

**DIPLOMA (MECHANICAL) – PART THREE**

**Optional Early Certificate: - Basics of Technology**

**Syllabus:-**

Sr. No.	Module Code	Name of Module	Credits	Total Marks
1	MC22-11	English - II	4	100
2	MC22-12	Applied Mathematics - II	5	100
3	MC22-13	Engineering Materials & Material Science	4	100
4	MC22-14	Thermodynamics	5	100
5	MC22-15	Mechanical Engineering Drawing	5	100

**Module Name: English-II**

- Functional Grammar:** Articles, Preposition, Tenses: Functions, Synthesis, Transformation, Spotting errors and correction of sentences.
- Pre- Requisites of Technical written Communication:** One word substitution, Spelling rules, Words often confused & misused, Phrases.
- The Structure of sentences/ clauses:** Adverb clause, Adjective clause, Noun clause. Sentences: Simple, Double, Multiple and complex, Transformation of sentences: simple to complex & vice versa, simple to compound & vice-versa, Interrogative to assertive & to negative & vice-versa.
- Technical Communication:** Nature, Origin and Development, Salient features, Scope & Significance, Forms of Technical Communication, Difference between Technical Communication & General writing, Objective Style vs. Literary Composition.

**Module Name: Applied Mathematics-II**

- Complex Numbers:** Complex Numbers, phasor and Application of Complex Number in R.L.C. Circuits
- Differential Calculus:** Functions and Limits, Differentiation, Approximation of Errors by Differentials.
- Integral Calculus:** Indefinite Integral, Definite Integrals, Area Bounded by a Curve and Axes, Average Value and Root Mean Square Value of a function, Finite Differences and Numerical.
- Partial Differentiation:** Partial Differentiation.
- Solution of Ordinary Differential Equations:** Differential Equations, Linear Differential Equations, Applications of Differential Equations to R-L-C Electric Circuits.

## **Module Name:** Engineering Materials & Material Science

### **1. General**

- Introduction to engineering Materials.
- Classification of Materials.
- Thermal, chemical, electrical, Mechanical Properties of Various Materials.
- Selection criteria for use in Industry.

### **2. Structure of Metal and Their Deformation**

- Metal Structure.
- Relation of Metal structure to its properties
- Arrangement of atoms in metal (Basic Idea).
- Crystalline Structure of metals.
- Crystal imperfections.
- Deformation of Metal.
- impact of Cold and Hot working on metal Structure.
- Corrosion, its Cause and Prevention

### **3. Ferrous Materials**

- Classification of Iron and Steel.
- Sources of iron ore and its availability.
- manufacture of pig iron, wrought iron, Cast iron and Steel (Flow Diagrams Only).
- Types of Cast iron, White, malleable, grey, Mottled, Modular and alloy and their usage.
- Steels and alloy steels.
- Classification of steels.
- Different manufacturing method of Steel-open hearth, Bessemer, electric arc.
- Availability, Properties and Usage of Steels.
- Specification as per BIS and equivalent standards.
- Effect of Various alloying element like Cr, Ni, Co, Va, W, Mo, Si, Mn, S on mechanical properties of Sheet.
- Use of alloy steels(high speed steel, stainless steel, spring, steel, Silicon steel)

### **4. Non-Ferrous Materials**

- Important ores and Properties of aluminum, Copper, Zinc, tin, Lead.
- Properties and User of Al alloys, Copper alloys, Bearing metals, Solders.

### **5. Engineering Plastic and Fibers**

- Important Source of plastics.
- Classification- Thermoplastic and Thermoset.
- Various trade names of engg. Plastics.
- plastic Coasting.
- Fibers and Their Classification, Inorganic and organic Fibers.
- Usage of Fibers.

### **6. Insulating Materials**

- Various Heat insulating material and Their usage like asbestos, glass wool, thermocole, Cork, puf, China clay.
- Various electrical insulating material and Their use like China clay, leather, Bakelite, ebonite, glass wool, rubber, felt.

## **Module Name:** Thermodynamics

1. **Basic Concept and First Law:** Basic Concepts of Continuum, macroscopic approach, Thermodynamic systems-closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Concepts of ideal and real gases. First law of thermodynamic -application to

closed and open systems, internal energy , specific heat capacities, enthalpy, steady flow process with reference to various thermal equipment.

2. **Second Law:** Second law of thermodynamics-Kelvin's and Clausius statements of second law. Reversibility and irreversibility. cannot theorem, cannot cycle, reversed cannot cycle, efficiency, COP. Thermodynamic temperature scale, Clausius inequality, Concept of entropy, entropy of ideal gas, Principle of increase of entropy- availability.
3. **Properties of Pure Substance and Steam Power Cycle:** Properties of Pure Substance- Thermodynamic properties of pure substances in solid, Liquid and vapour phases, Phases rule P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of Work done and heat transfer in nonflow and flow processes. Standard Rankin cycle, Reheat and Regenerative cycle.
4. **Ideal and real Gases and Thermodynamic Relations:** Gas mixtures- Properties ideal and real gases, Equation of state, Compressibility factor, exact differential, T-D relations, Maxwell's relations, Clausius Chaperon Equations, Joule- Thomson Coefficient.
5. **Psychrometry :** Psychrometry and psychrometric charts, Property Calculations of air Vapour Mixtures. Psychrometric Process - Sensible heat exchange Processes. Latent Heat exchange Processes. Adiabatic Mixing, Evaporative Cooling(Use of Standard Thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant property tables are permitted).

#### **Module Name:** Mechanical Engineering Drawing

1. **Basic Principles:** Introduction, Engineering Drawing Instruments, Materials and Their Use, General Instructions, Types of Lines, Lettering, Dimensioning.
2. **Geometrical Construction:** Lines, Divide a Line into a Given Number of Equal parts, Angles, Triangles, Circles, Determine the Diameter of a Circle whose Circumference is Known, Curves, Bisect a Given Arc, Construction, Inscription and Circumscription of Polygons.
3. **Conic Sections and Special Curves:** Introduction, Ellipse, Parabola, Hyperbola, Special Curves, Involutives.
4. **Free Hand Sketching:** Introduction, Techniques of Lines, Straight Lines, hidden Lines, Circle and Arcs, multi-view Projection, One-view Drawing, Isometric Sketching, Oblique Sketching.
5. **Screw Thread and Fasteners :** Screw Threads, Internal and External , Threads, Pitch, Lead and Multistate threads, Components of a Screw Thread, Types of Thread, bolts, various Types of Bolts, Types of Nuts, Washer, Assembly of Bolt, Nut and Washer, Stud, Cap Screw, Set Screws, pins, Foundation bolts.
6. **Welded Joints, Pipes and pipe Joints:** Welded joints, Additional weld Symbol, Pipe and Pipe Joints, joints Steam pipes, Joints for Copper Steam Pipes.
7. **Bearings:** Introduction Types of Bearings
8. **Pulleys and fly wheel:** Pulley, fly Wheel.
9. **IC Engine Parts:** Introduction, Pistons, Connecting Roads, Crankshaft.