CS – COMPUTER SCIENCE AND ENGINEERING , INFORMATION TECHNOLOGY & SOFTWARE TECHNOLOGY

Engineering Mathematics

Mathematical Logic:

Syntax of First Order Logic, Semantics of First Order Logic, a Sequent Calculus, the Completeness Theorem, the Limitations of First Order Logic.

Differential and Integral Calculus :

Limit, Continuity, Differentiability, Leibniz theorem, Mean Value Theorems, Taylor's theorem, Integrals, Improper integrals, Total Differentiation, Partial derivatives ,Maxima and Minima, vector calculus, Linear differential equations.

Probability and Statistics:

probability, conditional probability, Baye's theorem, means, median, mode, moments, standard deviation. Random variables, Uniform, Binomial, Poisson, normal distributions, Correlation and regression, Sampling and Tests of significance.

Numerical Methods:

solutions to algebraic and transcendental equations(Bisection and Newton Raphsons' methods), simultaneous linear algebraic equations(Gauss elimination, Crouts, Gauss seidal and relaxation), Interpolation methods (forward, backward and central), numerical integration (Trapezoidal, Simpson's and Wedd le's) eigen values and eigen vectors, Numerical solutions to ordinary (Euler, modified Euler, Runga Kutta 4^{th} order) and partial differential(parabolic, elliptic and Hyperbolic) equations.

Linear Algebra and Transforms:

linear vector space, determinants, matrices, eigen values, eigen vectors, elements of complex analysis, laplace transforms, Fourier analysis.

Theoretical Computer Science

Discrete Mathematics:

sets, relations and functions, algebra of matrices and determinants, algebraic structures, Boolean algebra and applications, order relations and structures, graph theory, logic and combinatorics.

Theory of computation:

Regular languages and finite automata, context free languages and Push down automata, recursively enumerable sets and Turing machines, undecidability.

Analysis of algorithms and computational complexity: Asymptotic analysis (best , worst, average case) of time and space, Upper and lower bounds on the complexity of specific problems, NP-completeness, code and query tuning techniques, numerical analysis, power analysis & resiliency, intractable problems.

Computer Hardware

Electronics:

Network analysis, semiconductor devices, bipolar transistors, FET's, Power supplies, amplifier, Oscillators, Operational amplifiers, elements of digital electronics, logic circuits.

Digital logic:

Number systems and codes, Gates, TTL circuits, Boolean algebra and Karnaugh maps, Arithmetic logic units, Flip flops, registers and counters, Memories, Combinational and sequential logic circuits .

Computer Architecture and organization:

Machine instructions and addressing modes, ALU and data path, Register Transfer Language , hardware and micro programmed control, memory interface, RAM, ROM I/O interface (Interrupt and DMA modes), serial communication interface, instruction pipelining, Cache, main and secondary memory storage, organization and structure of disk drives, RAID architectures Microprocessors: 8085, 8086, Interfacing and memory addressing.

Software systems

Data structures:

Notion of abstract data types, stack, Queue, List, set, string, Tree, binary search trees, heap, graph.

Programming methodology:

Introduction to programming, pointers, arrays, control structures, Iterational control structures, functions, recursion, testing, debugging, code review, structures, files.

Algorithms for problem solving:

Tree and graph traversal, connected components, spanning trees, shortest paths, hashing, sorting, searching, design paradigms (Greedy, dynamicprogramming, divide and conquer).

Programming language processors:

Compiler, Interpreter, assembler, Linker, Loader, Macro processors, phases of compilers, Lexical analysis, parsing, Top-down parsing and bottom up parsing, syntax directed translation, runtime environment, Symbol table, type checking, intermediate Code generation, Code optimization, code generation.

Operating systems:

Memory management, page faults, overlay, processor management, device management, dead locks, Process, thread and inter process communication, CPU scheduling, file systems, I/O systems, protection and security.

System & program development methodology: Software paradigms, principles of programming in any language, documentation, system analysis and design methodologies, User Interface Design (UID), software construction, software testing, software quality, Object Oriented Aanlaysis and Design (OOAD) concepts.

Management Information systems:

Aspects of Management and Information systems, decision support and operation support system, systems approaches to MIS, computers andinformation system in business.

Databases management systems:

Data, database and DBMS, Data dictionary/directory, schema, description of database structure, forms of DBMS systems, Hierarchical, network and RDBMS, DDL, DML, stored data structure language and query language, Recent trends in database management systems, Memory management techniques used in computers, query languages(SQL), file structures (sequential files, indexing, B* trees) Transactions and concurrency control, Basic concepts of transaction processing, ACID properties of transactions, serializability of transactions, concurrency control, recovery, OLAP.

Computer networks & Data communications:

Analog versus Digital communication, modems, multiplexers, and concentrators, serial versus parallel communication, simplex, duplex, and half duplex communication, synchronous and asynchronous communication, Error detection/correction methods, data link control protocols, balanced and unbalanced interfaces, communication media, ISO/OSI stack, Sliding window protocol, LAN Technologies (Ethernet, Token ring), TCP/UDP, IP, switches, gateways, and routers.

Web technologies:

HTML, XML, Concepts of network and internet, WWW and HTTP, web server, web applications, load balancing and application server, web securities.

Computing Technologies:

Client server computing, Logical layers in client server architecture, Two-tier versus Three-tier, Distributed computing, Middleware, Mobile Computing, Cloud Computing.