Syllabus for PG Exam (Mech Engg.)

Section – I

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; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods

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

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; gears and gear trains; flywheels, balancing of reciprocating and rotating masses; gyroscope.

Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping: vibration isolation; resonance; 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.

Section – II

Fluid Mechanics: Fluid properties; fluid statics, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy differential equations of continuity and momentum; 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, free and forced convective heat transfer, heat exchanger performance, radiative heat transfer, Stefan-Boltzmann law, Wien's displacement law

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 and irreversibility; thermodynamic relations.

Section – III

Casting, Forming and Joining Processes: Different types of castings, design of patterns; solidification and cooling; 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 and 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.

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry