SEMESTERWISE COURSE CONTENTS

Semester – I

MC – 101: Computational Mathematics

Objective: To develop logical thinking and introduce basic concepts.

Unit – 1

Graph Theory: Basic terminology, multigraphs and weighted graphs, paths and circuits, searching techniques: BFS, DFS and their applications, shortest paths in weighted graphs, Eulerian paths and circuits, Hamiltonian paths and circuits, Traveling Salesperson problem, planar graphs, trees and rooted trees, prefix codes, minimal spanning trees, cut sets, directed graphs.

Unit – 2

Finite Automata and Regular Languages: Deterministic and non-deterministic finite automata, regular expressions, regular languages and their relationship with finite automata, pumping lemma and closure properties of regular languages.

Unit – 3

Context Free Grammars and Pushdown Automata: Context free grammars (CFG), parse trees, ambiguities in grammars and languages, pushdown automaton (PDA) and the language accepted by PDA, deterministic PDA, Non- deterministic PDA, properties of context free languages; normal forms, pumping lemma, closure properties, decision properties.

Unit – 4

Turing Machines: Turing machine as a model of computation, programming with a Turing machine, variants of Turing machine and their equivalence.

Unit – 5

Undecidability: Recursively enumerable and recursive languages, undecidable problems about Turing machines: halting problem, Post Correspondence Problem, and undecidability problems about CFGs.

Reference Books

1. Narsingh Deo,"**Graph Theory and application to Engineering and Computer sciences** ",1986 PHI.
2. J.A Anderson , " **Automata Theory Of Modern Application"** Cambridge University Press,2006
3. H.R Lewis, C.H Papadimitriou, C. Papadimitriou, **"Elements Of The Theory Of Computation (2nd edition)"** Prentice Hall NJ 1997.
4. Thomas Koshy, **Discrete Mathematics with Applications**, Academic Press, Reprint 2005.
5. Kenneth H Rosen, **Discrete Mathematics & its Applications with Combinatorics and Graph Theory**, 6th Edition, McGraw Hill, 2007.

MC – 102: Computer Organization and Architecture

Objective: To introduce the nature and characteristics of modern-day Computers

Unit – I

Digital Logic Circuit: Number Systems – Binary, Octal, Hexadecimal, Boolean Algebra, Map Simplification, Logic gates, Combinational Circuits, Adder, Subtractor, Multiplexer, Decoders, Sequential Circuits, Flip Flops, Registers, Counters.

Unit – II

Memory: Internal Memory – RAM and ROM CHIPS, External Memory – Magnetic Tape, Magnetic Disk, RAID, Optical Memory, Memory Organization- Associative Memory, Virtual memory, Cache Memory

Unit – III

Central Processing Unit: Arithmetic and Logic Unit- Instruction sets, Characteristics and function, Machine Instruction Characteristics, Type of operands, Type of operations, Addressing Modes and Format, Processor Organization, Instruction Cycle, Instruction Pipelining

Unit – IV

Peripherals: External devices, I/O Modules, Programmed I/O, Interrupt driven I/O, Direct Memory Access, I/O Channels and Processors, The external Interface, Asynchronous Data transfer

Unit – V

Advanced Architecture: Reduced Instruction Sets Computers, RISC Pipelining, The RISC Versus CISC, Super Scalar Processors- Design issues, Parallel Processing, Multi-Processing Vector Computation, Parallel Processors,

Reference Books

1. M. Morris Mano, **Computer System Architecture** (3rd ed.), Prentice –Hall of India, 2007.
2. W. Stallings, **Computer Organization and Architecture: Designing for Performance** (7th ed.), Pearson Education, 2006
3. A.S. Tanenbaum, **Structured Computer Organization** (4th ed.), Prentice–Hall of India, 1999.
4. J.P. Hayes, **Computer Architecture and Organization** (2nd ed.), McGraw-Hill Book Company, 1988.

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MC – 103: Object Oriented Programming, Analysis and Design

Objective: To Study the Programming analysis and design aspects of Object-Oriented Methodology.

Unit – I

Concepts, Operator Overloading, Friends: Concepts in object-oriented programming, Classes and Objects, C++programming basics, Object-oriented analysis, Object-oriented Design methods, Operator Overloading, Friend functions and operators.

Unit – II

Arrays, Pointers and Inheritance: Arrays, Pointers and inheritance: Derived classes, the protected access specifier, Derived class constructors, Overriding Member functions, Class Hierarchies, Public and Private inheritance, Multiple Inheritance and other types of inheritance.

Unit – III

Polymorphism, Virtual Functions Files: Polymorphism: Virtual Functions, Abstract base classes and Pure Virtual Functions, File and Streams, Templates, Generic Programming

Unit – IV

Concepts: Object Oriented Analysis, Object Oriented Design Method, Object Model, Classes and Object, Nature Relationship among Objects, Nature of a class, Nature of Class, Relationship among classes, Identifying Classes and Object, Key abstraction and mechanism, Module and Process diagram UML

Unit – V

Methods: Notational elements- Class, State Transition Object, Interaction, OMT analysis (James & Rumbaugh), Comparison of various Object Oriented Analysis of Design Methodologies, Case Studies.

