

Mechanical Engineering Discipline
(Diploma Level)

Metrology:

Limits, fits & tolerance, standards of measurement

Linear measurement: Vernier caliper, micrometer, height gauge, depth, gauge, radius gauge, feeler gauge, dial indicators, slip gauges.

Angular measurements: Combination set, vernier bevel protractor, sine bar, taper measurement by rollers.

Surface measurement: straight edge, try square, surface plate

Surface finish measurement: of Roughness and waviness, various roughness value - CLS, ms, mean, principle of working of measuring instrument. ,

Thread measurement: Measurement of Internal and external thread, screw pitch gauge, screw thread micrometer, thread limit gauge.

Other measuring instrument: autocollimator, Tool maker's microscope, profile projector, coordinate measuring machine.

Testing of material:

Non-destructive testing: Ultrasonic testing, radiography, magnetic particle testing eddy current testing, dye penetration testing.

Physical testing: Tensile test, % elongation, % reduction in area, hardness (Brinell, Rockwell, Vickers), impact test (Izod, Charpy), bend test, shear test, fatigue test, creep test.

Chemical testing ferrous and non ferrous metals

Metallography: micro and macro examination

Testing of paints, rubber, textiles, wood, plastics.

Inspection and quality control:

Probability, frequency distribution, statistical measures, normal curve, binomial curve, Poisson curve, statistical quality control, acceptance sampling (single, double, sequential), ACL, LTPO concepts, AQL plants, OC curve, control charts, BIS codes.

Manufacturing process:

Foundry technology: Pattern making, sand mould making, sand testing. core , marking, gating and risers, melting (including pit furnace, cupola & electric furnace) and pouring, solidification and cooling, finishing &. inspection, special casting processes (permanent mould casting, investment casting, die casting, centrifugal casting), casting defects

Welding Electric arc welding, gas welding, gas cutting, resistance welding, TIG & MIG welding, thermit welding, brazing, soldering, welding defectst

Heat treatment: hardening, annealing, tempering, normalizing, -surface hardening, case hardening.

Cold and hot working of metals: forging, rolling, extrusion, wire & tube drawing, blanking punching, bending ‘

Introduction to general machining processes: turning, drilling, boring, reaming milling, shaping, slotting planing, breaching, grinding, honing, sawing, gear

cutting thread cutting, jigs and fixtures, power transmission, Coolants & lubricants.

Principles of electroplating, galvanizing, anodizing.

Engineering material. Material science, Extraction of material, Mechanics of solids & Theory of machines.

Engineering materials:

Cast iron: Different types of cast iron, their properties, composition and uses. ,
Wrought iron properties, composition and uses.

Steels: Different types of steel & classification. Properties composition and uses of plain carbon, alloy steel, high speed steel, stain less steel, spring steel.

Effect of various alloying element like Cr, Ni, Co, Mo, Mn, S on mechanical properties of steel

Properties of Al, Cu, Zn, Sn, Pb

Plastics: Sources, classification-thermo plastic and thermoset, plastic coating, organic and inorganic fibres

Insulating materials: Various material and their uses e.g. asbestos, glass, wool, cork, china clay, bakelite, ebonite, glass wool, rubber, felt.

Material science:

Properties of material (thermal, chemical, electrical, magnetic, mechanical structure of metals (arrangement of atoms, crystalline & amorphous structure, crystal imperfections), solid solution, diffusion in metals and alloys, deformation of metal, impact of cold & hot working on metal, corrosion, its causes and prevention..

Mechanics of solids:

Stress, strain and elasticity, Hook's law, strain energy, equations of equilibrium, thermal stress, resilience and shock torsion of circular shafts, shearing force and bending moment in beams, theory of bending, stress in beams, deflection of beams, pipes, cylinders, spheres, discs, flat plates, column and struts,

Theory of machines:

Velocity, acceleration, vectors, force, centre of gravity, moment of a couple, moment of inertia, SHM & oscillations, degree of freedom '

Simple mechanism: Introduction to link, kinematics pair, lower and higher pair, Kinematic chain, straight line mechanism, inversion, mechanical advantages of linkages, cams and followers.

Mechanical design & Thermal engineering

Mechanical design:

Multifunctional criteria for material selection, designing for strength and rigidity, key & others, riveted joint, welded joint, fastenings, levers, columns, shafts & '

couplings, clutches & brakes, vee & flat belt pulley drives, steel wire, ropes & chain drives, flywheels, helical and leaf springs, bearings, gear and gear drives.

Thermal engineering

second law, flow of gases, kinetic theory of gases, combustion processes, heat transmission, fuels (solid liquid & gaseous), air cycles (Carnot cycle, otto cycle, diesel cycle, Joule cycle), introduction to steam & gas turbines (operating principles, working cycles, essential components, impulse and reaction steam turbines multi staging, efficiency, governing, performance characteristics), introduction to IC engines (operating principles, essential components, working, cycles, power and efficiencies, performance characteristics, valve operating mechanisms, method of governing inlet and exhaust system, two stroke cycle, engines, fuel supply mixing and combustion), introduction to refrigeration- (principles, methods of refrigeration, units of refrigeration, refrigeration efficiency, reversed Carnot cycle, refrigerants and properties), principles of jet, propulsion, " introduction to thermal power plant (water boilers, boiler efficiency, steam generators, boiler furnaces.)