

## **Diploma Level Exam Syllabus (Mechanical Engineering)**

Composition and resolution of forces, parallel forces and couples, moments and their applications, equilibrium of forces, centre of gravity, friction, simple lifting machines, motion of a particle, laws of motion, work, power and energy.

Simple stresses and strains, mechanical properties and their testing, shear force and bending moment, principal planes and principal stresses, bending stresses in beams, shear stresses in beams, deflection of beams, torsion of shaft, spring, column and struts, stress in frames, thin cylinders and spheres.

Design of m/c elements subjected to direct and shear loads, design of m/c. elements, subjected to bending and twisting and combined bending and twisting, design of riveted joint, simple welded joints, threaded joints and clutch, introduction to CAD/CAM.

Requirement of engineering materials, mechanical properties and their testing, structure of solid materials, solidification of metal and ingot structure, equilibrium phase diagrams and phase transformation, iron- carbon equilibrium system, heat treatment of steels, ferrous and non-ferrous metals and alloys, plastics, powder metallurgy.

Fundamentals of fluid flow, pressure and its measurement, flow through orifice and mouth pieces and the flow measurement, flow through notches and weirs, flow through pipes, water turbines, water pumps.

Basic concept of thermodynamics, first and second law of thermodynamics, ideal gases, thermodynamics cycles, two phase system, steam generators, steam nozzle, condensers and turbines, i.c. engines, heat transfer, basic components of vapour compression, vapour absorption refrigeration system. introduction to air conditioning, psychometry.

Simple mechanism, velocity and acceleration of points and links, dynamic force analysis, crank effort diagram and flywheel, brakes and dynamometers, power transmission, governors, cams and followers, balancing of machine parts, vibrations, gear and gear trains.

Inventory control, EOQ, safety stock, abc analysis, storing procedure and store records. production systems, Gantt chart, value analysis, CPM and PERT, simple linear programming problem formulation and solution.

Inspection, quality control, quality assurance, total quality control, introduction to iso-9000. Deming's PDCA cycle, kaizen, quality circle, just in time, entrepreneurship basics.

Method study, principles of motion economy, material handling and plant layout, micro-motion study. work measurement, most technique for work measurement, job evaluation, wages and incentives, statistical quality control, control charts for variables and attributes.

Metal cutting theory, lathe, shaper, drilling & boring machine, milling machines, grinding machines and finishing processes, jig and fixtures, plastic moulding.

Metal casting, pattern making, moulding, press working, hot and cold working, metal rolling, metal drawing, extrusion, forging, resistance welding, gas welding and gas cutting, arc welding,

Basics of unconventional machining methods, introduction to numerical control, g and m code, total productive maintenance, basics of six sigma

Limits, fits and tolerances, linear measurement, angular measurement, straightness, flatness, squareness and roundness, surface roughness, screw thread measurement, limit gauges, temperature measurement- thermometers, thermocouple, thermister and pyrometer,

Corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance. types and causes of wear.

## SYLLABUS OF DIPLOMA IN ELECTRICAL ENGINEERING

- 1- **BASIC ELECTRICAL ENGINEERING**- D.C. Circuits, A.C. Fundamentals, Electrical Engineering materials, conductors, insulators and semiconductors, properties and applications.
- 2- **ELECTRICAL CIRCUITS**- Circuit analysis, Network theorems, Superposition, Thevenin's, Nortons and maximum power theorems, Polyphase circuits, star and delta connections, power in three phase circuits, Transients, variation of current when connected to D.C. or A.C., Time constant.
- 3- **ELECTRICAL MACHINES**- D.C. Generator, Principle, construction, EMF equation, D.C. Motors, back EMF, torque equation, classification, characteristics of D.C. motors, starters, Single phase transformers, principle, construction, classification, equivalent circuit, open and short circuit tests, losses and efficiency, all day efficiency, auto transformer, three phase transformer, three phase induction motor, synchronous motor, synchronous generator, single phase induction motors, universal motor, repulsion motor, stepper motor.
- 4- **ELECTRICAL MEASUREMENT**- Electrical measuring instrument, moving coil, moving iron, induction type, shunt and multipliers, wattmeter and energy meters, measurement of resistance, cathode ray oscilloscope, digital instruments, error, transducers, classification, LVDT, RVDT, thermocouples, piezo-electric transducers, photo conductive cells,
- 5- **ELECTRONICS**- semiconductor devices, transistor, different configurations :CB, CE, CC., characteristics, tunnel diode, photo diode, varactor, FET, MOSFET, UJT, rectification efficiency, filter and types of filters, amplifiers, types of transistor amplifiers, biasing techniques, oscillators, principal, working & applications, digital techniques, number system, logic gates, thyristor, triggering circuits, rectification, single phase HW and FW converters, inverter, converter, speed control of motors.
- 6- **POWER SYSTEMS**- Sources of energy, solar, wind, biogas, ocean, tidal, geothermal, fuel cell, generating stations, thermal, hydro, nuclear, concept of load, types of tariff, concept of transmission, H.V.D.C. transmission system, corona, string efficiency, distribution system, ring main, radial and interconnected system, single line diagram, per unit quantity, ABCD constants, fault analysis, L-G, L-L and L-L-G fault, protective relay, induction,

electromagnetic, thermal, primary and back up relay, isolator and circuit breakers, over-voltage protection, earth wire, lighting arresters, surge absorber, merz price differential protection, protection of transformer, buchholz relay, feeder and transmission line protection.

