

**DIPLOMA IN ELECTRONICS AND COMMUNICATION ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
(FIRST YEAR)**

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
EC-101	English	3	-	90	3			100
EC-102	Engineering Mathematics - I	5	-	150	3			100
EC-103	Engineering Physics	4	-	120	3			100
EC-104	Engineering Chemistry & Environmental Studies	4	-	120	3			100
EC-105	Basic Electrical & Electronics Engineering	4	-	120	3			100
EC-106	Engineering Materials & Practices	4	-	120	3			100
PRACTICAL:								
EC-107	Engineering Drawing Practice	-	6	180	3			100
EC-108	Basic Electronic Workshop Practice	-	6	180	3			100
EC-109	109-A Engineering Physics Lab practice 109-B Engineering Chemistry Lab practice	-	3	90	3 (1.5+1.5)			100 (50+50)
EC-110	Computer fundamentals Lab practice	-	3	90	3			100
TOTAL		24	18	1260				1000

ENGLISH
(Common to all Branches)

Subject Title : English
Subject Code : EC – 101
Periods per Week : 03
Periods per Year : 90

Time Schedule

SI No	Major Topics	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary	5	13	1	1
2	Grammar	30	31	7	1
3	Reading	10	10	-	1
4	Writing	30	40	-	4
5	English in Action	15	16	2	1
		90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-14 Curriculum the focus is on the special English needs of technician studies and training. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing reports, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

On completion of this course the student shall be able to:

- 1.0 Build their vocabulary in the direction of their future needs
- 2.0 Learn various grammatical structures
- 3.0 Read and comprehend English and understand the details and draw inferences
- 4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
- 5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

- 1.1 Locate words, learn spellings, understand meanings

- 1.2 Pronounce words intelligibly
- 1.3 Find synonyms and antonyms
- 1.4 Use affixation
- 1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

- 2.1 Identify and use nouns
- 2.2 Identify and use pronouns
- 2.3 Use the present tense
- 2.4 Use the past tense
- 2.5 Use the future tense
- 2.6 Identify and use adjectives
- 2.7 Identify and use adverbs
- 2.8 Use prepositions
- 2.9 Use linkers
- 2.10 State basic sentence structures
- 2.11 Construct different types of sentences
- 2.12 Frame questions to elicit information
- 2.13 Frame questions for conformation
- 2.14 Use active voice
- 2.15 Use passive voice
- 2.16 Use direct speech
- 2.17 Use indirect speech
- 2.18 Identify and correct errors

3.0 Read and comprehend English

- 3.1 Identify the main ideas
- 3.2 Identify the specific details
- 3.3 Draw inferences
- 3.4 Give contextual meanings of the words
- 3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

- 4.1 Identify components of a good paragraph
- 4.2 Write types of paragraphs
- 4.3 Distinguish between formal and informal letters
- 4.4 Write personal letters
- 4.5 Write leave letters
- 4.6 Write official letters
- 4.7 Write letters of complaints
- 4.8 Prepare a resume
- 4.9 Write a cover letter
- 4.10 Write short messages
- 4.11 Report incidents
- 4.12 Report experiments
- 4.13 Report Industrial visits
- 4.14 Write work done statements
- 4.15 Write maintenance reports
- 4.16 Make notes using Cue method and Mapping method
- 4.17 Summarize Paragraphs

4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

5.0 Practice spoken communication suited to various situations.

- 5.1 Use appropriate expressions to greet and take leave
- 5.2 Use proper expressions to make requests
- 5.3 Use apt expressions for asking and giving directions
- 5.4 Use suitable expressions to seek and offer suggestions
- 5.5 Use suitable expressions to state intentions
- 5.6 Use suitable expressions to state feelings
- 5.7 Use appropriate expressions to state agreement and disagreement
- 5.8 Use proper expressions to make complaints
- 5.9 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

- 1. Essential English Grammar (Intermediate Level) Raymond Murphy
- 2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
- 3. Grammar Builder (Entire Series) Oxford University Press
- 4. High School English Grammar (Revised Edition) Wren and Martin
- 5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
- 6. Word Power Made Easy Norman Lewis
- 7. Spoken English Shashi Kumar and Dhamija

ENGINEERING MATHEMATICS – I

(Common to all Branches)

Subject Title : Engineering Mathematics-I
Subject Code : EC-102
Periods per week : 05
Periods per year : 150

Blue print

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
		Theory	Practice		R	U	App	R	U	App
	Unit - I : Algebra									
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0
15	Conic Sections	5	4	10	0	0	0	0	1	0

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
Unit – IV : Differential Calculus										
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
Unit - V : Applications of Differentiation										
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	7	3	0	2	2 1/2	3 1/2
Marks					21	9	0	20	25	35

R: Remembering type 41 marks

U: Understanding type 34 marks

App: Application type 35 marks

Objectives

Upon completion of the course the student shall be able to:

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

- 1.1 Define logarithm and list its properties.
- 1.2 Distinguish natural logarithms and common logarithms.
- 1.3 Explain the meaning of e and exponential function.
- 1.4 State logarithm as a function and its graphical representation.
- 1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

- 2.1 Define the following fractions of polynomials:
 1. Rational,
 2. Proper and
 3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$$\begin{array}{ll} i) \frac{f(x)}{(x+a)(x+b)(x+c)} & ii) \frac{f(x)}{(x+a)^2(x+b)(x+c)} \\ iii) \frac{f(x)}{(x^2+a)(x+b)} & iv) \frac{f(x)}{(x+a)(x^2+b)^2} \end{array}$$

3.0 Use Matrices for solving engineering problems

- 3.1 Define a matrix and order of a matrix.
- 3.2 State various types of matrices with examples (emphasis on 3rd order square matrices).
- 3.3 Compute sum, scalar multiplication and product of matrices.
- 3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.
- 3.5 Define the transpose of a matrix and write its properties.
- 3.6 Define symmetric and skew-symmetric matrices.
- 3.7 Resolve a square matrix into a sum of symmetric and skew-symmetric matrices with examples in all cases.
- 3.8 Define minor, co-factor of an element of a 3x3 square matrix with examples.
- 3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.
- 3.10 Distinguish singular and non-singular matrices.
- 3.11 Apply the properties of determinants to solve problems.
- 3.12 Solve system of 3 linear equations in 3 unknowns using Cramer's rule.
- 3.13 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.
- 3.14 Compute adjoint and multiplicative inverse of a square matrix.
- 3.15 Solve system of 3 linear equations in 3 unknowns by matrix inversion method
- 3.16 State elementary row operations.
- 3.17 Solve a system of 3 linear equations in 3 unknowns by Gauss- Jordan method

UNIT – II

Trigonometry :

4.0 Understand Trigonometric Ratios

- 4.1 Define trigonometric ratios of any angle.
- 4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$ and $\cot(A\pm B)$

5.2 Give simple examples on compound angles to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles $2A$, $3A$ etc and sub multiple angles $A/2$ in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

7.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, where $x \geq 0, y \geq 0, xy < 1$ etc.,

8.6 Solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

9.2 Solve models of the type $a \sin^2 x + b \sin x + c = 0$, $a \cos x + b \sin x = c$ etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

- 10.1 State sine rule, cosine rule, tangent rule and projection rule.
- 10.2 Explain the formulae for $\sin A/2$, $\cos A/2$, $\tan A/2$ and $\cot A/2$ in terms of semi-perimeter and sides a , b , c and solve problems.
- 10.3 List various formulae for the area of a triangle.
- 10.4 Solve problems using the above formulae.
- 10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

- 11.1 Define $\sinh x$, $\cosh x$ and $\tanh x$ and list the hyperbolic identities.
- 11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

- 12.1 Define complex number, its modulus, conjugate and list their properties.
- 12.2 Define the operations on complex numbers with examples.
- 12.3 Define amplitude of a complex number
- 12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.
- 12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

- 13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form
- 13.2 Solve simple problems on the above forms
- 13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

- 14.1 Define locus of a point – circle and its equation.
- 14.2 Find the equation of a circle given
 - (i) Center and radius
 - (ii) Two ends of a diameter

- (iii) Centre and a point on the circumference
 - (iv) Three non collinear points
 - (v) Centre and tangent
- 14.3 Write the general equation of a circle and find the centre and radius.
- 14.4 Write the equation of tangent and normal at a point on the circle.
- 14.5 Solve the problems to find the equations of tangent and normal.

15.0 Appreciate the properties of Conics in engineering applications

- 15.1 Define a conic section.
- 15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.
- 15.3 Find the equation of a conic when focus, directrix and eccentricity are given
- 15.4 Describe the properties of Parabola, Ellipse and Hyperbola
- 15.5 Solve engineering problems in simple cases of Parabola and Ellipse.

UNIT - IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

- 16.1 Explain the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = l$ and state the properties of limits .
- 16.2 Mention the Standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$, $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}}$, $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ (All without proof).
- 16.3 Solve the problems using the above standard limits
- 16.4 Evaluate the limits of the type $\lim_{x \rightarrow l} \frac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$
- 16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

- 17.1 State the concept of derivative of a function $y = f(x)$ – definition, first principle as

$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

- 17.2 State the significance of derivative in scientific and engineering applications.
- 17.3 Find the derivatives of elementary functions like x^n , a^x , e^x , $\log x$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\csc x$ and $\cot x$ using the first principles.
- 17.4 Find the derivatives of simple functions from the first principle .
- 17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.
- 17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2 + \frac{2}{t}}$ (ii) $x^2 \sin 2x$ (iii) $\frac{x}{\sqrt{x^2 + 1}}$ (iv) $\log(\sin(\cos x))$.

- 17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.
- 17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.
- 17.9 Find the derivatives of hyperbolic functions.
- 17.10 Explain the procedures for finding the derivatives of implicit function with examples.
- 17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.
- 17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.
- 17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.
- 17.14 Explain the definition of Homogenous function of degree n
- 17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

- 18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve $y=f(x)$ at any point on the curve.
- 18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve $y=f(x)$ at any point on it.
- 18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve $y=f(x)$.

- 18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

- 19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.
- 19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

- 20.1 Define the concept of increasing and decreasing functions.
- 20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.
- 20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.
- 20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

- 21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms :

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$$\begin{array}{ll} i) \frac{f(x)}{(x+a)(x+b)(x+c)} & ii) \frac{f(x)}{(x+a)^2(x+b)(x+c)} \\ iii) \frac{f(x)}{(x^2+a)(x+b)} & iv) \frac{f(x)}{(x+a)(x^2+b)^2} \end{array}$$

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables- Solutions by Cramers's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry:

4. Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. Compound angles: Formulas of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$, $\cot(A\pm B)$, and related identities with problems.
6. Multiple and sub multiple angles: trigonometric ratios of multiple angles $2A, 3A$ and submultiple angle $A/2$ with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.
9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :
 $\sin x = k$, $\cos x = k$, $\tan x = k$.
 Solutions of simple quadratic equations, equations involving usage of transformations- problems.
10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle- problems.
11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form(Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle, definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points and (v) centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms - applications of parabola and ellipse to engineering situations.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle)- different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, subtangent and subnormal to the curve at any point . Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.

20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS
(Common to all Branches)

Subject Title : **Engineering Physics**
Subject Code : **EC -103**
Periods per week : **04**
Total periods per year : **120**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	12	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	14	13	1	1
11.	Modern Physics	10	03	1	-
	Total:	120	103	10	8

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

- 1.1 Explain the concept of Units
- 1.2 Define the terms
 - a) Physical quantity, b) Fundamental physical quantities and
 - c) Derived physical quantities
- 1.3 Define unit
- 1.4 Define fundamental units and derived units
- 1.5 State SI units with symbols
- 1.6 State Multiples and submultiples in SI system
- 1.7 State Rules of writing S.I. units
- 1.8 State advantages of SI units
- 1.9 Define Dimensions
- 1.10 Write Dimensional formulae
- 1.11 Derive dimensional formulae of physical quantities
- 1.12 List dimensional constants and dimensionless quantities
- 1.13 State the principle of Homogeneity of Dimensions
- 1.14 State the applications of Dimensional analysis
- 1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Elements of Vectors

- 2.1 Explain the concept of Vectors
- 2.2 Define Scalar and Vector quantities

- 2.3 Give examples for scalar and vector quantities
- 2.4 Represent vectors graphically
- 2.5 Classify the Vectors
- 2.6 Resolve the vectors
- 2.7 Determine the Resultant of a vector by component method
- 2.8 Represent a vector in space using unit vectors (i, j, k)
- 2.9 State triangle law of addition of vectors
- 2.10 State parallelogram law of addition of vectors
- 2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
- 2.12 Derive expression for magnitude and direction of resultant of two vectors
- 2.13 State polygon law of addition of vectors
- 2.14 Explain subtraction of vectors
- 2.15 Define Dot product of two vectors with examples (Work done, Power)
- 2.16 Mention the properties of Dot product
- 2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
- 2.18 Mention the properties of Cross product.
- 2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

- 3.1 Recapitulate the equations of motion in a straight line
- 3.2 Define acceleration due to gravity
- 3.3 Derive expressions for
 - a) Maximum Height, b) time of ascent, c) time of descent, and d) time of
- 3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
- 3.5 Define projectile motion with examples
- 3.6 Explain Horizontal projection
- 3.7 Derive an expression for the path of a projectile in horizontal projection
- 3.8 Explain oblique projection
- 3.9 Derive an expression for the path of projectile in oblique projection
- 3.10 Derive formulae for
 - a) Horizontal Range, b) Maximum range of a projectile in oblique projection
- 3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

- 4.1 Define friction
- 4.2 Classify the types of friction
- 4.3 Explain the concept of Normal reaction
- 4.4 State the laws of friction
- 4.5 Define coefficients of friction
- 4.6 Explain the Angle of friction
- 4.7 Derive an expression for acceleration of a body on a rough horizontal surface
- 4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
- 4.9 Define Angle of repose
- 4.10 Derive an expressions for acceleration of a body on a smooth inclined plane (up and down)
- 4.11 Derive an expressions for acceleration of a body on a rough inclined plane (up and down)
- 4.12 List the Advantages and Disadvantages of friction
- 4.13 Mention the methods of minimizing friction

4.14 Solve the related numerical problems

5.0 Understand the concept of Work, Power, and Energy

- 5.1 Define work
- 5.2 State SI units and dimensional formula for work
- 5.3 Define power
- 5.4 State SI units and dimensional formula for power
- 5.5 Define energy
- 5.6 State SI units and dimensional formula for energy
- 5.7 Define potential energy
- 5.8 Derive the expression for Potential energy with examples
- 5.9 Define kinetic energy
- 5.10 Derive the expression for kinetic energy with examples
- 5.11 State the Work- Energy theorem
- 5.12 Explain the relation between Kinetic energy and momentum
- 5.13 State the law of conservation of energy
- 5.14 Verify the law of conversion of energy in the case of a freely falling body
- 5.15 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

- 6.1 Define Simple harmonic motion
- 6.2 State the conditions of Simple harmonic motion
- 6.3 Give examples for Simple harmonic motion
- 6.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM
- 6.5 Derive expression for displacement
- 6.6 Derive expression for velocity
- 6.7 Derive expression for acceleration
- 6.8 Derive expression for Time period and frequency of S H M
- 6.9 Define phase of S H M
- 6.10 Derive expression for Time period of simple pendulum
- 6.11 State the laws of simple pendulum
- 6.12 State the laws of Seconds pendulum
- 6.13 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

- 7.1 Explain the concept of expansion of gases
- 7.2 Explain Boyle' s law
- 7.3 State Charles law in terms of absolute temperature
- 7.4 Define absolute zero temperature
- 7.5 Explain absolute scale of temperature
- 7.6 Define ideal gas
- 7.7 Derive ideal gas equation
- 7.8 Define gas constant and Universal gas constant
- 7.9 Explain why universal gas constant is same for all gases
- 7.10 State SI unit of universal gas constant
- 7.11 Calculate the value of universal gas constant
- 7.12 State the gas equation in terms of density
- 7.13 Distinguish between r and R
- 7.14 Explain Isothermal process with the help of P-V and T- θ diagram
- 7.15 Explain adiabatic process with the help of P-V and T- θ diagram
- 7.16 Distinguish between isothermal and adiabatic process

- 7.17 State first and second laws of thermodynamics
- 7.18 Define specific heats & molar specific heats of a gas
- 7.19 Derive the relation $C_p - C_v = R$
- 7.20 Solve the related numerical problems

8.0 Understand the concept of Sound

- 8.1 Define the term sound
- 8.2 Explain longitudinal and transverse wave motion
- 8.3 Distinguish between musical sound and noise
- 8.4 Explain noise pollution and state SI unit for noise
- 8.5 Explain causes of noise pollution
- 8.6 Explain effects of noise pollution
- 8.7 Explain methods of minimizing noise pollution
- 8.8 Explain the phenomenon of beats
- 8.9 List the applications of beats
- 8.10 Define Doppler effect
- 8.11 List the Applications of Doppler effect
- 8.12 Explain reverberation and reverberation time
- 8.13 Write Sabine's formula
- 8.14 Explain echoes
- 8.15 State conditions of good auditorium
- 8.16 Solve the related numerical problems

9.0 Understand the properties of matter

- 9.1 Define the term Elasticity
- 9.2 Define the terms stress and strain
- 9.3 State the units and dimensional formulae for stress and strain
- 9.4 State the Hooke's law
- 9.5 Define the surface tension
- 9.6 Explain Surface tension with reference to molecular theory
- 9.7 Define angle of contact
- 9.8 Define the capillarity
- 9.9 Write the formula for surface tension based on capillarity
- 9.10 Explain the concept of Viscosity
- 9.11 Provide examples for surface tension and Viscosity
- 9.12 State Newton's formula for viscous force
- 9.13 Define co-efficient of viscosity
- 9.14 Explain the effect of temperature on viscosity of liquids and gases
- 9.15 State Poiseulle's equation for Co-efficient of viscosity
- 9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

- 10.1 Explain the concept of Electricity
- 10.2 State the Ohm's law
- 10.3 Explain the Ohm's law
- 10.4 Define specific resistance, conductance and their units
- 10.5 State Kichoff's laws
- 10.6 Explain Kichoff's laws
- 10.7 Describe Wheatstone's bridge with legible sketch
- 10.8 Derive expression for balancing condition of Wheatstone's bridge

- 10.9 Describe Meter Bridge with legible sketch
- 10.10 Write the formula for Meter Bridge to determine specific resistance
- 10.11 Explain the concept of magnetism
- 10.12 State the Coulomb's inverse square law of magnetism
- 10.13 Define magnetic field and magnetic lines of force
- 10.14 State the Magnetic induction field strength-units and dimensions
- 10.15 Derive Magnetic induction field strength at a point on the axial line
- 10.16 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
- 10.17 Derive Magnetic induction field strength at a point on the equatorial line
- 10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

- 11.1 Explain Photo-electric effect
- 11.2 Write Einstein's photoelectric equation
- 11.3 State laws of photoelectric effect
- 11.4 Explain the Working of photoelectric cell
- 11.5 List the Applications of photoelectric effect
- 11.6 Recapitulate refraction of light and its laws
- 11.7 Define critical angle
- 11.8 Explain the Total Internal Reflection
- 11.9 Explain the principle and working of Optical Fiber
- 11.10 Mention types of optical fibers
- 11.11 List the applications of Optical Fiber
- 11.12 Define super conductor and superconductivity
- 11.13 List the examples of superconducting materials
- 11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units- Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:

Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction of vectors- Dot and Cross products of vectors-Problems

3. Kinematics:

Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. **Friction:**
Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems
5. **Work, Power and Energy:**
Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems
6. **Simple Harmonic Motion:**
Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems
7. **Heat and Thermodynamics:**
Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R - Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats of a gas - Problems
8. **Sound:**
Sound- Nature of sound- Types of wave motion - usual sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Condition of good auditorium- Problems
9. **Properties of matter**
Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseulle's equation for Co-efficient of viscosity- The related numerical problems
10. **Electricity & Magnetism:**
Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge- Coulomb's inverse square law magnetic field- magnetic lines of force- Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.
11. **Modern Physics;**
Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I
2. Unified physics Volume 1,2,3 and 4
3. Text book of physics Volume I
4. Text book of applied physics
5. Fibre optics

Deepthi
 Dr.S.L Guptha and Sanjeev Guptha
 Resnick & Holiday
 Dhanpath Roy
 D.A Hill

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	12	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	10	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	14	13	0	1	0	0	1	0
11.	Modern Physics	10	03	1	0	0	0	0	0
	Total:	120	110	3	5	2	2	5	1

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
(Common to all Branches)

Subject Title : Engineering Chemistry & Environmental Studies
Subject Code : EC -104
Periods per week : 04
Total periods per year : 120

Blue Print

S.No	Major topic	No of Periods	Weight age of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTAL STUDIES		18	16	1	1	0	0	1	0	
total		120	110	6	2	2	3	3	1	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERING CHEMISTRY

1.0 Understand the concept of Atomic structure

- 1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,
- 1.2 Explain the concept of atomic number and mass number
- 1.3 State the Postulates of Bohr's atomic theory and its limitations
- 1.4 Explain the concept of Quantum numbers with examples
- 1.5 Explain 1.Aufbau's principle, 2.Hund's rule and 3.Pauli's exclusion principle with respect to electron stability
- 1.6 Define Orbital in an atomic structure

- 1.7 Draw the shapes of s, p and d Orbitals in an atomic structure
- 1.8 Distinguish between Orbit and Orbital
- 1.9 Write the electronic configuration of elements up to atomic number 30
- 1.10 Explain the significance of chemical bonding
- 1.11 Explain the Postulates of Electronic theory of valance
- 1.12 Define the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic
- 1.13 Explain the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and Metallic
- 1.14 Explain bond formation in NaCl and MgO
- 1.15 List Properties of Ionic compounds
- 1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method
- 1.17 List Properties of Covalent compounds
- 1.18 Explain Metallic bond with Electron sea model theory
- 1.18 Define the terms 1.Oxidation, 2.Reduction and 3.Oxidation number
- 1.19 Calculate the Oxidation Number
- 1.20 Differentiate between Oxidation Number and Valence

