GOVERNMENT OF BIHAR

DEPARTMENT OF SCIENCE & TECHNOLOGY

STATE BOARD OF TECHNICAL EDUCATION

BIHAR, PATNA

COURSE OF STUDY

FOR

PART - I

THREE YEAR DIPLOMA COURSE
# INDEX

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<td>Basic Engineering Drawing</td>
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Rationale:

The Subject Engineering Mathematics is being introduced into the Diploma Course to provide mathematical background to the students so that they can be able to grasp the engineering subjects properly. This course will enable them to analyse and understand the engineering problems scientifically based on Mathematics.

The subject is divided into two papers, viz. Engineering Mathematics - I and Engineering Mathematics - II. The paper Engineering Mathematics - I consists of the following:

1. Algebra
2. Trigonometry
3. Co-ordinate Geometry
4. Computer Studies

The details are given in the curriculum:

Objectives:

By covering the course in Engineering Mathematics - I, the students will be able to:

- Know Sequence & Series, Permutations and Combinations, Binomial Theorem, Determinates and Matrices, Properties of Triangles, Solution of Trigonometrical equations, Inverse Circular functions, complex quantities, co-ordinate systems, equations of lines, circles, equations of lines in three dimensions, equation of plane, about the organisation of computers, how
to write algorithms, how to prepare flow charts and how to write programmes in BASIC to solve simple problems.
- Understand their engineering applications.
- Solve related simple numerical problems which will enable them to understand the subject.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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<tbody>
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<tr>
<td></td>
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<td>- Partial Fraction</td>
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<td></td>
<td>- Permutation and Combination</td>
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<td></td>
<td>- Binomial Theorem</td>
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<td>- Determinants and Their Properties</td>
<td></td>
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<td></td>
<td>- Matrix Algebra</td>
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<td>- Complex Quantities</td>
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<td>02</td>
<td>Trigonometry</td>
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<td></td>
<td>- Trigonometrical Function up to trigonometrical ratio of sub-multiple angles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Properties of Triangle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Logarithm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Solution of Triangles &amp; General Value</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inverse Circular Function</td>
<td></td>
</tr>
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<td>03</td>
<td>Co-ordinate Geometry</td>
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</tr>
<tr>
<td></td>
<td>- Two dimensional : upto equation of circles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Three dimensional: upto straight line</td>
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</tr>
<tr>
<td>04</td>
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<tr>
<td></td>
<td>- Components of a Computer System</td>
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<td></td>
<td>- Number System</td>
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<td></td>
<td>- Programming</td>
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</tr>
</tbody>
</table>
CONTENTS:

TOPIC: 01 - ALGEBRA:

01.01 Sequence & Series: Arithmetic Progression (A.P.), Simple examples of A.P., Geometrical Progression (G.P.), Sum to infinity of a G.P., Sum of Squares and cubes of a naturals, idea of Harmonic Progression (H.P.), Relation between Arithmetic mean, Geometrical Mean and Harmonic mean. Insertions of AMs, GMs & HMs between two numbers.  [04]

01.02 Partial Fraction: Resolution into partial fraction of simple form - (i) Non-repeated linear factors and (ii) Repeated linear factors.  [02]

01.03 Permutations & Combinations: Introduction, Fundamental Principle of counting; The Factorial; Permutations, Simple practical problems on permutation; Combinations; simple practical problems on combinations.  [02]

01.04 Binomial Theorem:  [04]
Binomial Theorem for positive Index, Some applications of Binomial Theorem for any Index, Idea of Exponential and Logarithmic Series. (Simple Problem).

01.05 Determinates:  [02]
Determinants and their fundamental properties, simple problem, Difference between determinant and a matrix.

01.06 Matrices:  [04]
- Different types of Matrices
- Algebra of Matrices
- Transpose, Adjoint & Inverse of Matrices
- Solution of linear simultaneous equations by matrix method

01.07 Complex Quantities: Idea of a complex number, its geometrical representation, Modulus and Amplitude, Conjugate of a Complex number, Addition & Subtraction of a complex number with geometric notation, geometric notation. Derive the relations:  [04]
(i) $|z + z^2| \leq |z| + |z^2|
(ii) |z - z^2| \geq |z| - |z^2|
Multiplication and Division of one complex number by another with geometric representation. Idea of DeMoivre's Theorem, Roots of a Complex and Cube root of unity.

**TOPIC: 02 - TRIGONOMETRY:**

02.01 Trigonometrical Functions, Trigonometrical Functions of angles of arbitrary magnitude, Trigonometrical ratios of Compound angles. Trigonometrical ratios of Multiple and sub-multiple angles and transformation formulae. [04]

02.02 Properties of Triangle: Relations between the side and angles of a triangle. Simple problems based on it. [04]

02.03 Logarithm: Definition, Fundamental Rules and properties of Logarithms. [02]

02.04 General Values and Inverse Functions: Formulae for all angles which have a given Sine, Cosine and Tangent. Formulae for angles both equi-sinal and equi-cosinal Inverse Circular Functions, Solution of Equations expressed in inverse notation. [05]

**TOPIC: 03 - CO-ORDINATE GEOMETRY:**

03.01 Two Dimensional Co-ordinate Geometry

03.01.01 Idea of cartesian and polar co-ordinate systems. Relations between them. [01]

03.01.02 Distance between two points, section formula and Area of Triangle. Intelligent questions based on these (cartesian system only), centroid and incentre of a triangle. [02]

03.01.03 Equations of Locus: Equation of a straight line in different forms. Angle between two straight lines and their deduction, equation of circle, simple problem. [04]

03.02 Three Dimensional Co-ordinate Geometry
03.02.01 Co-ordinates of a point, Distance between two points, Section formula (Cartesian system only) [01]

03.02.02 Direction Cosines, Angle between two lines, Important deductions. [02]

03.02.03 Plane, Projection of the join of two points on a plane, Equation of plane, Angle between two planes, Important deductions. [02]

03.02.04 Equation of a straight line as intersection of two planes, Symmetric form of a straight line, simple problem. [03]

**TOPIC: 04 - COMPUTER STUDIES:**

04.01 Components of a Computer System: Input/Output devices, Memory unit, Central processing unit. [01]

04.02 Number System: Binary, Octal, Decimal & Hexadecimal System Radix conversion [02]

04.03 Computer Arithmetics: Binary, addition & subtraction, Boolean Algebra & Karnaugh Map, ASCII Code. [02]

04.04 Programming: Algorithm, Flow Chart: Elements of BASIC programming. Typical examples on (i) Sum & Product of a number (ii) Finding the maximum or minimum of three given numbers. [03]
Books Recommended:

Mathematics - I & Mathematics - II

1. Mathematics for Class XI Part I - NCERT
2. Mathematics for Class XI Part II - NCERT
3. Mathematics for Class XII Part I - NCERT
4. Mathematics for Class XII Part II - NCERT
5. Dynamics Via Calculus - Dr. H.N. Sharma, Dr. K.C. Sinha
6. Statics Via Vector - 

Reference Books:

3. Solid Geometry - Lal Jee Prasad

<table>
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<tr>
<th>S.No.</th>
<th>Scheme of Examination</th>
<th>Percentage</th>
<th>Marks</th>
<th>Types of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>To test the knowledge of the subject</td>
<td>20%</td>
<td>16</td>
<td>Objective type question covering the entire syllabus.</td>
</tr>
<tr>
<td>2.</td>
<td>To test the understanding &amp; Application of the subject</td>
<td>80%</td>
<td>64</td>
<td>Short and/ or long answer type</td>
</tr>
</tbody>
</table>

Break-up given as under:

- Algebra 30% 24
- Trigonometry 20% 16
- Co-ordinate Geometry 20% 16
- Computer Studies 10% 8
Engineering Mathematics-II

Subject Code: 00102

<table>
<thead>
<tr>
<th>Theory</th>
<th>No. of Periods in one session</th>
<th>60</th>
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<tbody>
<tr>
<td>No. of Periods per week</td>
<td>Full Marks : 100</td>
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<td>T</td>
<td>P/S</td>
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<tr>
<td>3</td>
<td>0</td>
<td>0</td>
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</tbody>
</table>

Rationale:

The Subject of Engineering Mathematics is being introduced into the Diploma Course to provide mathematical background to the students so that they can be able to grasp the engineering subjects, which they will come across in their higher classes properly. The course will give them the insight to understand and analyse the engineering problems scientifically based on Mathematics.

The subject is divided into two papers - Engineering Mathematics - I and Engineering Mathematics - II. The Curriculum of Engineering Mathematics - II consists of the following broad topics:

1. Calculus
2. Vector Algebra & Statics
3. Differential Equations
4. Dynamics.

The details of the above broad topics have been provided in the curriculum:

Objectives:

By covering the course in Engineering Mathematics - II, the students will be able to:

- Know the basics of Differential and Integral Calculus, the meaning of limit, continuity and derivative of a single variable and their applications to engineering problems, the various methods of integration, how to solve simple ordinary differential equation of 1st and 2nd order, the concept of vector algebra, how to apply concepts of vector algebra to statics, how to
apply the concepts of Differential and Integral Calculus in solving the problems of Dynamics.
- Understand their engineering application
- Solve related simple numerical problems which will help them to understand the subject.

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<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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<td>04</td>
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**CONTENTS:**

**TOPIC: 01 - CALCULUS:**

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<th>01.01</th>
<th>Functions: Constants, Variables, Functions, Graphical representation of function, odd &amp; even functions, explicit &amp; implicit functions &amp; other types of functions.</th>
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<tr>
<td>01.02</td>
<td>Limits: Definition, fundamental Theorem, important formulas. And its important deductions, Simple problems.</td>
<td>[02]</td>
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<tr>
<td>01.03</td>
<td>Continuity of a function: Left hand limit and Right hand limit. Definition of a continuous function. Simple problems to test the continuity of a function.</td>
<td>[02]</td>
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<tr>
<td>01.04</td>
<td>Differentiation of a function: Increment, Differential co-efficient, Derivatives of an algebraic, trigonometric, exponential, logarithmic and inverse functions from first principle, Differentiation of Sum, Difference, Product, Quotient of two functions, Fundamental theorems of differentiation of implicit function &amp; parametric functions.</td>
<td>[04]</td>
</tr>
<tr>
<td>01.05</td>
<td>Geometric meaning: Significance of derivative and its sign, Geometric interpretation of dy/dx, Equation of tangents and</td>
<td>[02]</td>
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</tbody>
</table>
normals to a curve. Angle between two curves.

01.06 Application of dy/dx: Approximate Calculations and Small Errors interpretation of dy/dx as a rate measure, practical problems, Maximum & Minimum functions of single variable. [03]

01.07 Successive Differentiation: Definition and Notations, the nth derivatives of some special functions. Leibnitz theorem. [03]

01.08 Partial Differentiation: Idea of a partial differentiation, partial derivatives, successive partial derivatives, Euler's Theorem on Homogeneous Functions, Partial Differentiation of Implicit Functions, Total Differential. [03]

01.09 Integration: Integration as inverse process of differentiation, Introduction, Integration by transformation, Integration by Substitution and Integration by parts. [03]

01.10 The Definite integral, Properties of the definite integral. Problem of area by Integration method. [04]

**TOPIC: 02 - VECTORS & STATICS:**

02.01 Introduction to Vectors: Definition of Scalars and Vectors with example, Representation of a vector, type of vectors (Unit vector, Zero vector, negative of a vector and Equality of vectors), Addition and Subtraction of vectors, Multiplication of vectors by a scalar. [03]

02.02 Position vector: Position vector of a Point Resolution of vectors (coplanar vectors and space vectors) : Point of Division, Centroid of triangle. [02]

02.03 Product of two vectors: Scalar or Dot Product, Vector or Cross Product. Geometrical interpretation and their properties. [04]

02.05 Physical application: Test of collinearity, coplanarity and linear dependence of vectors, work done as a scalar product.

