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**GATE**Computer Science &  
Information Technology

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# GATE

Graduate Aptitude Test in Engineering

## IIT Institutes



GATE 2024 will be conducted by  
Indian Institute of Science, IISc Bangalore



GATE 2023 conducted by  
Indian Institute of Technology, Kanpur



GATE 2022 conducted by  
Indian Institute of Technology, Kharagpur



Indian Institute of Technology, Mumbai



Indian Institute of Technology, Delhi



Indian Institute of Technology, Chennai



Indian Institute of Technology, Guwahati



Indian Institute of Technology, Roorkee



### Eligibility Criteria for GATE 2024

Degree/Program	Qualifying Degree/Examination	Description of Eligible Candidates	Expected Year of Completion
B.E. / B.Tech. / B.Pharm.	Bachelor's degree in Engineering / Technology (4 years after 10+2 or 3 years after B.Sc. / Diploma in Engineering / Technology)	Currently in the 3 <sup>rd</sup> year or higher grade or already completed	2025
B. Arch.	Bachelor's degree of Architecture (5- year course) / Naval Architecture (4- year course) / Planning (4- year course)	Currently in the 3 <sup>rd</sup> year or higher grade or already completed	2026 (for 5-year program), 2025 (for 4-year program)
B.Sc. (Research) / B.S.	Bachelor's degree in Science (Post-Diploma/4 years after 10+2)	Currently in the 3 <sup>rd</sup> year or higher grade or already completed	2025
Pharm. D. (after 10+2)	6 years degree program, consisting of internship or residency training, during third year onwards	Currently in the 3 <sup>rd</sup> /4 <sup>th</sup> /5 <sup>th</sup> /6 <sup>th</sup> year or already completed	2027
M.B.B.S.	Degree holders of M.B.B.S. and those who are in the 5 <sup>th</sup> /6 <sup>th</sup> /7 <sup>th</sup> semester or higher semester of such programme.	5 <sup>th</sup> , 6 <sup>th</sup> , 7 <sup>th</sup> or higher semester or already completed	2025
M. Sc. / M.A. / MCA or equivalent	Master's degree in any branch of Arts/Science/Mathematics/Statistics/Computer Applications or equivalent	Currently in the first year or higher or already Completed	2025
Int. M.E./ M.Tech. (Post-B.Sc.)	Post-B.Sc Integrated Master's degree programs in Engineering/ Technology (4-year program)	Currently in the 1 <sup>st</sup> / 2 <sup>nd</sup> /3 <sup>rd</sup> /4 <sup>th</sup> year or already completed	Any Year
Int. M.E./ M.Tech. or Dual Degree (after Diploma or 10+2)	Integrated Master's degree program or Dual Degree program in Engineering/Technology (5-year program)	Currently in the 3 <sup>rd</sup> /4 <sup>th</sup> /5 <sup>th</sup> year or already completed	2026
B.Sc. / B.A. / B.Com.	Bachelor degree in any branch of Science / Arts / Commerce (3 years program)	Currently in the 3 <sup>rd</sup> year or already completed	2024
Int. M.Sc. / Int. B.S. / M.S.	Integrated M.Sc. or 5-year integrated B.S.-M.S. program	Currently in the 3 <sup>rd</sup> year or higher or already completed	2025
Professional Society Examinations (equivalent to B.E. / B.Tech. / B.Arch.)	B.E./B.Tech./B.Arch. equivalent examinations of Professional Societies, recognized by MoE/UPSC/AICTE (e.g. AMIE by Institution of Engineers-India, AMICE by the Institute of Civil Engineers-India and so on)	Completed Section A or equivalent of such professional courses	Enrolled upto 31 <sup>st</sup> May 2013
B.Sc (Agriculture, Horticulture, forestry)	4-year Program	Currently in the 3 <sup>rd</sup> /4 <sup>th</sup> year or already completed	2025



# GATE Syllabus

## GENERAL APTITUDE

### Verbal Aptitude

**Basic English Grammar:** tenses, articles, adjectives, prepositions, conjunctions, verb-noun agreement, and other parts of speech.

**Basic Vocabulary:** words, idioms, and phrases in context, Reading and comprehension, Narrative sequencing.

### Quantitative Aptitude

**Data Interpretation:** data graphs (bar graphs, pie charts, and other graphs representing data), 2-and 3-dimensional plots, maps, and tables.

**Numerical Computation and Estimation:** ratios, percentages, powers, exponents and logarithms, permutations and combinations, and series, Mensuration and geometry, Elementary statistics and probability.

### Analytical Aptitude

**Logic:** Deduction and induction, Analogy, Numerical relations and reasoning.

### Spatial Aptitude

**Transformation of Shapes:** translation, rotation, scaling, mirroring, assembling, and grouping Paper folding, cutting, and patterns in 2 and 3 dimensions.

## Section1: 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 context-free languages, pumping lemma. Turing machines and undecidability.

