

MECHANICAL ENGINEERING – SYLLABUS

i. Engineering Mechanics:

Free body diagrams and equilibrium trusses and frames.

ii. Mechanics of Materials:

Stress and strain, bending moment diagrams; shear stresses; deflection of beams; thermal stresses; strain gauges; testing of materials with universal testing machine, testing of hardness and impact strength.

iii. Theory of Machines:

Velocity, acceleration, gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses.

iv. Vibrations:

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

v. Machine Design:

principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

vi. Fluid Mechanics:

Fluid properties, fluid statics, manometry, buoyancy, dimensional analysis; viscous flow of incompressible fluids, elementary turbulent flow flow through pipes, head losses in pipes, bends and fittings.

vii. Heat-Transfer:

Modes of heat transfer: dimensional heat, resistance concept and electrical analogy, unsteady heat conduction, 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; radiative heat.

viii. Thermo dynamics:

Thermodynamic processes; 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.

ix. Applications:

Air and gas compressors, concepts of regeneration and reheat. Refrigeration and air-conditioning, Vapour and gas refrigeration and heat pump cycles,

Turbo machinery: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines. IC Engines, Dynamics of Machinery Welding Technology, Industrial Safety Engineering, Coil Hydraulics & Pneumatics, Vibration Analysis & Control.

- x. **Engineering Materials:**
Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.
- xi. **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. Principles of welding, brazing, soldering and adhesive bonding.
- xii. **Machining and Machine Tool Operations:**
Mechanics of machining, basic machine tools.
- xiii. **Metrology and Inspection:**
Limits, fits and tolerances, linear and angular measurements, gauge design, alignment and testing methods, tolerance analysis in manufacturing and assembly.
- xiv. **Computer Integrated Manufacturing:**
Basic concepts of CAD/CAM and their integration tools.
- xv. **Production Planning and Control:**
Forecasting models, aggregate production planning, scheduling, materials requirement planning.
- xvi. **Inventory Control:**
Deterministic models, safety stock inventory control systems.
- xvii. **Operations Research:**
Linear programming, simplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.
- xviii. **Engineering Mechanics & Design:**
Solid Mechanics, Strength of Materials, Mechanics of Machines, Design of Mechanical Drives, Mechanics of Materials, Theory of Machines, Vibrations, Machine Design, Optimization in Engineering Design.
- xix. **Fluid Mechanics and Thermal Sciences:**
Fluid Mechanics, Heat Transfer and Thermodynamics, Combustion Engineering, Refrigeration & Air Conditioning, Fundamentals of Heat & Mass Transfer, Thermal Engineering.
- xx. **Materials, Manufacturing and Industrial Engineering:**
Engineering materials, Joining Processes, Machining and Machine Tool Operations, Metrology and Inspection, Production Planning and Control, Inventory Control.