

COMPUTER ENGINEERING (unit-wise)

1. Computer Architecture, Organization, Parallel & Distributed Computing

Number systems and coding Schemes, Von-Neumann Model: Introduction to Computer Hardware: Block Diagram of Computer -CPU, I/O and Memory & Operating System; Types of CPU; Various I/O Devices; Buses and I/O Mechanisms; Memory Hierarchy; Hardware and Software Concepts; Hard wired and Micro Programmed Control; Memory and Fetch cycles; Secondary storage systems; Computer Arithmetic: Number Systems, Integer Arithmetic, Floating Point Arithmetic; Assembly and Machine Language Programming; PC Architecture; Digital Logic Design. Introduction to Multiprocessors. Parallel computing -Flynn's classification; Array Processing ; Pipelining and Multiprocessing; Distributed computing Fundamentals.

2. Computer Programming, Data Structures & Object Oriented Analysis and Design

Fundamentals of Computer Programming, Programming Languages, Programming Environments, Flowchart, Algorithms and pseudocoding; Program Design Concept; various data types; Control Structures - Sequence, condition, unconditional, Iteration ; Recursive Procedure and functions; Data structures - Arrays, strings, structures, pointers, Files, Linked lists, Stack, Queue, trees, graphs, records, sets; Programming in C / C++; Object orientation concepts - Inheritance, Polymorphism and data Encapsulation; Agents, Responsibility, Messages and methods; RDD and CRC; Objects and Classes; Components and Frameworks; Coupling and Cohesion; Classes and Methods in C++, Java and Small Talk ; Basic concepts of UML; class diagrams, interaction diagrams and object diagrams, object - oriented databases, Process - Macro and Micro Process and Pragmatics- Management, Planning, Staffing, Quality Assurance. Python, PHP.

3. System Programming and Operating Systems

Introduction, Concepts of System Programs; system programming tools - Lex, YACC, Parsers ; Operating system Concepts - types of OS; OS - functions Services and policies;

Process Management; multithread programming, CPU scheduling; process coordination: synchronization, deadlocks; I/O management; memory and storage management, virtual memory; File system and Management; Case study of DOS, unix and windows.

4. Numerical Computation, Algorithm Design and Complexity of Computing

Errors - Types and causes ; Handling techniques ; Root finding Polynomials and transcendental equations ; solution of linear systems of equations ; Gauss Elimination, Gauss Jordan and Gauss Seidel methods ; Interpolation methods, polynomials, rational functions, trigonometric, spline functions; Curve Fitting Numerical differentiation and integration, extrapolation, Gaussian integration, Eigen values and Eigen vector Computation, Linear equations, Gaussian elimination, orthogonalization, Data fitting, Computer Programming of Numerical Problems ; C programs for Numerical Computation; Time and space complexity of algorithms and Programs; Big-O, θ , Big- Ω Notations; Complexity of Sorting - Heap Sort, Fibonacci Heaps, searching - Binary search Trees, Red- Black Trees, Amortized Analysis, Splash Trees; Matrix Algorithms; Dynamic Programming; Greedy methods; Prune and Search, Divide and conquer method; Asymptotic Considerations; P, NP, NC classes of Algorithms; NP - Completeness ; Heuristic and Non - Deterministic approaches to algorithms; Depth First, Breadth First, Branch and Bound Algorithms; A* & AO* Algorithms shortest path computation; TSP.

5. Theoretical Foundations of Computing

Discrete structures - Sets, Logic; Counting Techniques and Combinations ; relations and functions ; graphs and trees ; Algebraic systems - Groups, Rings, Fields, Lattices and Boolean Algebras ; Applications in Computer Science, Regular languages - Grammars, Expressions, Linear languages, Context free languages - CKY and Earley's Parsing Algorithms,, Automata Theory - Finite State Machine, Push down Automaton, Context sensitive Languages, Recursively enumerable languages, Turing Machine ; Formal Language Theory - Chomsky Hierarchy; Computability and Decidability; Theory of program correctness; Predicate Calculus.

6. Artificial Intelligence and Neural Networks

Basic Principles of AI – search, Heuristics ; Non-Determinism ; Computer-Assisted Decision Making, Pattern Recognition, symbolic computation, knowledge representation schemes; Genetic Algorithms, Programming in Logic; Neural Network - Foundations, Neural Models, Classification of Network, Learning and Training, Supervised and unsupervised Learning; Fuzzy logic Expert system overview and natural language and understanding concepts.

7. Data Base and Information System

System Analysis and Design Concepts; File Types - Sequential, Indexed, random access and relative files; Data Models, Schemas, Instances; DBMS -types and applications ; Data Base Design Concepts; Normalization Techniques; Data Redundancy and consistency, Data description; manipulation and definition languages ; RDBMS - concepts, constraints, schemas, SQL programming - complex queries, triggers, views; Relational Algebra, Calculus, SQL Server; overview of Oracle; MS Office - Word ; Excel and Access; Distributed databases. Analytics – Descriptive, Predictive, Prescriptive.

8. Computer Networks and Web Engineering

Evolution of Computer Networks; ISO – OSI model ; computer networking hardware, Channels & Bandwidth Considerations, Computer network design - Topology, Protocols, Information sharing techniques ; Routing Algorithms; Congestion, Packet Design; Circuit and Message Switching, Ethernet, LAN , MAN and WAN features; Internet, Intranet and Extranet Applications of Computer Networking ; IPV4, IPV6, TCP, UDP, Storage area networks, Optical Networking of Computers, Network Simulation, Network Security Fundamentals; Error Detection and Recovery; Computer Networking Standards. Concepts of WWW, Website Development, Markup Language - HTML, DHTML features; Applets and Servlets; MVC Architecture, client – server model of Web Development; types of servers - Web Server, Application server and Data Base Server, Data base Connectivity ; Scripting Languages; basis features of JSP, ASP and Java Scripts; Overview of J2EE – EJB and COM / DCOM; Front – end development ; Web services – XML technologies, Java Frameworks.

9. Computer Graphics & C.A.D.

Overview of computer graphics, Hardware & Computer Graphics software; shapes & Transforms - line drawing Algorithms; Polygon and Circle drawing, Two dimensional and Three dimensional transformations, Hierarchical Modeling; Planes and Surface Description, line clipping ; B-Spline methods; Animation Graphics ; Computer Graphics Applications in C.A.D; Basic features of Auto CAD - viewing, Layers, precision, snap tools, co-ordinates.

10. Software Engineering and Project Management

Software development life cycle; Process, requirements Engg; Process Models - Iterative development; Waterfall Development ; Agile methodology, System Modeling, Software Metrics; Software Testing and Quality Assurance; User name Analysis and Architectural - Centric Design; Project Management, Configuration and Change arrangement, Project management Tools; Project Execution; Risk Management; Project Life Cycle, SDLC, Cost estimation and Scheduling ; Man - Power Coordination. Re-Engineering.