



**NATIONAL INSTITUTE OF TECHNOLOGY,
TIRUCHIRAPPALLI-620015**

Department of Mechanical Engineering
Syllabus for written test

Engineering Graphics:

Orthographic projection concepts - Orthographic views of objects from their isometric views, projections of points, lines and simple solids. Sectioning of solids with planes of perpendicular, parallel and inclined to another plane. Intersection of surfaces, cylinders, cones and prisms. Development of surfaces, prisms, pyramids, cylinders and conical surfaces. Isometric and perspective projection of different planes and simple solids.

Engineering Mechanics

Engineering Mechanics - Free-body diagrams and equilibrium, friction and its applications (belt-pulley, brakes, clutches, screw jack, wedge, vehicles, etc.), trusses and frames, virtual work, kinematics and dynamics of rigid bodies in plane motion, impulse and momentum (linear and angular) and energy formulations, Lagrange's equation.

Fluid Mechanics

Fluid Mechanics and heat transfer - Properties and types of fluids, forces on submerged bodies, stability of floating bodies, control-volume analysis of mass, momentum and energy, fluid acceleration, equations of continuity and momentum, Bernoulli's equation, dimensional analysis, concepts of the boundary layer (Causes, effects and control measures), flow through pipes, head losses in pipes, bends and fittings, concepts of hydraulic machines (Centrifugal pumps and turbines), basics of compressible fluid flow. Heat Transfer - Modes of heat transfer, one-dimensional heat conduction (single and multi-layers), heat transfer through extended surfaces, unsteady heat conduction, lumped parameter system, Heisler's charts, thermal boundary layer, dimensionless parameters in convective heat transfer, 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.

Thermal Engineering

Thermal Engineering - Thermodynamic systems and processes, properties of pure substances, behavior of ideal and real gases, zeroth and first and second laws of thermodynamics, calculation of work and heat in various processes, availability, and irreversibility, thermodynamic relations. Applications - Air and gas compressors, steam 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, Basic psychrometric processes. Turbomachinery - Impulse and reaction principles, velocity diagrams, steam and gas turbines.

Mechanics of Materials:

Mechanics of Materials - Stress and strain, elastic constants, Poisson's ratio, Mohr's circle for plane stress and plane strain, concepts of mechanical joints, thin and thick pressure vessels, shear force and bending moment diagrams, bending and shear stresses, concept of shear centre, deflection of beams, torsion of circular shafts,

columns (Rankine theory, Euler's theory), energy methods, thermal stresses, strain gauges and rosettes, testing of materials with the universal testing machine, testing of hardness and impact strength. Engineering Materials - Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

Design of Mechanical Systems:

Dynamic of Machines: Displacement, velocity and acceleration analysis of plane mechanisms, dynamic analysis of linkages, cams, gears and gear trains, flywheels and governors, 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: Selection of materials, failure theories, static and dynamic loading, fatigue strength and the S-N diagram, design of mechanical joints (bolted, riveted and welded), shafts, keys & couplings, gears (Spur, helical, bevel and worm & worm wheel), rolling & sliding contact bearings, brakes and clutches, springs. Fits and tolerance.