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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 rd 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 rd 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 rd 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 rd /4 th /5 th /6 th year or already completed	2027
M.B.B.S.	Degree holders of M.B.B.S. and those who are in the 5 th /6 th /7 th semester or higher semester of such programme.	5 th , 6 th , 7 th 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 st / 2 nd /3 rd /4 th 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 rd /4 th /5 th 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 rd 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 rd 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 st May 2013
B.Sc (Agriculture, Horticulture, forestry)	4-year Program	Currently in the 3 rd /4 th 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.

Section 1: Engineering Mathematics

Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigenvalues and eigenvectors, rank, solution of linear equations- existence and uniqueness.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems.

Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems.

Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, sequences, series, convergence tests, Taylor and Laurent series, residue theorem.

Probability and Statistics: Mean, median, mode, standard deviation, combinatorial probability, probability distributions, binomial distribution, Poisson distribution, exponential distribution, normal distribution, joint and conditional probability.

Section 2: Networks, Signals and Systems

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer.

Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform.

Linear 2-port network parameters, wye-delta transformation.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

Section 3: Electronic Devices

Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors.

Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell.

Section 4: Analog Circuits

Diode circuits: clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response.

Current mirrors and differential amplifiers.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

Section 5: Digital Circuits

Number representations: binary, integer and floating-point- numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders.

Sequential circuits: latches and flip-flops, counters, shift-registers, finite state machines, propagation delay, setup and hold time, critical path delay.

Data converters: sample and hold circuits, ADCs and DACs.

Semiconductor memories: ROM, SRAM, DRAM.

Computer organization: Machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining.

Section 6: Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

Section 7: Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers.

Information theory: entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER.

Fundamentals of error correction, Hamming codes, CRC.

Section 8: Electromagnetics

Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart.

Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

Chapter-Wise Analysis

GATE PAPERS (Electronics & Communication Engineering)

Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1. Engineering Maths											
1 Mark Questions	4	3	4	5	4	5	6	4	5	3	5
2 Marks Questions	6	4	3	4	5	3	3	3	3	5	5
Total Marks	16	11	10	13	14	11	12	10	11	13	15
2. Network Theory											
1 Mark Questions	3	3	3	5	1	1	1	3	1	2	4
2 Marks Questions	2	2	3	3	2	3	4	2	5	3	2
Total Marks	7	7	9	11	5	7	9	7	11	8	8
3. Signals & Systems											
1 Mark Questions	0	4	2	1	3	2	3	2	2	2	3
2 Marks Questions	1	4	4	2	3	2	1	2	3	2	4
Total Marks	2	12	10	5	9	6	5	6	8	6	11
4. Electronic Devices & Circuits											
1 Mark Questions	6	4	4	3	5	3	3	2	3	2	3
2 Marks Questions	4	2	3	3	3	2	2	4	2	3	2
Total Marks	14	8	10	9	11	7	7	10	7	8	7
5. Analog Circuits											
1 Mark Questions	1	2	2	2	1	2	3	3	3	4	2
2 Marks Questions	6	5	3	3	4	5	5	5	5	4	3
Total Marks	13	12	8	8	9	12	13	13	13	12	8
6. Digital Circuits											
1 Mark Questions	3	3	4	2	3	3	2	3	3	3	4
2 Marks Questions	3	5	4	3	4	4	1	3	2	4	2
Total Marks	9	13	12	8	11	11	4	9	7	11	8
7. Control Systems											
1 Mark Questions	4	3	2	2	3	3	1	2	2	2	1
2 Marks Questions	4	4	3	3	4	5	4	4	1	3	3
Total Marks	12	11	8	8	11	13	9	10	4	8	7

Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
8. Communication systems											
1 Mark Questions	3	2	2	2	4	4	3	3	4	3	2
2 Marks Questions	0	2	4	4	2	3	6	4	5	5	4
Total Marks	3	6	10	10	8	10	15	11	14	13	10
9. Electromagnetic Theory											
1 Mark Questions	1	1	2	3	1	2	3	3	2	4	1
2 Marks Questions	3	2	3	5	3	3	4	3	3	1	5
Total Marks	7	5	8	13	7	8	11	9	8	6	11
10. Computers-organization											
1 Mark Questions	-	-	-	-	-	-	-	-	0	-	-
2 Marks Questions	-	-	-	-	-	-	-	-	1	-	-
Total Marks	-	-	-	-	-	-	-	-	2	-	-
11. General Aptitude											
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
Total Marks	15	15	15	15	15	15	15	15	15	15	15