2.0 Calculate Molarity, Molality and Normality of given Solution

- 2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent
- 2.2 Classify solutions based on physical state and solubility
- 2.3 Define mole
- 2.4 Explain, with examples, the 'Mole concept'
- 2.5 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight
- 2.6 Calculate Molecular weight and Equivalent weight of given Acids, Bases and Salts
- 2.7 Define 1.Molarity, 2. Molalty and 3.Normality of solutions
- 2.8 Explain with examples Normality
- 2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Understand the concepts of Acids and bases

- 3.1 Explain Arrhenius theory of Acids and Bases
- 3.2 State the limitations of Arrhenius theory of Acids and Bases
- 3.3 Explain Bronsted – Lowry theory of acids bases
- 3.4 State the limitations of Bronsted – Lowry theory of acids bases
- 3.5 Explain Lewis theory of acids and bases
- 3.6 State the limitations Lewis theory of acids and bases
- 3.7 Explain the Ionic product of water

- 3.8 Define pH and explain Sorenson scale
- 3.9 Solve the Numerical problems on pH (Strong Acids and Bases)
- 3.10 Define buffer solution
- 3.11 Give the at least three examples foe buffer solutions
- 3.12 State the applications of buffer solution

4.0 Understand the Principles of Metallurgy

- 4.1 List at least eight Characteristics of Metals
- 4.2 Distinguish between Metals and Non Metals
- 4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4. Flux and 5. Slag
- 4.4 Describe the methods of concentration of ore like 1.Hand picking,2. Levigation, and 3. Froth Floatation
- 4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
- 4.6 Explain the purification of Metals by Electrolytic Refining
- 4.7 Define an Alloy
- 4.8 Write the Composition of the following alloys:1.Brass, 2.German silver, and Nichrome
- 4.9 List the uses of following Alloys: Brass, German silver, Nichrome

5.0 Understand the concepts of Electrochemistry

- 5.1 Define the terms1. conductor, 2. Insulator, 3.Electrolyte and 4.Non – electrolyte
- 5.2 Distinguish between metallic conduction and Electrolytic conduction
- 5.3 Explain Arrhenius theory of electrolytic dissociation
- 5.4 Explain electrolysis by taking example fused NaCl
- 5.5 Explain Faraday's laws of electrolysis
- 5.6 Define 1.Chemical equivalent and 2.Electrochemical equivalent
- 5.7 Solve the Numerical problems based on Faraday's laws of electrolysis
- 5.8 Define Galvanic cell
- 5.9 Explain the construction and working of Galvanic cell
- 5.10 Distinguish between electrolytic cell and galvanic cell
- 5.11 Explain the standard electrode potentials
- 5.12 Explain the electrochemical series and its significance
- 5.13 Explain the emf of a cell
- 5.14 Solve the numerical problems on emf of cell

6.0 Understand the concept of Corrosion

- 6.1 Define the term corrosion
- 6.2 Explain the Factors influencing the rate of corrosion

- 6.3 Explain the concept of electrochemical theory of corrosion
- 6.4 Describe the formation of a) composition cells, b) stress cells c) concentration cells
- 6.5 Explain the mechanism of rusting of iron
- 6.6 Explain the methods of prevention of corrosion: a) Protective coatings
b) Cathodic protection (Sacrificial anode process and Impressed – voltage process)

7.0 Understand the concept of Water Technology

- 7.1 State the various Sources of water like Surface and sub surface sources
- 7.2 Define the terms soft water and hard water with respect to soap consumption
- 7.3 Define the term of hardness of water
- 7.4 Explain the various types of hardness of water like temporary and permanent hardness; and carbonate and bicarbonate hardness of water.
- 7.5 List the usual compounds causing hardness (with Formulae)
- 7.6 State the disadvantages of using hard water in industries
- 7.7 Define Degree of hardness, units of hardness (mg/L)
- 7.8 Explain the methods of softening of hard water: a) Ion-Exchange process, b) Reverse osmosis process(RO)
- 7.9 List the advantages of RO
- 7.10 State three essential qualities of drinking water like
1).Safety, 2). Economy and 3)..Aesthetic

8.0 Understand the concepts of Polymers

- 8.1 Explain the concept of polymerisation
- 8.2 Describe the methods of polymerisation a) addition polymerisation of Ethylene b) condensation polymerisation of phenol and formaldehyde (Only flow chart i.e. without chemical equations)
- 8.3 Define the term plastic
- 8.4 Classify the plastics with examples
- 8.5 Distinguish between thermo and thermosetting plastics
- 8.6 List the Characteristics of plastics
- 8.7 State the advantages of plastics over traditional materials
- 8.8 State the disadvantages of using plastics.
- 8.9 Explain the methods of preparation of the following plastics:
1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde
- 8.9 Explain the uses of the following plastics:
1. Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde
- 8.10 Define the term natural rubber
- 8.11 State the structural formula of Natural rubber
- 8.12 Explain the processing of Natural rubber from latex

- 8.13 List the Characteristics of natural rubber
- 8.14 Explain the process of Vulcanization
- 8.15 List the Characteristics of Vulcanized rubber
- 8.16 Define the term Elastomer
- 8.17 Describe the preparation of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber
- 8.18 List the uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

9.0 Understand the concepts of Fuels

- 9.1 Define the term fuel
- 9.2 Classify the fuels based on physical state – solid, liquid and gaseous fuels,
- 9.3 Classify the fuels based on occurrence- primary and secondary fuels
- 9.4 List the characteristics of good fuel
- 9.5 State the composition and uses of gaseous fuels:
a) water gas, b) producer gas, c) natural gas, d) coal gas, e) Bio gas and f) acetylene

B. ENVIRONMENTAL STUDIES

- 1.1 Define the term environment
- 1.2 Explain the scope and importance of environmental studies
- 1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD
- 1.4 Explain the growing energy needs
- 1.5 State the differences between renewable and non renewable energy sources-alternative energy sources.
- 1.6 Define an Ecosystem- biotic component, abiotic component and energy component,
- 1.7 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.
- 1.8 Explain biodiversity and threats to biodiversity
- 1.9 Define air pollution
- 1.10 Classify the air pollutants- based on origin and state of matter
- 1.11 Explain the causes of air pollution
- 1.12 Explain the use and over exploitation of forest resources and deforestation
- 1.13 Explain the effects of air pollution on human beings, plants and animals
- 1.14 Explain the green house effect - ozone layer depletion and acid rain
- 1.15 Explain the methods of control of air pollution
- 1.16 Define water pollution
- 1.17 Explain the causes of water pollution

1.18 Explain the effects of water pollution on living and non living things

1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds – Metallic bond

Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number- calculations, differences between Oxidation Number and Valency

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. Acids and Bases

Introduction – theories of acids and bases and limitations – Arrhenius theory-Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water – pH and related numerical problems – buffer solutions –Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell

6. Water technology

Introduction –soft and hard water – causes of hardness – types of hardness –disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis

7. Introduction - factors influencing corrosion - electrochemical theory of corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials

– Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polyethylene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels – characteristics of good fuel - composition and uses of gaseous fuels.

B. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – renewable and non renewable energy sources – Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

air pollution - causes-Effects – forest resources : uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCE BOOKS

- | | | |
|----|--------------------------------|--|
| 1. | Intermediate chemistry Vol 1&2 | Telugu Acedemy |
| 2. | Intermediate chemistry Vol 1&2 | Vikram Publishers |
| 3. | Intermediate chemistry Vol 1&2 | Vignan Publishers & Deepthi Publishers |
| 4. | Engineering Chemistry | Jain & Jain |
| 5. | Engineering Chemistry | O.P. Agarwal, Hi-Tech. |
| 6. | Engineering Chemistry | Sharma |
| 7. | Engineering Chemistry | A.K. De |

Basic Electrical & Electronics Engineering

Subject Title : Basic Electrical & Electronics Engineering
Subject Code : EC-105
Periods/Week : 04
Periods/Year : 120

TIME SCHEDULE

Sl. No	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Basic Electricity Work power and energy	24	13	1	1
2	Magnetism	10	8	1	1/2
3	Electrostatics & Capacitance	16	13	1	1
4	Chemical effects of electric current & Batteries	6	8	1	1/2
5	AC Fundamentals	10	13	1	1
6	Passive components	18	13	1	1
7	Switches and Relays	10	13	1	1
8	PCBs	8	8	1	1/2
9	Semiconductor Diode	6	8	1	1/2
10	Power supplies	12	13	1	1
Total		120	110	10	8

OBJECTIVES

On completion of the course the student should be able to

1.0 Comprehend the basic Principles of Electricity

1.1 Explain the concept of Electric current, Potential difference, Voltage and emf.

- 1.2 Explain the concept of a circuit
- 1.3 State Ohm's Law
- 1.4 Give the concept of Resistance to flow of electrons,
- 1.5 Define the terms specific resistance and conductivity.
- 1.6 Deduce the relation $R = (\rho l) / a$
- 1.7 Solve simple problems using the above formula.
- 1.8 Explain the effects of temperature on resistance
- 1.9 Define temperature co-efficient of resistance.
- 1.10 Derive the formula $R_t = R_o (1 + \alpha_o t)$ to find resistance at any given temperature
- 1.11 Solve Simple problems using the above formula.
- 1.12 Explain series and parallel connections of Resistances
- 1.13 Derive the expressions for equivalent resistance for series and parallel connections.
- 1.14 Solve simple problems on series and parallel circuits
- 1.15 Explain the division of current in parallel circuits
- 1.16 Solve simple problems on the above.
- 1.19 List the 4 effects of Electric current
- 1.20 Explain the Heating effect of Electric current
- 1.21 Define Electric Power
- 1.22 Give the formula for power and mention Units (Watts , kilo Watts , Mega watts)
- 1.23 Define Electrical energy and mention the units (watt hours, kilo watt hours , Megawatt hours)
- 1.24 Mention the typical power ratings of home appliances like Electrical lamps (Incandescent , Florescent , CFL & LED) Water Heater , electric Iron, Fans, Refrigerators , Air coolers , Television set and computer.
- 1.25 Calculate total Electrical energy consumption and cost given the wattage , hours of operation and Electricity tariff
- 1.26 Mention the merits of CFL and LED lamps over Incandescent lamps from power consumption point of view
- 1.27 Derive expression for conversion of Electrical energy into equivalent heat energy in kilo Calories (joules Law)
- 1.28 Define thermal efficiency
- 1.29 Solve problems on Electrical heating
- 1.30 Mention the practical applications of Electric heating like, Water heater, Electric Iron etc.

2.0 Understand the magnetic effects of Electric Current

- 2.1 State coulombs laws of magnetism.
- 2.2 Define the terms Absolute and relative permeability of medium.
- 2.3 Explain the concept of lines of force & magnetic Field.
- 2.4 Define field intensity, Magnetic potential, Flux, Flux density .
- 2.5 Give the relation between Absolute and relative permeability
- 2.6 Draw and explain the field patterns due to
 - a. Straight current carrying conductor
 - b. Solenoid and
 - c. Toroidal
- 2.7 Explain Work law and its applications
- 2.8 State Laplace law (Biot-Savart's Law)
- 2.9 Give expressions for field strength,

- 2.10 Derive the expression for magnitude of the force on a conductor in a magnetic field
- 2.11 Give the expression for the force between two parallel current carrying conductors
- 2.12 Explain the nature of the force with different directions of the currents
- 2.13 Define ampere
- 2.14 Explain the concept of the Magnetic circuit
- 2.15 Define magneto motive force (mmf), permeability, flux and Reluctance
- 2.16 Solve problems on simple magnetic circuits
- 2.17 Compare magnetic circuit with electric circuit.
- 2.18 Explain the effect of air gap in a magnetic circuit
- 2.19 Explain the terms leakage flux and leakage co-efficient
- 2.20 Give the equation for the energy stored per unit volume in a magnetic field.
- 2.21 Calculate energy stored per unit volume
- 2.22 Give the expression for lifting power of a magnet.

3.0 Understand Electric Charge and Electrostatic Field

- 3.1 State Coulomb's law of electrostatics and define unit charge
- 3.2 Define absolute and relative permittivity.
- 3.3 Solve simple problems based on Coulomb's law
- 3.4 Explain electrostatic field.
- 3.5 Compare electrostatic and magnetic fields
- 3.6 Define field intensity
- 3.7 State Gauss theorem
- 3.8 Explain the concept of electric potential and potential difference
- 3.9 Define di-electric strength and di-electric constant
- 3.10 Give the Permittivity of commonly used die- electric materials
- 3.11 Define the term capacitance.
- 3.12 Draw the symbol of capacitor
- 3.13 State unit of capacitance
- 3.14 Derive the formula for capacitance of a parallel plate capacitor
- 3.15 Explain equivalent capacitance of
 - A. Capacitors connected in series;
 - B. Capacitors connected in parallel
- 3.16 Explain charging and discharging of capacitor.
- 3.17 Give the expression for energy stored in a capacitor
- 3.18 Solve simple problems related to capacitors

4.0 Chemical effects of Current and Batteries

- 4.1 Explain Faradays laws of Electrolysis
- 4.2 Explain Polarisation or Back emf
- 4.3 Explain how the value of Back emf can be determined
- 4.4 Define Primary and Secondary Cells.
- 4.5 Explain series and parallel connections of cells to form Battery
- 4.6 Give the formulae for output voltage and current when connected in 1. Series and 2. Parallel

- 4.7 Explain when it is preferred to have 1. Series connection 2. Parallel connection of the batteries
- 4.8 Explain the constructional details of a Lead acid Battery
- 4.9 List the active materials used in the construction of lead acid Battery
- 4.10 Explain the chemical reactions that take place during Charging and discharging
- 4.11 Explain the significance of internal resistance of a Battery
- 4.12 Define the Ampere Hour and Watt Hour Efficiencies of the cell.
- 4.13 Draw the Electrical characteristics of Lead acid cell and explain.
- 4.14 Explain the condition of a Fully charged cell.
- 4.15 List the six important applications of Lead acid batteries
- 4.16 Explain constant current and Constant Voltage methods of Charging Lead acid batteries.
- 4.17 Solve simple problems to find charging current requirements
- 4.18 Explain the need for Trickle charging
- 4.19 Explain the sulphation and its prevention
- 4.20 List the precautions to be observed to maintain the lead acid batteries.
- 4.21 Explain the Constructional details of lithium ion Batteries
- 4.22 List any 4 merits and demerits of Lithium Ion Batteries
- 4.23 List all the precautions to be taken when charging and discharging of lithium ion batteries
- 4.24 List other types of Batteries used in Electronic Industry namely A. Zinc – Carbon B. Alkaline C.9V Battery D. Button cells (both Lithium and Silver oxide types)
- 4.25 Mention the output voltages of above cells
- 4.26 Mention the Common and IEC standard codes to specify the size of the cell
- 4.27 Mention any 3 applications of the above
- 4.28 Compare Primary and Secondary cells.

5.0 Understand the concept of Alternating current

- 5.1 Explain the generation of Alternating current with simple loop generator concept.
- 5.2 Draw the sine wave and explain the concept of a cycle
- 5.3 Define Time period , Frequency and Amplitude of a sine wave
- 5.4 Give the formula for the instantaneous value in terms of maximum value, frequency and time.
- 5.5 Write different forms of emf equation
- 5.6 Solve simple problems to calculate Amplitude ,frequency and Time Period
- 5.7 Define the average value, R.M.S. value, form factor and peak factor for sine wave.
- 5.8 Explain the terms phase and phase difference.
- 5.9 Explain the concept of Leading , lagging and inphase with the help of waveforms
- 5.10 Explain vector representation of Alternating quantities
- 5.11 Draw the vector diagrams of sine waves of same frequency.
- 5.12 Perform addition and subtraction of alternating quantities using vector method.
- 5.13 Solve problems to find resultant vector of several alternating quantities.
- 5.14 Explain the effect of AC flowing through Pure Resistance , Inductance and Capacitance with vector diagrams.
- 5.15 Define the terms Inductive reactance, Impedance, admittance, conductance and Power Factor
- 5.16 Explain Active and Reactive components of AC current
- 5.17 Explain Active and Reactive and apparent power in AC circuit.
- 5.18 Explain the importance of power factor
- 5.19 Define **Q factor** of a coil.

- 5.20 Explain power in an iron cored choking coil.
- 5.21 Explain AC through Resistance and capacitance connected in series.
- 5.22 Solve simple problems on RC series circuits
- 5.23 Calculate the impedance, power, current, phase angle and power factor in RL,RC and RLC series circuits.

6.0 Understand passive components

- 6.1 Classify types of resistors.
- 6.2 List the specifications of a resistor, and state their importance.
- 6.3 Explain the necessity of preferred values in resistor.
- 6.4 Explain the features of following Resistors.
 - a. Carbon Film Resistors
 - b. Metal film Resistors
 - c. Metal oxide Resistors.
 - d. Precision Resistors
- 6.5 List the applications of the above Resistors
- 6.6 Identify Resistance Value by using Colour Code.(4band and 5 band)
- 6.7 List the common faults in resistors.
- 6.8 Classify wire wound Resistors
- 6.9 Explain the constructional details of wire wound resistors.
- 6.10 List any 4 applications of Wire wound Resistor Including Fan Regulator
- 6.11 List the two types of Variable resistors (Potentiometer and Preset)
- 6.12 Distinguish between Preset and Potentiometer
- 6.13 Draw the European and US standard symbols of Potentiometers and Presets
- 6.14 Describe constructional details of carbon and wire wound potentiometers.
- 6.15 Compare the features of carbon and wire wound potentiometers
- 6.16 List different types of Presets and Trimmers
- 6.17 Mention any 3 applications of precision multi turn Cermet trimmer
- 6.18 Mention the need for tapering in potentiometers.
- 6.19 Define Linear and Logarithmic Potentiometers
- 6.20 Explain the use of Logarithmic potentiometer in Audio amplifier for Volume control
- 6.21 Explain the construction and working of rheostat
- 6.22 Explain the use of Rheostat as 1. Variable Resistance. 2. Potentiometer
- 6.23 List the 4 types of special Resistors (Thermistor , Sensistor, LDR and VDR)
- 6.24 Explain P.T.C. and N.T.C. of Resistors.
- 6.25 Explain the working of thermistor and sensistor
- 6.26 Give standard specifications for the above
- 6.27 List any 3 applications. of above
- 6.28 Give Constructional details of LDR (Light Dependant Resistor)
- 6.29 List 3 important specifications of LDR
- 6.30 List any 3 applications of LDR
- 6.31 Explain the use of VDR
- 6.32 Explain resistor packs and SMD Resistors

Familiarise with different types of inductors used in electronic circuits and their applications

- 6.33 Classify inductors.
- 6.34 Draw the symbol of different types of inductors

- 6.35 List the specifications of inductors.
- 6.36 List and Explain the important parameters of Air cored inductors
- 6.37 Explain the terms Stray inductance and stray capacitance
- 6.38 List various core materials used in the construction of inductors
- 6.39 Describe the constructional features
- 6.40 List the applications of A.F. and R.F chokes.
- 6.41 List the common faults in inductors
- 6.42** Explain the use of Ferrites in the construction of high frequency inductors

Familiarise with different types of capacitors used in electronic circuits and their applications

- 6.43 Classify the different types of capacitors.
- 6.44 List the specifications of a capacitor and state their importance.
- 6.45 Explain different markings on the a) Electrolytic capacitors b) Ceramic and Plastic capacitors (Value, Polarization, Voltage, Tolerance, temperature rating)
- 6.46 Explain working voltage of a capacitor
- 6.47 Reading the capacitor value and tolerance by 1. Using colour code. 2. Value printed
- 6.48 State the factors affecting the capacitance of a capacitor.
- 6.49 Mention the properties, range of values and applications of
1. Paper 2. mica, 3. glass, 4. polyester 5. Polystyrene 6. ceramic 7. Electrolytic capacitors.
- 6.50 Explain the importance of polarity in Electrolytic capacitors
- 6.51 Explain the use of capacitors for coupling AC signal and blocking DC
- 6.52 Explain self healing in metalized capacitors
- 6.53 List different types of variable capacitors and mention their applications.
- 6.54 Explain the use of ganged capacitor in AM radio for tuning
- 6.55 Explain the use of trimmer capacitors
- 6.56 Mention the losses in capacitors.
- 6.57 List 3 common faults in capacitors.

7.0 Familiarise with different types of switches, Connectors and Relays.

- 7.1 Explain the working of a switch.
- 7.2 Classify switches according to poles and throws (SPST, SPDT, DPST, DPDT, Multi-pole multi-throw)
- 7.3 Explain the working of toggle, push button, rotary, slider, keyboard, and thumb wheel switches with a mention to their ratings and applications.
- 7.4 Draw the I.S.I symbols of various switches.
- 7.5 Explain the need of fuse in electronic equipment.
- 7.6 Mention different types of fuses.
- 7.7 List 3 metals used for fuses
- 7.8 Mention significance of fuse ratings.
- 7.9 Explain the need for connectors in electronic circuits.
- 7.10 List different types of connectors.
- 7.11 Mention the use of MCB.
- 7.12 Define an Electromagnetic relay.
- 7.13 Draw the symbol of a relay
- 7.14 Classify different relays based on principle of operation, polarization and application.
- 7.15 Mention specifications of relays.