02.06 Statics via vectors: resultant of two forces acting at a point, parallel forces, Moments.

**TOPIC: 03 - DIFFERENTIAL EQUATION:**

03.01 Introduction: Definition of a Differential Equation, Formation of a Differential Equation, Ordinary and Partial Differential Equation, Order and Degree of a Differential Equation.

03.02 Equation of first Order and first Degree: Solution of different types of equations: (i) Variable separable (ii) Homogeneous Equations (iii) Equation reducible to homogeneous form (iv) Linear Equations (v) Exact Differential Equations.

03.03 Linear Differential Equations: with constant coefficients of orders two: Definition, complete solution Rules for finding the complementary function. Rules for finding the particular Integral, Simple Problems.

**TOPIC: 04 - DYNAMICS VIA CALCULUS:**

04.01 Introduction: Definition of Important terms used in Dynamics - Uniform Velocity, Uniform Acceleration, Motion under Gravity, Simple problems.

04.02 Projectile: Terminology: Motion of a Projectile velocity at any point, Greatest height, Time of Flight and Horizontal Range, Two directions of projectile, Minimum Speed for a Range, Motion of a given height.
Books Recommended:
Mathematics - I & Mathematics - II

1. Mathematics for Class XI Part I - NCERT
2. Mathematics for Class XI Part II - NCERT
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Do Break-up given as under:

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<tr>
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</thead>
<tbody>
<tr>
<td>Calculus</td>
<td>40%</td>
<td>32</td>
</tr>
<tr>
<td>Vector &amp; Statics</td>
<td>20%</td>
<td>16</td>
</tr>
<tr>
<td>Differential Equation</td>
<td>10%</td>
<td>8</td>
</tr>
<tr>
<td>Dynamics via Calculus</td>
<td>10%</td>
<td>8</td>
</tr>
</tbody>
</table>
Rationale and Objective:

Knowledge of Physics is so interwoven with engineering studies that one cannot think of pursuing engineering studies without the knowledge of Physics. Study of Physics is essential for Diploma holders in engineering and technology to develop in them proper understanding of physical phenomenon, scientific temper and engineering aptitude.

The course covers the basic laws and principles of Physics and its applications. The course contents are so chosen that it should be more relevant to the modern development of science to meet the challenge posed by fast-changing technology.

Keeping these objectives in view the subject has been divided into the following topics:

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<th>S.No.</th>
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<td>3.</td>
<td>Electrostatics</td>
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<td>Current Electricity &amp; Magnetism</td>
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<tr>
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<td>Modern Physics</td>
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<tr>
<td>6.</td>
<td>Environment &amp; Safety</td>
<td>(02)</td>
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</tbody>
</table>

(50)

Teachers are advised to use the latest technology of teaching (e.g. use of LRs etc.) and make maximum use of demonstration so that the subject will be interesting.
to the students. The Engineering applications of the principles of physics should be discussed broadly. Use of S.I. units for all measurements and calculations is recommended.

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**TOPIC: 01 - GENERAL PHYSICS:**

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<td></td>
<td>01.01.02 System of Units - C.G.S., M.K.S., F.P.S. &amp; S.I. System and their full forms (Foot Pound Second)</td>
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<tr>
<td></td>
<td>01.01.03 Basic &amp; Supplementary Units - Names &amp; Symbols</td>
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<tr>
<td></td>
<td>01.01.04 Advantages of S.I. System - Comprehensive, Coherent &amp; Rational</td>
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<tr>
<td></td>
<td>01.01.05 Dimensions &amp; Dimensional formula of simple Physical quantities, Dimensionless quantities.</td>
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<tr>
<td></td>
<td>01.01.06 Dimensional equations and their uses - Conversion of Units from one system to another, to check correctness of equation, establish relation between different physical quantities.</td>
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<tr>
<td></td>
<td>01.01.07 Limitations of Dimensional analysis.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>02</th>
<th>01.02</th>
<th>Scales &amp; Measurements</th>
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<tbody>
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<td>01</td>
<td>01.02.01 Vernier Scale &amp; least count.</td>
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<tr>
<td></td>
<td>01.02.02 Vernier (Slide) Callipers.</td>
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<tr>
<td></td>
<td>01.02.03 Screw - Pitch &amp; Least Count.</td>
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<tr>
<td></td>
<td>01.02.04 Screw Gauge (Micrometer Gauge) &amp; Spherometer - their construction and operation.</td>
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<tr>
<td></td>
<td>01.02.05 Spherometer - Measurement of thickness of a sheet or plate.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>02</th>
<th>01.03</th>
<th>Scalars &amp; Vectors</th>
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<tbody>
<tr>
<td>01</td>
<td>01.03.01 Scalar &amp; Vector quantities, Representation of a Vector.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>01.03.02 Addition &amp; Subtraction of two vectors - triangle method.</td>
<td></td>
</tr>
</tbody>
</table>
01.03.03 Resolution of vector into two mutually perpendicular components.

01.04 Linear Motion

01.04.01 Speed & velocity - Definition, Difference (Distinction), their Units & Dimensions.
01.04.02 Uniform Velocity, Uniformly accelerated Velocity (Uniform acceleration) & Retardation.
01.04.03 Derivation of formulas:
   (i) \( v = u + at \)
   (ii) \( s = ut + \frac{1}{2} at^2 \)
   using differentiation & integration method.

01.05 Motion Under Gravity

01.05.01 Acceleration due to gravity - Unit & Dimension. Weight and mass.
01.05.02 Co-ordinate Convention of displacement, Velocity and acceleration.
01.05.03 Equations of motion of body moving freely under gravity:
   (i) Downwards
   (ii) Upwards

01.06 Projectile

01.06.01 Projectile - Definition & examples.
01.06.02 Oblique projection - Derivation of equation for trajectory, Range, Maximum height, Time of flight & time for attaining maximum height.
01.06.03 Angle of projection for maximum range for fixed speed of projection.
01.06.04 Horizontal & vertical projectiles and their path.
01.06.05 Simple numericals based on formulas.

01.07 Friction

01.07.01 Friction - Definition, Types of friction - Sliding & Rolling, Static & Dynamic (Kinetic).
01.07.02 Limiting frictional force. Laws of Static & Kinetic friction. Experimental Verification not required.
01.07.03 Co-efficient of friction - a unitless quantity.
01.07.04 Equilibrium of a body on rough inclined plane under the effect of its weight & frictional force.
01.07.05 Angle of Repose & its uses.
01.07.06 Friction - necessary evil.
01.07.07 Use of lubricants to reduce friction - solid, liquid & gas.
01.07.08 Simple numericals based on formulas.

01.08 Circular Motion

01.08.01 Circular Motion - Definition.
01.08.02 Angular Displacement, Velocity and acceleration & their units.
01.08.03 Relation between linear and angular velocity and acceleration - Differential Calculus method.
01.08.04 Centripetal Force and its derivation by Vector method.
01.08.05 Centrifugal force, its presence felt only in rotational systems - Pseudo force.
01.08.06 Applications of Circular motion:
   - motion of cyclist on curved path
   - banking of tracks
   - principle of working of cream separator, cloth drier, centrifuge machine
01.08.07 Simple numericals based on formulas.

01.09 Simple Harmonic Motion

01.09.01 Periodic motion & S.H.M. - Definitions.
01.09.02 Expressions for displacement, velocity, acceleration and time period of S.H.M.
   Derivation not required.
01.09.03 Phase & Epoch - Definition.
01.09.04 Equation of S.H.M. starting from equilibrium position and another point.
   \[ y = a \sin wt \] \[ y = a \sin (wt+\phi) \]
01.09.05 Elastic spring & spring constant.
01.09.06 Motion of a block tied to a massless spring moving on a horizontal
frictionless table.

01.09.07  Time period of a Simple pendulum - derivation.
01.09.08  Simple numericals based on formulas.

01.10  Gravitiation  [02]

01.10.01  Newton's law & formula for force between two bodies.
01.10.02  Units & Dimensions of 'G' and 'g'.
01.10.03  Relation between 'G' and 'g' and their values.
01.10.04  Value of 'g' at earth's surface, above and below earth's surface - maximum value.
          No Derivation required.
01.10.05  Satellite - Orbital Velocity and time period.
01.10.06  Parking Orbit - Definition
01.10.07  Escape Velocity - Definition & expression in terms of 'g'.
          Derivation not required.
01.10.08  Simple numericals based on formulas.

01.11  Rotational Motion and Moment of Inertia  [03]

01.11.01  Moment of Inertia & Radius of Gyration - Definition, units and dimension.
01.11.02  M.I. of Uniform ring & Uniform Disc about their natural axes.
01.11.03  M.I. of Solid Sphere about its diameter - derivation of expression.
01.11.04  Rolling on inclined smooth plane without slipping - Expression for acceleration along the plane to be derived.
01.11.05  Sliding motion of a body down a rough inclined plane under its own weight only - No external force - derivation of expression.
01.11.06  Torque and angular momentum - definition & expression.
01.11.07  Principle of Conservation of angular momentum and its examples.
          No derivation required.
01.11.08  Simple numericals based on formula.

01.12  Fluids  [01]

01.12.01  Surface Tension & Surface Energy - Introduction, Unit & Dimension.
01.12.02  Capillary rise - expression and its applications.
01.12.03 Laminar Flow & Co-efficient of Viscosity - Unit & Dimension.
01.12.04 Streamline & Turbulent flow - Definition.
01.12.05 Motion of Spinning ball in air (a viscous medium) and free fall of rain drops - Qualitative Discussion.

**TOPIC: 02 - HEAT:**

02.01 Heat

02.01.01 Heat form of energy. Unit of heat - Joule & Calorie.
02.01.02 Modes of heat transfer and their examples.

**TOPIC: 03 - ELECTROSTATICS:**

03.01 Field & Potential

03.01.01 Electric Field, Intensity and Potential due to a point charge.
03.01.02 Units & Dimensions of electric intensity & potential.
03.01.03 Derivation of potential at a point due to point charge.

03.02 Capacity & Condenser

03.02.01 Capacity of a Single Conductor and Condenser (Capacitor).
03.02.02 Capacity of a Parallel Plate Condenser - Expression only.
No derivation required.
03.02.03 Series & Parallel grouping of Condensers and expressions for equivalent capacities.
No derivation required.

**TOPIC: 04 - CURRENT ELECTRICITY AND MAGNETISM:**

04.01 E.M.F. & P.D.
04.01.01 Definition - Units
04.01.02 Internal resistance of cell.
   Expression for current $I = E/(R+r)$.

04.02 Kirchhoff's Laws

04.02.01 Kirchhoff's Laws and Wheatstone bridge - Condition for balance.
   No derivation required.

04.03 Magnetic Effect

04.03.01 Biot-Savart's Law, Expression for magnetic induction & direction of magnetic induction.
04.03.02 Expression for magnetic induction due to an infinitely long conductor carrying electric current.
   No derivation required.
04.03.03 Expression for magnetic induction due to Circular Coil carrying electric current,
   - at centre of the coil &
   - at a point on the axis of the coil.
   No derivation required.

04.04 Heating Effect

04.04.01 Heat developed in a current carrying conductor - expression.
04.04.02 Electrical Power & energy and their units.
04.04.03 Specifications marked on electrical appliances - Wattage & Voltage.
04.04.04 Resultant power (Total power) consumed in parallel combination of electrical appliances.
   Kilo watt hour (Kwh) and electrical unit.
   Expressions only.
   No derivation required.
04.04.05 Simple numericals based on formulas.

04.05 Electromagnetic Induction

04.05.01 Magnetic Flux - Definition & Unit.
04.05.02 Electromagnetic Induction - definition.
04.05.03 Faraday's Law & Lenz's Law of Electromagnetic Induction.
04.05.04 Eddy (Focault's) Current & its used in induction furnace and braking (stopping) of rotating wheels.

04.06 Alternating Current

04.06.01 Uniform rotation of a coil in uniform magnetic field - Derivation of expression for e.m.f. induced.
04.06.02 Peak Value & R.M.S. Value of A.C.
Rated Value - R.M.S. Value.
04.06.03 Expressions for e.m.f. and curent in A.C. Circuit containing:
- resistance only
- Inductance only
- capacitance only
Expressions only. No Derivation required.
04.06.04 Choke Coil - Simple introduction.
04.06.05 Transformer & losses in it - Simple ideas.

