

**DIPLOMA (MECHANICAL) – PART ONE**

**Optional Early Certificate :- N/A**

**Syllabus:-**

| Sr. No. | Module Code | Name of Module      | Credits | Total Marks |
|---------|-------------|---------------------|---------|-------------|
| 1       | MC22-01     | English-I           | 4       | 100         |
| 2       | MC22-02     | Applied Mathematics | 5       | 100         |
| 3       | MC22-03     | Applied Physics     | 5       | 100         |
| 4       | MC22-04     | Applied Chemistry   | 5       | 100         |
| 5       | MC22-05     | Applied Mechanics   | 4       | 100         |

**Module Name:** English-I

- Functional Grammar:** Patterns & Parts of speech Subject, Predicate, Noun, Pronoun, Adjective, Adverb, Verb, Verb phrases, Conjunction, Interjection.
- Vocabulary:** Word formation, Prefix, Suffix, Compound words, Conversion, Synonyms, Antonyms, Homophones and Homonyms, How to look up a dictionary.
- Communication:** Meaning & importance of communication, Barriers to effective communication, Channels of communication, Language as a tool of communication.
- Requisites of Sentence writing:** Fragmented sentences, A good sentence, expletives, Garbled sentences, Rambling sentences, Loaded sentences, Parallel Comparison, Squinting construction, Loose & periodic sentences.

**Module Name:** Applied Mathematics

1. Quadratic Equations
2. Arithmetic Progressions
3. Geometric Progressions
4. Partial Fractions
5. Permutations
6. Combinations
7. Binomial Theorem (For Positive Integral Index)
8. Binomial Theorem (For Fractional Index)
9. Measurement of Angles
10. Trigonometric Functions
11. Trigonometric Functions of Sum and Difference of Two Angles
12. Transformation Formulae
13. Trigonometric Functions of Multiple and Sub-Multiple Angles
14. Relations Between the Sides and the Trigonometric Ratios of the Angles of a Triangle
15. Area of a Triangle
16. Solution of Triangles
17. Cartesian Coordinates (Two Dimensions)
18. Locus
19. Straight Lines
20. Circles
21. Plotting of Curves
22. Translation of Axes
23. Parabolas
24. Ellipses
25. Hyperbolas
26. Polar Coordinates

**Module Name:** Applied Physics

1. **Units and Dimensions:** Fundamental and Derived Units in SI System, Dimensions of Physical Quantities, Principle of Homogeneity Dimensional Equation, Applications of Dimensional Analysis: Checking the Correctness of Physical Equations, Derivation of Simple Physical Relations, Limitation of Dimensional Analysis, Significant Figures and Error Analysis.
2. **Force and Motion:** Scalars and Vectors, Velocity & acceleration, Equations of Motion, Newton's Law of Motion, Force & its Derivation from Newton's Laws of Motion, Composition and resolution of forces, Parabolic Motion Horizontal Projection and Projection at an angle, Time of Flight, Horizontal Range and Maximum Horizontal Range, Simple Problems, Centripetal Acceleration, Centripetal and Centrifugal Forces, Concept of Friction and its Application, Application to Banking of roads.
3. **Work, Power and Energy:** Work and its Units, Work Done on Bodies Moving on Horizontal and Inclined Planes (Consider Frictional Forces Also). Concept of Power and its Units, Calculations of Power (Simple Cases), Concept of Kinetic Energy and Potential Energy Expressions for P.E and K.E, Conservation of Energy in the Case of Freely Falling Bodies, Principle of Conservation of Energy.
4. **Rotational and Simple Harmonic Motions:** Definition of Moment of Inertia, Moment of Inertia of Disc, Ring, & Sphere, Torque and Angular Momentum and Their Inter Relation, Principles of Conservation (Angular Momentum and its Applications). Kinetic Energy of Rolling Body, S.H.M –

Derivation of Displacement, Velocity, Acceleration, Time Period and Frequency, Motion of Cantilever, Free, Forced and Resonant Vibrations (No Derivation).

5. **Heat- Temperature and its Measurement:** Concept of Heat and Temperature on the Basis of K.E. of Molecules, Unit of Heat Basic Principles of Measurement of Temperature, Thermocouple, Bimetallic and Resistance, Pyrometers and Thermometers Criteria for the Selection of Thermometers.
6. **Expansion of Solids:** Coefficient of Linear, Surface and Cubical Expansions and Relation Amongst Them, Thermal Stresses (Qualitative Only) and their Applications.
7. **Heat Transfer:** Three Modes of Transfer of Heat, Coefficient of Thermal Conductivity, its Determination by Searle's Method and Lee's Disc Method, Conduction Through Compound Media (Series and Parallel for Two Materials Only), Heat Radiation, Characteristics of Heat Radiations, Prevost's Theory of Heat Exchange, Black Body Radiations, Emissivity and Absorptivity Kirchhoff's Law and Stefan's Law of Radiation.

**Module Name:** Applied Chemistry

1. **Structure of Atom:** Chemistry as Important Branch of Science, Basic Concept of Elements Mixture and Compound, Chemical Equation, its Balancing, Implications and Limitations, Recapitulation of Fundamental Particles of Atom i.e., Electron, Proton and Neutron, Bohr's Model of Atom, Line Spectrum of Hydrogen, Modern Concept of Atom-Four Quantum Numbers, Shells, Subshells, Orbital (Shapes of s & p Orbital), Pauli's Exclusion Principle, Aufbau Energy Ranking Rule, Orbital Concept Types of bonds co-valency, formation of s-s, s-p, p-p, bonding with examples, Hybridization sp, sp<sup>2</sup>, sp<sup>3</sup>, (Consider BeF<sub>2</sub>, BF<sub>3</sub>, CH<sub>4</sub>) molecules, Brief Concept of Modern Periodic Table of Elements.
2. **Chemical Equation, Oxidation & Reduction:** Concept of Oxidation & Reduction, Electronic Concept of Oxidation & Reduction, Redox Reactions (Direct and Indirect), Oxidation Number Balancing of Simple Redox Reactions by Oxidation Number.
3. **Ionic Equilibrium:** Ionization, Degree of Ionization, Focus Effecting Ionization, Ionization of Water, Ionization Equilibrium in Aqueous Solutions, Common Ion Effect.
4. **Acids and Bases:** Concept of Acids and Bases, Their Strength in Ionization Constant, PH Value, Acid Base Titration, Choice of Indicators, Hydrolysis, Buffer Solution.
5. **Electrolysis:** Concept of Electrolysis, Faraday's Law of Electrolysis, Engineering Applications (Electro-Metallurgy, Electroplating & Electro-Refining)
6. **Water:** Hard and Soft Water, Removal of Hardness by: Soda Lime Process, Permutit's Process, Ion Exchange Method., Disadvantages of Hard Water in Industrial User, Boiler Scales, Priming, Foaming Corrosion and Caustic Embrittlement, Expressing the Degree of Hardness of Water in (With Simple Problems): Clark's Degree, O' Hener's Method, Determination of Degree of Hardness by (With Simple Problems): Soap Titration Method, O' Hener's Method: Water for Drinking Purposes.
7. **Solutions & Colloids:** Solute, Solvent, Solution & Colloids, Particle Size and Colloidal State, Tyndell Effect, Brownian movement, Coagulation.

**Module Name:** Applied Mechanics

1. **Introduction:** Concept of Mechanics and Applied Mechanics, Explanation of Mechanics and Applied Mechanics, Its Importance and Necessity, Giving Suitable Examples on Bodies at Rest and in Motion, Explanation of Branches of this Module, Concept of Rigid Bodies.
2. **Laws of Forces:** Force and its Effects, Units and Measurement of Force, Characteristics of Force Vector Representation, Bow's Notation, Types of Forces, Action and Reaction, Tension, Thrust and Shear Force, Force Systems: Coplanar and Space Force Systems, Coplanar Concurrent and Non-Concurrent Forces, Free Body Diagrams, Resultant and Components Concept of Equilibrium, Parallelogram Law of Forces, Equilibrium of Two Forces, Superposition and Transmissibility of Forces, Newton's Third Law, Triangle of Forces, Different Cases of Concurrent Coplanar, Two Force Systems, Extension of Parallelogram Law and Triangle Law to Many Forces Acting at One Point-

Polygon Law of Forces, Method of Resolution into Orthogonal Components for Finding the Resultant, Graphical Methods, Special Case of Three Concurrent, Coplanar Forces, Lami's Theorem.

3. **Moments:** Concept of Moment, Varignon's Theorem- Statement Only, Principle of Moments- Application of Moments to Simple Mechanism, Parallel Forces, Calculation of their Resultant, Concept of Couple Properties and Effect, Moving a Force Parallel to its Line of Action, General Cases of Coplanar Force System, General Conditions of Equilibrium of Bodies Under Coplanar Forces.
4. **Friction:** Concept of Friction, Laws of Friction, Limiting Friction and Coefficient of Friction, Sliding Friction.
5. **Centre of Gravity:** Concept of Gravity, Gravitational Force, Centroid and Center of Gravity, Centroid for Regular Lamina and Center of Gravity for Regular Solids, Position of Center of Gravity of Compound Bodies and Centroid of Composition Area, CG of Bodies with Portions Removed.
6. **Laws of Motion:** Concept of Momentum, Newton's Laws of Motion, Their Application, Derivation of Force Equation from Second Law of Motion, Numerical Problems on Second Law of Motion, Piles, Lifts, Bodies Tied with String, Newton's Third Law of Motion and Numerical Problems Based on it, Conservation of Momentum, Impulsive Force (Definition Only).
7. **Simple Machines:** Concept of Machine, Mechanical Advantage, Velocity Ratio and Efficiency of a Machine, their Relationship, Law of Machine, Simple Machines (Lever, Wheel and Axle, Pulleys, Jacks Winch Crabs Only).