

GATE SYLLABUS: MECHANICAL ENGINEERING

- Exam conducted once a year in the 1st weekend of February in two time slots i.e. 9am to 12noon & 2pm to 5pm.
- To be amongst the Top - 100 rankers don't skip any topic from the syllabus. Moment you do that, you will be out of competition.
- GATE would be 100 marks paper of 3 hour duration.

Technical Subjects	Engineering Mathematics	General Aptitude
70 marks	15 marks	15 marks

SYLLABUS: TECHNICAL SUBJECTS

Has three parts of total weightage = 70 marks

Part - 1: Applied Mechanics and Design

Engineering Mechanics: Free Body Diagrams and Equilibrium; Trusses and Frames; Virtual Work; Kinematics and Dynamics of Particles and of Rigid Bodies in plane motion; Impulse and Momentum (linear and angular) and Energy formulations & Collisions.

Mechanics of Materials - SOM: Stress and Strain, Elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; Thin Cylinders; Shear Force and Bending Moment Diagrams; Bending and Shear stresses; Deflection of beams; Torsion of circular shafts; Euler's theory of Columns; Energy methods; Thermal stresses; Strain Gauges and Rosettes; Testing of Materials with Universal Testing Machine; Testing of Hardness and Impact Strength.

Theory of Machines: Displacement, Velocity and Acceleration analysis of plane mechanisms; Dynamic Analysis of linkages; Cams; Gears & Gear trains; Flywheels & Governors; Balancing of Reciprocating & Rotating masses and Gyroscope.

Vibrations: Free and Forced Vibration of single degree of freedom systems, Effect of Damping; Vibration Isolation; Resonance and Critical speeds of shafts.

Machine Design: Design for Static and Dynamic Loading; Failure theories; Fatigue strength and the S-N diagram; Principles of the design of machine elements such as Bolted, Riveted and Welded joints; Shafts, Gears, Rolling and Sliding contact Bearings, Brakes and Clutches and Springs.

Part - 2: Fluid Mechanics & Thermal Sciences

Fluid Mechanics: Fluid properties; Fluid Statics, Manometers, Buoyancy Forces on Submerged Bodies, Stability of Floating Bodies; Control Volume analysis of Mass, Momentum and Energy; Fluid Acceleration; Differential Equations of Continuity and Momentum; Bernoulli's Equation; Dimensional Analysis; Viscous Flow of Incompressible fluids, Boundary layer, Elementary turbulent flow, Flow through pipes, Head losses in pipes, bends and fittings.

Heat-Transfer: Modes of Heat Transfer; One dimensional Heat Conduction, Resistance concept and Electrical analogy, Heat transfer through fins; Unsteady Heat Conduction, Lumped parameter system, Heisler's charts; Thermal Boundary layer, Dimensionless parameters in Free and Forced Convective Heat Transfer, Heat Transfer correlations for flow over flat plates and through pipes, Effect of turbulence; Heat Exchanger performance, LMTD and NTU methods; Radiation heat transfer, Stefan Boltzmann law, Wein's displacement law, Black and Grey surfaces, View factors & Radiation Network Analysis.

Thermodynamics: Thermodynamic systems and processes; Properties of Pure substances, Behaviour of Ideal and real gases; Zeroth and First Laws of Thermodynamics, Calculation of Work and Heat in various processes; Second law of Thermodynamics; Thermodynamic Property charts and Tables, Availability & Irreversibility and Thermodynamic relations.

Applications:

- **Power Engineering:** Air and Gas Compressors; Vapour & Gas Power cycles, Concepts of Regeneration and Reheat. I.C. Engines: Air-standard Otto, Diesel and Dual cycles.
- **Refrigeration & Air Conditioning:** Vapour and Gas Refrigeration and Heat Pump cycles; Properties of Moist air, Psychrometric chart & Psychrometric processes.
- **Turbo - Machinery:** Impulse and Reaction principles, Velocity diagrams, Pelton wheel, Francis and Kaplan turbines.

Part - 3: Materials, Manufacturing & Industrial Engineering

Engineering Materials: Structure & properties of Engineering materials, Phase diagrams, Heat treatment & stress-strain diagrams for Engineering materials.

Casting, Forming & Joining Processes: Different types of castings, Design of patterns, moulds and cores; Solidification and cooling; Riser and Gating design. Plastic deformation and yield criteria; fundamentals of Hot and Cold working processes; Load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) Metal forming processes; Principles of Powder Metallurgy. Principles of Welding, Brazing, Soldering and Adhesive Bonding.

Machining & Machine Tool Operations: Mechanics of Machining; Basic Machine Tools; Single and Multi - point Cutting tools, Tool geometry and materials, Tool life and wear; Economics of Machining; Principles of Non - Traditional Machining processes; Principles of Work holding, Design of Jigs and Fixtures.

Metrology & Inspection: Limits, fits and tolerances; Linear and Angular measurements; Comparators; Gauge design; Interferometry; Form and finish measurement; Alignment and Testing methods; Tolerance Analysis in Manufacturing and Assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

Production Planning & Control: Forecasting models, Aggregate production planning, Scheduling, Materials requirement planning.

Inventory Control: Deterministic models; safety stock inventory control systems.

Operations Research: Linear programming, Simplex method, Transportation, Assignment, Network flow models, Simple queuing models, PERT and CPM.

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SYLLABUS: ENGINEERING MATHEMATICS

Weightage = 15 marks

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigen values and Eigen vectors.

Calculus: Functions of single variable, limit, continuity and differentiability, Mean value theorems, Indeterminate forms; Evaluation of Definite and Improper integrals; Double and Triple integrals; Partial derivatives, Total derivative, Taylor series (in one and two variables), Maxima and Minima, Fourier series; Gradient, Divergence and Curl, Vector Identities, Directional derivatives, Line, Surface and Volume integrals, Applications of Gauss, Stokes and Green's theorems.

Differential equations: First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; Solutions of heat, wave and Laplace's equations.

Complex variables: Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series.

Probability and Statistics: Definitions of Probability, Sampling theorems, Conditional probability; Mean, Median, Mode and Standard Deviation; Random variables, Binomial, Poisson and Normal distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations; Integration by Trapezoidal and Simpson's rules; Single and multi-step methods for differential equations.

SYLLABUS: GENERAL APTITUDE

Weightage = 15 marks

Verbal Ability: English Grammar, Sentence Completion, Verbal Analogies, Word Groups, Instructions, Critical Reasoning and Verbal Deduction.

Numerical Ability: Numerical Computation, Numerical Estimation, Numerical Reasoning and Data Interpretation.

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Address

Room 112, 1st floor, Pearl Centre, Next to Janta Cloth Market, Tulsi Pipe Road (Senapati Bapat Marg), Dadar (w).
Once out of Rly. Stn, take immediate right. It's at 5 mins of walking distance from Rly. Stn.