- 7.16 Explain the construction & working of general-purpose electromagnetic relay.
- 7.17 Explain the purpose of NC and NO contacts
- 7.18 Explain arcing during changeover
- 7.19 List the contact materials used in relays and list their characteristics.
- 7.20 Explain the use of solenoid
- 7.21 Explain the need for fly back diode across the relay coil when used in electronic circuits
- 7.22 Distinguish between relay and contactor

8.0 Comprehend PCB materials and their fabrication

- 8.1 Explain the need of PCB in electronic equipment.
- 8.2 Classify PCBs.
- 8.3 List types of laminates used in PCBs.
- 8.4 Mention the methods of layout preparation of PCB.
- 8.5 List the methods of transferring layout on the copper clad sheet.
- 8.6 List the steps involved in screen-printing for making PCBs.
- 8.7 List the materials used in screen-printing.
- 8.8 Describe the photo processing techniques for PCB preparation.
- 8.9 Mention the methods of etching, cleaning and drilling of PCB.
- 8.10 Describe the steps involved in making double-sided PCB.
- 8.11 Give the standard specification for PCB
- 8.12 Explain the need for multilayer PCBs
- 8.13 Explain the use of Surface mount Technology (SMT)
- 8.14 List the materials used in soldering.
- 8.15 List the soldering methods of PCBs.

9.0 Understand the working of Semiconductor Diodes

- 9.1 State the electrical properties of solid Semiconductor materials.
- 9.2 Sketch energy level diagrams for conductors, Semiconductors, Insulators.
- 9.3 Distinguish between Intrinsic and extrinsic Semiconductors.
- 9.4 Describe the formation of P type and N type materials and sketch the energy band diagrams.
- 9.5 Explain Majority and Minority carriers in P and N Type materials.
- 9.6 Distinguish between Drift and Diffusion current.
- 9.7 Explain the formation of PN junction diode.
- 9.8 Describe the working of PN junction Diode with various biasing voltages.
- 9.9 Explain the forward/Reverse Bias Voltage characteristics of diode.
- 9.10 Interpret the manufacturer specifications of a given diode from data sheet.
- 9.11 Describe the formation and working of Zener diode.
- 9.12 Explain the characteristics of Zener diode.
- 9.13 Distinguish between Zener breakdown and Avalanche breakdown.

10.0 Understand the working of DC Power Supplies

- 10.1 Explain the necessity of D.C. power supply for Electronic circuits.

- 10.2 Describe the working of HW, FW and Bridge section circuits with wave forms
- 10.3 Give the equations for RMS value, average DC value; ripple factor and efficiency for the above circuits.
- 10.4 Define Voltage Regulation.
- 10.5 Explain the need for a filter circuit in power supplies.
- 10.6 Explain the operation of a rectifier circuit using RC, CRC, CLC filters.
- 10.7 State the need for a regulated power supply and list its specifications.
- 10.8 Explain the working of a simple Zener regulated DC Power supply.

COURSE CONTENT

1. Concept of Electric current, Potential difference, Voltage and emf and circuit-Ohm's Law - concept of Resistance - specific resistance and conductivity. Problems related to specific resistance – Effect of temperature on resistance-Temperature co- efficient of resistance.- resistance at any given temperature-Solve Simple problems - Series and parallel connections of Resistances-Formulas for equivalent resistance for series and parallel connections.-Solve simple problems on series and parallel circuits division of current in parallel circuits-Effects of Electric current

Units of work, power and energy- Heating effect of Electric current – Electrical power - formula for power and Units -Power ratings of home appliances -Electrical energy consumption calculations - merits of CFL and LED lamps -joules Law-Thermal efficiency – solve problems on Electrical heating practical applications of Electric heating like, Water heater, Electric Iron etc.

2.Magnetic Effects of Electric Current

Coulombs laws of magnetism-Absolute and relative permeability of medium-Explain the concept of lines of force & magnetic Field- Field intensity, Magnetic potential, Flux, Flux density-Relation between Absolute and relative permeability - Field patterns due to Straight current carrying conductor ,Solenoid and Toroid

Work law and its applications- Laplace law (Biot-Savart's Law)- expressions for field strength, - magnitude of the force on a conductor in a magnetic field- force between two parallel current carrying conductors- nature of the force with different directions of the currents

Define ampere - concept of the Magnetic circuit -Define magneto motive force (mmf), permeability, flux and Reluctance-Solve problems on simple magnetic circuits-Compare magnetic circuit with electric circuit-Effect of air gap in a magnetic circuit- leakage flux and leakage co-efficient- equation for the energy stored per unit volume in a magnetic field. expression for lifting power of a magnet.

3.Electrostatics

Coulomb's law of electrostatics - Unit charge- Absolute and Relative permittivity. Problems based on Coulomb's law - Electrostatic field.-Compare electrostatic and magnetic fields - field intensity- Gauss theorem- Concept of electric potential and potential difference - di-electric

strength and dielectric constant- Permittivity of commonly used dielectric materials - capacitance- symbol of capacitor- Unit of capacitance- Formula for capacitance of a parallel plate capacitor- equivalent capacitance of capacitors connected in series & capacitors connected in parallel- Charging and discharging of capacitor- Expression for energy stored in a capacitor- Simple problems related to capacitors.

4. Chemical effects of electric current

Faraday's laws of Electrolysis- Polarisation or Back emf- determination of Back emf - Primary and Secondary Cells- series and parallel connections of cells to form Battery- Explain when it is preferred to have 1. Series connection 2. Parallel connection of the batteries- Constructional details of a Lead acid Battery- materials used - Chemical reactions that take place during Charging and discharging -Internal resistance of a Battery- Ampere Hour and Watt Hour Efficiencies of the cell.- Electrical characteristics of Lead acid cell -Condition of a Fully charged cell- Applications of Lead acid batteries- Constant current and Constant Voltage methods of Charging Lead acid batteries- Charging current requirements- Trickle charging- Sulphation and its prevention- Precautions

Constructional details of lithium ion Batteries- merits and demerits of Lithium Ion Batteries

Precautions to be taken - Batteries used in Electronic Industry namely A. Zinc – Carbon B. Alkaline C. 9V Battery D. Button cells (both Lithium and Silver oxide types)- output voltages of above cells- Common and IEC standard codes - Applications -Compare Primary and Secondary cells.

5. AC Fundamentals :

Generation of Alternating current - Concept of a cycle -Time period , Frequency and Amplitude of a sine wave- formula for the instantaneous value- different forms of emf equation -average value, R.M.S. value, form factor and peak factor for sine wave- phase and phase difference.

Vector representation of Alternating quantities- addition and subtraction of alternating quantities-Resultant vector of several alternating quantities- Effect of AC flowing through Pure Resistance , Inductance and Capacitance - Inductive reactance, Impedance, admittance, conductance and Power Factor- Active and Reactive components of AC current- Explain Active and Reactive and apparent power in AC circuit- Importance of power factor- **Q factor** of a coil- Power in an iron cored choking coil.- AC through Resistance and capacitance connected in series-Solve simple problems on RC series circuits-Calculate the impedance, power, current, phase angle and power factor in RL, RC and RLC series circuits.

6. Passive components

Resistors: Types of resistors- specifications - Preferred values- features of Carbon Film Resistors, Metal film Resistors, Metal oxide Resistors. Precision Resistors-applications - Using Colour Code.(4band and 5 band) - Common faults in resistors. Wire wound Resistors Types- Constructional details of wire wound resistors. Types of Variable resistors (Potentiometer and Preset) European and US standard symbols -Constructional details of carbon and wire wound potentiometers.- Features of carbon and wire wound potentiometers- Presets and Trimmers-Applications - Need for tapering in potentiometers -Linear and Logarithmic Potentiometers-Rheostat-Uses – Special Resistors (Thermistor , Sensistor, LDR and VDR)- P.T.C. and N.T.C. of Resistors- Specifications - Applications.

Constructional details of LDR (Light Dependant Resistor)- Specifications & Applications of LDR- VDR- Resistor packs and SMD Resistors

Inductors: Classify inductors- symbols - Specifications - Important parameters of Air cored inductors- Stray inductance and Stray capacitance-List various core materials used constructional features - Applications of A.F. and R.F chokes- Common faults in inductors - Use of Ferrites in the construction of high frequency inductors

Capacitors: Types of capacitors- specifications - markings on Capacitors - Working voltage of a capacitor-Using colour code. - Factors affecting the capacitance-properties, range of values and applications of different types of capacitors-Importance of polarity in Electrolytic capacitors- Use of capacitors for coupling AC signal and blocking DC- Self healing in metalized capacitors- Types of variable capacitors and their applications- Use of ganged capacitor in AM radio for tuning- Use of trimmer capacitors-Mention the losses in capacitors- Common faults in capacitors.

7. Switches, connectors and Relays:

Switches- Classification and types -Ratings and applications. I.S.I symbols – Fuse protection-Types of fuses-Metals used for fuses- Fuse ratings- Connectors - Types of connectors-MCB- Electromagnetic relay- Symbol -Classification - Specifications – Constructional details of general-purpose electromagnetic relay- NC and NO contacts- Arcing during changeover-- Contact materials - Use of Solenoid- Fly back diode- Difference between Relay and Contactor

8. PCBs:

Need for PCB –Classification of PCBs.- Types of laminates - Layout preparation of PCB-transferring layout - Screen-printing - materials used - photo processing techniques – etching methods- cleaning and drilling - steps involved in making double-sided PCB-- standard specification for PCB-Explain the need for multilayer PCBs- Surface mount Technology (SMT) -Materials used in soldering- soldering methods

9. Semiconductor diodes:

Electrical properties of semiconductor materials, energy level diagrams of conductor, semi conductor and Insulator. Formation of P-Type and N-Type materials and their properties. Drift and diffusion current. Formation and behaviour of PN junction diode.-Forward and Reverse bias- characteristics-Specifications- Zener diode- Characteristics-zener breakdown and avalanche breakdown

10. DC Power supplies

Need of DC power supply- Half wave, Full wave and Bridge rectifiers. RMS value, Ripple factor, Voltage regulation. Filters – RC, CRC, and CLC. Zener regulator – series and shunt. IC regulators and specifications of RPS

RECOMMENDED BOOKS

1. A Textbook of Electrical Technology

- | | |
|--|--|
| Basic Electrical Engineering (Volume1) | by BL Theraja &AK Theraja
Chand Publications |
| 2. Basic Electrical Engineering Volume 1 | by PS Dhogal , TMH |
| 3. Electronic devices and applications | by B. Somanathan Nair, PHI. |
| 4. Understanding Electronics Components | by Filipovic D. Miomir. Mikroe online
Edition |

REFERENCE BOOKS

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|--|----------------------|---------------|
| 1. Electronic Devices and Circuits | by David A.Bell | Prentice hall |
| 2. Hand book of components for Electronics | by Charles A. Harper | McGrahills |
| 3. Printed circuit Boards Design &Technology | by Walter C. Boshart | TMH |

EC-106 ENGINEERING MATERIALS AND PRACTICES

Subject Title	:	Engineering Materials & Practices
Subject Code	:	EC-106
Periods/Week	:	04
Periods/year	:	120

Rationale ; The knowledge of Engineering materials & workshop practices is indispensable to a diploma holder in Electronics & Communication engineering as per the expectations of the industry. With the lean staff concept in the industry, Technicians working at supervisory level must be versatile and possess interdisciplinary skills. Care has been taken to introduce most essential and latest topics in the subject which will enhance their understanding of other subjects in future courses.

Time Schedule

S No	Major topics	No of periods	Weightage of marks	Short answer questions	Essay questions
1	Classification of materials and properties of conductors	20	16	2	1
2	Properties and applications of Insulating materials	20	16	2	1
3	Properties and applications of magnetic materials	20	13	1	1
4	Properties and applications of Special materials	12	13	1	1
5	Introduction to Workshop processes	12	13	1	1
6	Important machines used in the workshops	12	13	1	1
7	Fastening	12	13	1	1
8	Soldering Brazing and Welding				
9	Heat treatment				
10	Electrical hazards- First Aid and safety	12	13	1	1
	Total	120	110	10	8

OBJECTIVES.

On completion of the study the student will be able to

1.0 Understand the Classification of Materials

- 1.1 Explain the atomic structure of the atom
- 1.2 Explain the electronic structure of the atom
- 1.3 Explain energy band diagram
- 1.4 Classify the material into conducting, semi conducting and insulating materials
- 1.5 Distinguish between conductor, insulator and semi-conductor with respect

to valence electrons

- 1.6 Explain how the resistance of a conductor is affected by presence of impurities
- 1.7 Classify the conducting material as low resistivity and high resistivity materials
- 1.8 List the 4 Metals commonly used in Electrical and Electronics fields .
- 1.9 Define the following Mechanical properties of materials
1.Density 2.stress 3. Strain 4.strength 5.Ductility 6.Hardness 7.Wear 8. Impact resistance
9. Fracture 10. Toughness 11. Fatigue
- 1.10 List the Electrical properties of Copper (conductivity, resistivity, temperature coefficient) of copper.
- 1.11 Explain the mechanical properties of copper
- 1.12 Explain general properties like conductivity, resistivity, temperature coefficient, Solderability.
- 1.13 Explain general properties like conductivity, resistivity, corrosion, temperature Coefficient and mechanical properties of Steel.
- 1.14 List 6 important Uses of different conductors in electronics engineering,.
- 1.15 Define corrosion.
- 1.16 List four methods to prevent corrosion of conductors.
- 1.17 Explain the process of anodization of Aluminum

2.0 Understand General Properties of Insulating materials;

- 2.1 Define Insulating Materials.
- 2.2 State the important electrical properties of Insulating materials.
- 2.3 Define Insulating resistance ,Volume and Surface resistance
- 2.4 Explain factors affecting insulating resistance.
- 2.5 Classify Insulating materials on the basis of temperature like Y,A,E,B,F,H and C class.
- 2.6 Mention the properties of Impregnated paper, Wood, Cardboard, Asbestos, Mica, Ceramics and Glass.
- 2.7 List the uses of above insulating materials
- 2.8 Explain Thermoplastic & Thermosetting resins with examples.
- 2.9 Explain the properties & applications of PVC

3.0 Comprehend Magnetic Materials

- 3.1 Classify the magnetic Materials (Ferromagnetic, Paramagnetic, Diamagnetic and Ferrimagnetic)
- 3.2 Define the above magnetic materials.
- 3.3 Define Soft and Hard magnetic materials
- 3.4 Distinguish between soft and Hard magnetic Materials
- 3.5 Give 3 examples for each.
- 3.6 List the important magnetic materials used in the Electrical & Electronic industry
- 3.7 List the important properties of Magnetic materials
- 3.8 Explain the effect of temperature on magnetism
- 3.9 Define the curie point
- 3.10 Explain the terms Hysteresis and Hysteresis loss
- 3.11 Explain the use of Soft Magnetic Materials like Silicon sheet steel for transformers,.
- 3.12 Explain the merits of Cold rolled grain oriented steels for transformer

4.0 Understand the use of Special Materials and alloys

- 4.1 Define an alloy
- 4.2 Explain the need for alloying.
- 4.3 List the 6 important alloys used in electrical engineering
- 4.4 Explain about low resistivity copper alloys: Brass, Bronze

- 4.5 Explain the use of cadmium copper and Beryllium copper
- 4.6 List alloys used for Bimetallic strips , soldering and fuse material,
- 4.7 Give the combination of manganin, constantin, Nichrome, and solder metal
- 4.8 Mention the uses of above alloys.
- 4.9 Explain the use of Nickel-iron alloys,
- 4.10 Define ceramic material.
- 4.11 Explain the use of ceramics for making insulators.
- 4.12 List 6 applications of ceramic materials in the electrical engineering.
- 4.13 Define ferrites
- 4.14 List the important properties of Ferrites
- 4.15 Mention important uses of above materials
- 4.16 Explain the composition of Neodymium.
- 4.17 List any 3 important applications of Neodymium magnets
- 4.18 Explain superconductivity phenomenon.
- 4.19 List 3 superconducting metals
- 4.20 Mention the 3 applications of superconductivity.

5.0 Understand various Workshop practices and Hand Tools

- 5.1 Explain the use of Engineers Files
- 5.2 Show the parts of a file with a sketch.
- 5.3 List various Files used in the workshop
- 5.4 Mention their usage.
- 5.5 Explain the precautions to be taken in handling and maintenance of files.
- 5.6 Explain the use of Hacksaw
- 5.7 Show the parts of hacksaw with a sketch.
- 5.8 List the types of Hacksaw blades
- 5.9 Explain the choice of above blades.
- 5.10 Explain the use of Cold Chisels
- 5.11 List the types of cold chisels
- 5.12 List the types of hammers.
- 5.13 Explain the parts of Ball peen hammer with a sketch.
- 5.14 Explain the use of Screw drivers.
- 5.15 List the types of Screw Drivers used in the workshop.
- 5.16 Explain the use of Taps and Dies

Explain the use of Cutting tools and Cutting Fluids

- 5.17 List the 6 important types of Cutting tool materials.
- 5.18 Explain the use of 1. High speed steels 2. Stellite 3. Cemented carbide 4. Ceramic 5. Cubic Boron nitride 6. Diamond. For cutting tools.
- 5.19 Explain the need for cutting fluids
- 5.20 List the 5 types of cutting fluids
- 5.21 Mention the precautions to be taken while handling cutting fluids.

6.0 Understand the use of Machines Used in the workshop

- 6.1 List the important Operations carried out in the workshop 1. Drilling 2. Turning 3. Grinding 4. Milling
- 6.2 Name the machines used to carry out the above operations.
- 6.3 Name the various parts of a drilling machine and mention their purpose.
- 6.4 List the cutting tools used with drilling machine.
- 6.5 Explain the use of twist drill and Reamer.
- 6.6 Explain Countersunk and Counter bore operations

- 6.7 Explain how sheet metal drilling is carried out.
- 6.8 Explain How Plastic drilling is carried out.
- 6.9 Explain the process of Turning.
- 6.10 List the parts of Centre Lathe machine.
- 6.11 Explain the parts of Centre Lathe machine and their functions.
- 6.12 Explain the use of Face plate.
- 6.13 List the 6 important operations of lathe machine
- 6.14 Explain the operations 1. Turning 2. Drilling 3. Reaming 4. Boring 5. Taper turning.6. Thread cutting
- 6.15 Explain the purpose of grinding
- 6.16 List the parts of surface grinding machine
- 6.17 Explain the functions of above.
- 6.18 Mention the two Abrasive materials used for grinding wheels and explain the importance of grain size and grade.
- 6.19 Explain the milling operation.
- 6.20 List the Three types of Milling machines.
- 6.21 List the parts of Milling machines with a sketch.
- 6.22 Mention the purpose of above parts.

7.0 Comprehend the use of Mechanical Fasteners

- 7.1 List the Four types of Mechanical Fasteners 1. Screws Bolts, Nuts and Rivets.
- 7.2 Classify machine screws based on the types of screw Head
- 7.3 Explain the use of Socket screws and Self tapping screws
- 7.4 Explain the use of Bolts and Nuts
- 7.5 List different types of Nuts used in the industry.
- 7.6 Explain the Purpose of washers
- 7.7 List different types of screw threads
- 7.8 Explain the use of Self locking screws and Bolts.
- 7.9 Explain the use of locking Nuts
- 7.10 Explain thread locking.
- 7.11 Explain the use of Locking washers.
- 7.12 Mention the 4 types of Locking washers and circlips.
- 7.13 Explain the process of Riveting
- 7.14 Mention any 4 advantages of Riveting
- 7.15 Mention the applications of Rivets.
- 7.16 List the metals used for riveting
- 7.17 Explain how electrical connections are secured using mechanical fastening devices
- 7.18 Explain the use of Bullet connector for Automobile Electrical connections.
- 7.19 Explain the use of Adhesives for joining
- 7.20 Explain the advantages of joining parts by using adhesives
- 7.21 Mention the demerits of adhesives.
- 7.22 Classify adhesives
- 7.23 Explain the use of Thermoplastic Resins.
- 7.24 Explain the use of cyanoacrylate (Superglue)
- 7.25 Explain Thermosetting Resins
- 7.26 Explain the use of Epoxys

8.0 Understand the processes Soldering, Brazing and Welding

- 8.1 Explain the process of soft soldering.
- 8.2 Explain the use of flux in soldering
- 8.3 Explain the Heating requirements in the soldering process.

- 8.4 List three types of soldering joints for joining Electrical conductors.
- 8.5 Explain the metals and their mix ratios used in producing solder alloys.
- 8.6 Explain Eutectic point of metals.
- 8.7 Mention the Tin Lead ratios for a) general purpose Electrical soldering b) Plumber solder and dipping baths.
- 8.8 Explain the process of Brazing.
- 8.9 Explain alloys used for brazing. brass and Silver Brazing
- 8.10 Explain the purpose of flux in Brazing.
- 8.11 Name the Fluxes used in Brazing
- 8.12 Mention heat sources suitable for brazing
- 8.13 Explain with a sketch the joint designs suitable for brazing
- 8.14 List any 4 applications of Brazing.
- 8.15 Explain the process of welding
- 8.16 Mention the two types of Welding
- 8.17 Explain the process of Arc Welding
- 8.18 Explain the Process of Gas welding.
- 8.19 Mention the applications of Arc and Gas welding.