**7-UTILIZATION OF ELECTRICAL POWER** - Electric drives, power factor improvement, electric traction system in India, A.C. electric locomotive, traction mechanics, domestic & industrial estimating and costing, energy management and audit, energy conservation in various sectors and co-generation, economic analysis of energy conservation.

## SYLLABUS FOR DIPLOMA LEVEL EXAM IN CIVIL ENGINEERING

### Surveying:

Importance, types, objects, principles and classification of surveying; chain & cross staff survey, compass survey, levelling, contouring, plane table survey, theodolite survey, curves, errors and adjustments, remote sensing.

### Material Technology:

Masonry materials, binding materials, aggregates, mortars, concrete, timber, artificial timber, paints, varnishes & colours.

### Building Construction:

Building components, construction of sub structure and super structure, building finishes, safety and environmental aspects.

### Hydraulics:

Properties of fluid, hydrostatic pressure, measurement of liquid pressure in pipes, fundamentals of fluid flow, flow of liquid through pipes, flow through open channel, flow measuring devices, hydraulic machines.

### Building Drawing:

Conventions as per IS: 962-1967 practices, planning of building.

### Soil Mechanics:

Physical properties and classification of soil, permeability and seepage analysis, shear strength and bearing capacity of soils, earth pressure, compaction of soil & stabilization, site investigation and sub soil exploration.

### Applied Mechanics:

Composition and resolution of forces, parallel forces and couples, moments and their applications, equilibrium of forces, centre of gravity, friction, simple lifting machines, motion of a particle, laws of motion, work, power and energy.

### Mechanics of Structures:

Stress & strain, elastic constants & principal stresses, shear force and bending moment, moment of inertia, stresses in beams, analysis of trusses, columns.

### Transportation Engineering:

Road engineering, classification of roads, traffic and tonnage, investigation for road project, geometric design of highways, construction of roads pavements and materials, traffic engineering, drainage of roads, maintenance and repairs of roads, arboriculture.

### Irrigation Engineering:

Advantages of irrigation, ill effects of over irrigation, types of irrigation project; hydrological cycle, rainfall, rain gauge and rain gauge station, average annual rain fall, run off, flood discharge, unit hydrograph, yield and dependable yield, water requirement of crops, investigation and reservoir planning, dams and spillways, diversion head works, canals,

canal regulation, alignment of off-taking channels, metering flumes, canal outlets or modules, cross drainage works, hydro-electric power.

#### **Quantitative Surveying, Estimating & Costing:**

Estimating & costing, meaning of the terms, purpose of estimating and costing, types of estimate, detailed estimate, revised estimate, supplementary estimate, maintenance & repair estimate, specification, mode of measurements, rate analysis, taking out quantities of work for roads, dam, canals, railway embankments, cement concrete road; estimate of RCC structures, estimate of culvert & bridges, valuation.

#### **Structural Design & Drafting (RCC)**

Meaning and purpose of reinforcement, reinforcement steel, types of steel used for reinforcement, permissible stresses in concrete and steel, concrete mix, fixed & continuous beam, working stress method, limit state method, analysis and design of singly reinforced and doubly reinforced sections (LSM), shear, bond and development length (LSM), analysis and design of T-beam (LSM), design of slab (LSM), design of axially loaded column and footing (LSM), prestressed concrete, principal of earth quake engineering.

#### **Structural Design & Drafting-II (Steel Structures)**

Types of sections used, grades of steel, strength characteristics, advantages and disadvantages of steel as construction material, design of riveted joint for axially loaded member, eccentric riveted connection, welded connection, design of fillet weld and butt weld subjected to axial load, analysis and design of tension member with welded and riveted connection, analysis and design of axially loaded angle struts with welded and riveted connection, stanchion and columns, simple and built up sections, analysis and design of axially loaded column, design of compound column, design of lacing angles and batten plates, column bases, design of slab base & concrete block, cleat angles, simple and built-up beam sections, design of simple and built-up beams, check for shear, roof truss.

#### **Public Health Engineering:**

Demands of water, source of water, quality & purification of water, conveyance and distribution of water.

**Sanitary Engineering:** Building sanitation, systems of sewerage, analysis of sewage, treatment of sewage, rural sanitation.