## Section 7: Compiler Design

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation. Loop optimisation, Data flow analyses: constant propagation, liveness analysis, common subexpression 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.



# Chapter-Wise Analysis

GATE PAPERS (Computer Science & Information Technology)

Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Engineering &amp; Discrete Mathematics</b>											
1 mark Questions	5	5	4	5	5	5	7	3	5	5	4
2 marks Questions	2	5	6	4	2	7	4	8	6	5	6
<b>Total Marks</b>	<b>9</b>	<b>15</b>	<b>16</b>	<b>13</b>	<b>9</b>	<b>19</b>	<b>15</b>	<b>19</b>	<b>17</b>	<b>15</b>	<b>16</b>
<b>Theory of Computation</b>											
1 mark Questions	1	5	1	3	3	1	2	1	2	2	3
2 marks Questions	2	6	3	3	4	2	3	1	3	4	3
<b>Total Marks</b>	<b>5</b>	<b>17</b>	<b>7</b>	<b>9</b>	<b>11</b>	<b>5</b>	<b>8</b>	<b>3</b>	<b>8</b>	<b>10</b>	<b>9</b>
<b>Digital Logic</b>											
1 mark Questions	3	3	1	2	1	2	4	2	1	1	4
2 marks Questions	1	5	2	1	3	1	2	1	2	2	2
<b>Total Marks</b>	<b>5</b>	<b>13</b>	<b>5</b>	<b>4</b>	<b>7</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>5</b>	<b>5</b>	<b>8</b>
<b>Computer Organization &amp; Architecture</b>											
1 mark Questions	1	2	1	1	2	3	1	4	2	2	3
2 marks Questions	7	2	2	3	3	4	1	5	2	3	2
<b>Total Marks</b>	<b>15</b>	<b>6</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>11</b>	<b>3</b>	<b>14</b>	<b>6</b>	<b>8</b>	<b>7</b>
<b>Programming &amp; Data Structures</b>											
1 mark Questions	2	0	5	5	4	4	4	3	2	3	2
2 marks Questions	5	2	3	6	7	4	6	3	3	3	4
<b>Total Marks</b>	<b>12</b>	<b>4</b>	<b>11</b>	<b>17</b>	<b>18</b>	<b>12</b>	<b>16</b>	<b>9</b>	<b>8</b>	<b>9</b>	<b>10</b>
<b>Algorithm</b>											
1 mark Questions	5	1	4	1	1	1	1	2	4	3	2
2 marks Questions	3	2	4	3	2	3	1	2	4	3	2
<b>Total Marks</b>	<b>11</b>	<b>5</b>	<b>12</b>	<b>7</b>	<b>5</b>	<b>7</b>	<b>3</b>	<b>6</b>	<b>12</b>	<b>9</b>	<b>6</b>
<b>Compiler Design</b>											
1 mark Questions	2	1	2	1	2	2	2	4	2	1	1
2 marks Questions	2	2	1	1	0	2	3	2	3	2	3
<b>Total Marks</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>5</b>	<b>7</b>
<b>Operating System</b>											
1 mark Questions	1	0	2	1	2	4	1	2	3	2	3
2 marks Questions	1	2	2	5	2	3	4	4	1	2	3
<b>Total Marks</b>	<b>3</b>	<b>4</b>	<b>6</b>	<b>11</b>	<b>6</b>	<b>10</b>	<b>9</b>	<b>10</b>	<b>5</b>	<b>6</b>	<b>9</b>



Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
<b>Data Bases</b>											
1 mark Questions	1	3	1	3	2	0	2	2	2	3	1
2 marks Questions	4	2	2	0	2	2	2	3	3	2	2
<b>Total Marks</b>	<b>9</b>	<b>7</b>	<b>5</b>	<b>3</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>5</b>
<b>Computer Networks</b>											
1 mark Questions	4	4	2	2	3	3	1	2	2	3	2
2 marks Questions	2	2	3	4	2	2	4	1	3	4	3
<b>Total Marks</b>	<b>8</b>	<b>8</b>	<b>8</b>	<b>10</b>	<b>7</b>	<b>7</b>	<b>9</b>	<b>4</b>	<b>8</b>	<b>11</b>	<b>8</b>
<b>*Software Engineering</b>											
1 mark Questions	0	0	1	1	0	0	0	0	0	0	0
2 marks Questions	0	1	0	1	0	0	0	0	0	0	0
<b>Total Marks</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>*Web Technology</b>											
1 mark Questions	0	0	0	1	0	0	0	0	0	0	0
2 marks Questions	0	0	0	1	0	0	0	0	0	0	0
<b>Total Marks</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>General Aptitude</b>											
1 mark Questions	5	5	5	5	5	5	5	5	5	5	5
2 marks Questions	5	5	5	5	5	5	5	5	5	5	5
<b>Total Marks</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>

*\*Topics not included in GATE 2017-2023 Syllabus.*