



GATE Syllabus

Computer Science and Information Technology



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COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Subject Code: CS

Course Structure

Sections/Units	Topics
Section A	Engineering Mathematics
Unit 1	Discrete Mathematics
Unit 2	Linear Algebra
Unit 3	Calculus
Unit 4	Probability
Section B	Digital Logic
Section C	Computer Organization and Architecture
Section D	Programming and Data Structures
Section E	Algorithms
Section F	Theory of Computation
Section G	Compiler Design
Section H	Operating System
Section I	Databases
Section J	Computer Networks

Course Syllabus

Section A: Engineering Mathematics

Unit 1: Discrete Mathematics

- Propositional and first order logic
 - Sets

- Relations
- Functions
- Partial orders
- Lattices
- Groups
- Graphs:
 - Connectivity
 - Matching
 - Coloring
- Combinatorics:
 - Counting
 - Recurrence relations
 - Generating functions

Unit 2: Linear Algebra

- Matrices
- Determinants
- System of linear equations
- Eigenvalues and eigenvectors
- LU decomposition

Unit 3: Calculus

- Limits, continuity and differentiability
- Maxima and minima
- Mean value theorem
- Integration

Unit 4: Probability

- Random variables
- Uniform, normal, exponential, poisson and binomial distributions
- Mean, median, mode and standard deviation
- Conditional probability
- Bayes theorem

Section B: Digital Logic

- Boolean algebra
- Combinational and sequential circuits
- Minimization. Number
- representations and computer arithmetic (fixed and floating point)

Section C: Computer Organization and Architecture

- Machine instructions and addressing modes
- ALU, data-path and control unit
- Instruction pipelining
- Memory hierarchy:
 - Cache
 - Main memory and secondary storage
 - I/O interface (interrupt and DMA mode)

Section D: Programming and Data Structures

- Programming in C
- Recursion
- Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs

Section E: Algorithms

- Searching, sorting, hashing
- Asymptotic worst case time and space complexity
- Algorithm design techniques:
 - Greedy
 - Dynamic programming
 - Divide-and-conquer
- Graph search, minimum spanning trees, shortest paths

Section F: Theory of Computation

- Regular expressions and finite automata
- Context-free grammars and push-down automata
- Regular and context-free languages, pumping lemma
- Turing machines and undecidability

Section G: Compiler Design

- Lexical analysis, parsing, syntax-directed translation
- Runtime environments
- Intermediate code generation

Section H: Operating System

- Processes, threads, inter-process communication, concurrency and synchronization
- Deadlock
- CPU scheduling
- Memory management and virtual memory
- File systems

Section I: Databases

- ER-model
- Relational model:
 - Relational algebra
 - Tuple calculus
 - SQL
- Integrity constraints, normal forms
- File organization, indexing (e.g., B and B+ trees)
- Transactions and concurrency control

Section J: Computer Networks

- Concept of layering
- LAN technologies (Ethernet)
- Flow and error control techniques, switching
- IPv4/IPv6, routers and routing algorithms (distance vector, link state)
- TCP/UDP and sockets, congestion control
- Application layer protocols (DNS, SMTP, POP, FTP, HTTP)
- Basics of Wi-Fi
- Network security:
 - Authentication
 - Basics of public key and private key cryptography
 - Digital signatures and certificates
 - Firewalls