Reference Books

1. Neill Graham, "**Learning C++**" 1991 Mc Graw Hill Inc. Intl. Edition.
2. Robert Lafore, "**Object Oriented Programming in Turbo C++**",1992 Galgotia Publications.
3. Grady Booch, "**Object Oriented Analysis and Design With Application**",1994 Benjamin Cummings Publishing Company Inc.
4. Strastroup, "**C++ Programming Language** ".
5. Roger S. Pressman "Software Engineering a Practiton Approach", McGraw-Hill Book Company.

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MC – 104: Modern Operating Systems

Objective: To understand the concept of OS and its various function, to impart knowledge of various strategies and techniques used to realize these functions and to enable the students understand and appreciate the design principles involved in some of current OS.

Unit – I

Operating System Overview: What is an Operating System (OS), Goals of an Operating System, Generations of Operating Systems, Types of Operating Systems, Functions of OS.

Unit – II

Processes: Concept of Process, System Calls for Process Management, Process Scheduling, Scheduling Algorithms, scheduling, Performance evaluation of the Scheduling Algorithms, Interprocess Communication, Interprocess Synchronization, Semaphores, Classical problems in concurrent programming, Deadlock detection and recovery, deadlock avoidance, Deadlock prevention and other issues.

Unit – III

Memory Management: Overlays and Swapping, Logical and Physical Address Space, Single Process Monitor, Contiguous Memory Methods, Paging, Principles of operation, Page allocation, Hardware Support for Paging, Protection and Sharing, Segmentation, Principles of operation, Address Translation Protection and Sharing. Virtual Memory, Principles of operation, Virtual Memory management, Protection and sharing, Demand paging, Page Replacement policies, Thrashing, Working Set Model, Page Fault Rate, Demand Segmentation, Combined Systems, Segmented paging, Paged segmentation

Unit – IV

I/O and File Management: Organization of the I/O function, I/O Buffering, Disk Organization, Disk Scheduling, RAID, Disk Cache, Command language user's view of File System, The System programmer's view of the file, System, The Operating systems' view of file Management, Directories, Disk Space Management, Disk address translation, File related system services, Asynchronous Input / Output.

Unit – V

Distributed Operating Systems: History of Distributed Computing, Distributed Systems, Key features and Advantages of a Distributed System, Design Goals of Distributed Systems, Design Issues Involved in Distributed Systems, Distributed System Structure, Mutual Exclusion in Distributed Systems, Remote Procedure Calls Other Middleware Technologies.

Reference Books

1. William Stallings: **Operating Systems: Internals and Design Principles**, Prentice Hall, 2013, 6th Edition.
2. Gary Nutt: **Operating Systems**, Pearson, 2014, 3rd Edition.
3. Silberschatz, Galvin, Gagne: **Operating System Concepts**, Wiley, 2008, 8th Edition.
4. Andrew S. Tanenbaum, Albert S. Woodhull: **Operating Systems, Design and Implementation**, Prentice Hall, 2006, 3rd Edition.
5. Pradeep K Sinha: **Distributed Operating Systems, Concept and Design**, PHI, 2007.

MC – 105: Advanced Database Management Systems

Objective: To introduce the concepts of database systems and to study in detail about relational databases.

Unit – I

Review on Fundamentals of Databases: Concepts, Architecture, ER Modelling, Relational Databases, Fundamental and extended operations in Relational Database Model, SQL, basic and Complex queries in SQL. **Database Normalization and Security**: Normalization of Database Tables, Transaction and concurrency control, Database security, Authorization and Encryption.

Unit – II

Object Relational Database Systems: Objects, Object Identity, and Reference Types, Inheritance, Features of Object-relational Systems, Database Design for an ORDBMS, New Challenges in Implementing an ORDBMS, OODBMS, Comparing RDBMS with OODBMS and ORDBMS.

Emerging Database Technologies: Active Database Concepts and Triggers, Temporal Database, Multimedia Databases, Spatial Databases, Geographic Information Systems (GIS) and Deductive Databases.

Unit – III

Distributed Databases: Introduction to Distributed DBMS, Client-Server Model, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design. Types of distributed database systems: - Federated database systems, Multi-database systems; Query processing in distributed databases. **XML and Internet Databases:** Structured, unstructured and semi structured data, XML Hierarchical data model, XML document, DTD and XML Schema XML documents and databases, and XML query.

Unit – IV

Data Warehousing: Characteristics of data warehouses, Data warehousing Components – Building a Data warehouse, Typical functionality of a data warehouse: Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools – Metadata.

Reference Books

1. Raghu Ramakrishnan and Jhonnes Gehrke: Database Management Systems, McGrawHill 2000, Second Edition.
2. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 1999, Sixth Edition.

