles of Al   - N.J. Nilsson, Narrows Publishing House.
6. Programming In Prolog   - Clocks & Melissa, Narrows Publishing House.
7. Rule Based Expert S   ystem   - M. Sasikumar, S. Ramani, Narosa Pub. House
8. Artificial Intelligence   – P.H. Winston 2nd Edition, Addison-Wesley ,1984.
9. Prolog From The Beginning   - H.Konigslerg & F.De .Bruyn, MC-Graw Hill Ed.

PAPER 20: COMPILER DESIGN

Unit-I:
Introduction to Compilers : Overview, Structure, implementation. Programming Language Grammars: Inter Language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars & expressions.

Unit-II:
Scanning and Parsing Techniques : The Scanner, parser, translation, elementary symbol table organization, structures.

Unit-III:
Memory Allocation: Static and dynamic memory allocation, array allocation and access, allocation for strings, structure allocation, common & equivalence allocation. Introduction to Compilation of expressions.

Unit-IV:
Compilation of Control Structures : Control transfers, procedural calls, conditional execution, interation control constructs. Error detection, indication & recovery. Compilation of I/O Statements: Compilation of I/O list, compilation of FORMAT list, IOSUB, file control.

Unit-V:
Code Optimization: Major issues, optimizing transformations, local optimizations, program flow analysis, Global Optimization, writing compilers.

References:

1) Compiler Construction - D.M.Dhandhere (M)
2) Compiler Writing - Tremble-Sorenson (TMH)
3) Computers : Princ, Techniques cools by Aho - Person.
4) The Essence of Compilers by Hanter - Pearson.

PAPER 21 : Internet Computing with ASP.NET

Unit-I:
HTML Basics: Introduction to Internet, Applications, Web designing, web browser, web pages, home page, web site, web servers, www. Concepts of hypertext, hypermedia, versions of HTML, elements of HTML, syntax, sections of HTML, building & executing html documents, Various tags of HTML: Headings & Title, Text-level elements, Changing Colors font, size using FONT> Tag, Text alignment & paragraph Creating links with <A Href> tag, Inserting image using <IMG> tag, Creating Table with <TABLE> tag, rowspan, colspan attributes. <FRAMESET> & <FRAME> tag, <FORM> tag, creating text boxes, buttons, checkboxes, radio buttons, hidden control, password, lists & dropdown list, textarea. Submitting a form, get & post method. ASP & HTML forms. Working with Cascading Style Sheet (CSS):

Unit-II:
ASP.NET Controls: Overview of dynamic web page, introduction & features of ASP.NET, understanding ASP.NET controls, applications, web servers, installation of

IIS. Web fors, web form controls, server controls, client controls, adding controls to web form, buttons, text box, labels, checkbox, radio buttons, list box. Adding controls a runtime, Running a web application, creating a multiform web project, Form validation: client side and server side validation, Validation controls: required field comparison range, Calendar control, Ad rotator control, Internet Explorer control.

Unit-III:

ADO.NET: Overview of ADO.NET, from ADO to ADO.NET, ADO.NET architecture, Accessing data using data adapters and datasets, using command and data reader, binding data to data bind controls, displaying data in data grid.

Unit-IV:

XML in .NET: XML basics, attributes, fundamentals of XML classes: Document, text writer, text reader, XML validations, XML in ADO.NET, Data document

Unit-V:

Web Services: Introduction, State management, view state, session state, application state, service description language, building & consuming a web service. Web application development, Caching, Threading concepts, Creating threads in .NET, Managing threads, Thread Synchronization, features of .NET, role based security & code access security, permissions

References:

1. The Completer Reference ASP.NET – Mathew Macdonald (TMH)
2. Professional ASP.NET – Wrox publication
3. VB.NET Programming Black Book – Steven Holzner (Dreamtech pub.)
4. Introduction to .NET framework – Wrox publication.
5. ASP.NET Unleashed   - bpb publication.
6. Learn HTML in a weekend – Steven E. Callihan (TMH)
7. Using HTML – Lee Anne Philips (PHI)

PAPER 22- ELECTIVE 2

Elective 2.1 Biometrics

Unit I:

Introduction :Operation of a biometric system, Verification versus identification, Performance of a biometric system, Applications of biometrics, Biometric characteristics, Limitations of biometric systems, Introduction to Biometrics and its various techniques.

Unit II:

Finger Print Verification Techniques: Introduction, History, Matching Verification and Identification, Feature Types, Image processing and verification.

Unit III:

Hand Geometry Based Verification Introduction, System Operation, Implementation Issues, Applications.