**TOPIC: 05 - MODERN PHYSICS:**

05.01 Atomic Structure

05.01.01 Bohr's atomic model.
05.01.02 Stationary orbits & energy levels.
05.01.03 Transition of electron between two orbits - emission of electromagnetic radiation, Expression for wavelength of emitted radiation.
No derivation required.
05.01.04 Simple numericals based on formulas.

05.02 Thermionic Emission

05.02.01 Thermionic emmission and Diode Valve.
05.02.02 Half Wave rectifier.

05.03 X-Rays
05.03.01 Simple ideas of production of X-ray (No Diagram needed), Soft & hard X-rays.
05.03.02 Expression of minimum wavelength.
05.03.03 Use of X-ray in medicine & industry.
05.03.04 Simple numericals based on formulas.

05.04 **Photoelectric Effect**

05.04.01 Definition, Photon and its energy.
05.04.02 Threshold frequency

05.04.03 Effect of Intensity & Energy of incident light on Photoelectric effect.
05.04.04 Use of Photoelectric effect:
- medical use in Glucometer (Blood Sugar Measurement)
- Exposure meter
- Density measurement of exposed X-ray & photo films
- Television telecasting
05.04.05 Simple numericals based on formulas.

05.05 **Radioactivity**

05.05.01 Definition, Radioactive Decay and its formula - Half life time.
05.05.02 Types of radiations emitted from radioactive materials
05.05.03 Fission and Fusion - Simple ideas.
05.05.04 Principle of nuclear reactor and Stellar energy (energy from star)
05.05.05 Simple numericals based on formulas.

05.06 **Ultrasonics**

05.06.01 Definition
05.06.02 Piezo electric effect - Simple ideas (No diagram).
05.06.03 Uses in medicine and industry - simple ideas.

05.07 **Laser & Optical Fibre**

05.07.01 Introduction & Working principle - simple ideas.
05.07.02 Uses in medicine & industry - simple ideas.
05.08  **Semiconductor**  

05.08.01  Intrinsic & Extrinsic Semiconductor - simple ideas.  
05.08.02  Tetravalent Structure of intrinsic semiconductor.  
Doping material (Impurity) trivalent & pentavalent.  
05.08.03  PN junction & simple introduction of forward and reverse bias.

**TOPIC: 06 - ENVIRONMENT & SAFETY:**  

06.01  **Environment & Safety**  

06.01.01  Noise pollution and its effect on human health.  
06.01.02  Radiation Hazards and Safety thereof.  
06.01.03  Non conventional Energy- Solar Energy, Solar battery Cell, Wind Energy, Geothermal Energy.
Books Recommended for Engineering Physics:

Text Books:

1. Introductory Physics (Vol. I & II) - By N.N. Ghosh
3. Physics for Class XI & XII Part I - By N.K. Bajaj
   (Tata McGraw Hill)

Reference Books:

1. University Physics - By Sears & Zeemansky
2. Physics Part I & Part II - By Halliday & Resnik
3. Applied Physics Vol. I & II - By TTTI Chandigarh,
   (Tata McGraw Hill)
5. Intermediate Physics - By S.C. Roy Chowdhary & Dr.
   D.B. Singh
6. Intermediate Physics - By Lakhmer Singh &
   Subramaniam
   (Pitambar Publishing Co., New Delhi)
# SCHEME OF EXAMINATION FOR ENGINEERING PHYSICS
## THEORY

F.M. : 80

The Question Paper' of Engg. Physics Theory should be divided as following in four groups:

<table>
<thead>
<tr>
<th>Group</th>
<th>Mark(s) of each question</th>
<th>No. of questions to be attempted</th>
<th>Out of total no. of questions in the group</th>
<th>Total Marks for the particular group</th>
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<tbody>
<tr>
<td>A</td>
<td>01</td>
<td>15</td>
<td>15 Q.No. 1(i) (ii) .... to (xv)</td>
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<tr>
<td>B</td>
<td>03</td>
<td>05</td>
<td>08 Q.No. 2 to 9</td>
<td>15</td>
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<td>C</td>
<td>10</td>
<td>03</td>
<td>05 Q.No. 10 to 14</td>
<td>30</td>
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<tr>
<td>D Numericals</td>
<td>05</td>
<td>04</td>
<td>06 Q.No. 15 to 20</td>
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Distribution of Questions (except numericals in Group 'D') should be limited to:

<table>
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<th>S.No.</th>
<th>Topic</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1.</td>
<td>General Physics &amp; Heat</td>
<td>50%</td>
</tr>
<tr>
<td>2.</td>
<td>Electrostatics, Current Electricity &amp; Magnetism</td>
<td>25%</td>
</tr>
<tr>
<td>3.</td>
<td>Modern Physics &amp; Environment</td>
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<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Engineering Chemistry

Subject Code
00104

No. of Periods
50

in one session

Full Marks : 100
Annual Exam. : 80
Internal Exam. : 20

Rationale & Objective:

Keeping in view the recent developments in Science and the present needs in Industries, the curriculum of Engineering Chemistry has been revised so that the Engineers or Technicians may have a better knowledge of Chemistry, especially regarding the application of the subject in various fields of Industries. An emphasis, in this direction, has been made in the curriculum.

A new chapter on Environmental Chemistry has been introduced to make the students aquainted with the various pollution hazards which is becoming more critical everyday.

The following topics are so chosen that through their contents the students are able to develop knowledge, skill and scientific attitude. It will enable them to distinguish, differentiate, analyse and solve engineering problems.

S.No. Topics Periods

GROUP - A
1. Importance of Chemistry for Engineers and its applications in industries (02)
2. General Chemistry (05)
3. Atomic Structure (03)
4. Chemical Bonding (03)
5. Chemical Equilibrium (03)
6. Metallurgical Operations (08)
7. Water Treatment (08)
8. Fuel & Combustion (08)
CONTENTS:

GROUP - A

**Topic: 01 - Introduction** [02]
01.01 Importance of Chemistry for Engineers and its application in industries.

**Topic: 02 - General Chemistry** [05]
02.01 Atomic Wt. Equivalent Wt., Molecular Wt. and their determination, Numerical Problems.
02.02 Mole Concept, Avogadro's number, Numerical Problems.

**Topic: 03 - Atomic Structure** [03]
03.01 Basic idea of fundamental particles, Atomic Number, Mass Number, Rutherford model & Bohr's model.
03.02 Electronic configuration in s, p, d, f notation.

**Topic: 04 - Chemical Bonding** [03]
04.01 Ionization Potential, Electron affinity, electronegativity.
04.02 Types of Chemical Bonds - Electrovalent, Covalent (Polar and non-polar) and Co-ordinate bonds.

**Topic: 05 - Chemical Equilibrium** [03]
05.01 Reversible and Irreversible reaction, Chemical Equilibrium.
05.02 Law of mass action.
05.03 Ionic product of water, PH-scale, Common Ion Effect and Numerical problems.

**Topic: 06 - Metallurgical Operations** [08]
06.01 General metallurgical operations, Concentration of metal ore, Roasting, Calcination, Smelting, refining of metals.
06.02 Extraction of Iron, Aluminium and Copper.
06.03 Manufacture of steel - (a) Bessemer process, (b) Open Hearth process, effect of impurities such as Mn, P, S and Si. Heat treatment of steel, Anealing, Hardening, Tempering, Normalising, Case hardening, Nitriding and Cyaniding

06.04 Introduction, Importance, Classification and uses of alloys with examples.

GROUP - B

**Topic: 07 - Water Treatment**  
07.01 Introduction - Use of water for Industrial and domestic purposes, sources of water supply.

07.02 Hardness of water, degree of hardness and its estimation (Hehner and EDTA methods). Numerical problems on degree of hardness. PH-value of water, disinfection of water and Municipal Supply.

07.03 Softening of hard water (Lime-Soda method, Permutit, Ion Exchange and calgon methods).

**Topic: 08 - Fuel and Combustion**  
08.01 Introduction - Importance of fuels in Industries, classification of fuels, calorific values, Determination of calorific value and Numerical problems. Characteristics of an ideal fuel.

08.02 Refining and cracking of petroleum, knocking. Octane Number and Cetane Number. Merits and demerits of fuels, L.P.G., Coal gas, Oil gas and Producer gas.

**Topic: 09 - Lubricants**  
10.01 Introduction & Classification of lubricants.

10.02 Properties of lubricants, Lubricants Oil, grease, emulsions.

**Topic: 10 - Paints and Varnishes**  
11.01 Characteristics of a good paint, brief study of various constituents of a paint.

**Topic: 11 - Environmental Chemistry**  
13.01 Introduction:
13.01.01 Effect of pollution on human health (Name of diseases) and plant.

13.02 Air Pollution:
13.02.01 Causes of air pollution like factory smoke discharge, automobile exhaust gas, deforestation etc.
13.02.02 Brief idea of pollution effects like acid rain, green house effect, action of ozone layer which causes green house effect on earth, effect of chlorofluorocarbon on depletion of ozone layer.

13.03 Water Pollution:
13.03.01 Standard prescribed by WHO, IMC and bureau of Indian Standard for pure drinking water.

Books Recommended:

1. Text Book of Engineering Chemistry - M.M. Uppal
2. Text Book of Engineering Chemistry - C.V. Agrawal
3. Text Book of Engineering Chemistry - P.C. Jain
4. Pradyogiki Rasayan (Hindi) - S.Z. Aahmad & Prof. Subuktgin
5. Takniki Rasayan Bhag 1 evam 2 (Hindi) - Roop Prakashan
6. a. Inorganic Chemistry - P.L. Soni
   b. Physical Chemistry - P.L. Soni
7. a. Inorganic Chemistry - Biltu Singh
   b. Physical Chemistry - Biltu Singh
8. a. Inorganic Chemistry - Ram Ratan Pd.
9. Environmental Chemistry -
## SCHEME OF EXAMINATION FOR FINAL EXAMINATION

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>Marks</th>
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<tr>
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<tr>
<td>1.</td>
<td>Objective</td>
<td>[05]</td>
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<tr>
<td>2.</td>
<td>Short Answer</td>
<td>[06]</td>
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<tr>
<td>3.</td>
<td>Long Answer</td>
<td>[24]</td>
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<tr>
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<td><strong>GROUP - B</strong></td>
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<tr>
<td>4.</td>
<td>Objective</td>
<td>[05]</td>
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<tr>
<td>5.</td>
<td>Short Answer</td>
<td>[08]</td>
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Language & Communication Skill
English & Hindi

Subject Code
00105

<table>
<thead>
<tr>
<th>Theory</th>
<th>No. of Periods in one session</th>
</tr>
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<tbody>
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No. of Periods in one session 60

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<th>No. of Periods per week</th>
<th>Full Marks</th>
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<th>Internal Exam.</th>
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<tbody>
<tr>
<td>L T P/S</td>
<td>100</td>
<td>80</td>
<td>20</td>
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</table>

Rationale & Objective:

The primary aim of this course is to help technical students studying in Polytechnics and Engineering Institutes acquire the skills of language and communication in order to be successful in their studies and subsequent professional life. It has been found that in the world of work of diploma holder they have to perform various job functions like Letter Writing, maintaining office records, drawing up tender notices, writing technical reports, communicating with sub-ordinate staff and/or labourer and with superiors.

The curriculum has been designed to improve the knowledge of the Language, comprehension and its application to develop communication skill.

The curriculum also seeks to develop the student's power of oral communication through effective use of body language and necessarily puts knowledge to practice through exposure in varied form.

