

Syllabus for JTS- Mechanical Engineering

Mathematics: Linear Algebra, Basics of calculus, Matrices, Analytical geometry, Vectors and Transforms, Complex analysis.

Solid Mechanics and Design: 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. Stress and strain, 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; strain gauges and rosettes; testing of materials with universal testing machine. Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors. Free and forced vibration of single degree of freedom systems, vibration isolation; resonance. Design for static and dynamic loading; failure theories; principles of design of machine elements such as bolted, riveted and welded joints; shafts, gears, bearings.

Fluids and Thermal Engineering: Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; laws of thermodynamics, availability and irreversibility. Fluid properties; fluid statics, manometry, control-volume analysis of mass, momentum and energy; Bernoulli's equation; viscous flow of incompressible fluids, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings. Modes of heat transfer; heat conduction, free and forced convective heat transfer and radiative heat transfer. Compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines, Air standard cycles. Refrigeration and Air-conditioning. Hydraulic and thermal turbomachinery.

Manufacturing Science and Engineering: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials. Casting, Forming, Welding. Mechanics of machining; basic machine tools, economics of machining; principles of non-traditional machining processes; principles and design of jigs and fixtures. Limits, fits and tolerances; gauge design; linear and angular measurements; comparators; interferometry; form and finish measurements; alignment and testing methods. Basic concepts of CAD/CAM and their integration tools. Scheduling, materials requirement planning, deterministic inventory models; safety stock inventory control systems.