Unit IV:

Retina Recognition Introduction, Retina/Choroidas Human Descriptor, Computing Subsystem

Unit V:

DNA Based Identification: Introduction, A brief History of DNA based Identification, Applications of DNA Identification Technology,

References:

1. BIOMETRICS Personal Identification in Networked Society, edited by
Anil K. Jain and Ruud Bolle and Sharath Pankanti
2. Handbook of Multibiometrics by Arun A, Ross and Karthik Nandakumar and Anil K. Jain Springer-Verlag New York Inc, Oct 19, 2007, (ISBN: 9780387710402) (Only Chapter 1)
3. Biometric Systems: Technology, Design and Performance Evaluation,(Hardcover) James Wayman, Anil Jain, Davide Maltoni, Dario Maio

Elective 2.2: Bioinformatics

Unit I:

What Is Bioinformatics, Goal, Scope, Applications, Limitations, , How Is Computing Changing Biology, Isn't Bioinformatics Just About Building Databases, What Does Informatics Mean to Biologists, What Challenges Does Biology Offer Computer Scientists, What Skills Should a Bioinformatician Have, Why Should Biologists Use Computers, What Is a Database, Types of Databases, Biological Databases, Pitfalls of Biological Databases.

Unit II:

Molecular Biology's Central Dogma, What Biologists Model, Why Biologists Model, Chemical Composition of Biomolecules, Composition of DNA and RNA, Watson and Crick Solve the Structure of DNA, Development of DNA Sequencing Methods, Gene finders and Feature Detection in DNA, DNA Translation, Pair wise Sequence Comparison, Sequence Queries Against Biological Databases, Multifunctional Tools for Sequence Analysis

Unit III:

Multiple Sequence Alignments, Trees, and Profiles, The Morphological to the Molecular Multiple Sequence Alignment, Phylogenetic Analysis, Profiles and Motifs, Visualizing Protein Structures and Computing Structural Properties, A Word About Protein Structure Data, The Chemistry of Proteins, Web-Based Protein Structure Tools, Structure Visualization, Structure Classification, Structural Alignment, Structure Analysis, Solvent Accessibility and Interactions, Computing Physicochemical Properties.

Unit IV:

Predicting Protein Structure and Function from Sequence, Determining the Structures of Proteins, Predicting the Structures of Proteins, From 3D to 1D, Feature Detection in Protein Sequences, Secondary Structure Prediction, Predicting 3D Structure.

Unit V:

Tools for Genomics and Proteomics, From Sequencing Genes to Sequencing Genomes, Sequence Assembly, Accessing Genome Information on the Web, Annotating and Analyzing Whole Genome Sequences , Functional Genomics: New Data Analysis Challenges, Proteomics, Biochemical Pathway Databases, Modeling Kinetics and Physiology

Reference Books:
1. Developing Bioinformatics Computer Skills, By Cynthia Gibas & Per Jambeck
Publisher: Shroff/O'Reilly, First Edition April 2001, ISBN: 9788173662423
2. Essential Bioinformatics By JIN XIONG, Cambridge University Press. (Only Chapter One)
3. Bioinformatics Technologies By Springer ISBN 3-540-20873-9 Springer Berlin Heidelberg New York
4. Bioinformatics: Sequence and Genome Analysis By David Mount

2.3) Neural Network
Unit-I:
Intrduction The role of neural networks in engineering, artificial intelligence, and cognitive modelling.
Unit-II:
Supervised learning in neural networks: Feed-forward neural networks of increasing complexity, gradient descent learning and extensions, learning and generalization theory
Unit-III:
Computation and dynamical systems : Hopfield model of content-addressable memory, Hopfield-Tank approach to optimisation, resistive networks for vision models, complex dynamical learning models.
Unit-IV:
Reinforcement Learning: The problem of reinforcement learning, Arp learning, Q-learning, TD-learning. Generalization and function approximation. Unsupervised Learning :Competitive learning, Self-organizing feature maps, ART networks, GWR networks.
Unit-V:
Selected Applications : The perceptron and linear separable functions multilayer perceptrons backpropagation, one basic learning algorithm for feedforward networks variations and improvements of backpropagation generalisation ability recurrent networks: Hopfield Networks and Boltzmann Machines unsupervised learning self-organising feature maps

Reference Book:
 1.An Introduction to Neural Networks by K Gurney
 2. Neural Neural by Sue

Paper-23

Major Project

```
Project Work      : 40
Project Report    : 20
Viva Voce         : 10
------------------------------------
Total             : 70
------------------------------------
```

Paper-24

Seminar: 30 marks