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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



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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, auring 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: Matrix Algebra, Systems of linear equations, Eigenvalues, Eigenvectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series, Vector identities, Directional derivatives, Line integral, Surface integral, Volume integral, Stokes's theorem, Gauss's theorem, Divergence theorem, Green's theorem.

Differential Equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's equation, Euler's equation, Initial and boundary value problems, Partial Differential Equations, Method of separation of variables.

Complex Variables: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, Taylor series, Laurent series, Residue theorem, Solution integrals.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, Median, Mode, Standard Deviation, Random variables, Discrete and Continuous distributions, Poisson distribution, Normal distribution, Binomial distribution, Correlation analysis, Regression analysis.

Section 2: Electric Circuits

Network elements: Ideal voltage and current sources, dependent sources, R, L, C, M elements; Network solution methods: KCL, KVL, Node and Mesh analysis; Network Theorems: Thevenin's, Norton's, Superposition and Maximum Power Transfer theorem; Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, two port networks, balanced three phase circuits, star-delta transformation, complex power and power factor in ac circuits.

Section 3: Electromagnetic Fields

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

Section 4: Signals and Systems

Representation of continuous and discrete time signals, shifting and scaling properties, linear time invariant and causal systems, Fourier series representation of continuous and discrete time periodic signals, sampling theorem. Applications of Fourier Transform for continuous and discrete time signals, Laplace Transform and Z transform.

Section 5: Electrical Machines

Single Phase Transformer: Equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three-phase transformers: connections, vector groups, parallel operation; Auto-transformer, Electromechanical energy conversion principles; DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, speed control of dc motors; Three-phase induction machines: principle of operation, types, performance, torque-speed characteristics, no-load and blocked-rotor tests, equivalent circuit, starting and speed control; Operating principle of single-phase induction motors;

Synchronous Machines: Cylindrical and salient pole machines, performance and characteristics, regulation and parallel operation of generators, starting of synchronous motors; Types of losses and efficiency calculations of electric machines.

Section 6: Power Systems

Basic concepts of electrical power generation, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, Power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over current, differential, directional and distance protection; Circuit breakers, System stability concepts, Equal area criterion, Economic Load Dispatch (with and without considering transmission losses).

Section 7: Control Systems

Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady state analysis of linear time invariant systems, Stability analysis using Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, Solution of state equations of LTI systems, R.M.S. value, average value calculation for any general periodic waveform.

Section 8: Electrical and Electronic Measurements

Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Section 9: Analog and Digital Electronics

Simple diode circuits: clipping, clamping, rectifiers; Amplifiers: biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers: characteristics and applications; single stage active filters, Sallen Key, Butterworth, VCOs and timers, combinatorial and sequential logic circuits, multiplexers, demultiplexers, Schmitt triggers, sample and hold circuits, A/D and D/A converters.

Section 10: Power Electronics

Static V-I characteristics and firing/gating circuits for Thyristor, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost Converters; Single and three-phase configuration of uncontrolled rectifiers; Voltage and Current commutated Thyristor based converters; Bidirectional ac to dc voltage source converters; Magnitude and Phase of line current harmonics for uncontrolled and thyristor based converters; Power factor and Distortion Factor of ac to dc converters; Single-phase and three-phase voltage and current source inverters, sinusoidal pulse width modulation.

Chapter-Wise Analysis

GATE PAPERS (Electrical Engineering)

Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1. Engineering Mathematics											
1 Mark Questions	4	4	3	5	2	5	5	2	4	1	5
2 Marks Questions	4	5	4	5	4	5	4	2	4	6	3
Total Marks	12	14	11	15	10	15	13	6	12	13	11
2. Electric Circuits											
1 Mark Questions	4	3	3	3	3	4	2	2	3	5	2
2 Marks Questions	3	4	5	3	4	4	3	4	4	1	3
Total Marks	10	11	13	9	11	12	8	10	11	7	8
3. Electromagnetic Fields											
1 Mark Questions				3	2	1	1	1	2	1	1
2 Marks Questions				2	1	1	0	1	2	3	2
Total Marks				7	4	3	1	3	6	7	5
4. Signals and Systems											
1 Mark Questions	3	3	2	2	5	1	5	3	2	0	4
2 Marks Questions	1	2	2	2	3	3	1	3	3	4	4
Total Marks	5	7	6	6	11	7	7	9	8	8	12
5. Electrical Machines											
1 Mark Questions	2	4	3	2	2	3	5	4	2	2	3
2 Marks Questions	1	4	3	5	5	7	6	4	3	5	4
Total Marks	4	12	9	12	12	17	17	12	8	12	11
6. Power Systems											
1 Mark Questions	2	1	3	4	2	4	2	3	4	4	3
2 Marks Questions	3	4	2	2	5	1	4	5	4	2	4
Total Marks	8	9	7	8	12	6	10	13	12	8	11
7. Control Systems											
1 Mark Questions	3	2	3	0	2	2	2	2	2	2	3
2 Marks Questions	4	4	3	4	2	2	3	3	3	3	3
Total Marks	11	10	9	8	6	6	8	8	8	8	9

Subject	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
8. Electrical and Electronic Measurements											
1 Mark Questions	2	2	2	1	2	1	1	1	2	2	0
2 Marks Questions	1	3	3	2	0	2	1	1	0	0	1
Total Marks	4	8	8	5	2	5	3	3	2	2	2
9. Analog, Digital Electronics and Microprocessor											
1 Mark Questions	3	3	4	2	1	2	0	4	3	5	2
2 Marks Questions	5	3	5	2	4	4	4	3	3	2	4
Total Marks	13	9	14	6	9	10	8	10	9	9	10
10. Power Electronics & Drives											
1 Mark Questions	0	3	2	1	4	2	2	3	1	3	2
2 Marks Questions	6	1	3	4	2	1	4	4	4	4	2
Total Marks	12	5	8	9	8	4	10	11	9	11	6
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