AP PGECET 2025 Mechanical Engineering Syllabus

Engineering Mathematics Syllabus

Linear Algebra	• Matrix algebra • Systems of linear equations • Eigenvalues and eigenvectors
Calculus	• Functions of a single variable • Limit/continuity/differentiability • Mean value theorems • Evaluation of definite and improper integrals • Partial derivatives • Total derivative • Maxima & minima • Gradient • Divergence & curl • Vector identities • Directional derivatives • Line • Surface • Volume integrals • Stokes • Gauss & Green's theorems
Differential Equations	• First-order equations (linear and non-linear) • Higher-order linear differential equations with constant coefficients • Cauchy's & Euler's equations • Initial & boundary value problems • Laplace transforms • Solutions of one-dimensional heat and wave equations & laplace equation
Complex Variables	• Analytic functions • Cauchy's integral theorem • Taylor & Laurent series
Probability & Statistics	• Definitions of probability & sampling theorems • Conditional probability

	• Probability density function • Mean/median/mode/standard deviation • Random variables • Exponential • Poisson • Normal & binomial distributions
Numerical Methods	• Numerical solutions of linear and non-linear algebraic equations • Integration by trapezoidal and Simposon' rule • Single & multi-step methods for differential equations

Applied Mechanics and Design Syllabus

Engineering Mechanics	• Free body diagrams and equilibrium • Trusses & frames • Virtual work • Kinematics and dynamics of particles and rigid bodies in plane motion • Including impulse and momentum (linear & angular) & energy formulations • Impact
Strength of Materials	• Stress and strain • Stress-strain relationship and elastic constants • Mohr's circle for plane stress and plane strain • Thin cylinders • Shear force and bending moment diagrams • Bending and shear stresses • Deflection of beam • Torsion of circular shafts • Euler's theory of columns • Strain energy methods • Thermal stresses
Theory of Machines	• Displacement

	• Velocity & acceleration analysis of plane mechanics • Dynamic analysis of slider crank mechanism • Gear trains • Flywheels
Vibrations	• Free and forced vibration of single degree of freedom systems • Effect of damping • Vibration isolation • Resonance • The critical speed of shafts
Design	• Design for static and dynamic loading • Failure theories • Fatigue strength and the S-N diagram • Principles of design of machine elements such as bolted • Riveted and welded joints • Shafts • Spur gears • Rolling and sliding contact bearings • Brakes and clutches

Fluid Mechanics and Thermal Sciences Syllabus

Fluid Mechanics	• Fluid properties • Fluid statics/ manometry/ buoyancy • Control volume analysis of mass • Momentum and energy • Fluid acceleration • Differential equations of continuity and momentum • Bernoulli's equationns • Viscous flow of incompressible fluids • Boundary layer • Elementary turbulent flow • Flow through pipes • Head losses in pipes/ bends

Heat - Transfer	• Modes of heat transfer • One-dimensional heat conduction • Resistance concept • Electrical analogy • Unsteady heat conduction • Fins • Dimensionless parameters in free and forced convective heat transfer • Various correlations for heat transfer in flow over flat plates through pipes • Thermal boundary layer • Effect of turbulence • Radiative heat transfer • Black and grey surfaces • Shape factors • Network analysis • Heat exchanger performance • LMTD and NTU methods
Thermodynamics	• Zeroth, first, and second law of thermodynamics • Thermodynamic systems and processes • Carnot cycle • Irreversibility and availability • The behavior of ideal and real gases • Properties of pure substances • Calculation of work and heat in ideal processes • Analysis of thermodynamic cycles related to energy conversion
Applications	• Power engineering • Steam tables • Rankine • Brayton cycles with regeneration and reheat IC
Engines	• Air standard otto • Diesel cycles
Refrigeration and Air Conditioning	• Vapor refrigeration cycle • Heat pumps • Gas refrigeration

	• Reverse Brayton cycle • Moist air • Psychrometric chart / basic psychrometric processes
Turbomachinery	• Pelton wheel • Francis and Kaplan turbines • Impulse and reaction principles • Velocity diagrams

Manufacturing and Industrial Engineering Syllabus

Engineering Materials	• Structure and properties of engineering materials • Heat treatment • Stress-strain diagrams for engineering materials
Metal Casting	• Design of pattern • Molds and cores • Solidification and cooling • Riser and gating design • Design considerations
Forming	• Platic deformation and yield criteria • Fundamentals of hot and cold working processes • Load estimation for bulk and sheet metal forming processes • Principles of powder metallurgy
Joining	• Physics of welding • Brazing and soldering • Adhesive bonding • Design consideration in welding
Machining and Machine Tool Operations	• Mechanics of machining • 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 • Principles of design of jigs and

	fixtures
Metrology and 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 and Control	• Forecasting models • Aggregate production planning • Scheduling • Materials requirement planning
Inventory Control	• Deterministic and probabilistic models • Safety stock inventory control systems
Operations Research	• Linear programming • Simple & duplex method • Transportation • Assignment • Network flow models • Simple queuing models • PERT and CPM