The curriculum has been designed both in English & Hindi languages.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group</th>
<th>Topic</th>
<th>Periods</th>
<th>Marks</th>
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<tr>
<td>1</td>
<td>A</td>
<td>ENGLISH</td>
<td>30</td>
<td>50</td>
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<tr>
<td>2</td>
<td>B</td>
<td>HINDI</td>
<td>30</td>
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<td><strong>Total:</strong></td>
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GROUP - A [ENGLISH]

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<th>Topic</th>
<th>Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>A. Language Practice</td>
<td>[08]</td>
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<tr>
<td></td>
<td>B. Oral Communication</td>
<td>[05]</td>
</tr>
<tr>
<td>02</td>
<td>Comprehension</td>
<td>[03]</td>
</tr>
<tr>
<td>03</td>
<td>Paragraph Writing</td>
<td>[02]</td>
</tr>
<tr>
<td>04</td>
<td>Letter Writing</td>
<td>[04]</td>
</tr>
<tr>
<td>05</td>
<td>Tender Notice &amp; Advertisement</td>
<td>[04]</td>
</tr>
<tr>
<td>06</td>
<td>Report Writing</td>
<td>[04]</td>
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Total: 30

CONTENTS:

**TOPIC 01(A) - Language Practice:**

<table>
<thead>
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<th>Topic</th>
<th>Periods</th>
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<tr>
<td>01.01 Tenses of verbs</td>
<td>[08]</td>
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<tr>
<td>01.01.01 Writing about the Present</td>
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</tr>
<tr>
<td>- Subject verb agreement</td>
<td></td>
</tr>
<tr>
<td>- Negative statements</td>
<td></td>
</tr>
<tr>
<td>- Is/ Are VERB - ed (is needed, are powered etc.)</td>
<td></td>
</tr>
<tr>
<td>01.01.02 Writing about the Past</td>
<td></td>
</tr>
<tr>
<td>- VERB - ed (Past Simple)</td>
<td></td>
</tr>
<tr>
<td>- Was/ Were VERB - ed (Past simple passive)</td>
<td></td>
</tr>
<tr>
<td>- Has/ Have VERB - ed</td>
<td></td>
</tr>
<tr>
<td>- Has/ Have been VERB - ed</td>
<td></td>
</tr>
<tr>
<td>- Has VERB - ed + VERB - ed (Past perfect + Past simple)</td>
<td></td>
</tr>
<tr>
<td>(The demonstration has already started before the office broke for lunch)</td>
<td></td>
</tr>
<tr>
<td>- Was/ Were VERB - ed + VERB - ed (Past continuous + past simple)</td>
<td></td>
</tr>
<tr>
<td>01.01.03 Writing about the Future</td>
<td></td>
</tr>
<tr>
<td>- Shall/ Will VERB (Future simple)</td>
<td></td>
</tr>
<tr>
<td>- Shall/ Will be VERB - ed (Future simple passive)</td>
<td></td>
</tr>
<tr>
<td>01.02 Auxiliaries</td>
<td></td>
</tr>
<tr>
<td>- Use of can could, will would, shall should, may might etc.</td>
<td></td>
</tr>
<tr>
<td>(Drilling exercise with suitable examples to be done)</td>
<td></td>
</tr>
</tbody>
</table>
01.03 Word Formation
- Common roots in Technical English
- Noun endings, -tion, -ment, -ance, -ity, -logy, -meter, -metry, -or, -er etc.
- Prefixes that mean NOT: in, on, non, il, im, de, dis, mis, mal
- Words that end with: -ize, -ate, -ify
- Adjectives that end with: -al, -ic, -ical, -ar, -ary, -ory, -ing

01.04 Single Word Substitution
- Drilling of exercise
  (Page No. 147 to 151 of Text Book)

01.05 Sentence Structure
- Completing, joining, reframing (for emphasis) and transformation of sentences

01.06 Punctuation
- Correct use of comma, semi-colon, colon, full stop, apostrophe, inverted commas, note of exclamation, note of interruption, dash, brackets, hyphen, capital letters and italics.

**TOPIC 01(B) - Oral Communication:**

- Manners & basic etiquettes
- Body Language - the role of body postures, movements, gestures, facial expressions, dress & make up in effective communication
- Information/ Desk/ Front Office/ Telephone conversation
  (Practice with audio/ video cassettes
- Conduct while facing interviews (Mock Interview)
- Group discussions, debates, elocution

**TOPIC 02 - Comprehension:**

02.01 Prescribed unit from communication in English for Technical Students (Orient Longman):
  i. Uses of Mango Wastes
  ii. Making Money in India
  iii. Radar: its operation and benefits
  iv. Technology for Mankind
TOPIC 03 - Paragraph Writing:

03.01 General – Specific
03.02 Process – Description
03.03 Problem – Solution
03.04 Data – Comment

TOPIC 04 – Letter/ Application Writing:

04.01 Official letters to an from higher authorities/ departments regarding administrative/ establishment/ financial matters.
04.02 Commercial letters regarding enquiries/ proposals for purchase/ service.
04.03 Drafting application for jobs - format, style & contents

TOPIC 05 - Tender Notice & Advertisement:

05.01 Inviting Tenders/ Quotations - format & contents, formalities involved, placing orders.
05.02 Drafting advertisements for 'situation vacant'/ 'situation wanted' columns, for sale/ purchase of items etc.

TOPIC 06 - Report Writing:

06.01 Types, structure and utility of reports
06.02 Technical reports
06.02.01 Project reports
06.02.02 Enquiry reports
06.02.03 Stock verification reports etc.

(The teacher should help the students in the preparation of their project report)
**Books Recommended:**

**Text Book:**


**Reference Books:**

1. An Intermediate English Practice Book - by S. Pit Corder (Orient Longman)
2. Living English Structure - by W.S. Allen (Orient Longman)
3. Advance Learner's Dictionary - by A.S. Hornby (O.U.P.)

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

**OUTLINE FOR SETTING QUESTION**

<table>
<thead>
<tr>
<th>Percentage of Marks</th>
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<tbody>
<tr>
<td>1. Cognative domain Knowledge of the subject: Definition/ Objective type questions</td>
</tr>
<tr>
<td>2. Comprehension for the purpose highlight understanding</td>
</tr>
<tr>
<td>3. Short answers for Quotation, Reminder, Book reservation, Book recalling etc.</td>
</tr>
<tr>
<td>4. Long Answers - Descriptive - Report type</td>
</tr>
</tbody>
</table>

**Total:** 100%
GROUP - B [HINDI]

<table>
<thead>
<tr>
<th>Øe</th>
<th>ikB~;</th>
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</tr>
<tr>
<td>01</td>
<td>Hkk&quot;kk vH;kl</td>
<td>[08]</td>
</tr>
<tr>
<td>02</td>
<td>ekSf[kd lEçs&quot;k.k</td>
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<tr>
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CONTENTS:

**ikB~; 01 & Hkk"kk vH;kl%** [08]

<table>
<thead>
<tr>
<th>01-01</th>
<th>'kCn jpuk</th>
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01-04  - foijhrkFkZd 'kCn
- ;qXe 'kCn
- vusd 'kCnksa ds fy, ,d 'kCn
- ,d 'kCn vkJ fofoHké ç|ksx
- ,d 'kCn dk fofoHké 'kCn Hksnksa esa ç|ksx
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ikB~; 02 & ekSf[kd laçs"k.k%  [05]
02-01  rkJnjhds ,oa vkJ/kkHkwf f'k"Vkpj
02-02  'kkjhfd Hkk"kk & 'kkjhfd HkkoHkafxek }kjk lEçs"k.k] vfrfogr] ladjr eq[kkd`fr }kjk lEçs"k.k] iks'kkd rFkk çikh/kj }kjk çHkkodkjh lEçs"k.k
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  ¼J"VkJ n`; dSlsVksa }kjk vH;kl½
02-04  vUrohZ{kk ds le; vkJ.k
02-05  lkewfgd ifjppkZ[ okn&fookn} oDr`rk

ikB~; 03 & vifBr x|ka'k vkJ ç'ucksÜkj%  [03]
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ikB~; 04 & vuqPNsn ys[ku%  [05]
04-01  lkekU; & fo'ks"k
04-02  çfO;k & o.kZu
04-03  leL;k & lek/kku
04-04  vfdaNk & lek{kk

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05-02 iwNrN@ Ø;@ lsok ls lEcFUlkr i=kpkjA
05-03 fu;kstuj gsrq vkosnu

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 lEc) vkSpkfjdrk] vkns'kA
06-02 ffDr;kj@ vko';drk@ Ø;@ foØ; vknf ds fy;s foKKiu dk
 çk:iA

ikB~; 07 & çfrosnu ys[ku%
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07-02 rduhdh çfrosnu & ifj;stk çfrosnu] tkp çfrosnu vknf
 ¼ifj;stuk çfrosnu rS;djus esa f'k{k dks
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   Hkkjrh Hkou] iVuk
2. fgUnh esa mUur fVli.k vkJj - jke fouk;d flag]
yksd Hkkjrh çdk'ku]
   bykgkckn
3. fgUnh esa ç'kklfud i= ys[ku - jke fouk;d flag]
yksd Hkkjrh çdk'ku]
   bykgkckn
4. fgUnh çk:i.k vkJj fVli.k - eYgks=k]
  Ýstj jksM] iVuk
5. F'k{kFkhZ fgUnh 'kCndks'k - Mkň gjnso okgjh] jkeiky ,.M IUI
6. vaxzsth fgUnh 'kkldh; ç;ksx dks'k - xksihukFk JhokLro] le ıký ,.M IUI

**ijh{kk dk vk;ksstu@ vadksa dk foHkktu**

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Rationale and Objective:

Drawing is said to be the language of engineers. All material objects have a shape and form, which can be represented by a combination of known geometrical figures. A thorough grounding in drawing to represent these objects on a plane is considered very essential for Diploma holders. Any construction or fabrication be it be a building, a factory or a machine has to begin with a drawing which forms the basis and guide to get the work done.

Drawing is commonly used mode of communication in the engineering industry. Proper exposure to drawing helps the students to translate different ideas into practice. Acquisition of skill will produce a drawing to represent a given object with sufficient knowledge to understand and interpret. As such drawing is regarded a pre-requisite for technician engineer.

With these objectives in view the following topics have been prescribed.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>Periods</th>
<th>No. of Plates</th>
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<tbody>
<tr>
<td>1.</td>
<td>Introduction</td>
<td>(06)</td>
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<tr>
<td>2.</td>
<td>Lettering, Numbering &amp; Dimensioning</td>
<td>(12)</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Conic Section</td>
<td>(24)</td>
<td>02</td>
</tr>
<tr>
<td>4.</td>
<td>Orthographic Projection</td>
<td>(39)</td>
<td>05</td>
</tr>
<tr>
<td>5.</td>
<td>Section views &amp; Auxiliary views</td>
<td>(12)</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Isometric, Pictorial &amp; oblique Drawing</td>
<td>(18)</td>
<td>02</td>
</tr>
<tr>
<td>7.</td>
<td>Development of Surfaces</td>
<td>(15)</td>
<td>01</td>
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<td><strong>Total</strong></td>
<td><strong>(120)</strong></td>
<td><strong>12 sheets</strong></td>
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TOPIC: 01 - Introduction:

01.01 Importance of Engineering Drawing as graphic communication. Link between engineering drawing and other subjects of study in diploma course.
01.02 I. S. specification for preparation of drawings.
01.03 Use of drawing instruments and materials. Basic Tools-classification and brief description.
01.04 Special tools- Mini-drafter. Drafting Machine.
01.05 Scales, Recommended, reduced & enlarged scale.
01.06 Lines, Types of lines, Selection of line thickness.
01.07 Selection of Pencils.
01.08 Drawing sheets, different sheet sizes and standard layouts. Title block as per I. S. specification.
01.09 Care and maintenance of drawing material

TOPIC: 02 - LETTERING, NUMBERING & DIMENSIONING:

02.01 Importance of lettering. Different types of lettering as per I. S. code. Capital and small letters of vertical & slanting type as per I. S. code.
02.02 Numerical figures of vertical and slanting type as per I. S. code. Single stroke and double stroke, advantages.
02.03 Necessity of dimensioning. Principles and method of dimensioning and dimensioning practice as per I. S. I. code.
02.04 Making of centre line, Section line, dimensioning lines etc.
02.05 Drawing of plain and diagonal scales and dimensioning practice.

