

## SYLLABUS - EXECUTIVE (MECHANICAL)

- **Mechanics of Materials**

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; concept of shear centre; 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.

- **Fluid Mechanics**

Fluid properties; fluid statics, 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; basics of compressible fluid flow, pump and fan operation principles.

- **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; radiative heat transfer, Stefan-Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis

- **Thermodynamics:**

Thermodynamic systems and processes; properties of pure substances, behavior 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 and irreversibility; thermodynamic relations.

- **Applications:**

Power Engineering: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. Turbomachinery: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines; steam and gas turbines,

Refrigeration cycles (carnot, Rankine, Vapour compression), Refrigerants and their properties, Components: Compressor, Evaporation, Condenser, Expansion valves.

- **Engineering Materials:**

Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

- **Renewable Energy:**

Types of Energy: Renewable vs Non Renewable, Solar Energy, Solar Radiation, Geothermal Energy basis, Green building concepts, Energy units and conversions.

- **Project and Cost Management**

BOQ and Estimation, Scheduling and resource planning, lifecycle cost analysis Energy efficiency and ROI, Project Lifecycle: Feasibility, Design, Procurement and Commissioning.

- **NBC (National Building Code), CPWD Specification, etc.**

Knowledge of latest National Building Code of India (NBC); CPWD specification; CPWD plinth Area rates (PAR) & Delhi Schedule of Rate (DSR).

\*\*\*\*\*