**GATE 2025 SYLLABUS**

**Registration Form date – AUGUST**

**REGISTRATION FORM FEES - 1700**

**EXAM DATE – FEBRUARY**

**RESULT DATE – MARCH**

**STUDENT NAME – ABHIYANK YADAV**

**Int.MTech (Data Science)**

**22MIP10074**

**Section 1: Engineering Mathematics**

**Discrete Mathematics:**

* Graphs: connectivity, matching, coloring
* Combinatorics: counting, recurrence relations, generating functions
* Propositional and First Order Logic
* Monoids, Groups
* Sets, Relations, Functions, Partial Orders and Lattices

**Linear Algebra:**

* Matrices
* System Of Linear Equations
* Determinants
* LU Decomposition
* Eigenvalues and Eigenvectors

**Calculus**:

* Maxima and Minima
* Integration
* Mean Value Theorem
* Limits, Continuity and Differentiability

**Probability and Statistics:**

* Mean, Median, Mode And Standard Deviation
* Conditional Probability And Bayes Theorem
* Uniform, Normal, Exponential, Poisson and Binomial Distributions
* Random Variables

Computer Science and Information Technology

**Section 2: Digital Logic**

* Boolean Algebra
* Number Representations And Computer Arithmetic (Fixed And Floating Point)
* Minimization
* Combinational And Sequential Circuits

**Section 3: Computer Organization and Architecture**

* I/O Interface (Interrupt And DMA Mode)
* ALU, Data-Path And Control Unit
* Memory Hierarchy: Cache, Main Memory And Secondary Storage
* Machine Instructions And Addressing Modes
* Instruction Pipelining, Pipeline Hazards

**Section 4: Programming and Data Structures**

* Recursion
* Programming in C
* Arrays, Stacks, Queues, Linked Lists, Trees, Binary Search Trees, Binary Heaps, Graphs

**Section 5: Algorithms**

* Algorithm Design Techniques: Greedy, Dynamic Programming And Divide-And-Conquer
* Graph Traversals, Minimum Spanning Trees, Shortest Paths
* Searching, Sorting, Hashing
* Asymptotic Worst Case Time And Space Complexity

**Section 6: Theory of Computation**

* Turing Machines And Undecidability
* Regular Expressions And Finite Automata
* Regular And Context-free Languages, Pumping Lemma
* Context-free Grammars And Push-down Automata

**Section 7: Compiler Design**

* Runtime Environments
* Lexical Analysis, Parsing, Syntax-Directed Translation
* Local Optimisation, Data Flow Analyses: Constant Propagation, Liveness Analysis, Common Subexpression Elimination
* Intermediate Code Generation

**Section 8: Operating System**

* File Systems
* System Calls, Processes, Threads, Inter-Process Communication, Concurrency And Synchronization
* Deadlock
* Memory Management And Virtual Memory
* CPU And I/O Scheduling

**Section 9: Databases**

* Integrity Constraints, Normal Forms
* ER-Model
* Transactions And Concurrency Control
* File Organization, Indexing (E.g., B And B+ Trees)
* Relational Model: Relational Algebra, Tuple Calculus, SQL

**Section 10: Computer Networks**

* Fragmentation And IP Addressing, IPv4, CIDR Notation, Basics Of IP Support Protocols (ARP, DHCP, ICMP), Network Address Translation (NAT)
* Basics Of Packet, Circuit And Virtual Circuit-Switching
* Transport Layer: Flow Control And Congestion Control, UDP, TCP, Sockets
* Routing Protocols: Shortest Path, Flooding, Distance Vector And Link State Routing
* Concept Of Layering: OSI And TCP/IP Protocol Stacks
* Application Layer Protocols: DNS, SMTP, HTTP, FTP, Email
* Data Link Layer: Framing, Error Detection, Medium Access Control, Ethernet Bridging

**GATE Syllabus 2025 for Data Science and Artificial Intelligence**

* Probability and Statistics
* Linear Algebra
* Calculus and Optimization
* Programming, Data Structures, and Algorithms
* Database Management and Warehousing
* Machine Learning
* AI

**CS Computer Science and Information Technology**

Section 1: Engineering Mathematics

Discrete Mathematics:

Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Monoids, Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Linear Algebra: Matrices, determinants, system of linear equations, eigenvalues and eigenvectors, LU decomposition.

Calculus: Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Probability and Statistics: Random variables. Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.

Computer Science and Information Technology

Section 2: Digital Logic Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

Section 3: Computer Organization and Architecture Machine instructions and addressing modes. ALU, data‐path and control unit. Instruction pipelining, pipeline hazards. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

Section 4: Programming and Data Structures Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.

Section 5: Algorithms Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide‐and‐conquer. Graph traversals, minimum spanning trees, shortest paths

Section 6: Theory of Computation Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Section 7: Compiler Design Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Local optimisation, Data flow analyses: constant propagation, liveness analysis, common sub expression elimination.

Section 8: Operating System System calls, processes, threads, inter‐process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.

Section 9: 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 10: Computer Networks Concept of layering: OSI and TCP/IP Protocol Stacks; Basics of packet, circuit and virtual circuit-switching; Data link layer: framing, error detection, Medium Access Control, Ethernet bridging; Routing protocols: shortest path, flooding, distance vector and link state routing; Fragmentation and IP addressing, IPv4, CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT); Transport layer: flow control and congestion control, UDP, TCP, sockets; Application layer protocols: DNS, SMTP, HTTP, FTP, Email.