TOPIC: 03 - CONIC SECTION:

03.01 Concept of Drawing and concept of conic section and its simple properties.
03.02 Concept of ellipse and its construction by various methods. Drawing of tangent & normal on ellipse.
03.03 Concept of parabola and its construction by various methods. Drawing of tangent & normal to parabola.
03.04 Concept of hyperbola and its construction by various methods. Drawing of tangent & normal to hyperbola.
03.05 Concept of spirals; construction of Logarithmic & Archemerian spirals. To draw tangent and normal to the curves.

**TOPIC: 04 - ORTHOGRAPHIC PROJECTIONS:**

04.01 Principles of orthographic projection. Concept of horizontal, vertical and auxiliary planes. 1st angle and 3rd angle projection.
04.02 Projection of points on horizontal, vertical and auxiliary planes and its implication.
04.03 Projection of lines on different planes, Length of line and its true inclination with different planes and its traces.
04.04 Concept of orthographic projection of planes.
04.05 Projection of solids (Prism, Cone, Pyramids, Cylinder, Cube etc.).

**TOPIC: 05 - SECTION VIEWS & AUXILIARY VIEWS:**

05.01 Concept of sectioning and drawing section lines, Need for drawing sectional views.
05.02 Section of simple geometrical solids-cases involving different types of cutting planes.
05.03 Conventional representation of materials as per I. S. Code.

**TOPIC: 06 - ISOMETRIC, PICTORIAL OBLIQUE DRAWING:**

06.01 Introduction to pictorial drawing. Brief description of different types of pictorial drawing viz Isometric, oblique & perspective and their applications.
06.02 Concept of Isometric views. Isomeric Projection and Isometric Scale.
06.03 Isometric Projection of simple solids, frustum of solids, truncated solids and sets of simple solids.
06.04 Concept of oblique & perspective views.
06.05 Simple drawing of oblique views.
TOPIC: 07 - DEVELOPMENT OF SURFACE:  

07.01 Development of surfaces of Cylinders, Prisms, Pyramids, cones and their frustum & truncated objects.

Books Recommended:

1. Descriptive Geometry - Abbot
2. Elementary Engineering Drawing - N. D. Bhatt
4. Gyameetic Aarekhan (Hindi) - Dadan, Ravindra, Daya Shankar Srivastava
5. I.S.I. Specification on drawing -
7. Engineering Drawing - P. S. Gill
8. Engineering Drawing - Parkinson
Elementary Mechanical Engineering and Engineering Material

Subject Code
00107

Theory

<table>
<thead>
<tr>
<th>No. of Periods per week</th>
<th>Full Marks</th>
<th>Annual Exam.</th>
<th>Internal Exam.</th>
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<td>L T P/S</td>
<td>100</td>
<td>80</td>
<td>20</td>
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No. of Periods in one session
60

Rationale & Objective:

The technicians have to handle and deal with so many materials to be used in construction of Engineering product and making machine tools and structures etc. They have to face many problems involving general mechanical, electrical, electronics and civil Engg. As such the knowledge of general Engg. principles of different branches is essential for a Diploma holder.

The course has been designed with a view to include various materials commonly used in Engineering Constructions and general principles of working of different machine tools.

S.No.  Topics  Periods

GROUP - A (Mechanical Engineering)

1. Linear Measurement  (04)
2. General Process  (04)
3. Heat Engines  (07)
4. Power Transmission  (07)
5. Boilers  (04)
GROUP - B (Engineering Material)

6. Stones (04)
7. Clay Products (03)
8. Cement & their products (03)
9. Timber (03)
10. Ferrous Metals (04)
11. Non-ferrous metals (05)
12. Miscellaneous Material (12)

(60)

CONTENTS:

GROUP - A (MECHANICAL ENGINEERING)

TOPIC: 01 - LINEAR MEASUREMENT: [04]

01.01 Concept of standard length.
01.02 Measurement of length.
01.03 Concept of Least Count.
01.04 Steel rule, Callipers, Verniers, Gauges
   - Description of each and their application.

TOPIC: 02 - GENERAL PROCESS: [04]

02.01 Principle of Soldering, brazing & welding.
02.02 Application of soldering, brazing & welding.
02.03 Flame Cutting and Welding.
02.04 Different types of flames used in cutting.
02.05 Safety precautions in Welding & Cutting.
TOPIC: 03 - HEAT ENGINES

03.01 Concept of External & Internal Combustion engines.
03.02 Difference between External & Internal Combustion engines.
03.03 Concept of Heat and Energy. Thermodynamic system and their properties.
03.04 General concept of working principles of Internal Combustion engines.
03.05 Introduction of Two-stroke and four-stroke I.C. engine.

TOPIC: 04 - POWER TRANSMISSION

04.01 General Concept of power transmission by simple Gears.
04.02 Definition of Gear and its classification & application.
04.03 Type of belt drives - open belt drive & crossed belt drive.
04.04 Slip and Creep in belt drive.
04.05 Chain and Rope drive.
04.06 Selection criteria of Gear, belt, rope & chain drive.

TOPIC: 05 - BOILERS

05.01 Classification of boilers - Fire tube & water tube boiler.
05.02 Boiler accessories & Mounting, their functions.

GROUP - B (ENGINEERING MATERIAL)

TOPIC: 06 - STONES:

06.01 Introduction of stones as engineering materials
06.02 Classification of Rocks, qualities, selection and uses of different types of stones in various engineering construction works.
06.03 List of tests on stones,
    - Dressing of stones & quarrying of stones.
TOPIC: 07 - CLAY PRODUCTS:

07.01 Common Clay products, their manufacture and application.
07.02 Uses of brick and characteristics of good bricks.

TOPIC: 08 - CEMENT & THEIR PRODUCTS

08.01 Lime:
  - Introduction
  - Different types of limes & its applications
08.02 Cement:
  - Introduction
  - Different types of cements, their ingredients and applications

TOPIC: 09 - TIMBER

09.01 Classification of Timber
09.02 Characteristics of good timber
09.03 Preservation of timber and its uses

TOPIC: 10 - FERROUS METAL

10.02 Different type of bar section and their uses
10.03 Introduction of Corrosion of ferrous metals.
  - Protection against corrosion

TOPIC: 11 - NON FERROUS METALS

11.01 Advantages & disadvantages of non-ferrous metals.
11.02 Properties and uses of Important metals like Aluminium, Copper, Zinc etc.

11.03 Different types of alloys, their properties & uses.

**TOPIC: 12 - MISCELLANEOUS MATERIALS**

12.01 Plastics:
- Introduction, important commercial products of plastics used in engineering works
- Types of plastics - Thermoplastic & Thermosetting

12.02 Glass:
- Types of glass
- Composition of glass
- Uses of glass as industrial material

12.03 Adhesive:
- Types of Adhesive
- Its ingredients and uses

12.04 Rubber:
- Characteristics of Rubber
- Types and uses of Rubber

12.05 Magnetic Material:
- Introduction & Classification
- Magnetic Materials for Electrical & Electronics Devices and their applications
### Books Recommended:

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Author</th>
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<tbody>
<tr>
<td>1.</td>
<td>Workshop Technology</td>
<td>By Hazare and Choudhary</td>
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<tr>
<td>2.</td>
<td>Heat Engine</td>
<td>By Pandey &amp; Saha</td>
</tr>
<tr>
<td>3.</td>
<td>Engineering Material</td>
<td>By Banga &amp; Sharma</td>
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<td>4.</td>
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<td>By Narang</td>
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<td>5.</td>
<td>इंजीनियरिंग पदार्थ</td>
<td>जनार्दन झा</td>
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<td>6.</td>
<td>Electrical Engineering</td>
<td>By Uppal</td>
</tr>
<tr>
<td>7.</td>
<td>वैप्लुत अभियांत्रिकी</td>
<td>डी.आर. नारायण</td>
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</table>
Rationale & Objective:

The subject forms the foundation of electrical and electronics engineering. It prepares the students to familiarize with basic concepts and principles of electrical and electronics as these are encountered in every large and small installations of each type of industries. The diploma holders will be using machines and systems extensively which have electronics and electrical circuits inside. To understand their basic functioning, the students will be required to study the working principles, construction, characteristics, specifications and uses of basic devices and circuits.

Keeping in view the importance and relevance, this course has been developed and incorporated in the curriculum. The content has been divided into the following topics:-

PART-A

**Electrical Engineering (Annual Exam : 55 marks)**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Topics</th>
<th>Periods</th>
<th>Marks</th>
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<tr>
<td>1.</td>
<td>Electro-magnetism</td>
<td>07</td>
<td>10</td>
</tr>
<tr>
<td>2.</td>
<td>D.C. Fundamentals</td>
<td>08</td>
<td>14</td>
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<tr>
<td>3.</td>
<td>A.C. Fundamentals</td>
<td>09</td>
<td>14</td>
</tr>
<tr>
<td>4.</td>
<td>Storage Batteries</td>
<td>04</td>
<td>11</td>
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<tr>
<td>5.</td>
<td>Measuring Instruments</td>
<td>04</td>
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<tr>
<td>6.</td>
<td>Power Supply</td>
<td>03</td>
<td></td>
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<tr>
<td>7.</td>
<td>Electrical Lighting and Power Installation</td>
<td>03</td>
<td>06</td>
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<tr>
<td>8.</td>
<td>Safety Procedures</td>
<td>02</td>
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PART-B
Electronics Engineering (Annual Exam : 25 marks)

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<td>Resistor &amp; Colour Code</td>
<td>03</td>
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<tr>
<td>2.</td>
<td>Semiconductor &amp; Diode</td>
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<td>3.</td>
<td>Vacuum Tubes</td>
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<td>4.</td>
<td>Transistors</td>
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<td>05</td>
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<td>Field Effect Transistor</td>
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<td>6.</td>
<td>Digital Electronics</td>
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PART-A
Electrical Engineering

Contents :

**Topic 1. -Electro-Magnetism** (07)

01.01 Magnetic field due to current carrying straight conductor. Magnetic Flux, Flux density.
01.02 Force on a moving charge and current in a Magnetic field. Force between two current carrying parallel conductors.
01.03 Magnetic circuit, series and parallel, Reluctance. Analog between magnetic and electric circuits.
01.05 Eddy current, its concept. Eddy Current Laws.
01.06 Induce e.m.f. dynamically and statically induced e.m.f.
01.07 Inductance- Self and mutual co-efficient of coupling.
01.08 Energy stored in a magnetic field. Lifting power of an electromagnet.
01.09 Related problems.
**Topic 02. -D. C. Fundamentals**

02.01 Ohm's law and Law of resistance. Concept of resistivity and conductivity, their units and dependence on temperature in a conductor.

02.02 Kirchoff's voltage and current laws and their application in simple circuits.

02.03 Star-delta transformation.

02.04 Thevenin's theorem, Norton's theorem, Super position theorem, Maximum power transformer theorem.

02.05 Related problems.

02.06 D.C. Generators-construction, principle, types, characteristics and applications.

02.07 D.C. Motors - working principle, Type characteristic.

02.08 Principle of Starter - uses & application.

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**Topic 03. -A. C. Fundamentals**

03.01 Concept of Alternating current and voltage, difference between A.C. and D.C. concept of cycle, Frequency, period, amplitude, instantaneous value. Average value. R.M.S. value and peak value. Form Factor.

03.02 Concept of phase and phase difference.

03.03 Power in A. C. circuits and power factors.

03.04 Alternating voltage applied to pure resistance, pure inductance and pure capacitance.

03.05 Concept of impedance, impedance triangle.

03.06 Single phase circuit (R-L, R-C, R-L-C) series and parallel circuits, calculation of impedance, current, power factor, power and voltage drop.

03.07 Transformer-principle construction and e.m.f. equation.

03.08 Core type and shell type shell type transformers. Transformer Ratio, efficiency and rating.

03.09 Different type of Transformer - Auto-transformer and Welding transformer.

03.10 Three phase Transformers - connections star-Delta transformation.

03.11 Applications of Transformer.
03.12 Induction Motor - Principle, construction and types.
03.13 Different types of starter and its connection to induction motor.
03.14 Applications of induction motor.
03.15 Alternators - working principle, construction and use, speed & frequency relations.

**Topic 04. - Storage Batteries**

04.01 Cell - Primary and Secondary Cell.
04.02 Construction of Lead Acid and Nickel & alkaline cells.
04.03 Capacity and rating.
04.04 Operation and Maintenance of Battery.
04.05 Study of Battery charges.
04.06 Connection of Batteries.

**Topic 05. - Measuring Instruments**

05.01 Classification of instruments. Construction and Principle of moving iron and moving instruments.
05.02 Introduction & Application of Watt Meter.
05.03 Introduction & Application of Frequency Meter.
05.04 Introduction & Application of Power factor Meter.
05.05 Uses of multimeters.
05.06 Introduction & principle of operation of energy meters with load
   (i) Single phase meter.
   (ii) 3 phase meter.

**Topic 06. - Power Supply**

06.01 Working principle of constant voltage Transformer (C.V.T.), Ratings.
06.02 Working principle of Uninterrupted power supplies (U.P.S.) and their ratings.
**Topic 07. - Electrical Lighting and Power installation** (03)

07.01 Electrical Lighting accessories like switches, sockets, distribution boards, Junction boxes, Fuse and others related with wiring, wire and cable type and characteristic.

**Topic 08. - Safety Procedures** (02)

08.01 Effects of shocks and burns.
08.02 Procedures to be adopted in case of electrical shocks.

**PART-B**

**Electronics**

**Topic: 01 – Resistor & Colour Code** [03]

01.01 Definition, Introduction and application connection of Resistors, Condenser, Colour Code. Value calculation of resistors through colour code & Tolerance.

**Topic: 02 - Semiconductor and Diodes** [05]

02.01 Conductors, Semiconductors, insulators, differences between them.
02.02 Conduction in intrinsic and extrinsic semiconductors. Concept of electrons and holes, Donor and acceptor impurities. P and N type semiconductors and their conductivity, effect of temperature on conductivity, drift and diffusion currents.
02.03 P-N Junction diode, Forward and Reverse bias, characteristics of P-N Junction and effect of Temperature, Reverse breakdown voltage.
02.04 Diode (P N Junction) as rectifier, Half wave, Full wave and bridge rectifier.
02.05 Zener Diode and its application.
02.06 Photo diodes.
02.07 Light Emitting diode.

**Topic: 03 - Vacuum Tubes**

03.01 Introduction to vacuum Tubes, Electron-emission, types-in brief.
03.02 Triodes, Tetrodes, Pentodes-Principles, operations and characteristics.

**Topic: 04 – Transistors**

04.01 Concept of Bipolar Transistor, PNP and NPN Transistors, Transistor action, Transistor configurations, characteristics modes of operation.
04.02 Transistor as an amplifier. Classification of Amplifiers, CB, CC and CE amplifiers, Input and Output character of amplifiers.
04.03 Thermal stability, effect of Temperature, Stability factor, Transistor biasing, Collector to base bias, emitter bias, Voltage Divider Bias.
04.04 Hybrid equivalent circuit for a bipolar Transistor, h-parameters, current gain, input impedance, voltage gain, output impedance, power gain.

**Topic: 05 - Field Effect Transistor**

05.01 Classification, merits and demerits, basic construction, principles, operation, characteristics, equivalent circuit and its application.
05.02 C. S., C. D. and C. G. amplifiers, MOSFET-characteristics and applications, Enhancement mode, Depletion mode.
05.03 Comparison of JFET, MOSFET, BJT.
05.04 S. C. R. Thyristor, Diacs, Triacs Integrated circuits (ICS) in brief.

**Topic: 06 - Digital Electronics**

06.01 Basic ideas about-
   © Basic gates,
   © Adders and
   © Converters/familiarity with their application.
06.02 Introductory concept of memories.
Books Recommended:

1. Electrical Technology - B. L. Threja-S. Chand & Co.
2. Electrical Technology - Edward Hyghes
5. Basic Electricity - B. R. Sharma-Staya Prakashan, N. Delhi
13. Introduction to Microprocessor - Dr. B. Ram, Fhanpat Ray & Sons

The outline for setting questions:

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Types of questions</th>
<th>Percentage marks allotted</th>
<th>Marks</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td>Objective</td>
<td>10%</td>
<td>8</td>
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<tr>
<td>02</td>
<td>Short Answers</td>
<td>20%</td>
<td>16</td>
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<tr>
<td>03</td>
<td>Long Answers</td>
<td>50%</td>
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<tr>
<td>04</td>
<td>Numerical</td>
<td>20%</td>
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<td><strong>80</strong></td>
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</tbody>
</table>
Rationale & Objective:

Today, all the workplaces and the living environmental are being computerised. In order to prepare diploma engineers to work in those environments, it is essential that they are exposed to various aspects of Information Technology such as understanding the concept of Information Technology and its scope, operating a computer, good working knowledge to work in DOS and Windows environment, using internet etc., form the broad competency profile of Diploma holders. This exposure will enable the students to enter the world with confidence, live in these environments in a harmonious way and contribute to the productivity.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td>Introduction to Computer</td>
<td></td>
</tr>
<tr>
<td>01.01</td>
<td>Basics of Computer</td>
<td>(06)</td>
</tr>
<tr>
<td>01.02</td>
<td>Input &amp; Output Devices</td>
<td>(06)</td>
</tr>
<tr>
<td>01.03</td>
<td>Memory</td>
<td>(04)</td>
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<tr>
<td>01.04</td>
<td>Basics of Data &amp; Information</td>
<td>(05)</td>
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<tr>
<td>02</td>
<td>Power Supply</td>
<td>(03)</td>
</tr>
<tr>
<td>03</td>
<td>Introduction to Operating System</td>
<td>(04)</td>
</tr>
<tr>
<td>03.01</td>
<td>DOS</td>
<td>(07)</td>
</tr>
<tr>
<td>03.02</td>
<td>Windows Operating System</td>
<td>(09)</td>
</tr>
</tbody>
</table>
CONTENTS:

**TOPIC: 01 - INTRODUCTION TO COMPUTER:**

History and evolution of Computers. Classification, application and limitations of different types of computers.

01.01 **Basics of Computer** [06]

01.01.01 Computer Organisation, Block diagram of a Computer, C.P.U. Booting Process, Concepts of program & program implementation.

01.01.02 Concepts of Hardware & Software; Operating System, System Software, Applications Software.

01.01.03 Binary and other number systems and their conversion from one to other.

01.01.04 Memory, bit, byte & word.

01.01.05 ASCII and EBCDIC Codes - Machine Language, Assembly Language & High Level Language.

01.01.06 Compilers, Assemblers, Loaders and Linkers.

01.02 **Input & Output Devices** [06]

01.02.01 Working of various Input Devices such as:
- Key Board
- Mouse
- Joystick
- Light Pen
- Digitizers

01.02.02 Working of various Output devices such as:
- Different types of Printers and Plotters
- Scanners
01.03 Memory

01.03.01 Primary & Secondary Memory, Primary Storage Media: RAM, ROM, PROM, EPROM, Cache, extended and expanded memory.

01.03.02 Removable & non-removable secondary memory, Magnetic Taes & Disks, CD ROM, DVD.

01.03.03 Comparison of these devices based on technology (technical characteristics) & speed.

01.03.04 Organisation of data on disks, tracks, sectors, cylinders.

01.03.05 Heads, access time, seek time, latency time.

01.03.06 Device controllers: serial port, parallel port, system bus.

01.04 Basics of Data & Information

01.04.01 Introduction, Definition and application of data, difference between data and information.

01.04.02 Data types, entities, attributes and relationship - Introduction only.

01.04.03 Elements of Electronic Data Processing - different stages involved - processing methodologies. Transaction and Online Data Processing, Real Time Processing and their uses. Introductory Concepts of Text Processing and its applications.

**TOPIC: 02 - POWER SUPPLY:**

02.01 N-E. Voltage, Earthings.

02.02 Working of Constant Voltage Transformer (C.V.T.) - KVA & KW ratings.

02.03 Working of Uninterrupted Power Supply (U.P.S.).

02.04 Connections & Cables.
TOPIC: 03 - INTRODUCTION TO OPERATING SYSTEM:

Concepts of Operating System, A brief history of operating system, definition.
Operating System classification, single user, multi-user, batch processing, time-sharing, real time and multi-operating system.

03.01  DOS

03.01.01  Introduction, Definition & Application of Operating System and types of OS, Introduction to DOS, Booting, File and Directory.
03.01.02  Commands: Internal & External commands, Using various commands such as Directory commands, File Management commands, General commands, DISK Management commands, Edit commands.
03.01.03  Batch file commands, Introduction to simple batch files.
03.01.04  DOS Utility commands
03.01.05  Security & Recovery of Data

03.02  Windows Operating System

03.02.01  Concept of windows, overview of Graphic User Interface, Mouse, ICONS.
03.02.02  Using the mouse & manipulation of ICONS, Menus and opening different applications simultaneously.
03.02.03  Basic commands of windows: CREATE, MOVE, COPY, DELETE, RENAME a file or folder. Copy a file to floppy disk.
03.02.04  Difference in Windows 95, 98 and 2000.
03.02.05  Working with documents: changing, moving, deleting and saving information.
03.02.06  Brief introduction of Windows Accessories like Notepad, Calculator etc.
03.02.07  Printing: Setting up a printer and printing a document.
03.02.08  Basic concepts of installing Windows and based packages.

03.03  UNIX
03.03.01 Overview of UNIX, Comparison of DOS with UNIX.
03.03.02 Log on and Log off, user passwords.
03.03.03 Basic files/ directory manipulation commands.
03.03.04 Concept of Shell and Kernel, Elements of V-I editor.

03.04 Windows NT
03.04.01 Overview of Windows NT
03.04.02 Concept of client server and Windows NT server
03.04.03 Log on and Log off Control Panel
03.04.04 Administrative tools, File Manager.

**TOPIC: 04 - COMPUTER & COMMUNICATION:**

04.01 Introduction to Networking, Need and advantages.
04.02 Introduction to Internet & Web Browser.
04.03 Concept of LAN and WAN, Internet Protocol and TCP/IP.
04.04 Applications of Internet like e-mail & browsing, PPP, SMTP, Terminal types.
04.05 Down loading information from internet.
04.06 Sending and receiving e-mail through standard e-mail clients.
Knowledge of surveying in respect of Land Survey and measurement is essential to all of the Engineering students. Any project can take off only after proper conduct of the desired survey work and preparation of the necessary map using the physical data. For these the knowledge of Land Survey is essential. The students must also develop the skill to measure by proper use of Survey instruction through the knowledge of surveying so that the technicians can fix the slope of floor. Conveyors, waste & water pipe-lines and fix the height of machines & chimneys. The following topics and contents will fulfill the objectives.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>General Introduction</td>
<td>(05)</td>
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<tr>
<td>2.</td>
<td>Chain Surveying</td>
<td>(12)</td>
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<tr>
<td>3.</td>
<td>Compass Surveying</td>
<td>(09)</td>
</tr>
<tr>
<td>4.</td>
<td>Plane table Surveying</td>
<td>(06)</td>
</tr>
<tr>
<td>5.</td>
<td>Levelling</td>
<td>(12)</td>
</tr>
<tr>
<td>6.</td>
<td>Theodolite &amp; Layout of Structure</td>
<td>(06)</td>
</tr>
</tbody>
</table>

(50)
CONTENTS:

**TOPIC: 01 - GENERAL INTRODUCTION:**

01 Definition, Classification, Principle of Surveying.
Scales: Plain, diagonal & vernier scales.

**TOPIC: 02 - CHAIN SURVEYING:**

02.01 Measurement of distance, different types of chain & tapes, testing of chain & its adjustment. Instruments used in chain survey, Ranging, Direct & Indirect Ranging, line ranger, error in length due to incorrect chain, chaining of sloping ground, error in chaining, Tape corrections.
02.02 Chain Surveying, principle of chain surveying, surveying stations, base line, check line, tie line offsets, oblique offsets, booking field notes, field works. Instruments for setting-out right angles staffs and optical square, right angle with chain & tape, obstacles in chaining, cross staff survey plotting of chain survey.

**TOPIC: 03 - COMPASS SURVEYING**

03.01 Purpose, use & comparison with chain surveying traversing.
03.02 Compass - prismatic & survey's compass, its description.
03.03 Bearing, meridians, type of bearing, Fore bearing & Back bearing, computation of included angles.
03.04 Local attraction causes, errors corrections, Dip, Declination.
03.05 Traversing with chain & compass, plotting of traverse survey. Closing error and its adjustment.
TOPIC: 04 - PLANE TABLE SURVEYING

04.01 Object & comparison with chain & compass surveying instruments used in plane table surveying.
04.02 Setting up of plane table, centering, orientation & levelling.
04.03 Method of plane table surveying - (i) Radiation (ii) Intersection (iii) Traversing (iv) Resection.
04.04 Statement of two points & three points problem and their solution.
04.05 Errors in plane tabling & their elimination.

TOPIC: 05 - LEVELLING

05.01 Definition of terms used in levelling, instruments used in levelling and their description.
05.02 Adjustment of the level, temporary adjustments. Bench marks, different types of B.M., change points, steps in levelling, Principle of levelling, reduction of levels, H.I. method, rise & fall method, booking of staff reading, examples on levelling.
05.03 Classification of levelling, fly levelling, longitudinal & cross-sectional levelling.
05.04 Curvature & refraction.
05.05 Elementary knowledge of contours, use & characteristic of contour lines.

TOPIC: 06 - THEODOLITE & LAYOUT OF STRUCTURES

06.01 Introduction, different parts of the theodolite.
06.02 Temporary adjustments of the theodolite.
06.03 Measurements of horizontal and vertical angles.
06.04 Introduction, application of principle of surveying for layout of structures.
<table>
<thead>
<tr>
<th></th>
<th>Books Recommended</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Surveying &amp; Levelling Part-I</td>
<td>By T.P. Kanetkar &amp; S.V. Kulkarni</td>
</tr>
<tr>
<td>2.</td>
<td>Surveying Vol. I</td>
<td>By B.C. Punamia</td>
</tr>
<tr>
<td>3.</td>
<td>Surveying</td>
<td>By Hussain &amp; Nagraj</td>
</tr>
<tr>
<td>4.</td>
<td>Surveying &amp; Levelling</td>
<td>By Agar</td>
</tr>
<tr>
<td>5.</td>
<td>सर्वेक्षण</td>
<td>जे. झा</td>
</tr>
<tr>
<td>6.</td>
<td>सर्वेक्षण</td>
<td>गुरुचरण सिंह</td>
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<tr>
<td>7.</td>
<td>Plane &amp; Geodetic Surveying Vol. I</td>
<td>By David Clark</td>
</tr>
</tbody>
</table>
At Least ten experiments to be performed:

1. Determination of diameter using Slide Callipers.
2. Determination of depth using Slide Callipers.
5. Determination of thickness of a plate using Spherometer.
7. Study the relation between length of a Simple pendulum and square of its time period.
9. Verification of Laws of Series and parallel grouping of resistances using P.O. Box.
10. Determination of resistance using meter bridge.
11. Study relationship between current and potential difference at different lengths of meter bridge (or potentiometer) wire.

12. Comparison of e.m.fs two cells using potentiometer.

13. Determination of angle of repose using inclined plane friction table and to find co-efficient of friction.


15. Comparison of illuminating power (luminous intensity) of two light sources using Photoelectric Cell.

Books Recommended for Engineering Physics (Lab.):

1. Practical Physics - By N.N. Ghosh
2. Practical Physics - Sharma Singh & Prasad
   Bharti Bhawan Publication
3. Practical Physics - By Durga Pd. Singh
4. Practical Physics - By C.L. Arora
   S. Chand & Co.
5. Practical Physics - By K.K. Mahindroo
   Pitambar Publishing Co., New Delhi
Rationale & Objective:

The Chemistry Lab. Practical has been introduced with a view to develop scientific attitude among the students. The topics (experiments) have been chosen to develop skill among the students so that they can measure, differentiate and analyse the best results. This will help them solve the engineering problems in their world of work.

S.No. Topics Periods

(At least ten experiments are to be performed)

1. Preparation of derivatives
2. Titration
3. Quantitative Analysis
4. Quantitative Analysis of Simple Inorganic Salts
5. Qualitative and Quantitative Analysis of drinking water

CONTENTS:

Topic: 01 - Preparation of derivatives

01.01 Preparation of Barium Sulphate from Barium Chloride.
01.02 Preparation of Copper Sulphate from Copper Carbonate.
01.03 Preparation of Copper Sulphate from Copper Nitrate.
01.04 Preparation of Copper Chloride from Copper Sulphate.
01.05 Preparation of Calcium Carbonate from Calcium Oxide.

**Topic: 02 - Titration**

02.01 Preparation N/10 solution of oxalic acid and Sodium Carbonate
02.02 Standardisation of the given solution of NaOH or KOH with the help of N/10 Oxalic acid solution.
02.03 Determination of the volume of a drop of water.
02.04 To determine the quantity of Na$_2$CO$_3$/litre in a mixture of Na$_2$CO$_3$ and NaOH solution.

**Topic: 03 - Quantitative Analysis**

03.01 Determination of percentage of calcium or calcium carbonate in a given sample of calcium carbonate.
03.02 Determination of percentage of moisture in a given sample of coal.

**Topic: 04 - Qualitative Analysis**

04.01 Analysis of simple inorganic salts containing not more than two radicals among the following :-

Pb$^{++}$, Hg$^{++}$, Cu$^{++}$, Cd$^{++}$, Bi$^{+++}$, As$^{+++}$, Sb$^{+++}$, Fe$^{++}$ or Fe$^{+++}$, Al$^{+++}$, Cr$^{+++}$, Mn$^{++}$, Zn$^{++}$, Co$^{++}$, Ca$^{++}$, Sr$^{++}$, Ba$^{++}$, Mg$^{++}$, Na$^+$, K$^+$, NH$_4$$^{++}$, Cl$^-$, Br$^-$, I$^-$, NO$_3^-$, CO$_3^{2-}$, SO$_4^{2-}$, S$^-$, and NO$_2^-$

**Topic: 05 - Qualitative & quantitative Analysis of Drinking Water**

Note :- Water samples from five different sources, Well, handpump, water supply etc. from neighbourhood to be collected by each group of two students and following tests to be conducted :-

Qualitative Analysis (with the help of field test kits available) or the following :-
i. Total Solid dissolved.
ii. Chlorine.
iii. Flourine.
iv. Iron.
v. Nitrite.
vi. Nitrate.
vii. Sulphide/Sulphate.

Quantitative Analysis in the laboratory

i. pH-Value-By pH meter.
ii. Chlorine- By Gravimetric method.
iii. Sulphate- By Gravimetric method.
Rationale & Objective:

After learning the theoretical paper, it is essential for students to have a practice for surveying in the field with the help of instruments and survey accessories learnt in theory, to develop desired skill in land surveying and measurement.

List of Activities: Field Work

S.No.  Topic

1. Testing & adjustment of chain.

2. Chaining & Ranging a line and recording in the field book including taking offsets (using optical square & other instruments), doing chain survey.


4. Study of plane table survey equipment, setting up of plane table, orientation of plane table, doing plane table survey by radiation, intersection and traversing.
5. Study of levels. Temporary adjustment of levels, taking staff reading on different stations & recording in level book, finding difference of level between two distant points. Plotting longitudinal section & cross-sections.

6. Taking out theodolite from the box mounting on the Tripod and placing it back. Study of theodolite, temporary adjustment of the theodolite, reading of vernier and calculation of least count and taking readings.

Books Recommended for Field Survey Practice (Practical):

1. Surveying & Levelling Part-I - By T.P. Kanetkar & S.V. Kulkarni
2. Surveying Vol. I - By B.C. Punamia
3. Surveying - By Hussain & Nagraj
4. Surveying & Levelling - By Agar
5. सर्वेक्षण - जे. झा
6. सर्वेक्षण - गुरूचरण सिंह
7. Plane & Geodetic Surveying Vol. I - By David Clark
Rationale & Objective:

A Diploma holder technician must know how to work on shop floor. This helps to develop psychomotor skill and attitude. The knowledge & skill to use machines, equipment, tools and measuring instruments is required to be developed. Safe handling of machines and tools is also very important. So, it is essential for students of 1st year to undergo basic workshop practical training. The topics include practical works in carpentry, welding, fitting, smithy sheet metal shop & machine shop. It is required to inculcate safe habits and attitude so that accidents are avoided at every step. Topics have been prescribed to fulfil these objectives.

The students are supposed to come in proper workshop dress. Wearing shoes in the workshop is compulsory.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>No. of Jobs</th>
<th>No. of Periods</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>Safety precautions and knowledge of hand tools</td>
<td>--</td>
<td>(03)</td>
</tr>
<tr>
<td>02</td>
<td>Wood working (carpentry section)</td>
<td>02</td>
<td>(24)</td>
</tr>
<tr>
<td>03</td>
<td>Fitting Section</td>
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<tr>
<td>04</td>
<td>Blacksmithy Section</td>
<td>02</td>
<td>(18)</td>
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<tr>
<td>05</td>
<td>Welding</td>
<td>02</td>
<td>(12)</td>
</tr>
<tr>
<td>06</td>
<td>Sheet metal work</td>
<td>02</td>
<td>(15)</td>
</tr>
</tbody>
</table>
CONTENTS:

**TOPIC: 01 - SAFETY PRECAUTIONS & KNOWLEDGE OF HAND TOOLS:**

01.01 Importance, general safety precautions on different shop floors.
01.02 Personal, tools and general safety.

**TOPIC: 02 - WOOD WORKING (CARPENTRY SECTION):**

02.01 Carpentry Practice

02.01.01 Use of hand tools for holding drilling, cutting, marking & mixed tools such as vice, clamps, saw, hammers, mallet, screwdriver etc.
02.01.02 Different carpenter joints & their application (Mortish & Tanon, Dovetail, half lap etc).

02.02 Identification of joint in a particular job articles of furniture items.

02.03 Jobs to be made:

02.03.01 Wall hanger
02.03.02 Pulse mixer

**TOPIC: 03 - FITTING SECTION:**

03.01 Importance of fitting operation such as chipping, sawing, filling, scraping, drilling, reaming etc.
03.02 Functions, classification of tools, work holding and clamping
specific tools for example File (length, type, grade of cut etc.)
vices, cold chiesel, hand tools etc.

03.03 Use of hand dies & tape for pipe work (water and sans)  [03]

03.04 Fitting practice & jobs  [15]
03.04.01 Male female joint - 01
03.04.02 Chipping, Filling, Scraping - 01
03.04.03 Marking, fitting

TOPIC: 04 - BLACKSMITHY SECTION:  [18]

04.01 Introduction to smithy tools and their uses  [03]
04.02 Smithy Practice (forging)  [03]
04.02.01 Smithy operation such as offsetting, drawing, bending, welding
round to square section and vice-versa.

04.03 Jobs to be made:  [12]
04.03.01 Chiesel
04.03.02 Ring
04.03.03 Punch
04.03.04 Screw Driver

TOPIC: 05 - WELDING:  [12]

Before starting welding, the Foreman/ Instructor should show to the
students the methods of line testing, working of iron clad switches, knife switches.
By observation a student is able to:
- Identify welding materials
- Understand difference between gas welding & electric welding
- Understand difference between welding & soldering
- Know the materials which can be welded and materials which can not be welded.

05.01 Introduction to gas welding.  [03]
05.02 Use of welding equipment and tools and accessories including
Personal Protective requirement such as Boot, Gloves, safety
goggles, Apron etc.

05.03    Welding Practice
05.03.01  Butt joint
05.03.02  'T' joint
05.04    Introduction to brazing process, filler material and fluxes application of brazing.

**TOPIC: 06 - SHEET METAL WORK:**

06.01    Introduction to sheet metal, procedure and safety precautions.
06.02    Aquaintance with sheet metal tools and their safe use.
06.03    Sheet metal practice.
06.03.01 Simple Development and cutting, bending and shearing of sheet metal
06.03.02 Marking
06.03.03  Filing & Finishing
06.03.04  Fabrication of a sheet metal:
          - Cabinet
          - Conical funnel

**TOPIC: 07 - PAINT & VARNISH SHOP:**

07.01    Introduction, application and Identification of Painting & Varnishes.
07.02    Preparation of surface before painting, application of primer coat and painting steel item.
07.03    Polishing and Painting on wooden items.
07.04    Practice in anodizing.
07.05    Practice in electroplating a component.
TOPIC: 08 - ELECTRICAL & ELECTRONICS W/S PRACTICES:

08.01 Electrical Fuse
08.02 Tester
08.03 Diode Rectifier
08.04 Wiring (Including two ways switch)
08.05 Main switch
08.06 Different types of soldering Iron and soldering practices
08.07 Colour code and Identification of registers, capacitors and inductors - their combinations in series and parallel.
08.08 Multimeter and its uses in measurement of resistance, current and voltage - a.c. and d.c. components.

Books Recommended for Workshop Practice (Practical):

1. Shop Theory - By Anderson
   (Tata McGraw Hill)
2. Workshop and Tools Hand Book - Audel Series

Reference Books:

1. Workshop Practice - Chapman
# Basic Engineering Drawing

**Subject Code**  
00115

**Sessional**

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<thead>
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<th>No. of Periods per week</th>
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**No. of Periods in one session**  
50

**Full Marks**  
100

**Annual Exam.**  
60

**Internal Exam.**  
40

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<th>S.No.</th>
<th>Topic</th>
<th>No. of Plates</th>
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<tbody>
<tr>
<td>1.</td>
<td>Lettering, Numbering &amp; Dimensioning</td>
<td>01</td>
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<tr>
<td>2.</td>
<td>Conic Section</td>
<td>02</td>
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<tr>
<td>3.</td>
<td>-Projection of Points</td>
<td>02</td>
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<tr>
<td></td>
<td>-Projection of planes</td>
<td>01</td>
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<tr>
<td></td>
<td>-Projection of solids</td>
<td>02</td>
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<tr>
<td>4.</td>
<td>Sectional views &amp; Auxiliary views</td>
<td>01</td>
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<td>5.</td>
<td>Isometric, Pictorial &amp; oblique Drawing</td>
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<tr>
<td>6.</td>
<td>Development of Surface</td>
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**12 Plates**
### Workshop Practice

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<th>Topic</th>
<th>No. of Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wood Work (carpentry section):</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(a) Wall Hanger</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) Pulse Mixer</td>
<td>01</td>
</tr>
<tr>
<td>2.</td>
<td>Fitting Section:</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(a) Male-Female joint</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) Chipping, filing and scraping</td>
<td>01</td>
</tr>
<tr>
<td>3.</td>
<td>Blacksmithy Section:</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(a) Chiesel</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) Ring</td>
<td>01</td>
</tr>
<tr>
<td>4.</td>
<td>Welding Section:</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(a) Butt joint</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) &quot;T&quot; joint</td>
<td>01</td>
</tr>
<tr>
<td>5.</td>
<td>Sheet Metal Work:</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(a) Fabrication of a sheet metal cabinet</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) Conical Funnel</td>
<td>01</td>
</tr>
<tr>
<td>6.</td>
<td>Electrical &amp; Electronics Workshop Practice</td>
<td>02</td>
</tr>
</tbody>
</table>

(12) jobs
Rationale:

The subject is being introduced to produce more opportunity to practice for development of writing and oral skill both in English and Hindi language to be a good and effective communicator.

While designing the curriculum it has also been thought to promote certain student centred activities complementary to the language and communication skill. The body and sign language is also an effective method of communication and should therefore be learnt to ensure the generation of self confidence and overall personality development of the student.
### GROUP - A [ENGLISH]

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>20 Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Practice on Debate, Group Discussion, Elocution and Public Speech.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Practice on different role playing with emphasis on dress, behaviour, manner, personality.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Practice on Letter/ Application Writing, Report Writing &amp; Tender Notice.</td>
<td></td>
</tr>
</tbody>
</table>

#### CONTENTS:

**TOPIC 01 - Practice on Debate, Group Discussion, Elocution and Public Speech.**

The institute is free to undertake any topic that is current and relevant to the present need of individual, society, industrial growth, environment related to health, hygiene and sanitation, technological development and social problems etc. and a record of at least six topics is necessarily to be prepared for sessional examination.

**TOPIC 02 - Practice on different role playing with emphasis on dress, behaviour, manner, personality:**

- 02.01 As an executive/supervisor
- 02.02 As an office secretary
- 02.03 As an interviewer
- 02.04 As an interviewee
- 02.05 As an office assistant
- 02.06 As a front desk operator
- 02.07 While going to a formal party

**TOPIC 03 - Practice on Letter/ Application Writing, Report Writing & Tender Notice:**

- 03.01 Letter/Application writing
- 03.02 Report writing
- 03.03 Tender notice and advertisement

**NOTE:** Contents of the above topics are same as covered in theory papers and a record of at least two topics has to be necessarily prepared from each subtopic for sessional records.
# GROUP - B [HINDI]

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topic</th>
<th>20 Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>तौर–तरीक़ एवं आधारभूत शिष्टाचार</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>शास्त्रीय भाषा</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>जानकारी(डेस्क) कार्यालय का अग्रभाग</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>सामूहिक परिवार, वाद–विवाद वक्तृता अथवा वक्तव्य</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>अन्तर्विक्षा के समय आचरण</td>
<td></td>
</tr>
</tbody>
</table>

## CONTENTS:

### 1
- तौर–तरीक़ एवं आधारभूत शिष्टाचार
- शास्त्रीय भाषा
- जानकारी(डेस्क) कार्यालय का अग्रभाग
- सामूहिक परिवार, वाद–विवाद वक्तृता अथवा वक्तव्य
- पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन
- अन्तर्विक्षा के समय आचरण

### 2
- शास्त्रीय भाषा भंगिमा द्वारा सम्प्रेरण
- अतिविहित संकेत
- मुखाकृति द्वारा सम्प्रेरण
- पोशाक तथा प्रशाखन द्वारा सम्प्रेरण

### 3
- तौर–तरीक़ एवं आधारभूत शिष्टाचार
- शास्त्रीय भाषा भंगिमा द्वारा सम्प्रेरण
- जानकारी(डेस्क) कार्यालय का अग्रभाग
- सामूहिक परिवार, वाद–विवाद वक्तृता अथवा वक्तव्य
- पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन
- अन्तर्विक्षा के समय आचरण

### 4
- तौर–तरीक़ एवं आधारभूत शिष्टाचार
- शास्त्रीय भाषा भंगिमा द्वारा सम्प्रेरण
- जानकारी(डेस्क) कार्यालय का अग्रभाग
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- पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन
- अन्तर्विक्षा के समय आचरण

### 5
- तौर–तरीक़ एवं आधारभूत शिष्टाचार
- शास्त्रीय भाषा भंगिमा द्वारा सम्प्रेरण
- जानकारी(डेस्क) कार्यालय का अग्रभाग
- सामूहिक परिवार, वाद–विवाद वक्तृता अथवा वक्तव्य
- पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन
- अन्तर्विक्षा के समय आचरण

### 6
- तौर–तरीक़ एवं आधारभूत शिष्टाचार
- शास्त्रीय भाषा भंगिमा द्वारा सम्प्रेरण
- जानकारी(डेस्क) कार्यालय का अग्रभाग
- सामूहिक परिवार, वाद–विवाद वक्तृता अथवा वक्तव्य
- पत्र/ आवेदन लेखन, प्रतिवेदन लेखन, निविदा सूचना एवं विज्ञापन
- अन्तर्विक्षा के समय आचरण
GROUP - C [SELF & SOCIETY ORIENTED ACTIVITY]

10 Periods

**Self Promotion and society oriented activity:**
- Library study - Assessment will be made on the basis of exposition through debate
- To create awareness among rural mass about rural technology, sanitation, health and hygiene, drinking water etc.
- Participation in cultural activity
- Any other activity taken up by the institution - related to environment
Scheme of Teaching and Examinations for 3-years
PART-I DIPLOMA in ENGINEERING/ TECHNOLOGY/ NON-ENGG. BRANCHES

**THEORY**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>SUBJECTS</th>
<th>SUBJECT CODE</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION - SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Periods per week</td>
<td>Periods in one session (year)</td>
</tr>
<tr>
<td>1.</td>
<td>Engineering Mathematics-I</td>
<td>00101</td>
<td>03</td>
<td>60</td>
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<tr>
<td>2.</td>
<td>Engineering Mathematics-II</td>
<td>00102</td>
<td>03</td>
<td>60</td>
</tr>
<tr>
<td>3.</td>
<td>Engineering Physics</td>
<td>00103</td>
<td>02</td>
<td>50</td>
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<tr>
<td>4.</td>
<td>Engineering Chemistry</td>
<td>00104</td>
<td>02</td>
<td>50</td>
</tr>
<tr>
<td>5.</td>
<td>Language &amp; Communication Skill</td>
<td>00105</td>
<td>03</td>
<td>60</td>
</tr>
<tr>
<td>6.</td>
<td>Basic Engineering Drawing</td>
<td>00106</td>
<td>06</td>
<td>120</td>
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<tr>
<td>7.</td>
<td>Elementary Mechanical Engineering &amp; Engg. Material</td>
<td>00107</td>
<td>03</td>
<td>60</td>
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<tr>
<td>8.</td>
<td>Electrical &amp; Electronics Engg.</td>
<td>00108</td>
<td>03</td>
<td>60</td>
</tr>
<tr>
<td>9.</td>
<td>Basics of Computer &amp; Information Technology</td>
<td>00109</td>
<td>03</td>
<td>60</td>
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<tr>
<td>10.</td>
<td>Surveying &amp; Measurement</td>
<td>00110</td>
<td>02</td>
<td>50</td>
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**PRACTICAL**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>SUBJECTS</th>
<th>SUBJECT CODE</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION – SCHEME</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Periods per week</td>
<td>Periods in one session (year)</td>
</tr>
<tr>
<td>11.</td>
<td>Engineering Physics Lab.</td>
<td>00111</td>
<td>02</td>
<td>50</td>
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<tr>
<td>12.</td>
<td>Engineering Chemistry Lab.</td>
<td>00112</td>
<td>02</td>
<td>50</td>
</tr>
<tr>
<td>13.</td>
<td>Field Survey Practice</td>
<td>00113</td>
<td>Two weeks (12 days) continuous</td>
<td>60</td>
</tr>
<tr>
<td>14.</td>
<td>Workshop Practice</td>
<td>00114</td>
<td>06</td>
<td>120</td>
</tr>
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</table>

**SESSIONAL**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>SUBJECTS</th>
<th>SUBJECT CODE</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION - SCHEME</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Periods per week</td>
<td>Periods in one session (year)</td>
</tr>
<tr>
<td>15.</td>
<td>Basic Engineering Drawing</td>
<td>00115</td>
<td>40</td>
<td>60</td>
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<tr>
<td>16.</td>
<td>Workshop Practice</td>
<td>00116</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>17.</td>
<td>Student Centered Activity (A. Sessional of Language &amp; Communication Skill)</td>
<td>00117</td>
<td>02</td>
<td>50</td>
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</table>

Total Periods per week 42  Total Marks = 1500