9.0 Understand the purpose of Heat treatment of Steel

- 9.1 Explain the Process of Heat treatment.
- 9.2 List the desirable mechanical properties of steel
- 9.3 Explain the properties , Hardness , Toughness, Brittleness , Strength, Ductility, Malleability
- 9.4 Elasticity and toughness
- 9.5 With a Graph explain the relation between Critical temperature and carbon content
- 9.6 Explain the process of annealing
- 9.7 Explain the process of Normalizing
- 9.8 Explain the process of Hardening
- 9.9 Explain the process of surface hardening
- 9.10 Explain the process of Tempering

10.0 Understand Electrical Hazards – First aid and Safety

- 10.1 Explain the importance of safety in the industry.
- 10.2 Explain the major hazards which may arise from the use of electrical equipment
- 10.3 Explain the precautions to be taken to prevent accidents while using Machines
- 10.4 Explain how human body may act as a part of the circuit and cause Electrical shock
- 10.5 Explain method of first aid treatment for someone suffering from electric shock.
- 10.6 State general electrical safety rules
- 10.7 Explain the safety signs and colors
- 10.8 Show various safety symbols and explain their meaning.
- 10.9 Explain the causes of Fire and fire accidents in industry.
- 10.10 Explain Fire prevention measures.
- 10.11 List 4 types of Portable fire extinguishers
- 10.12 Explain the choice of above extinguishers.
- 10.13 Explain the First aid treatment in the case of burns

Course Content

1. Classification of materials

Atomic structure of the atom - Electronic structure of the atom - Energy band diagram - Types of materials –Conductors- Insulators& Semiconductors-Effect of impurities - Metals commonly

used in Electrical and Electronics - Mechanical properties of materials - Electrical and mechanical & General properties of Copper - Mechanical properties of Steel - Uses of different conductors in electronics engineering - Corrosion and methods to prevent corrosion.- Anodization of Aluminum

2. Insulating Materials

Insulating Materials - Electrical properties of Insulating materials - Insulating resistance, Volume and Surface resistance - Factors affecting insulating resistance - Types of Insulating materials on the basis of temperature like Y, A, E, B, F, H and C class - Properties of Impregnated paper, Wood, Cardboard, Asbestos, Mica, Ceramics and Glass and uses of these insulating materials - Thermoplastic & Thermosetting resins - Properties & applications of PVC

3. Magnetic Materials

Magnetic Materials – Classification-Ferromagnetic, Paramagnetic, Diamagnetic and Ferrimagnetic - Soft and Hard magnetic materials - Important magnetic materials used in the Electrical & Electronic industry - Properties of Magnetic materials - Effect of temperature on magnetism - Curie point - Hysteresis and Hysteresis loss - Use of Soft Magnetic Materials like Silicon sheet steel for transformers - Merits of Cold rolled grain oriented steels for transformer

4. Special Materials

Alloys - Important alloys used in electrical engineering - Low resistivity copper alloys: Brass, Bronze - Use of cadmium copper and Beryllium copper - Alloys used for Bimetallic strips, soldering and fuse material - Combination alloys of manganin, constantin, Nichrome, and solder metal and their uses - Uses of Nickel-iron alloys - Ceramic material - Applications of ceramic materials in the electrical engineering - Ferrites - Important properties of Ferrites - Composition of Neodymium - Applications of Neodymium magnets - Superconductivity phenomenon - Superconducting metals - Applications of superconductivity.

5. Introduction to Workshop practices and Hand Tools

Engineers Files - Parts of a file - Files used in the workshop and their usage - Precautions to be taken - Hacksaw - Parts of hacksaw - Types of Hacksaw blades - Choice of Hacksaw blades - Types of Cold Chisels and their uses - Types of hammers - Parts of Ball peen hammer – Types of Screw drivers and their uses - Taps and Dies and their uses - Types of Cutting tools & Cutting Fluids and their uses - Precautions to be taken while handling cutting fluids.

6. Machines Used in the workshop

Operations carried out in the workshop 1. Drilling 2. Turning 3. Grinding 4. Milling - Machines used - Parts of a drilling machine – Types of cutting tools used with drilling machine - Twist drill and Reamer - Countersunk and Counter bore operations - Sheet metal drilling - Plastic drilling - Process of Turning - Parts of Centre Lathe machine and their functions - Face plate - Important operations of lathe machine – Turning, Drilling, Reaming, Boring, Taper turning and Thread cutting - Parts of surface grinding machine and their functions - Abrasive materials used for grinding wheels - Importance of grain size and grade – Types of Milling machines - Parts of Milling machines and their functions

7. Mechanical Fasteners

Types of Mechanical Fasteners - Screws Bolts, Nuts and Rivets – Classification of machine screws - Use of Socket screws and Self tapping screws - Use of Bolts and Nuts - Different types of Nuts used in the industry - Purpose of washers - Different types of screw threads - Use of Self locking screws and Bolts - Use of locking Nuts - Thread locking - Use of Locking washers - Types of Locking washers and circlips – Riveting and advantages of Riveting - Applications of Rivets - Metals used for riveting - Mechanical fastening devices electrical connections - Use of Bullet connector for Automobile Electrical connections - Use of Adhesives for joining - Advantages of joining parts by using adhesives - Demerits of adhesives - Use of Thermoplastic Resins - Use of cyanoacrylate (Superglue) - Thermosetting Resins - Use of Epoxys

8. Soldering, Brazing and Welding

Soldering - Use of flux in soldering - Heating requirements in the soldering process - Types of soldering joints - Metals and their mix ratios used in producing solder alloys - Eutectic point of metals - Electrical soldering and Plumber soldering – Brazing and alloys used for brazing - Brass and Silver Brazing - Fluxes used in Brazing - Applications of Brazing – Types of Welding and their applications

9. Heat treatment of Steel

Heat treatment of Steel – Steel properties: Hardness, Toughness, Brittleness, Strength, Ductility and Malleability - Elasticity and toughness - Critical temperature and carbon content – Different processes: Annealing, Normalizing, Hardening, Surface Hardening and Tempering

10. Electrical hazards - first aid and safety

Importance of safety in the industry - Use of electrical equipment and major hazards - Precautions to be taken to prevent accidents - Human body and Electrical shock - Method of first aid treatment - General electrical safety rules - Safety signs & colors and their meaning - Fire and fire accidents in industry and prevention measures - Types of Portable fire extinguishers - Choice of fire extinguishers

RECOMMENDED BOOKS

1. Material science for Electrical and Electronic engineers by Ian p.Jones
2. Elements of Workshop Technology. Vol. I: Manufacturing Processes Edition 4 by S K Hajra Choudhury & A K Choudhury – J.K. Pubs., Limited
3. Workshop processes, practices and Materials by Bruce J. Black
4. Electrical and Electronic Engineering Materials by SK Bhattacharya, Khanna Publishers, New Delhi
5. Engineering Materials properties and selection by Kenneth G Budinski, Prentice Hall, New Delhi.

ENGINEERING DRAWING PRACTICE

Subject Title : Engineering Drawing Practice
Subject Code : EC-107
Periods/Week : 06
Periods Per Year : 180

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	01	-	-	-
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	5	1	-
4	Dimensioning Practice	01	09	5	1	-
5	Geometrical constructions	03	21	15	1	1
6	Projection of points, Lines, Planes & Solids	03	21	10	-	1
7	Auxiliary views	01	06	5	1	-
8	Sectional views	01	27	10	-	1
9	Orthographic Projection	01	33	10	-	1
10	Pictorial drawing	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		14	180	80	04	06

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Pre-Requisite: Clear visualization and sound pictorial intelligence

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the basic concepts of Engineering Drawing

1.1 State the importance of drawing as an engineering communication

- medium
- 1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.
- 1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

2.0 Use of Engineering Drawing Instruments

- 2.1 Select the correct instruments and draw lines of different orientation.
- 2.2 Select the correct instruments and draw small and large Circles.
- 2.3 Select the correct instruments for measuring distances on the drawing.
- 2.4 Use correct grade of pencil for different types of lines, thickness and given function.
- 2.5 Select and use appropriate scales for a given application.
- 2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
- 2.7 Prepare Title block as per B.I.S. Specifications.
- 2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

3.0 Write Free Hand Lettering and Numbers

- 3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height
- 3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height
- 3.3 Select suitable sizes of lettering for different layouts and applications
- 3.4 Practice the use of lettering stencils.

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

- 4.1 Define "Dimensioning.
- 4.2 State the need of dimensioning the drawing according to accepted standard.
- 4.3 Identify notations of Dimensioning used in dimensioned drawing.
- 4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
- 4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
- 4.6 Dimension standard features applying necessary rules.
- 4.7 Arrange dimensions in a desired method given in a drawing.
- 4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

Drawing Plate 3: (Having 08 to10 exercises)

5.0 Apply Principles of Geometric Constructions

- 5.1 Divide a given line into desired number of equal parts internally.
- 5.2 Draw tangent lines and arcs.
- 5.3 Use General method to construct any polygon.
- 5.4 Explain the importance of conics
- 5.5 Construct conics (ellipse, parabola and hyperbola) by general method
- 5.6 Construct ellipse by concentric circles method
- 5.7 Construct parabola by rectangle method
- 5.8 Construct rectangular hyperbola from the given data.
- 5.9 Construct involute from the given data.

5.10 Construct cycloid and helix from the given data.

5.11 State the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon

Drawing Plate -5: Having problems of construction of conics

Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Apply Principles of Projection of points, lines, planes & solids

6.1 Visualize the objects

6.2 Explain the I-angle and III-angle projections

6.2 Practice the I-angle projections

6.3 Draw the projection of a point with respect to reference planes (HP&VP)

6.4 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)

6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)

6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)

Drawing Plate -8: Having problems of projection of planes (6 exercises)

Drawing Plate -9: Having problems of projection of solids (10 exercises)

7.0 Understand the need of auxiliary views

7.1 State the need of Auxiliary views for a given engineering drawing.

7.2 Draw the auxiliary views of a given engineering component

7.3 Differentiate between auxiliary view and apparent view

Drawing plate No.10: (Having 4 exercises)

8.0 Appreciate the need of Sectional Views

8.1 Explain the need to draw sectional views.

8.2 Select the section plane for a given component to reveal maximum information.

8.3 Explain the positions of section plane with reference planes

8.4 Differentiate between true shape and apparent shape of section

8.5 Draw sectional views and true sections of regular solids discussed in **6.0**

8.6 Apply principles of hatching.

Drawing Plate-11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

9.1 Explain the principles of orthographic projection with simple sketches.

9.2 Draw the orthographic view of an object from its pictorial drawing.

9.3 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

10.1 State the need of pictorial drawings.

10.2 Differentiate between isometric scale and true scale.

10.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

11.1 State the need for preparing development drawing.

11.2 Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.

11.3 Prepare development of surface of engineering components like trays, funnel, 90° elbow & rectangular duct.

Drawing plate No. 14: (Having 05 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	<ul style="list-style-type: none"> Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	<ul style="list-style-type: none"> Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	<ul style="list-style-type: none"> Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	<ul style="list-style-type: none"> Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	<ul style="list-style-type: none"> Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	<ul style="list-style-type: none"> Draw the projection of a point, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	<ul style="list-style-type: none"> Draw the auxiliary views of a given Engineering component Differentiate between Auxiliary view and apparent view
8.	Sectional views	<ul style="list-style-type: none"> Differentiate between true shape and apparent shape of section Use conventional representation of Engineering materials as per B.I.S. Code. Apply principles of hatching. Draw simple sections of regular solids
9.	Orthographic Projection	<ul style="list-style-type: none"> Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial drawing	<ul style="list-style-type: none"> Differentiate between isometric scale and true scale. Draw the isometric views of given objects,.

11.	Development of surfaces	<ul style="list-style-type: none">• Prepare development of Surface of Engineering components like trays, funnel, 90° elbow & rectangular duct.
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COURSE CONTENT

NOTE

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate:

Lay out of sheet – as per SP-46-1988 to a suitable scale.

Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering

Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)

Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.

Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).

ii) Tangent arc of given radius touching a circle or an arc and a given line.

iii) Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon: construction of any regular polygon of given side length using

general method

Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,

Construction of any conic section of given eccentricity by general method

Construction of ellipse by concentric circles method

Construction of parabola by rectangle method

Construction of rectangular hyperbola

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.

(a) Parallel to both the planes.

(b) Perpendicular to one of the planes.

(c) inclined to one plane and parallel to other planes

Projection of regular planes

(a) Plane perpendicular to HP and parallel to VP and vice versa.

(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids

(a) Axis perpendicular to one of the planes

(b) Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

8.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work
-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays, funnels, 90⁰ elbow pipes and rectangular ducts.

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)
Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)
Engineering Drawing by N.D.Bhatt.
T.S.M. & S.S.M on “ Technical Drawing” prepared by T.T.T.I., Madras.
SP-46-1998 – Bureau of Indian Standards.

Basic Electronic Workshop Practice

Subject title : **Basic Electronic Workshop Practice**
Subject code : **EC-108**
Periods per week : **6**
Periods / Semester : **180**

TIME SCHEDULE

SI NO	Major Topics	Periods
1	Safety precautions and cleaning	3
	Identification of different Tools and Materials and their working	33
2	Identification of wires, cables , House wiring & Troubleshooting	36
3	Study and use of Electronic equipment	12
4	Testing of Electronic components	42
5	Soldering practice & Preparation of PCB	30
6	Group Project	24
	Total Periods	180

List of the Experiments

I. Identification of different Tools and Materials and their working

1. To Demonstrate the safety precautions and first aid
2. To Clean the equipment and Work Tables including Visual inspection and reporting any physical damage
3. To Practice with Measuring and Marking Tools
4. To Work with different types of screw Drivers.
5. To Work With Basic tools
6. To Work with Tools used in Electrical Wiring
7. To Work with different fastening devices, spanners, wrenches and Allen/ Hex keys
8. To Work with Pliers
9. To Work with Drilling Machine .
10. To Identify and observe the function of Grinding machine , Lathe machine , Milling machine and Blower.
11. To Work with Adhesives
12. To Identify conductors insulating materials semiconductors and magnetic materials

II. Identification of different wires, cables and House wiring

13. To Identify different wires and cables
14. To Practice wire joints
15. To Practice Termination of wires
16. To identify the Electrical accessories and their terminals
17. To Identify the mains supply Phase , Neutral , Ground By observation and testing
18. To verify the difference between AC and DC by Experimenting with 12 V battery & Transformer

19. To Identify and Draw the electrical symbols of the corresponding component /item
20. To Make simple switch connections using low voltage transformer and 12V lamp
21. To Make either of two lamps glow by two way switch
22. To assemble and connect Tube light set (To be done in the presence of Instructor)
23. To Troubleshoot electrical appliances

III. Study and use of Electronic equipment

24. To Identify electronic equipment and draw their circuit Symbols
25. To Work with Multimeter (Both Digital and analog)
26. To Connect batteries in series and parallel and observe the output voltage using DMM
27. To use the CRO and Function Generator to observe the signal and measure Voltage

IV. Testing of Electronic components

28. To identify and work with Resistors
29. To Measure DC Voltage and DC current using Voltmeter, ammeter & Multimeter
30. To Verify Ohms Law and kirchoff's laws
31. To Measure Resistance using Voltmeter and DRB
32. To Verify the laws of Resistance using a nichrome wire and Multimeter
33. To Verify the effect of temperature on Resistance Using electric lamp, Multimeter, Voltmeter and Ammeter
34. To Verify voltage and current relationship in series and parallel resistive circuits.
35. To Wind coils using winding machine and test
36. To Experiment with transformer
37. To Identify and find the value of different types of capacitors
38. To verify the behaviour of capacitor
39. To determine the component type (Black box testing) using multimeter and power supply
40. To Identify different switches & their terminals
41. To Connect a Fan regulator & switch to ceiling fan and test
42. To Test the given relay and identify NO and NC Contacts
43. To Identify the Bimetallic strip (used in Iron box) and observe its construction

VI. Soldering practice & Preparation of PCB

44. To Practice Soldering
45. To Practice Desoldering using Desoldering Wick and Desoldering Pump
46. To Use and populate General purpose PCB
47. To Identify and fix different types of connectors
48. To connect Public Address system and test
49. To Connect audio video equipment and LCD projector Tuning TV and test
50. To Connect the computer hardware (keyboard, mouse etc)
51. Group Project:

Competencies and Key competencies to be achieved by the student

ExpNo	Name of the Experiment (No of Periods)	Competencies	Key Competencies
1	Demonstrate the safety precautions and first aid (1 ½)	a) Follow the Precautions in the laboratory ,(starting and Stopping of equipment / Machinery) b)Identify the symbols and their meaning c) Identify the types of emergencies d) Follow the sequence of steps to be carried out e) Demonstrate basic first aid procedure	a) Take precautions to prevent accidents in the laboratory b) Alert under emergency situations c) Give Basic first aid.
2	To Clean the equipment and Work Tables including Visual inspection and reporting any physical damage (1 ½))	a)Keep work area clean b)Familiarization with equipment c)Follow the procedure for cleaning with Detergents, Shampoos and solvents. d) Follow the precautions to be taken (use of masks, Gloves, Washing hands with soda after cleaning the equipment)	a)Clean the equipment with appropriate cleaning agent. b)Report any damage of power cords , missing fuses , Low battery in DMMS etc.
3	To Practice with Measuring and Marking Tools (3)	a)Use 1.Measuring Tape 2. Steel rule 3.Trysquare 4. Center Punch 5. Plumb b)Use the measuring tape to measure a distance of 6 feet and above accurately and mark. c) Use the steel rule to measure an odd length given in inches and in millimeters accurately and mark. d) Use the Try square to mark perpendicular lines by selecting a finished edge. e) Use the centre punch to mark centre points as per the drawing f) Use the plumb to observe 1) inclination of wall ii) mark two horizontal points on a wall at a given height and at a given distance.	a)Use the right measuring/ marking tool carry out measurements and marking with precision b)Select right tool
4	To Work with different types	a)Select right screw driver	a)Select right screw

	<p>of screw Drivers. (3)</p> <p>a) Identify 1. Screw Driver a) b) Flat Head Screwdrivers c) Ratcheting Screwdrivers c) Use the Screw Driver to Remove and Fix wooden Screws d)To Fix and Remove screws of Metal cabinets using correct screw Driver</p>	<p>Tightening and removing screws b)Work with wood and metal c)Handle the screw drivers with care</p>	<p>driver b)Tighten and remove the screws</p>
5	<p>To Work With Basic tools (6)</p> <p>a) Identify 1.Hacksaw frame/ Blade 2.Ball peen hammers 3. Sledge hammer. 4 Claw hammer 5 Anvil 6 Chisels 7. Bench vice b) Fix the Hacksaw blade in the frame and use it to cut 1) Conduit pipe 2) Cut the Wooden piece with hacksaw frame by fixing it in the bench vice. c) Use a cold chisel to cut the 6mm Rod to required length. d) Use the sledge hammer to bend a 6mm Rod into a ring by striking it on the Anvil e) Drive nails in to a wooden piece with ball peen hammer. f) Remove the Nails using claw hammer</p>	<p>a) identify and select the right Hacksaw frame and blade b) Fix the hacksaw blade c) Use the hacksaw for cutting metal d) Use bench vice for fixing the job e) Use hammer with skill</p>	<p>a)Select Right tool for a particular situation b) Use the tools with skill c) Fix the hacksaw blade d) Use the hacksaw for cutting metal e) Use hammer with skill</p>
6	<p>To Work with Tools used in Electrical Wiring (3)</p> <p>A) Identify 1. wire stripper . 2. Insulation remover 3. Pocket knife 5.Electrical Tester 4.Phillips Head Screwdrivers 5. Mallet 6. Rawl plug jumper 7 .Standard wire Gauge b) Use the above tools to remove the insulation. c) Use the mallet to straighten the cable/ Conductor d) Measure the gauge of wire using Standard Wire Gauge.</p>	<p>a)Select right tool, b)Remove the insulation without damaging the conductor using 1) Pocket knife 2) Wire stripper c)Measure the wire Gauge d)Fix a screw in the wall.</p>	<p>a)Remove the insulation b)measure the wire Gauge c) Fix a screw in the wall. d)Use Rawl plug jumper</p>

	e) Make a hole in the wall for fixing a Screw/ Nail using Raw plug Jumper and ball peen Hammer.		
7	To Work with different fastening devices, spanners, wrenches and Allen/ Hex keys (3) 1. Identification of different types of fastening devices like Screws, Bolts and Nuts, Rivets, and know their specifications b) Tighten the bolts and nuts using correct type and number of spanner a) Normal b) Ring type , c) Use the Monkey Wrench and Pipe wrench to Tighten GI pipe coupling	a)identify various fastening devices by their name and shape b)Select the right fastener c)Use the spanner for tightening and loosening the bolts and nuts d)Use the Monkey Wrench and Pipe wrench to Tighten GI pipe coupling	a)Use the fastening devices b)Work with bolts , nuts and couplings
8	To Work with Pliers (3) a) Identify and use the various features of cutting pliers, Nose pliers, Pipe pliers, Flush cutter, top cutting pliers, Electronics pliers, Insulated cutting pliers b) perform the following operations 1. Holding 2. Wire cutting 3. Component bending 4. Twisting the wire	a)identify various types of {Pliers by their name and shape b)Select the right pliers for a particular job c)Perform various operations using pliers	a)Use the suitable pliers for a given job
9	To Work with Drilling Machine . (3) a) Use the Hand drill to make holes in the wood c) use Electrical hand held hammer drill to make holes in the wall. b . Identify Electrical drilling machine and observe how holes are made in Mild steel Plates	a)Identify the parts of Drilling Machine and drill bits used with hand drilling machine b)Fix the drilling bit in the chuck c) Follow Safety precautions d)Make the drill with precision	a)Use the drilling machine to make holes
10	To Identify and observe the function of Grinding machine , Lathe machine , Milling machine and Blower. (3)	a) Identify Grinding machines and observe its usage to sharpen cutting tools and Drill bits and for cutting operation on metals. b) Identify Lathe machine and observe various	a)Identify the machine and its function. b)Identify the processes carried out on the job

		operations like turning , taper turning , Knurling , Boring Etc c) Identify the milling machine and Know its usage. d) identify the Electric Blower and use it for Removing dust and cleaning	
11	To Work with Adhesives (3) a) Practice the use of adhesives like Araldite , Feviquick, Fevicol, Mseal, to join Non metals b) To Use PVC cement to join PVC Pipes	a)Practice joining using different adhesives b)Select right adhesive c)Use <i>Quickfix</i> and <i>Feviquick</i> to fix components on PCBs	a)Join the parts using Araldite, Mseal etc. b)Use <i>Quickfix</i> and <i>Feviquick</i> to Fix components on PCBs
12	To Identify conductors insulating materials semiconductors and magnetic materials like (3) 1. Copper , Aluminum , Tin , Solder Metal . 2. Plastics, Teflon, PVC, glass, porcelain, ceramic Bakelite, Mica, Paper, Cotton sleeves, Prespahn sheet, Transformer Oil. Etc 3. Carbon rods 4. Iron , Steel, Ferrites	a)Identify the Copper , aluminum , iron and other metals by physical observation b)Identify the Insulating materials by their name and physical observation	a)identify different conducting and Insulating materials
13	To Identify different wires and cables (1 ½) Identify A).Hookup wires i) PVC wire ii) Teflon wires iii) single strand iv) multi strand B) .Wires used for electrical wiring i) Service wire ii) TRS wires /PVC Wires (Al and Cu) iii) Single strand iv) Multi strand v) twisted Flexible pair wires vi). Enameled copper wire C) i) Power cord. li) UTP cables iii) Co axial cables iv) Flat ribbon cable for antennas v) Telephone cable vi)Ethernet cable vii) Ribbon cables viii) Optical fiber	a) Identify the wires by their technical names b) Identify the gauge of the wire c) Identify the insulation used and its purpose d) Identify the difference between single strand and Multistrand wire e) Select a wire for a particular application f) Find the current carrying capacity from the gauge of wire (refer to the standard tables)	a) Identify the type of wire and its current carrying capacity b) Measure the wire gauge

14	To Practice wire joints (3) To perform the following wire joints operations a) Twisting b) Splicing c) Insulating d) Western union joint e) Married joint f) Britania (straight Joint) g) Tee joint h) Joining running cables ,Pigtail or rat tail joint	a) Identify the types of joints and state their purpose. b) Select the right joint c) Remove the insulation d) Make the joint e) Tape the joint	a) Make the joint professionally and tape
15	To Practice Termination of wires (1 ½) a) Using lugs Using screws , nuts Terminal blocks Fixing Fuse wire	a) Identify different types of terminal blocks b) Make connections using lugs,Screws c) Fix the fuse wire	Use the terminal Block Fix the fuse wire
16	To identify the Electrical accessories(1 ½) a) SPST Switch ,SPDT switch , Two pin and 3pin Sockets and plugs ,Power Socket and Power plugs Lamp holders, Ceiling rose, Mains Switch,MCB ,Kitkat Fuse – Fuse wire ratings	a) Identify different electrical accessories b) Identify the item by its shape c) Use appropriate electrical accessories	a) Select appropriate Electrical accessories. b) make connections professionally c) Work with MCBS KITKAT Fuses
17	To Identify the mains supply Phase ,Neutral ,Ground By observation and testing (3) a) To Repair /prepare 2pin and 3pin power cords	a) Follow Precautions Identification of Phase Neutral and Earth terminals in mains supply by b) 1 observation 2 Using Tester 3 Using Test Lamp 4) Using DMM c) Make 2pin and 3pin Plug connections d) Make Power socket and switch connections e) Test the earth connection	a) Identify phase and Neutral terminals in mains supply with tester b) Identify Earth connections with Test lamp
18	To verify the difference between AC and DC by Experimenting with 12 V battery &Transformer (3) 1. To Verify unidirectional current flow 2. To Verify the effects of polarity 3. To Determine polarity using a Voltmeter /LED 4. To verify reversal of current using battery and DPDT switch 6. To observe AC waveform	a) To Check the polarity of DC voltage source b) Find the polarity in DC circuits by using DMM/ multimeter c) Observe the AC signal on CRO	a) Check the source type (AC/DC) using DMM / Multimeter b) Finding polarity in DC circuits c) Use the CRO to observe waveform

	on CRO using a Low voltage Transformer		
19	To Identify and Draw the electrical symbols of the corresponding component /item(1 ½)	a) Identify the physical component from the symbol	a) Identify the physical component from the symbol
20	To Make simple switch connections using low voltage transformer and 12V lamp(1 ½) 1. Connecting a 6V lamp to a switch (toggle) 2. 2 way switch connections 3. Series and parallel connection of lamps	a) Make the simple Switch connections b) use the two way switch for stair case wiring and c) Series and parallel connection of lamps	a) Use the switch for controlling lamp circuits a) Use Two way switches for stair case wiring and other controls
21	To Make either of two lamps glow by two way switch(1 ½) 5. Bright and Dim light arrangement (using a series lamp / using a Diode) 6.either two lamps bright or two lamps dim	a) Make two way Switch circuit connections b) Use two way switch for controlling lamps.	a) Use two way switch circuits for controlling different circuits and equipment.
22	To assemble and connect Tube light set(To be done in the presence of Instructor) (1 ½) b)To test the Effect of Low Voltage On tube light (Instructor applies low voltage With an auto Transformer) c) To start the tube light with starter removed. d) To Open the choke cover and observe the constructional details e) To connect a CFL Lamp and draw comparison	a) Identify the parts of tube light set b) Make tube light connections c) Identify the Choke and starter d) Observe the behavior of tubelight under low voltage conditions e) Open and observe the construction of choke f) g) Verify the purpose of starter h) Observe the CFL lamp	a) Make tube light connections
23	To Troubleshoot electrical appliances (15) , like a) Electric Iron b) heating coil c) Electric Heater d) Air cooler	a) Identify the problem in Electrical gadgets by testing it with b) a) physical observation c) b) Troubleshoot d) i. Using tester ii. Using test Lamp	a) Identify and rectify the problem in Electrical Gadgets
24	To Identify electronic equipment and draw their circuit Symbols(3)	a) Draw the symbols used in Electronic Circuits b) Identify the meters and	a) Identify and draw the symbols used in Electronic Circuits

	<p>. Identification of meters and equipment</p> <p>1. DMM 2. Analog Multimeter 3. DC Voltmeters/Ammeters 4. DC Power supply 5. DRB 6. DCB 7. DIB 8. CRO 9. Function Generator etc</p>	<p>equipment</p> <p>c) Use DRB, DIB and DCB</p> <p>d) Set the required voltage On power supply</p>	<p>b) Identify the meters and equipment</p> <p>c) Use DRB, DIB and DCB</p> <p>d) Set the required voltage On power supply</p>
25	<p>To Work with Multimeter (Both Digital and analog) (3)</p> <p>a) To Measure resistance of a wire/Component using multimeter</p> <p>b) To check continuity with multimeter</p> <p>c) To Measure Battery Voltage using Voltmeter and Multimeter</p>	<p>a) Identify analog and Digital multimeters</p> <p>b) Zero adjusting analog multimeter</p> <p>c) Select the correct Range</p> <p>d) Measuring Voltage, Current and Resistance with Multimeter</p>	<p>a) Use the Multimeter to measure Voltage, current, Resistance by choosing correct range and mode.</p>
26	<p>To Connect batteries in series and parallel and observe the output voltage using DMM (3)</p>	<p>a) Measure DC voltage with DMM</p> <p>b) Test the cells</p> <p>c) practice Series and Parallel connection of Cells</p> <p>d) Observe the polarity</p> <p>e) observe the effect on Terminal Voltage</p>	<p>a) Make series and parallel connection of batteries</p> <p>b) Use DMM to measure Voltage</p>
27	<p>To use the CRO and Function Generator to observe the signal and measure Voltage (3)</p>	<p>a) Connect function generator to CRO with BNC connector</p> <p>b) Adjust front panel controls</p> <p>c) Measure the voltage</p>	<p>Measure the AC/DC signal Voltage using CRO</p>
28	<p>To identify & Work with Resistors (3)</p> <p>a) To Identify different types of resistors i) CFR ii) MFR iii) Resistor packs iv) Wire wound Resistors, v) Presets</p> <p>b) To determine Resistance from colour code</p> <p>c) To Connect resistors in series and parallel and measuring the resistance using multimeter</p> <p>d) To make Rheostat connections</p>	<p>a) Identify different types of resistors</p> <p>b) Find the value of Resistance from colour code of CFR and MFR types</p> <p>c) Use resistor combination to get desired resistance</p> <p>d) Identify the terminals on Rheostat</p> <p>e) Set the Rheostat to Minimum and maximum positions</p> <p>f) Observe Resistance change using DMM</p>	<p>a) Identify resistance type by observation</p> <p>b) Finding the value of Resistance from colour code of CFR and MFR types</p> <p>c) Set the Rheostat to Minimum and maximum positions</p>
29	<p>To Measure DC Voltage and DC current (3)</p> <p>b) To measure Voltage</p>	<p>a) Connect Voltmeter and Ammeter to measure DC Voltage and Current using</p>	<p>a) measure DC Voltage and Current using Voltmeter and</p>

	¤t using Multimeter	Voltmeter and Ammeter b) Measure Voltage &Current using Multimeter	Ammeter
30	To Verify Ohms Law and Kirchoffs laws(3)	a) verify ohms law& Kirchoff's laws and establish relation between Voltage current and Resistance	a) Practically verify the relation between Voltage current and Resistance
31	To Measure Resistance using Voltmeter and DRB (1 ½)	a) Use the DRB b) Apply Ohms law in practical situations	a) Measure the Resistance using Voltmeter and DRB
32	To Verify the laws of Resistance using a nichrome wire and Multimeter(1 ½)	a) verify the laws of Resistance experimentally b) Measure resistance using Multimeter	a) Use the multimeter to measure Resistance
33	To Verify the effect of temperature on Resistance Using electric lamp ,Multimeter, Voltmeter and Ammeter (3)	a) Measure Resistance using multimeter by selecting correct range b) Observe the difference between Cold Resistance and Hot Resistance	a) Measure Voltage current and resistance
34	To Verify voltage and current relationship in series and parallel resistive circuits(3)	a) Observe branch currents in series Parallel circuits b) Verifying current division in parallel circuits with calculated values	a) Measure currents and Voltages and draw inferences
35	To Wind coils using winding machine (3) .a) To Make an Electromagnet and testing it on a DC power supply.	a) use Coil winding Machine and wind a coil of required number of turns b) Make an electromagnet c) Observe the relation between Current , Number of turns and Power of magnet	a) Wind the coil and Test it
36	To Experiment with transformer (3) a)Identify the transformer type based on tappings i. Center tapped ii. Multi tapped iii. Normal b) To test the given transformer using a multimeter identify the windings c) To find the Transformation ratio d) To Verify step up or step down action of transformer	a) Identify the transformer type based on tappings b) i. Center tapped ii. Multi tapped iii. Normal c) Test the given transformer using a multimeter identify the windings d) Find the Transformation ratio e) Verify step up or step down action of transformer	a) Identify the type of transformer b) Test the transformer with multimeter
37	To Identify and find the value of different types of capacitors (1 ½) a) Find the	a) Identify different types of capacitors by their name b) Read the specifications and Ratings	a) Identify capacitor type b) Read the value of capacitor

	value/specifications of capacitor from Value printed ,and from Color code	c) Find the value of capacitor from the color code	c) Test the capacitor
38	To verify the behavior of capacitor (3) a) To verify charging and discharging using an LED a) Investigate the effect of connecting capacitors in series and parallel b) To Test the capacitor Using multimeter, AC source (Transformer / Function generator) and headphones	a) Verify the behavior of capacitor by experimentation b) Connect Capacitors in series and parallel and observing the effect on total capacitance c) Test the capacitor using multimeter and other methods	a) Verify the behavior of capacitors b) c) Connect capacitors in series parallel combination to get desired value d) e) Test the capacitors
39	To determine the component type (Black box testing)using multimeter and power supply(1 ½) a) identify the given component concealed in a box with two terminals available for testing using multimeter and power supply	a) Identify a given component by testing with DMM and power supply	a) Identify a given component by testing with DMM and power supply b)
40	To Identify different switches & their terminals (3) a) Identify different types of switches and their symbols b) To use Toggle switches Rotary switches, Push button switches, DIP switches b) To Control a small Tape - recorder motor with a DPDT switch to run in forward and Reverse Directions.	a) Identify different types of switches by observation , By name and symbol b) Use DPDT switch to reverse the Direction Tape recorder motor c) Observe the constructional details and ratings of tape recorder motor	a) Identify the type of switch and its name b) Use DPDT switch c) Test switches using DMM
41	To Connect a Fan regulator & switch to ceiling fan and test(3) a) To observe the rotary switch connections and power Resistors	a) Identify and Use the Rotary switch b) Read the Fan Regulator circuit c) Make Fan Regulator connections d) Identify the type of Resistors used in the Fan Regulator	a) Make Fan Regulator connections
42	To Test the given relay and identify NO and NC Contacts(3) b) To Use the relay to control a lamp load	a) Observe the constructional details of Relay b) Test /identify the coil connections with Multimeter	a) Make relay connections b) Test and use the relay

	<p>c) To Use the double pole relay to control a fan motor</p> <p>d) To Make a simple relay motor control using double pole relay and push button switches</p>	<p>c) Use the relay in practical circuits</p>	
43	<p>To Identify the Bimetallic strip (used in Iron box) and observe its construction(3)</p> <p>a) To Open the tube light starter and observe its construction.</p> <p>b) To Connect a tubelight starter in series with an incandescent lamp and observe the operation of bimetallic strip</p>	<p>a) Identification of Bimetallic Strip</p> <p>b) Verify the behavior of Bimetallic strip</p> <p>c) Observe the constructional details of tube light starter</p> <p>d) Use bimetallic strip in practical circuits</p>	<p>a) Identify Bimetallic strips</p> <p>b) Use the Bimetallic strips in practical applications.</p>
44	<p>To Practice Soldering (9) by</p> <p>I. Making wire tips</p> <p>II. joining wires</p> <p>III. joining components</p> <p>IV. populating simple circuits like, Audio amplifier) on a breadboard</p> <p>b) To test the soldered connections using multimeter</p>	<p>a) Check whether a metal is solderable</p> <p>b) Check solder specifications</p> <p>c) use the Flux in soldering</p> <p>Practice the soldering</p> <p>d) check the soldered joint by physical observation and Multimeter</p>	<p>a) Practice soldering</p> <p>b) Populate PCBs</p> <p>c) Test the PCB tracks with DMM</p>
45	<p>To Practice Desoldering using Desoldering Wick and Desoldering Pump(3)</p>	<p>a) Desolder using</p> <p>b) a) Desoldering Wick</p> <p>c) b) Desoldering Pump</p>	<p>a) Desolder using Wick and Pump</p>
46	<p>To Use and populate General purpose PCB (6)</p> <p>a) To work with solder less bread board</p>	<p>a) Bend the components</p> <p>b) Design the component lay out</p> <p>c) Form common Ground</p> <p>d) Populate the circuit</p> <p>e) Cut and join the tracks wherever necessary</p> <p>f) Use the correct colour code for wires</p> <p>g) Work with solderless bread board</p>	<p>a) Bend the component leads As per layout design</p> <p>b) Use correct colour code for wires</p> <p>c) Work with solderless Bread board</p>
47	<p>To Identify and fix different types of connectors Identify(3)</p> <p>a) power connectors</p> <p>b) Molex connectors</p> <p>c) Edge connectors</p> <p>d) Terminal blocks</p> <p>e) Wire to Board, Board to</p>	<p>a) Identify different types of connectors used in electronic circuits by their name</p> <p>b) Select the right connector and terminal blocks based on the requirements</p>	<p>a) Identify different types of connectors used in electronic circuits by their name and use them in the circuits</p> <p>b) Select the right connector</p>

	Board , Flat cable connectors Keyed connectors for microphone Male and Female types f) Lugs , Blade connectors, Ring and spade terminals etc		c) Fix the wire terminals. d) Connect lugs by crimping and soldering
48	To connect Public Address system and test(3)	a) Make amplifier and speaker connections b) Observe Impedance matching c) Use the various front panel and back panel controls	a) Connect the amplifier , microphone and speakers
49	To Connect audio video equipment and LCD projector Tuning TV and test (3)	a) Identify user controls on the equipment b) Set up the LCD projector using menu control/ Remote control c) Identify audio video sockets on LCD projector /TV monitor/DVD player d) Connect audio video cable to the Monitor/ Projector to the DVD / Settop box and testing	a) Set up the projector using menu control/ Remote control b) Tune the TV receiver/ set top box
50	To Connect the computer hardware (keyboard, mouse etc) (3) a) connect computer to LCD projector	a) Connect the basic computer Hardware CPU , Keyboard , Mouse etc b) Identify the ports on CPU c) Connect Speakers to the computer) d) Identify Computer Power switch and various ports on CPU e) Identify various computer cables f) Connect mouse & keyboard g) Connect headphones /speakers/ Microphone h) Connect the monitor/ LCD Projector using VGA /HDMI cable	a) Connect external hardware to the CPU b) Set up LCD projector c) Connect PC/Laptop to Projector
51	Group Project (24) Assemble and test a small 0 to 12V , 500mA DC Power supply using Multi tapped transformer and a Rotary switch with enclosure	a) Read the circuit diagram b) Identify & select the Electronic components c) Populate on General purpose PCB d) Test the circuit	a) Complete the project and Test it

		e) Assemble the circuit and fix it in an enclosure	
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Note : Group Project is compulsory (Not to be given in the End Examination)

ENGINEERING PHYSICS LAB PRACTICE

Subject Title : **Engineering Physics Lab Practice**
Subject Code : **EC -109 A (Common)**
Periods per week : **03**
Total periods per year : **45**

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	45

Objectives:

Upon completion of the course the student shall be able to

- 1.0 Practice the Vernier caliper to determine the volume of a cylinder and sphere
- 2.0 Practice the Screw gauge to determine thickness of a glass plate and cross section of a wire
- 3.0 Verify the parallelogram law and Triangle law
- 4.0 Determine the value of acceleration due to gravity using Simple Pendulum
- 5.0 Determine the velocity of sound in air at room temperature
- 6.0 Determine the Focal length and focal power of convex lenses using U-V method
- 7.0 Determine the refractive index of a solid using travelling microscope
- 8.0 Determine the surface tension of a liquid using travelling microscope
- 9.0 Determine the viscosity of a liquid using capillary method
- 10.0 Verify the Boyle's law employing a Quill tube
- 11.0 Determine the specific resistance of wire material using Meter Bridge
- 12.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
1. Hands on practice on Vernier Calipers	<ul style="list-style-type: none"> • Find the Least count • Fix the specimen in position • Read the scales • Calculate the volume of given object 	<ul style="list-style-type: none"> • Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge	<ul style="list-style-type: none"> • Find the Least count • Fix the specimen in position • Read the scales • Calculate thickness of glass plate and cross section of wire 	<ul style="list-style-type: none"> • Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire
3. Verification of Parallelogram law of forces and Triangle law of forces	<ul style="list-style-type: none"> • Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle 	<ul style="list-style-type: none"> • Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum	<ul style="list-style-type: none"> • Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw I-T and I-T² graph 	<ul style="list-style-type: none"> • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw I-T and I-T² graph
5. Velocity of sound in air –Resonance method	<ul style="list-style-type: none"> • Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonating lengths • Calculate velocity of 	<ul style="list-style-type: none"> • Adjust the reservoir level • Find the first and second resonating lengths • Calculate velocity of sound • Calculate velocity of

Name of the Experiment	Competencies	Key competencies
6. Focal length and Focal power of convex lens (Separate & Combination)	<ul style="list-style-type: none"> • Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses 	<ul style="list-style-type: none"> • Calculate the focal length and power of convex lens • Draw u-v and $1/u - 1/v$ graph
7. Refractive index of solid using traveling microscope	<ul style="list-style-type: none"> • Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab 	<ul style="list-style-type: none"> • Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope	<ul style="list-style-type: none"> • Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water 	<ul style="list-style-type: none"> • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
9. Coefficient of viscosity by capillary method	<ul style="list-style-type: none"> • Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method 	<ul style="list-style-type: none"> • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water

Name of the Experiment	Competencies	Key competencies
10. Boyle's law verification	<ul style="list-style-type: none"> • Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value $P \times l$ 	<ul style="list-style-type: none"> • Find the length of air column • Find the pressure of enclosed air • Find the value $P \times l$
11. Meter bridge	<ul style="list-style-type: none"> • Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific 	<ul style="list-style-type: none"> • Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force	<ul style="list-style-type: none"> • Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines 	<ul style="list-style-type: none"> • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

ENGINEERING CHEMISTRY LAB PRACTICE

Subject Title : **Engineering Chemistry Lab Practice**
Subject Code : **EC-109 B (Common)**
Periods per week : **03**
Total periods per year : **45**

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. KMnO_4	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	45

Objectives:

Upon completion of the course the student shall be able to

- 1.0 Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
- 2.0 Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.
- 3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl
- 4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH
- 5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

- 6.0 Conduct titrations adopting standard procedures and using Std. KMnO_4 solution for estimation of Mohr's Salt
- 7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)
- 8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)
- 9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution
- 10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)
- 11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)
- 12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter
- 13.0 Conduct the test on given samples of water / solutions
 - a) To determine conductivity
 - b) To adjust the ionic strength of the sample to the desired value
- 14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU
- 15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
Familiarization of methods for Volumetric analysis	--	--
Preparation of Std Na_2CO_3 and making different diluted solution	<ul style="list-style-type: none"> ▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions 	<ul style="list-style-type: none"> ▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions

Name of the Experiment	Competencies	Key competencies
Estimation of HCl solution using Std. Na_2CO_3 solution	<ul style="list-style-type: none"> ▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results 	<ul style="list-style-type: none"> ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
Estimation of NaOH using Std. HCl solution		
Estimation of H_2SO_4 using Std. NaOH solution		
Estimation of Mohr's Salt using Std. KMnO_4		
Determination of acidity of water sample		
Determination of alkalinity of water sample		
Determination of total hardness of water using Std. EDTA solution		
Estimation of Chlorides present in water sample		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method)	<ul style="list-style-type: none"> ▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions 	<ul style="list-style-type: none"> ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter		
Determination of conductivity of water and adjusting ionic strength to required level		
Determination of turbidity of water		

Name of the Experiment	Competencies	Key competencies
Estimation of total solids present in water sample	<ul style="list-style-type: none"> ▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven 	<ul style="list-style-type: none"> ▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LAB PRACTICE

Subject Title : Computer Fundamentals Laboratory Practice
Subject Code : EC-110 (Common)
Periods/Week : 03
Periods/Year : 90

List of Experiments:

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	01	03
II.	Windows Operating System	02	06
III.	MS Word	09	27
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
Total		30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to widespread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a).To Familiarize with Computer system and hardware connections
b).To start and Shut down Computer correctly
c). To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system (Not for end examination)

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques

9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	<ul style="list-style-type: none"> a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse 	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	<ul style="list-style-type: none"> a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board 	<ul style="list-style-type: none"> a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	<ul style="list-style-type: none"> a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support 	<ul style="list-style-type: none"> a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	<ul style="list-style-type: none"> a. Find the details of Operating System being used b. Find the details of Service Pack installed 	Access the properties of computer and find the details
3.	To check the hardware present in your computer	<ul style="list-style-type: none"> a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar 	<ul style="list-style-type: none"> a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	<ul style="list-style-type: none"> a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders 	<ul style="list-style-type: none"> a. Create files and folders Rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	<ul style="list-style-type: none"> c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin 	<ul style="list-style-type: none"> b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	<ul style="list-style-type: none"> a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint 	<ul style="list-style-type: none"> a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	<ul style="list-style-type: none"> a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options 	<ul style="list-style-type: none"> a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	<ul style="list-style-type: none"> a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar 	<ul style="list-style-type: none"> a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	<ul style="list-style-type: none"> a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer 	<ul style="list-style-type: none"> a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	<ul style="list-style-type: none"> a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order 	<ul style="list-style-type: none"> a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	<ul style="list-style-type: none"> a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table. 	<ul style="list-style-type: none"> a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	<ul style="list-style-type: none"> a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes. 	Use Mail merge feature
12.	To use Equations and symbols features.	<ul style="list-style-type: none"> a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document 	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	<ul style="list-style-type: none"> a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets- Formula Bar-Status Bar 	<ul style="list-style-type: none"> a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	<ul style="list-style-type: none"> a. Move Around a Worksheets- Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel 	<ul style="list-style-type: none"> a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	<ul style="list-style-type: none"> a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width 	Format the excel sheet
16.	To use built in functions and Formatting Data	<ul style="list-style-type: none"> a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries 	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	<ul style="list-style-type: none"> a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help 	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	<ul style="list-style-type: none"> a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically 	<ul style="list-style-type: none"> a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	<ul style="list-style-type: none"> a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart 	<ul style="list-style-type: none"> a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	<ul style="list-style-type: none"> a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print 	<ul style="list-style-type: none"> a. Format Excel sheet b. Insert headers & footers and print
21.	To familiarize with Ribbon layout & features of PowerPoint 2007.	Use various options in Home, insert , design, animation , slideshow, Review & View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	<ul style="list-style-type: none"> a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide 	<ul style="list-style-type: none"> a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	<ul style="list-style-type: none"> a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation 	<ul style="list-style-type: none"> a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	<ul style="list-style-type: none"> a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects 	<ul style="list-style-type: none"> Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	<ul style="list-style-type: none"> a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art 	<ul style="list-style-type: none"> Create organizational charts and flow charts using smart art
26.	To insert a Table	<ul style="list-style-type: none"> a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend 	<ul style="list-style-type: none"> Insert tables and format
27.	To insert a Charts/Graphs	<ul style="list-style-type: none"> a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background 	<ul style="list-style-type: none"> Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio & video, Hyper links in a slide Add narration to the slide	<ul style="list-style-type: none"> a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks 	<ul style="list-style-type: none"> a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	<ul style="list-style-type: none"> a. Apply transitions to slides b. To explore and practice special animation effects like <i>Entrance, Emphasis, Motion Paths & Exit</i> 	Add animation effects
30.	Reviewing presentation	<ul style="list-style-type: none"> a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation <ul style="list-style-type: none"> (a) Slides (b) Handout 	<ul style="list-style-type: none"> a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

**DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
(FIRST YEAR)**

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theor y	Practi cal/T utoria l		Durati on (hour s)	Sessio nal Marks	End Exam Marks	Total Marks
THEORY:								
EE-101	English	3	-	90	3	20	80	100
EE-102	Engineering Mathematics - I	5	-	150	3	20	80	100
EE-103	Engineering Physics	4	-	120	3	20	80	100
EE-104	Engineering Chemistry & Environmental Studies	4	-	120	3	20	80	100
EE-105	Electrical Engineering Materials	3	-	90	3	20	80	100
EE-106	Basic Electrical Engineering	5	-	150	3	20	80	100
PRACTICAL:								
EE-107	Engineering Drawing	-	6	180	3	40	60	100
EE-108	108-Basic Electrical & Electronics Laboratory Practice	-	6	180	3	40	60	100
EE-109	109-A Physics Laboratory Practice	-	3	90	1½	20	30	50
	109-B Chemistry Laboratory Practice				1½	20	30	50
EE-110	Comp. Fundamentals Laboratory Practice	-	3	90	3	40	60	100
TOTAL		24	18	1260		280	720	1000

ENGLISH

Subject Title	:	English
Subject Code	:	EE-101(common to all branches)
Periods per Week	:	3
Periods per Year	:	90

Time Schedule

SI No	Major Topics	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary	5	13	1	1
2	Grammar	30	31	7	1
3	Reading	10	10	-	1
4	Writing	30	40	-	4
5	English in Action	15	16	2	1
Total		90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-14 Curriculum the focus is on the special English needs of technician studies and training. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing reports, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

On completion of this course the student shall be able to:

- 1.0 Build their vocabulary in the direction of their future needs
- 2.0 Learn various grammatical structures
- 3.0 Read and comprehend English and understand the details and draw inferences
- 4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
- 5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

- 1.1 Locate words, learn spellings, understand meanings
- 1.2 Pronounce words intelligibly
- 1.3 Find synonyms and antonyms
- 1.4 Use affixation
- 1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

- 2.1 Identify and use nouns
- 2.2 Identify and use pronouns
- 2.3 Use the present tense

- 2.4 Use the past tense
- 2.5 Use the future tense
- 2.6 Identify and use adjectives
- 2.7 Identify and use adverbs
- 2.8 Use prepositions
- 2.9 Use linkers
- 2.10 State basic sentence structures
- 2.11 Construct different types of sentences
- 2.12 Frame questions to elicit information
- 2.13 Frame questions for conformation
- 2.14 Use active voice
- 2.15 Use passive voice
- 2.16 Use direct speech
- 2.17 Use indirect speech
- 2.18 Identify and correct errors

3.0 Read and comprehend English

- 3.1 Identify the main ideas
- 3.2 Identify the specific details
- 3.3 Draw inferences
- 3.4 Give contextual meanings of the words
- 3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

- 4.1 Identify components of a good paragraph
- 4.2 Write types of paragraphs
- 4.3 Distinguish between formal and informal letters
- 4.4 Write personal letters
- 4.5 Write leave letters
- 4.6 Write official letters
- 4.7 Write letters of complaints
- 4.8 Prepare a resume
- 4.9 Write a cover letter
- 4.10 Write short messages
- 4.11 Report incidents
- 4.12 Report experiments
- 4.13 Report Industrial visits
- 4.14 Write work done statements
- 4.15 Write maintenance reports
- 4.16 Make notes using Cue method and Mapping method
- 4.17 Summarize Paragraphs
- 4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

5.0 Practice spoken communication suited to various situations.

- 5.1 Use appropriate expressions to greet and take leave
- 5.2 Use proper expressions to make requests
- 5.3 Use apt expressions for asking and giving directions
- 5.4 Use suitable expressions to seek and offer suggestions

- 5.5 Use suitable expressions to state intentions
- 5.6 Use suitable expressions to state feelings
- 5.7 Use appropriate expressions to state agreement and disagreement
- 5.8 Use proper expressions to make complaints
- 5.9 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary)
Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill)
John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija

Engineering Mathematics – I

Subject Title : **Engineering Mathematics – I**
Subject Code : **EE-102(common to all branches)**

Periods/Week : 05
 Periods/Year : 150

Blue Print

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
		Theory	Practice		R	U	App	R	U	App
	Unit - I : Algebra									
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0
15	Conic Sections	5	4	10	0	0	0	0	1	0
	Unit – IV : Differential Calculus									
16	Limits and Continuity	4	2	3	0	1	0	0	0	0

17	Differentiation	18	10	23	1	0	0	1	1	0
	Unit - V : Applications of Differentiation									
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
Total		92	58	110	7	3	0	2	2 1/2	3 1/2
				Marks	21	9	0	20	25	35

R: Remembering type 41 marks
U: Understanding type 34 marks
App: Application type 35 marks

OBJECTIVES

Upon completion of the course the student shall be able to:

UNIT – I Algebra

1.0 Use Logarithms in engineering calculations

- 1.1 Define logarithm and list its properties.
- 1.2 Distinguish natural logarithms and common logarithms.
- 1.3 Explain the meaning of e and exponential function.
- 1.4 State logarithm as a function and its graphical representation.
- 1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

- 2.1 Define the following fractions of polynomials:
 - i) Rational,
 - ii) Proper and
 - iii) Improper
- 2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

<i>i)</i> $\frac{f(x)}{(x+a)(x+b)(x+c)}$	<i>ii)</i> $\frac{f(x)}{(x+a)^2(x+b)(x+c)}$
<i>iii)</i> $\frac{f(x)}{(x^2+a)(x+b)}$	<i>iv)</i> $\frac{f(x)}{(x+a)(x^2+b)^2}$

3.0 Use Matrices for solving engineering problems

- 3.1 Define a matrix and order of a matrix.
- 3.2 State various types of matrices with examples (emphasis on 3rd order square matrices).

- 3.3 Compute sum, scalar multiplication and product of matrices.
- 3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.
- 3.5 Define the transpose of a matrix and write its properties.
- 3.6 Define symmetric and skew-symmetric matrices.
- 3.7 Resolve a square matrix into a sum of symmetric and skew-symmetric matrices with examples in all cases.
- 3.8 Define minor, co-factor of an element of a 3x3 square matrix with examples.
- 3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.
- 3.10 Distinguish singular and non-singular matrices.
- 3.11 Apply the properties of determinants to solve problems.
- 3.12 Solve system of 3 linear equations in 3 unknowns using Cramer's rule.
- 3.13 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.
- 3.14 Compute adjoint and multiplicative inverse of a square matrix.
- 3.15 Solve system of 3 linear equations in 3 unknowns by matrix inversion method
- 3.16 State elementary row operations.
- 3.17 Solve a system of 3 linear equations in 3 unknowns by Gauss- Jordan method

UNIT – II Trigonometry :

- 4.0 Understand Trigonometric Ratios
- 4.1 Define trigonometric ratios of any angle.
- 4.2 List the values of trigonometric ratios at specified values.
- 4.3 Draw graphs of trigonometric functions
- 4.4 Explain periodicity of trigonometric functions.
- 5.0 Solve simple problems on Compound Angles**
- 5.1 Define compound angles and state the formulae of $\sin(A\pm B)$, $\cos(A\pm B)$, $\tan(A\pm B)$ and $\cot(A\pm B)$
- 5.2 Give simple examples on compound angles to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.
- 5.3 Derive identities like $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ etc.,
- 5.4 Solve simple problems on compound angles.
- 6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles**
- 6.1 Derive the formulae of multiple angles $2A$, $3A$ etc and sub multiple angles $A/2$ in terms of angle A of trigonometric functions.
- 6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,
- 6.3 Solve simple problems using the above formulae
- 7.0 Apply Transformations for solving the problems in Trigonometry**
- 7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.
- 7.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.
- 8.0 Use Inverse Trigonometric Functions for solving engineering problems**
- 8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.
- 8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like

$$\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2} \text{ etc.}$$

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, where $x \geq 0, y \geq 0, xy < 1$ etc., and solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

9.1 Explain what is meant by solutions of trigonometric equations and find the general solutions of $\sin x = k$, $\cos x = k$ and $\tan x = k$ with appropriate examples.

9.2 Solve models of the type $a \sin^2 x + b \sin x + c = 0$, $a \cos x + b \sin x = c$ etc., and problems using simple transformations.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for $\sin A/2$, $\cos A/2$, $\tan A/2$ and $\cot A/2$ in terms of semi-perimeter and sides a, b, c and solve problems.

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define $\sinh x$, $\cosh x$ and $\tanh x$ and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus, conjugate and list their properties.

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT – III Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

13.2 Solve simple problems on the above forms

13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.

14.2 Find the equation of a circle given

- (i) Center and radius
- (ii) Two ends of a diameter
 - (iii) Centre and a point on the circumference
 - (iv) Three non collinear points
 - (v) Centre and tangent
- 14.3 Write the general equation of a circle and find the centre and radius.
- 14.4 Write the equation of tangent and normal at a point on the circle.
- 14.5 Solve the problems to find the equations of tangent and normal.

15.0 Appreciate the properties of Conics in engineering applications

- 15.1 Define a conic section.
- 15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.
- 15.3 Find the equation of a conic when focus, directrix and eccentricity are given
- 15.4 Describe the properties of Parabola, Ellipse and Hyperbola
- 15.5 Solve engineering problems in simple cases of Parabola and Ellipse.

UNIT – IV Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

- 16.1 Explain the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = l$ and state the properties of limits .
- 16.2 Mention the Standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$, $\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}}$, $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ (All without proof).
- 16.3 Solve the problems using the above standard limits
- 16.4 Evaluate the limits of the type $\lim_{x \rightarrow l} \frac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$
- 16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

- 17.1 State the concept of derivative of a function $y = f(x)$ – definition, first principle as $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.
- 17.2 State the significance of derivative in scientific and engineering applications.
- 17.3 Find the derivatives of elementary functions like x^n , a^x , e^x , $\log x$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\csc x$ and $\cot x$ using the first principles.
- 17.4 Find the derivatives of simple functions from the first principle .
- 17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.
- 17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

$$(i) \sqrt{t^2 + \frac{2}{t}} \quad (ii) x^2 \sin 2x \quad (iii) \frac{x}{\sqrt{x^2 + 1}} \quad (iv) \log(\sin(\cos x)).$$

- 17.7 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.
- 17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.
- 17.9 Find the derivatives of hyperbolic functions.
- 17.10 Explain the procedures for finding the derivatives of implicit function with examples.
- 17.11 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.
- 17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.
- 17.13 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.
- 17.14 Explain the definition of Homogenous function of degree n
- 17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT – V Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

- 18.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve $y=f(x)$ at any point on the curve.
- 18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve $y=f(x)$ at any point on it.
- 18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve $y=f(x)$.
- 18.4 Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

19.0 Understand the Physical Applications of Derivatives

- 19.1 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.
- 19.2 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

20.0 Use Derivatives to find extreme values of functions

- 20.1 Define the concept of increasing and decreasing functions.
- 20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.
- 20.3 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable - simple problems yielding maxima and minima.
- 20.4 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

21.0 Use Derivatives to find Errors and Approximations

- 21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I Algebra

1. Logarithms :

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

$$\begin{array}{ll} i) \frac{f(x)}{(x+a)(x+b)(x+c)} & ii) \frac{f(x)}{(x+a)^2(x+b)(x+c)} \\ iii) \frac{f(x)}{(x^2+a)(x+b)} & iv) \frac{f(x)}{(x+a)(x^2+b)^2} \end{array}$$

3. Matrices:

Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II Trigonometry :

4. Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. Compound angles: Formulas of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$, $\cot(A \pm B)$, and related identities with problems.
6. Multiple and sub multiple angles: trigonometric ratios of multiple angles $2A, 3A$ and submultiple angle $A/2$ with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.
9. Trigonometric equations: concept of a solution, principal value and general solution of trigonometric equations :
 $\sin x = k$, $\cos x = k$, $\tan x = k$.
Solutions of simple quadratic equations, equations involving usage of transformations- problems.
10. Properties and solutions of triangles: relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- solving a triangle- problems.
11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.

12. Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form(Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle, definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points and (v) centre and tangent equation - general equation of a circle - finding center, radius: tangent, normal to circle at a point on it.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms - applications of parabola and ellipse to engineering situations.

UNIT-IV Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.
17. Concept of derivative- definition (first principle)- different notations-derivatives of elementary functions - problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, subtangent and subnormal to the curve at any point . Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.
20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

References:

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS

Subject Title	:	Engineering Physics
Subject Code	:	EE-103(common to all branches)
Periods per week	:	04
Total periods per year	:	120

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	12	13	1	1
3.	Kinematics	12	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	14	13	1	1
11.	Modern Physics	10	03	1	-
	Total:	120	110	10	8

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

- 1.1 Explain the concept of Units
- 1.2 Define the terms
 - a) Physical quantity, b) Fundamental physical quantities and
 - c) Derived physical quantities
- 1.3 Define unit
- 1.4 Define fundamental units and derived units

- 1.5 State SI units with symbols
- 1.6 State Multiples and submultiples in SI system
- 1.7 State Rules of writing S.I. units
- 1.8 State advantages of SI units
- 1.9 Define Dimensions
- 1.10 Write Dimensional formulae
- 1.11 Derive dimensional formulae of physical quantities
- 1.12 List dimensional constants and dimensionless quantities
- 1.13 State the principle of Homogeneity of Dimensions
- 1.14 State the applications of Dimensional analysis
- 1.15 State the limitations of dimensional analysis

2.0 Understand the concept of Elements of Vectors

- 2.1 Explain the concept of Vectors
- 2.2 Define Scalar and Vector quantities
- 2.3 Give examples for scalar and vector quantities
- 2.4 Represent vectors graphically
- 2.5 Classify the Vectors
- 2.6 Resolve the vectors
- 2.7 Determine the Resultant of a vector by component method
- 2.8 Represent a vector in space using unit vectors (i, j, k)
- 2.9 State triangle law of addition of vectors
- 2.10 State parallelogram law of addition of vectors
- 2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
- 2.12 Derive expression for magnitude and direction of resultant of two vectors
- 2.13 State polygon law of addition of vectors
- 2.14 Explain subtraction of vectors
- 2.15 Define Dot product of two vectors with examples (Work done, Power)
- 2.16 Mention the properties of Dot product
- 2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
- 2.18 Mention the properties of Cross product.
- 2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

- 3.1 Write the equations of motion in a straight line
- 3.2 Explain the acceleration due to gravity
- 3.3 Derive expressions for vertical motion
 - a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
- 3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
- 3.5 Explain projectile motion with examples
- 3.6 Explain Horizontal projection
- 3.7 Derive an expression for the path of a projectile in horizontal projection
- 3.8 Explain oblique projection
- 3.9 Derive an expression for the path of projectile in oblique projection
- 3.10 Derive formulae for projectile in oblique projection
 - a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
 - e) Horizontal Range, f) Maximum range
- 3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

- 4.1 Define friction
- 4.2 Classify the types of friction
- 4.3 Explain the concept of Normal reaction
- 4.4 State the laws of friction
- 4.5 Define coefficients of friction
- 4.6 Explain the Angle of friction
- 4.7 Derive an expression for acceleration of a body on a rough horizontal surface
- 4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
- 4.9 Define Angle of repose

- 4.10 Derive expressions for acceleration of a body on a smooth inclined plane (up and down)
- 4.11 Derive expressions for acceleration of a body on a rough inclined plane (up and down)
- 4.12 List the Advantages and Disadvantages of friction
- 4.13 Mention the methods of minimizing friction
- 4.14 Solve the related numerical problems

5.0 Understand the concept of Work, Power, and Energy

- 5.1 Define the terms 1. Work, 2. Power and Energy
- 5.2 State SI units and dimensional formula for 1. Work, 2. Power, and Energy
- 5.3 Define potential energy
- 5.4 Derive the expression for Potential energy with examples
- 5.5 Define kinetic energy
- 5.6 Derive the expression for kinetic energy with examples
- 5.7 State the Work- Energy theorem
- 5.8 Explain the relation between Kinetic energy and momentum
- 5.9 State the law of conservation of energy
- 5.10 Verify the law of conversion of energy in the case of a freely falling body
- 5.11 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

- 6.1 Define Simple harmonic motion
- 6.2 State the conditions of Simple harmonic motion
- 6.3 Give examples for Simple harmonic motion
- 6.4 Show that the tip of the projection of a body moving in circular path with uniform speed is SHM
- 6.5 Derive expression for displacement
- 6.6 Derive expression for velocity
- 6.7 Derive expression for acceleration
- 6.8 Derive expression for Time period and frequency of S H M
- 6.9 Define phase of S H M
- 6.10 Derive expression for Time period of simple pendulum
- 6.11 State the laws of simple pendulum
- 6.12 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

- 7.1 Explain the concept of expansion of gases
- 7.2 Explain Boyle's law
- 7.3 State Charles law in terms of absolute temperature
- 7.4 Define absolute zero temperature

- 7.5 Explain absolute scale of temperature
- 7.6 Define ideal gas
- 7.7 Derive the Ideal gas equation
- 7.8 Define gas constant and Universal gas constant
- 7.9 Explain why universal gas constant is same for all gases
- 7.10 State SI unit of universal gas constant
- 7.11 Calculate the value of universal gas constant
- 7.12 State the gas equation in terms of density
- 7.13 Distinguish between r and R
- 7.14 Explain Isothermal process with the help of P-V and T- θ diagram.
- 7.15 Explain adiabatic process with the help of P-V and T- θ diagram
- 7.16 Distinguish between isothermal and adiabatic process
- 7.17 State first and second laws of thermodynamics
- 7.18 Define specific heats & molar specific heats of a gas
- 7.19 Derive the relation $C_p - C_v = R$
- 7.20 Solve the related numerical problems

8.0 Understand the concept of Sound

- 8.1 Define the term sound
- 8.2 Explain longitudinal and transverse wave motion
- 8.3 Distinguish between musical sound and noise
- 8.4 Explain noise pollution and state SI unit for noise
- 8.5 Explain causes of noise pollution
- 8.6 Explain effects of noise pollution
- 8.7 Explain methods of minimizing noise pollution
- 8.8 Explain the phenomenon of beats
- 8.9 List the applications of beats
- 8.10 Define Doppler effect
- 8.11 List the Applications of Doppler effect
- 8.12 Explain reverberation and reverberation time
- 8.13 Write Sabine's formula
- 8.14 Explain echoes
- 8.15 State conditions of good auditorium
- 8.16 Solve the related numerical problems

9.0 Understand the properties of matter

- 9.1 Define the term Elasticity
- 9.2 Define the terms stress and strain
- 9.3 State the units and dimensional formulae for stress and strain
- 9.4 State the Hooke's law
- 9.5 Define the surface tension
- 9.6 Explain Surface tension with reference to molecular theory
- 9.7 Define angle of contact
- 9.8 Define the capillarity
- 9.9 Write the formula for surface tension based on capillarity
- 9.10 Explain the concept of Viscosity
- 9.11 Provide examples for surface tension and Viscosity
- 9.12 State Newton's formula for viscous force
- 9.13 Define co-efficient of viscosity
- 9.14 Explain the effect of temperature on viscosity of liquids and gases

- 9.15 State Poiseuille's equation for Co-efficient of viscosity
- 9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

- 10.1 Explain the concept of Electricity
- 10.2 State the Ohm's law
- 10.3 Explain the Ohm's law
- 10.4 Define specific resistance, conductance and their units
- 10.5 State Kichoff's laws
- 10.6 Explain Kichoff's laws
- 10.7 Describe Wheatstone's bridge with legible sketch
- 10.8 Derive expression for balancing condition of Wheatstone's bridge
- 10.9 Describe Meter Bridge with legible sketch
- 10.10 Write the formula in Meter Bridge to determine specific resistance
- 10.11 Explain the concept of magnetism
- 10.12 State the Coulomb's inverse square law of magnetism
- 10.13 Define magnetic field and magnetic lines of force
- 10.14 State the Magnetic induction field strength-units and dimensions
- 10.15 Describe the moment of couple on a bar magnet placed in a uniform magnetic field
- 10.16 Derive Magnetic induction field strength at a point on the axial line
- 10.17 Derive Magnetic induction field strength at a point on the equatorial line
- 10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

- 11.1 Explain Photo-electric effect
- 11.2 Write Einstein's photoelectric equation
- 11.3 State laws of photoelectric effect
- 11.4 Explain the Working of photoelectric cell
- 11.5 List the Applications of photoelectric effect
- 11.6 Recapitulate refraction of light and its laws
- 11.7 Define critical angle
- 11.8 Explain the Total Internal Reflection
- 11.9 Explain the principle and working of Optical Fiber
- 11.10 Mention types of optical fibbers
- 11.11 List the applications of Optical Fiber
- 11.12 Define super conductor and superconductivity
- 11.13 List the examples of superconducting materials
- 11.14 List the applications of superconductors

COURSE CONTENT

1. Units and Dimensions:

Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units- Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. Elements of Vectors:

Scalars and Vectors –Types of vectors(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position

Vector). Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors-Subtraction of vectors- Dot and Cross products of vectors-Problems

3. Kinematics:

Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range - problems

4. Friction:

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction— Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. Work, Power and Energy:

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy- Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems

6. Simple Harmonic Motion:

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum- Problems

7. Heat and Thermodynamics:

Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R - Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats of a gas - Problems

8. Sound:

Sound- Nature of sound- Types of wave motion - usual sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Condition of good auditorium- Problems

9. Properties of matter

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems

10. Electricity & Magnetism:

Ohm's law and explanation- Specific resistance- Kirchoff 's laws- Wheatstone's bridge - Meter bridge- Coulomb's inverse square law magnetic field- magnetic lines of force-Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line –problems.

11. Modern Physics;

Photoelectric effect –Einstein’s photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect- Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

REFERENCE BOOKS

1. Intermediate physics Volume-I
2. Unified physics Volume 1,2,3 and 4
3. Text book of physics Volume I
4. Text book of applied physics
5. Fibre optics

Deepthi
Dr.S.L Gupta and Sanjeev Gupta
Resnick & Holiday
Dhanpath Roy
D.A Hill

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	12	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	10	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	14	13	0	1	0	0	1	0
11.	Modern Physics	10	03	1	0	0	0	0	0
Total:		120	110	3	5	2	2	5	1

Subject Title : **Engineering. Chemistry & Environmental Studies**
Subject Code : **EE-104(common to all branches)**
Periods per week : **04**
Total periods per year : **120**

Time Schedule & Blue Print

S.No	Major topic	No of Periods	Weight age of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
10	ENVIRONMENTAL STUDIES	18	16	1	1	0	0	1	0	
Total		120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A. ENGINEERING CHEMISTRY

1.0 Understand the concept of Atomic structure

- 1.1 Explain the fundamental particles of an atom like electron, proton and neutron etc.,
- 1.2 Explain the concept of atomic number and mass number
- 1.3 State the Postulates of Bohr's atomic theory and its limitations
- 1.4 Explain the concept of Quantum numbers with examples
- 1.5 Explain 1.Aufbau's principle, 2.Hund's rule and 3.Pauli's exclusion principle with respect to electron stability
- 1.6 Define Orbital in an atomic structure
- 1.7 Draw the shapes of s, p and d Orbitals in an atomic structure
- 1.8 Distinguish between Orbit and Orbital
- 1.9 Write the electronic configuration of elements up to atomic number 30
- 1.10 Explain the significance of chemical bonding
- 1.11 Explain the Postulates of Electronic theory of valance
- 1.12 Define the four types of Chemical bonding viz.,Ionic, Covalent, Coordinate and

Metallic

- 1.13 Explain the four types of Chemical bonding viz., Ionic, Covalent, Coordinate and Metallic
- 1.14 Explain bond formation in NaCl and MgO
- 1.15 List Properties of Ionic compounds
- 1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method
- 1.17 List Properties of Covalent compounds
- 1.18 Explain Metallic bond with Electron sea model theory
- 1.18 Define the terms 1. Oxidation, 2. Reduction and 3. Oxidation number
- 1.19 Calculate the Oxidation Number
- 1.20 Differentiate between Oxidation Number and Valence

2.0 Calculate Molarity, Molality and Normality of given Solution

- 2.1 Define the terms 1. Solution, 2. Solute and 3. Solvent
- 2.2 Classify solutions based on physical state and solubility
- 2.3 Define mole
- 2.4 Explain, with examples, the 'Mole concept'
- 2.5 Define the terms 1. Atomic weight, 2. Molecular weight and 3. Equivalent weight
- 2.6 Calculate Molecular weight and Equivalent weight of given Acids, Bases and Salts
- 2.7 Define 1. Molarity, 2. Molality and 3. Normality of solutions
- 2.8 Explain with examples Normality
- 2.9 Solve Numerical problems on Mole, Molarity and Normality

3.0 Understand the concepts of Acids and bases

- 3.1 Explain Arrhenius theory of Acids and Bases
- 3.2 State the limitations of Arrhenius theory of Acids and Bases
- 3.3 Explain Bronsted – Lowry theory of acids bases
- 3.4 State the limitations of Bronsted – Lowry theory of acids bases
- 3.5 Explain Lewis theory of acids and bases
- 3.6 State the limitations Lewis theory of acids and bases
- 3.7 Explain the Ionic product of water
- 3.8 Define pH and explain Sorenson scale
- 3.9 Solve the Numerical problems on pH (Strong Acids and Bases)
- 3.10 Define buffer solution
- 3.11 Give the at least three examples for buffer solutions
- 3.12 State the applications of buffer solution

4.0 Understand the Principles of Metallurgy

- 4.1 List at least eight Characteristics of Metals
- 4.2 Distinguish between Metals and Non Metals
- 4.3 Define the terms 1. Mineral, 2. Ore, 3. Gangue, 4. Flux and 5. Slag
- 4.4 Describe the methods of concentration of ore like 1. Hand picking, 2. Levigation, and 3. Froth Floatation
- 4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
- 4.6 Explain the purification of Metals by Electrolytic Refining
- 4.7 Define an Alloy
- 4.8 Write the Composition of the following alloys: 1. Brass, 2. German silver, and Nichrome

4.9 List the uses of following Alloys: Brass, German silver, Nichrome

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms 1. conductor, 2. Insulator, 3. Electrolyte and 4. Non – electrolyte

5.2 Distinguish between metallic conduction and Electrolytic conduction

5.3 Explain Arrhenius theory of electrolytic dissociation

5.4 Explain electrolysis by taking example fused NaCl

5.5 Explain Faraday's laws of electrolysis

5.6 Define 1. Chemical equivalent and 2. Electrochemical equivalent

5.7 Solve the Numerical problems based on Faraday's laws of electrolysis

5.8 Define Galvanic cell

5.9 Explain the construction and working of Galvanic cell

5.10 Distinguish between electrolytic cell and galvanic cell

5.11 Explain the standard electrode potentials

5.12 Explain the electrochemical series and its significance

5.13 Explain the emf of a cell

5.14 Solve the numerical problems on emf of cell.

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion

6.2 Explain the Factors influencing the rate of corrosion

6.3 Explain the concept of electrochemical theory of corrosion

6.4 Describe the formation of a) composition cells, b) stress cells c) concentration cells

6.5 Explain the mechanism of rusting of iron

6.6 Explain the methods of prevention of corrosion: a) Protective coatings
b) Cathodic protection (Sacrificial anode process and Impressed – voltage process)

7.0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface and sub surface sources

7.2 Define the terms soft water and hard water with respect to soap consumption

7.3 Define the term of hardness of water

7.4 Explain the various types of hardness of water like temporary and permanent hardness; and carbonate and bicarbonate hardness of water.

7.5 List the usual compounds causing hardness (with Formulae)

7.6 State the disadvantages of using hard water in industries

7.7 Define Degree of hardness, units of hardness (mg/L)

7.8 Explain the methods of softening of hard water: a) Ion-Exchange process, b) Reverse osmosis process(RO)

7.9 List the advantages of RO

7.10 State three essential qualities of drinking water like
1). Safety, 2). Economy and 3)..Aesthetic

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerisation a) addition polymerisation of Ethylene b) condensation polymerisation of phenol and formaldehyde (Only flow chart i.e. without chemical equations)

8.3 Define the term plastic

8.4 Classify the plastics with examples

8.5 Distinguish between thermo and thermosetting plastics

- 8.6 List the Characteristics of plastics
- 8.7 State the advantages of plastics over traditional materials
- 8.8 State the disadvantages of using plastics.
- 8.9 Explain the methods of preparation of the following plastics:
1. Polythene, 2. PVC, 3. Teflon, 4. Polystyrene and 5. Urea formaldehyde
- 8.9 Explain the uses of the following plastics:
1. Polythene, 2. PVC, 3. Teflon, 4. Polystyrene and 5. Urea formaldehyde
- 8.10 Define the term natural rubber
- 8.11 State the structural formula of Natural rubber
- 8.12 Explain the processing of Natural rubber from latex
- 8.13 List the Characteristics of natural rubber
- 8.14 Explain the process of Vulcanization
- 8.15 List the Characteristics of Vulcanized rubber
- 8.16 Define the term Elastomer
- 8.17 Describe the preparation of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber
- 8.18 List the uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber

9.0 Understand the concepts of Fuels

- 9.1 Define the term fuel
- 9.2 Classify the fuels based on physical state – solid, liquid and gaseous fuels,
- 9.3 Classify the fuels based on occurrence- primary and secondary fuels
- 9.4 List the characteristics of good fuel
- 9.5 State the composition and uses of gaseous fuels:
a) water gas, b) producer gas, c) natural gas, d) coal gas, e) Bio gas and f) acetylene

B. ENVIRONMENTAL STUDIES

- 1.1 Define the term environment
- 1.2 Explain the scope and importance of environmental studies
- 1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD
- 1.4 Explain the growing energy needs
- 1.5 State the differences between renewable and non renewable energy sources-alternative energy sources.
- 1.6 Define an Ecosystem- biotic component, abiotic component and energy component,
- 1.7 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.
- 1.8 Explain biodiversity and threats to biodiversity
- 1.9 Define air pollution
- 1.10 Classify the air pollutants- based on origin and state of matter
- 1.11 Explain the causes of air pollution
- 1.12 Explain the use and over exploitation of forest resources and deforestation
- 1.13 Explain the effects of air pollution on human beings, plants and animals
- 1.14 Explain the green house effect - ozone layer depletion and acid rain
- 1.15 Explain the methods of control of air pollution
- 1.16 Define water pollution
- 1.17 Explain the causes of water pollution
- 1.18 Explain the effects of water pollution on living and non living things
- 1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds – Metallic bond

Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number- calculations, differences between Oxidation Number and Valency

2. Solutions

Introduction-concentration methods – Mole concept, Molarity, Normality, Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. Acids and Bases

Introduction – theories of acids and bases and limitations – Arrhenius theory-Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water – pH and related numerical problems – buffer solutions –Applications.

4. Principles of Metallurgy

Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell

6. Water technology

Introduction –soft and hard water – causes of hardness – types of hardness –disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis

7. Introduction - factors influencing corrosion - electrochemical theory of corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polyethene 2. PVC 3. Teflon 4. Polystyrene 5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Butyl rubber, Buna-s, Neoprene rubber and their uses.

9. Fuels

Definition and classification of fuels – characteristics of good fuel - composition and uses of gaseous fuels.

B. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – renewable and non renewable energy sources – Concept of ecosystem,

producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

air pollution - causes-Effects – forest resources : uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution –

Water pollution – causes – effects – control measures,

REFERENCE BOOKS

- | | | |
|----|--------------------------------|--|
| 1. | Intermediate chemistry Vol 1&2 | Telugu Acedemy |
| 2. | Intermediate chemistry Vol 1&2 | Vikram Publishers |
| 3. | Intermediate chemistry Vol 1&2 | Vignan Publishers & Deepthi Publishers |
| 4. | Engineering Chemistry | Jain & Jain |
| 5. | Engineering Chemistry | O.P. Agarwal, Hi-Tech. |
| 6. | Engineering Chemistry | Sharma |
| 7. | Engineering Chemistry | A.K. De |

ELECTRICAL ENGINEERING MATERIALS

Subject Title : **Electrical Engineering Materials**
Subject Code : **EE-105**
Periods/Week : **03**
Periods/Year : **90**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1.	Conducting Materials	18	26	02	02
2.	Semi Conducting Material	12	13	01	01
3.	Insulating Materials	15	13	01	01
4.	Di- electric Materials	9	8	01	1/2
5.	Magnetic Materials	9	13	01	1
6.	Special Purpose Materials	9	11	02	1/2
7.	Batteries	18	26	02	02
	Total	90	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the Conducting Materials

- 1.1 Define Conducting Materials
- 1.2 State the properties of conducting materials
- 1.3 Define the terms (i) Hardening (ii) Annealing
- 1.4 Explain the effects of Hardening and Annealing on copper with regard Electrical and Mechanical properties.
- 1.5 State the main requirements of Low Resistivity Materials
- 1.6 State the main requirements of High Resistivity materials.
- 1.7 List some examples of
 - i) Low Resistivity Materials
 - ii) High Resistivity materials
- 1.8 Mention the Properties & Applications of Copper and Aluminium
- 1.9 Distinguish between Copper and Aluminium.
- 1.10 Mention the properties & applications of ACSR Conductors and AAAC.
- 1.11 State the requirements of High Resistive Materials.
- 1.12 State the types of High Resistive Materials.
- 1.13 List the properties & Applications of High Resistive Materials.
 - i) Manganin
 - ii) Eureka
 - iii) Constantan
 - iv) Nichrome
 - v) Tungsten
 - vi) Platinum
 - vii) Mercury
 - viii) Carbon
- 1.14 List the colour codes of the resistors as per BIS.

2.0 Understand the Semi conducting Materials

- 2.1 Define Semi-conducting materials
- 2.2 Understand Semi-conducting materials.
- 2.3 Classify Semi-conducting materials.
- 2.4 Define i) Intrinsic Semi-conductors and ii) Extrinsic Semi-conductors.
- 2.5 Distinguish between Intrinsic and Extrinsic semi-conductors.
- 2.6 Explain the formation of
 - i) P type semi-conductor and
 - ii) N type semi-conductors.
- 2.7 Distinguish between P and N type semi-conductors.

3.0 Comprehend the Insulating Materials

- 3.1 Define Insulating Materials
- 3.2 Draw energy level diagrams of conductors, insulators and semi-Conductors.
- 3.3 Distinguish between conductors, insulators and semi-Conductors
- 3.4 State the important electrical properties of Insulating materials.
 - (i) Insulating resistance (ii) Volume and (iii) Surface resistance
- 3.5 Explain factors affecting insulating resistance.
- 3.6 Classify Insulating materials on the basis of temperature i.e (Y, A, E, B, F, H and C class)
- 3.7 Classify insulating materials.
- 3.8 State the properties of
 - i) Impregnated paper ii) Wood iii) Cardboard
 - iv) Asbestos v) Mica vi) Ceramics and vii) Glass.
- 3.9 List the applications of the above insulating materials.
- 3.10 Explain Thermoplastic & Thermosetting resins with examples.
- 3.11 Explain the properties of PVC
- 3.12 List the applications of PVC.
- 3.13 State the effects of the following on P.V.C
 - (i) Filler (ii) Stabilizer (iii) Plasticizer (iv) Additives.

- 3.14 State the Properties of the following gasses
i) Air (ii) Nitrogen (iii) Hydrogen (iv) Sulphur – Hexafluoride (SF₆).
- 3.15 List the applications of the following gasses
i) Air (ii) Nitrogen (iii) Hydrogen (iv) Sulphur – Hexafluoride (SF₆).

4.0 **Know the Di- electric materials**

- 4.1 Give the Permittivity of commonly used di - electric materials
- | | |
|----------------------|---------------|
| i) Air | ii) Bakelite |
| iii) Glass | iv) Mica |
| v) Paper | vi) Porcelain |
| vii) Transformer oil | |
- 4.2 Explain Polarization.
- 4.3 Explain Dielectric Loss.
- 4.4 List any four the application of Dielectrics.
- 4.5 List the colour codes of the capacitors as per BIS.

5.0 **Know the Magnetic Materials**

- 5.1 Classify the Magnetic Material as:
(i) Ferro (ii) Para (iii) Dia-Magnetic materials with examples
- 5.2 Explain i) Soft Magnetic materials and ii) Hard Magnetic materials
- 5.3 Draw i) B-H. Curves and ii) Hysteresis loop
- 5.4 Explain. Hysteresis loop.
- 5.5 Explain Hysteresis loss and State Steinmetz equation (No-Problems)
- 5.6 Explain Eddy Current Losses
- 5.7 State Curie point
- 5.8 Define Magnetostriction.

6.0 **Understand the Special Purpose Materials**

- 6.1 State the need for protective materials
- 6.2 List the various protective materials like Lead, Paints, Steel Tapes etc.
- 6.3 Explain the thermo couple materials.
- 6.4 State the Bi-metals
- 6.5 State the soldering materials
- 6.6 Define fuse
- 6.7 State the different types of materials used for fuse.
- 6.8 Explain the process of Galvanising and Impregnation
- 6.9 State the use of Enamel coated copper wires (thin, medium and thick).
- 6.10 State the importance of Nano Materials.

7.0 **Comprehend the Batteries**

- 7.1 Classify cells as primary and secondary cells.
- 7.2 Distinguish between primary and secondary cells.
- 7.3 Name the types of storage cells as lead acid, Nickel iron and Nickel Cadmium.
- 7.4 Explain the parts of lead acid battery.
- 7.5 Write chemical reactions during charging and discharging of lead acid battery.
- 7.6 List indications of fully charged lead acid battery.
- 7.7 Explain parts of Nickel – iron cells
- 7.8 Write chemical reactions during charging and discharging of Nickel – iron cell.
- 7.9 State applications of (i) Lead acid battery (ii) Nickel iron cell
(iii) Nickel Cadmium battery.
- 7.10 Compare Lead acid cell with Nickel iron cell.

- 7.11 Explain charging of batteries by i)Constant current method and ii)Constant Voltage method.
- 7.12 State precautions to be taken during charging & discharging of batteries.
- 7.13 Explain trickle charging
- 7.14 State capacity of a battery and factors affecting capacity.
- 7.15 State Ampere- hour efficiency and Watt- hour efficiency of battery
- 7.16 Solve problems on the Ampere – Hour Efficiency and Watt – Hour Efficiency
- 7.17 Define maintenance free battery
- 7.18 Differentiate between maintenance free batteries and lead-acid batteries
- 7.19 Explain the construction and working of maintenance free batteries
- 7.20 State the applications of maintenance free batteries.

COURSE CONTENT

1. Conducting Materials

Hardening, Annealing - Low Resistive Materials – Requirements – Properties and applications of Copper and Aluminum - Comparison between Copper and Aluminum - ACSR Conductors, AAAC, - High Resistive Materials – Requirements- Properties and applications.

2. Semi conducting Materials

Semi-conductors - Intrinsic and extrinsic semi- conductors-`P' and `N' type Materials

3. Insulating Materials

Properties -Insulation resistance - Factors effecting Insulation resistance - Classification of Insulation materials - Properties – Applications.

4. Di- electric materials

Permittivity of di - electric materials- Polarisation - Dielectric Loss – Application of Dielectrics – Colour codes.

5. Magnetic Materials

Classification of magnetic materials - Soft & Hard magnetic materials- B-H Curves - Hysteresis loop - Hysteresis loss - Steinmetz constant - Eddy Current Loss -- Curie Point – Magnetostriction.

6. Special Purpose Materials

Protective materials – Thermocouple - Bi-Metals- Soldering- Fuses -Galvanizing and Impregnating - Nano Materials.