MC – 106: Computer Networks

Objective: To impart Knowledge of various topology and layers associated with computer network.

Unit – I

Introduction to computer Networking concepts: Local, Metropolitan and Wide Area Networks; Telecommunications and Cellular Networks Overview, Physical Layer - Basics of communications, Transmission Media, Protocols and standards, Standards Organizations, Line Configuration, Topology, Transmission mode, Networks Signals, Wired and Wireless media including copper cables, optical fiber and Wireless, Multiplexing and switching methods.

Unit – II

Data Link Layer and Logical Link Control (LLC) sub-Layer: Framing, Error control including Bit-parity, CRC and Hamming Codes, Reliable transmission and Automatic Repeat Request (ARQ) protocols including Stop-and-Wait, Go-back-N, Selective Repeat. Performance analysis of ARQ protocols. Example protocols such as HDLC and PPP.

Unit – III

Medium Access Control (MAC) sub–layer: Shared media systems, Bus, Star and Ring topologies, TDMA, FDMA, CSMA, CSMA/CD, Ethernet, related protocols such as ICMP, NAT, ARP and RARP.

Unit – IV

Network Layer: Internet Protocol (IP) suite, Hierarchical network architectures, IPv4 and IPv6 addressing and headers, Routing protocols including distance-vector and link-state approaches, Interior and Exterior Gateway Protocol concepts, Routing Algorithms including Dijkstra's algorithm and distributed Bellman – Ford algorithm; Example protocols : OSPF, RIP, BGP.

Unit – V

Transport Layer: Reliable end –to–end transmission protocols, UDP header; Details of TCP header and operation including options headers and congestion control, TCP variants such as Reno, Tahoe, Vegas, Compound and CUBIC.

Unit – VI

Application Layer: Socket Interface, Socket programming; Example Protocols such as DNS, SMTP, FTP and HTTP.

Reference Books

1. WilliamStallings– **Data & Computer Communications**, PHI, 6th ed.
2. Behrouz A Forouzan-**Data Communication & Networking**, McGrawHill, 2000, 2nd edition
3. Forouzan, B.A., "**TCP/IP Protocol**", TMH
4. LauraChappell (ed),"**Introduction to Cisco RouterConfiguration**", Techmedia, 1999.
5. Tananbaum A.S., **"ComputerNetworks"**, PHI .
6. Black U.,"ComputerNetworks-Protocols, Standards andInterfaces", PHI,1996.

MC – 107: PROGRAMMING LAB – 1

- Object Oriented Programming in C++

MC – 108: PROGRAMMING LAB – 2

- DBMS

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MCPE – 109: Computer Graphics and Multimedia

Objective: To study the software and hardware aspects of computer graphics,

Prerequisite: Mathematics, Matrix Theory, Analytical Geometry, Trigonometry

Unit – I

Graphics Devices – Line and Circle Drawing Algorithms: Overview of Graphic Systems - Display Devices Hard copy Devices - Interactive Input devices -- Display Processors, graphics Software - Line drawing various algorithms and comparisons Circle drawing algorithms.

Unit – II

Filling Transformation and Segments: Attributes - Area filling algorithms - Scan conversion algorithms - Transformations Two dimensional - Basic Composite and Other Transformations - Matrix representations Windowing and Clipping - Viewport Transformations - Segments.

Unit – III

Graphics and 3D Graphics: Interactive input methods - Input Devices - Input Functions - Three Dimensional Concepts - 3D Transformations-Curves Projections - Hidden Surface Elimination algorithms.

Unit – IV

Multimedia Introduction: Multimedia applications - System architecture - Objects of Multimedia Systems -Multimedia databases Compression and File formats Image compression CCITI' - JPEG-Video image compression - MPEG DVI Technology - Audio compression - RTF format TIFF file format -- RIFF FILE format - MIDI - JPEG DIB - TWAIN, Video & Audio Codecs.

Unit – V

Application Classes: Types of systems Virtual reality design - Components Databases Authoring Systems - Hyper media - User interface design Display/Playback issues - Hypermedia linking and embedding - Production of Multimedia systems.

Reference Books

1. Donald Hearn, M.Pauline Baker, 'Computer Graphics", 1992, PHI,
2 William M.New Man, Robert F. Sproull," Principles of Interactive Graphics", 1979, McGraw Hill.
3. Fred Hofstterrn, Multimedia Literacy", 1995, McGraw Hill.
4. Burger, "Desktop Multimedia Bible", 1993, Addison Wesley.
5. Matthew E.Hodges and Russell M.Sasnett, "Multimedia Computing", 1990, Addison
6. John F. Koegel Beford, "Multimedia Systems", 1994, Addison Wesley, University of Massachusetts, Lowell.
7. Simon Gibbs, Dennis Tsichritzis, "Multimedia Programming", 1995, Addison Wesley, University of Geneva.

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