Department of Mechanical Engineering
Guru Jambheshwar University of Science & Technology, Hisar

Ph.D. (Entrance Test Syllabus)

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

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, spur gears, rolling and sliding contact bearings, brakes and clutches.

Strength of Materials:
Stress and strain, stress-strain relationship and elastic constants, Mohr'scircle 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; strain energy methods; thermal stresses.

Theory of Machine:
Displacement, velocity and acceleration analysis of plane mechanisms;dynamic analysis of slider-crank mechanism; gear trains; flywheels.

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 equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Thermodynamics
Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle, irreversibility and availability; behaviour 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.

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 and 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.

Metal Casting:
Casting processes- types and applications; patterns- types and materials; allowances; moulds and cores- materials, making, and testing; casting techniques of cast iron, steels and nonferrous metals and alloys; solidification; design of casting, gating and risering; casting inspection, defects and remedies.

Metal Joining Processes:
Welding processes- manual metal arc, MIG, TIG, plasma arc,submerged arc, electroslag, thermit, resistance, forge, friction, and explosive welding; otherjoining processes-soldering, brazing, braze welding; inspection of welded joints, defects andremedies; introduction to advanced welding processes- ultrasonic, electron beam, laserbeam; thermal cutting.

Machining and Machine Tool Operations:
Basic machine tools; machining processes-turning,drilling, boring, milling, shaping, planning, gear cutting, thread production, broaching,grinding, lapping, honing, super finishing; mechanics of machining- geometry of cutting tools,chip formation, cutting forces and power requirements, Merchant's analysis; selection ofmachining parameters; tool materials, tool wear and tool life, economics of machining,thermal aspects of machining, cutting fluids, machinability ; principles and applications ofnontraditional machining processes-USM, AJM, WJM, EDM and Wire cut EDM, LBM, EBM, PAM,CHM, ECM.

Powder Metallurgy:
Production of metal powders, compaction and sintering.

Computer Integrated Manufacturing:
Basic concepts of CAD, CAM, CAPP, cellular manufacturing, NC, CNC, DNC, Robotics, FMS, and CIM.