7. Batteries

Primary cell and Secondary cells-Lead acid, Nickel iron and Nickel - cadmium-Chemical reactions during charging and discharging – Charging of Batteries- Constant current method and constant voltage method-Trickle charging - Capacity of Battery - Ampere-hour efficiency and watt-hour efficiency - Maintenance free batteries

REFERENCES

- 1 Electronic Components -Dr. K.Padmanabham
- 2 Electronic Components -D.V.Prasad
- 3 Electrical Engineering Materials – N.I T.T.T.R Publications
- 4 Introduction to Engineering materials – B.K.Agarwal.
- 5 Materials science for Electrical and Electronic Engineers – Ian P.Jones (Oxford Publications)

BASIC ELECTRICAL ENGINEERING

Subject Title : **Basic Electrical Engineering**
Subject Code : **EE-106**
Periods/Week : **05**
Periods/Year : **150**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short questions	Essay questions
1.	Electric Current-Ohm's law, Resistance.	35	26	02	02
2.	Work, Power and Energy	10	13	01	01
3.	Heating effects of electric Current	15	13	01	01
4.	Magnetic effects of Electric current	30	16	02	01
5.	Electromagnetic Induction	35	26	02	02
6.	Electrostatics	25	16	02	01
	Total	150	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Comprehend the basic Principles of Electricity

- 1.1 Distinguish between conductor, insulator and semi-conductor with respect to valence electrons.
- 1.2 State Ohm's Law.
- 1.3 Explain Ohm's Law
- 1.4 List the limitations of Ohms Law.
- 1.5 Explain the concept of Resistance to flow of electrons.
- 1.5 Define the terms i)specific resistance ii)conductance and iii)conductivity.

- 1.6 Deduce the relation $R = (\rho l) / a$
- 1.7 Solve simple problems based on the Ohm's Law & $R = (\rho l) / a$.
- 1.8 State the effect of Alloying on Resistivity.
- 1.9 Explain the effects of temperature on resistance
- 1.10 Develop the expression for resistance at any temperature as $R_t = R_o (1 + \alpha_o t)$
- 1.11 Define temperature co-efficient of resistance and give its unit.
- 1.12 Develop the formula for co-efficient of resistance at any temperature as $\alpha_t = \alpha_o / (1 + \alpha_o t)$
- 1.13 Solve problems based on the $R_t = R_o (1 + \alpha_o t)$ & $\alpha_t = \alpha_o / (1 + \alpha_o t)$.
- 1.14 Develop the expressions for equivalent Resistance with simple series connections.
- 1.15 Develop the expressions for equivalent Resistance with simple parallel connections.
- 1.16 Solve problems on equivalent resistance in the case of series- parallel networks.
- 1.17 Solve problems on division of current when Two Resistors are connected in parallel.

2.0 Explain the concept of work, power & energy

- 2.1 State the S.I. System of units for work, power and energy
- 2.2 Express work, power and energy in Electrical, Mechanical and Thermal Units.
- 2.3 Define efficiency.
- 2.4 Calculate electricity bill for domestic consumers.
- 2.5 Solve problems on work, power and energy in Electrical, Mechanical and Thermal units.

3.0 Appreciate the Heating effects of Electric Current

- 3.1 Explain the Mechanical equivalent of heat.
- 3.2 State the heat produced due to flow of current.
- 3.3 Explain the applications of heat produced due to Electric current in

i) Metal Filament lamps	ii) Electric kettle	iii) Electric cooker	iv) Electric
Iron			
v) Space heaters	vi) Geyser	vii) Infrared lamp.	
- 3.4 Define thermal efficiency.
- 3.5 Solve problems on the above.

4.0 Appreciate the magnetic effects of Electric Current

- 4.1 Draw the lines of force around a magnetic.
- 4.2 Explain the concept of field lines around current carrying conductors
- 4.3 State Right hand thumb rule.
- 4.4 Plot the field pattern due to

i) Straight current carrying conductor	ii) Solenoid	and iii) Toroid.
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- 4.5 Explain Work law and its applications.
- 4.6 State Laplace law (Biot-Savart's Law)
- 4.7 Give expressions for field strength (No derivation)
 - i) At Centre of a circular conductor
 - ii) At any point on the axis of a circular conductor
 - iii) Around a Straight conductor
 - iv) On the axis of a solenoid
- 4.8 Explain the Mechanical force on a current carrying Conductor in a Magnetic field.
- 4.9 Derive an expression for magnitude of the force on a conductor in a magnetic field.
- 4.10 State the Fleming's left hand rule
- 4.11 Derive an expression for the force between two parallel current carrying conductors.
- 4.12 State the nature of the force with different directions of the currents
- 4.13 Define ampere

- 4.14 Solve problems on the above.
- 4.15 Define i) magnetizing force ii) permeability iii) flux and iv) Reluctance
- 4.16 Derive the concept of the Magnetic circuits
- 4.17 Solve problems on simple magnetic circuits
- 4.18 Compare magnetic circuit with electric circuit.
- 4.19 State Magnetic leakage co-efficient.

5.0 Explain Electro Magnetic Induction

- 5.1 State Faraday's laws of electro - magnetic induction.
- 5.2 Explain dynamically and statically induced E.M.F.
- 5.3 State Lenz's law
- 5.4 Explain Fleming's right hand rule.
- 5.5 Explain the concept of self and mutual inductance.
- 5.6 Derive expressions for self and mutual inductance.
- 5.7 State co-efficient of coupling.
- 5.8 Explain the total inductance with series connections with reference to direction of flux.
- 5.9 Develop an expression for energy stored in a magnetic field.
- 5.10 Develop an expression for energy stored per unit volume
- 5.11 Develop an expression for lifting power of a magnet.
- 5.12 Solve problems on the above.

6.0 Comprehend Electric Charge and Electrostatic Field

- 6.1 State Coulomb's law of electrostatics and define unit charge
- 6.2 Define absolute and relative permittivity.
- 6.3 Solve problems on the above
- 6.4 Explain electrostatic field.
- 6.5 Plot electrostatic field due to
 - i) Isolated positive charges
 - ii) Isolated negative charge
 - iii) Unlike charges side by side
 - iv) Like charges side by side
- 6.6 State electric flux, electric flux density and field intensity.
- 6.7 Compare electrostatic and magnetic circuits.
- 6.8 State Gauss theorem.
- 6.9 Explain electric potential and potential difference.
- 6.10 Explain di-electric strength and di-electric constant
- 6.11 Define capacitance and state its unit.
- 6.12 Derive the formula for capacitance of a capacitor.
- 6.13 State different types of capacitors
- 6.14 Give uses of different capacitors
- 6.15 Explain equivalent capacitance of
 - i) Capacitors connected in series;
 - ii) Capacitors connected in parallel
- 6.16 Derive an expression for energy stored in a capacitor
- 6.17 Solve problems on the above

COURSE CONTENT

1. Electric Current - Ohm's Law - Resistance

Conductor, Insulator, semi-Conductor - Electric Potential – Ohm's law – Resistance – Specific Resistance – Conductivity – Temperature coefficient of Resistance – Resistance in series, parallel and series - parallel combinations

2. Work, Power & Energy

Units of work, power and energy. – Conversion of Units-Efficiency

3. Heating Effects of Electrical Current

Mechanical Equivalent of Heat - Heat produced due to flow of current in resistance-applications

4. Magnetic Effects of Electric Current

Lines of force - Field pattern due to long straight current carrying conductor-Field pattern of solenoid and Toroid -Work Law and its applications -Biot Savart Law(Laplace Law) - Field strength at centre and any point on the axis of a circular current carrying conductor- Field Strength around a straight current carrying conductor- Field strength on the axis of a solenoid-Mechanical force on a current carrying conductor in magnetic field - Direction of force - Fleming's left hand rule -Force between two parallel current carrying conductors – Ampere - Magnetic circuit- Magnetising force – permeability - flux - reluctance - Comparison of Magnetic circuit with electric circuit - Magnetic leakage.

5. Electro Magnetic Induction

Faraday's laws - Dynamically and statically induced E.M.F -Lenz's Law & Fleming's right hand rule -Self and mutual inductance - Co-efficient of coupling - Inductances in series -Energy stored in a magnetic field - Energy stored per unit volume - Lifting power of magnet

6. Electrostatics

Atom, Ion, positive and Negative charges -Laws of Electrostatics – coulomb - Permittivity - Electrostatic induction -Electrostatic field - lines of force -Comparison of electrostatic and magnetic lines of force - Strength of electric field- Flux density -Gauss theorem - Electric potential - potential difference –Dielectric strength - Dielectric constant - Capacitance -Capacitor - types - Capacitors in series and parallel- Energy stored in a capacitor.

REFERENCES

1. B.L.Theraja -Electrical Technology Vol.I- S.Chand &co.
2. T.K.Nagsarkar & M.S.Sukhija -Basic Electrical Engineering– Oxford.
3. Hughes-Electrical Technology
4. J.B.Gupta -Electrical Techology Vol.I
5. G.B.Bharadhwajan & A. Subba Rao -Elements of Electrical Engineering.
6. D C Kulshreshtha.-Basic Electrical Engineering .
7. Engineering D.P.Kothari & I.J.Nagarath -Theory and Problems of Basic Electrical -PHI
8. Abhijit Chakrabarthy,Sudipta nath, Chandan Kumar Chada -Basic Electrical Engineering.

ENGINEERING DRAWING

Subject Title	:	Engineering Drawing
Subject Code	:	EE-107 (common to all branches)
Periods/Week	:	06
Periods Per Year	:	180

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	01	-	-	-
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	5	1	-
4	Dimensioning Practice	01	09	5	1	-
5	Geometrical constructions	03	21	15	1	1
6	Projection of points, Lines, Planes & Solids	03	21	10	-	1
7	Auxiliary views	01	06	5	1	-
8	Sectional views	01	27	10	-	1
9	Orthographic Projection	01	33	10	-	1
10	Pictorial drawing	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		14	180	80	04	06

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Pre-Requisite: Clear visualization and sound pictorial intelligence

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the basic concepts of Engineering Drawing

- 1.1 State the importance of drawing as an engineering communication medium
- 1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.
- 1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

2.0 Use of Engineering Drawing Instruments

- 2.1 Select the correct instruments and draw lines of different orientation.
- 2.2 Select the correct instruments and draw small and large Circles.
- 2.3 Select the correct instruments for measuring distances on the drawing.
- 2.4 Use correct grade of pencil for different types of lines, thickness and given function.
- 2.5 Select and use appropriate scales for a given application.
- 2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
- 2.7 Prepare Title block as per B.I.S. Specifications.
- 2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

3.0 Write Free Hand Lettering and Numbers

- 3.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height
- 3.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height
- 3.3 Select suitable sizes of lettering for different layouts and applications
- 3.4 Practice the use of lettering stencils.

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

- 4.1 Define "Dimensioning.
- 4.2 State the need of dimensioning the drawing according to accepted standard.
- 4.3 Identify notations of Dimensioning used in dimensioned drawing.
- 4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
- 4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
- 4.6 Dimension standard features applying necessary rules.
- 4.7 Arrange dimensions in a desired method given in a drawing.
- 4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

Drawing Plate 3: (Having 08 to 10 exercises)

5.0 Apply Principles of Geometric Constructions

- 5.1 Divide a given line into desired number of equal parts internally.
- 5.2 Draw tangent lines and arcs.
- 5.3 Use General method to construct any polygon.
- 5.4 Explain the importance of conics
- 5.5 Construct conics (ellipse, parabola and hyperbola) by general method
- 5.6 Construct ellipse by concentric circles method
- 5.7 Construct parabola by rectangle method
- 5.8 Construct rectangular hyperbola from the given data.
- 5.9 Construct involute from the given data.
- 5.10 Construct cycloid and helix from the given data.
- 5.11 State the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon

Drawing Plate -5: Having problems of construction of conics

Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Apply Principles of Projection of points, lines, planes & solids

- 6.1 Visualize the objects
- 6.2 Explain the I-angle and III-angle projections
- 6.2 Practice the I-angle projections
- 6.3 Draw the projection of a point with respect to reference planes (HP&VP)
- 6.4 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)
- 6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)
- 6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)

Drawing Plate -8: Having problems of projection of planes (6 exercises)

Drawing Plate -9: Having problems of projection of solids (10 exercises)

7.0 Understand the need of auxiliary views

- 7.1 State the need of Auxiliary views for a given engineering drawing.
- 7.2 Draw the auxiliary views of a given engineering component
- 7.3 Differentiate between auxiliary view and apparent view

Drawing plate No.10: (Having 4 exercises)

8.0 Appreciate the need of Sectional Views

- 8.1 Explain the need to draw sectional views.
- 8.2 Select the section plane for a given component to reveal maximum information.
- 8.3 Explain the positions of section plane with reference planes
- 8.4 Differentiate between true shape and apparent shape of section
- 8.5 Draw sectional views and true sections of regular solids discussed in **6.0**
- 8.6 Apply principles of hatching.

Drawing Plate-11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

- 9.1 Explain the principles of orthographic projection with simple sketches.
- 9.2 Draw the orthographic view of an object from its pictorial drawing.
- 9.3 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

- 10.1 State the need of pictorial drawings.
- 10.2 Differentiate between isometric scale and true scale.
- 10.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

- 11.1 State the need for preparing development drawing.
- 11.2 Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.
- 11.3 Prepare development of surface of engineering components like trays, funnel, 90° elbow & rectangular duct.

Drawing plate No. 14: (Having 05 exercises)

Competencies to be achieved by the student

S.No	List of Practical	Competency
1.	Importance of Engineering Drawing	<ul style="list-style-type: none"> • Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	<ul style="list-style-type: none"> • Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	<ul style="list-style-type: none"> • Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	<ul style="list-style-type: none"> • Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	<ul style="list-style-type: none"> • Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	<ul style="list-style-type: none"> • Draw the projection of a point, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	<ul style="list-style-type: none"> • Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	Sectional views	<ul style="list-style-type: none"> • Differentiate between true shape and apparent shape of section • Use conventional representation of Engineering materials as per B.I.S. Code. • Apply principles of hatching. • Draw simple sections of regular solids
9.	Orthographic Projection	<ul style="list-style-type: none"> • Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial drawing	<ul style="list-style-type: none"> • Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
11.	Development of surfaces	<ul style="list-style-type: none"> • Prepare development of Surface of Engineering components like trays, funnel, 90° elbow & rectangular duct.

COURSE CONTENT

NOTE

1. **B.I.S Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate: Lay out of sheet – as per SP-46-1988 to a suitable scale.Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm) Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features “Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.

Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

- i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
- ii)Tangent arc of given radius touching a circle or an arc and a given line.
- iii)Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon: construction of any regular polygon of given side length using general method

Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,

Construction of any conic section of given eccentricity by general method

Construction of ellipse by concentric circles method

Construction of parabola by rectangle method

Construction of rectangular hyperbola

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.

i) Parallel to both the planes.

ii) Perpendicular to one of the planes.

iii) inclined to one plane and parallel to other planes

Projection of regular planes

i) Plane perpendicular to HP and parallel to VP and vice versa.

ii) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids

i) Axis perpendicular to one of the planes

ii) Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

8.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work

-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays, funnels, 90° elbow pipes and rectangular ducts.

REFERENCES

- 1) P I Varghese -Engineering Graphics– McGraw-hill
- 2) Basant Agarwal & C.M Agarwal Engineering Drawing - McGraw-hill
- 3) N.D.Bhatt -Engineering Drawing.
- 4) T.S.M. & S.S.M on “ Technical Drawing” prepared by T.T.T.I., Madras.
- 5) SP-46-1998 – Bureau of Indian Standards.

Subject Title : **Basic Electrical & Electronics Laboratory Practice**
Subject Code : **EE-108**
Periods/Week : **06**
Periods/Year : **180**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Wiring tools and Accessories	15
2.	Electrical Wiring Joints	21
3.	Lamp Circuits	33
4.	Soldering Practice	15
5.	AC and DC circuits	21
6.	Resistance Measurement	21
7.	Capacitance Measurement	21
8.	Battery voltage measurement	15
9.	Piping and Thread cutting skills	18
Total		180

OBJECTIVES

Upon completion of the practice the student shall be able to

1.0 Handle the Wiring Tools and Accessories

- 1.1 Identify the following electrical wiring tools with respect to
 - i)size ii)shape iii)purpose iv)speed and v) use .
 - a) Screw drivers
 - b) Pliers
 - c) Drilling machines & Drilling Bits.
 - d) Rawl plug jumper, and poker
 - e) Voltage/line tester
 - f) Splicers (insulation remover)
 - g) Standard Wire gauge
- 1.2 Identify different types of Electrical Wiring accessories with respect to
 - i)size ii)shape iii)purpose and iv) Use.
 - a) Switches
 - b) Ceiling roses
 - c) Lamp holders and adopters
 - d) Sockets
 - e) Plug
 - f) Fuses
- 1.3 Identify different types of main switches with respect to
 - i)rating ii) Purpose and iii)Use.
 SP,DP mains, TP,ICDP, ICTP, SPDT, DPDT, TPDT, Changeover-Knife type/globular, Rotary, micro, modular switches.
- 1.4 Study of 2-pole and 3-pole MCB's with respect to rating, purpose, And Use etc.
- 1.5 Study different types of wires and cables (1/18,3/20,7/20) with respect to sizes ,rating,

Purpose and Use etc

2.0 Prepare Electrical Wiring Joints

- 2.1 Prepare straight joint/ Married joint
- 2.2 Prepare T joint
- 2.3 Prepare Western union joint
- 2.4 Prepare pigtail joint

3.0 Practice Lamp Circuits

- 3.1 Make a circuit with One lamp controlled by one switch with PVC surface conduit system
- 3.2 Make a circuit with Two lamps controlled by two switches with PVC surface conduit system
- 3.3 Make a circuit with One lamp controlled by one switch and provision of 2/3-pin socket.
- 3.4 Make a circuit for Stair case wiring
- 3.5 Make a circuit for Godown wiring
- 3.6 Make a circuit for Electrical bell connection.

4.0 Practice Soldering

- 4.1 Get familiarized to use of various soldering tools and components
- 4.2 Solder simple electronic circuits with P.C.B

5.0 Demonstrate difference between AC and DC.

- 5.1 Demonstrate unidirectional current flow with 12 V battery
- 5.2 Determine polarity using a Voltmeter /LED
- 5.3 Demonstrate reversal of current using battery and DPDT switch
- 5.4 Make an Electromagnet and testing it on a DC power supply
- 5.5 Demonstrate AC using a Low voltage Transformer
- 5.6 Practice Series and parallel connection of lamps
- 5.7 Practice Bright and Dim light arrangement (using a series lamp / using a Diode)

6.0 Practice Resistance measurement

- 6.1 Identify different types of resistors
- 6.2 Calculate Resistance by its colour code
- 6.3 Measuring the resistance using multimeter
- 6.4 Connecting resistors in series and parallel and measuring the resistance using multimeter
- 6.5 Practice Rheostat connections

7.0 Practice Capacitor measurement

- 7.1 Identify different types of capacitors
- 7.2 Find the value/specifications of capacitor from Value printed and Color code
- 7.3 Demonstrate that capacitor can hold charge ,charging and discharging require a specific time.
- 7.4 Investigate the effect of connecting capacitors in series and parallel
- 7.5 Testing the capacitor Using multimeter,

8.0 Practice Battery voltage measurement

- 8.1 Measurement of Battery Voltage using Voltmeter and Multimeter

- 8.2 Connecting batteries in series and parallel and observing the output voltage using Voltmeter and DMM
- 8.3 Measurement of current supplied by Battery using ammeter and Multimeter with rheostat as load
- 9.0 Develop Piping and Thread cutting skills**
- 9.1 Cut a metal conduit, G.I. pipe and solid using hack saw
- 9.2 Practice Thread cutting G.I. pipe metal conduit and solid rod using Die set
- 9.3 Practice Internal thread cutting using Tap set reamers
- 9.4 Practice Thread Cleaning
- 9.5 Make a hexagonal nut from a round rod
- 9.6 Practice Thread cutting PVC pipe metal conduit using Die set.
- 9.7 Practice Internal thread cutting using Tap set reamers

Competencies to be achieved by the Student

S.No	Experiment title	Competencies
1	Handle the different wiring a) tools and accessories b) select switches, and MCB's c) Identify wires and cables as per the requirements of the load.	<ul style="list-style-type: none"> Identify the size and specifications of various tools used for electrical wiring. Understand the usage of the standard wire gauge. Identify the type, size and specifications of DP mains,
2.1	To prepare a Straight joint/Married joint using a 7/20 Al. Cable	<ul style="list-style-type: none"> Identify the size of the cable Perform splicing of Insulation properly. Perform Straight joint/Married joint
2.2	To prepare a T joint using a 7/20 Al. Cable	<ul style="list-style-type: none"> Insert the leads of the wires properly as per the sketches. Twist the wires properly.
2.3	To prepare a Western union joint using a single strand Al. Cable	<ul style="list-style-type: none"> Overlap the two wires properly Twist the binding wires properly
2.4	To prepare a pig tail joint using a single strand Copper Cable	<ul style="list-style-type: none"> Place the wires in V-shape. Twist the wires in clock wise direction.
3.1	To control one lamp by one 1-way switch with PVC surface conduit wiring system	<ul style="list-style-type: none"> Draw wiring diagram Identify the size of cable, PVC pipe, type of 1-way switch and lamp holder. Make Connections as per Wiring Diagram
3.2	To control two lamps by two 1-way switches with PVC surface conduit wiring system	<ul style="list-style-type: none"> Draw wiring diagram Handle the screw driver, electrician Knife, line tester to fix the PVC pipe using saddles and junction boxes. Select colour and length of wire for phase and neutral Switch on the supply after making of the connections Disconnect the circuit after testing.

3.3	To control one lamp and 2/3 pin socket by two 1-way switches with PVC surface conduit wiring system	<ul style="list-style-type: none"> • Connect 2/3 pin socket properly with respect to phase, neutral and earth. • Connect phase wire through switches.
3.4	Stair-case wiring	<ul style="list-style-type: none"> • Select two 2-way switches • Connect 2-way switches as per circuit diagram. • Test with 1-phase, 230V, 50 Hz supply to the circuit connected through ICDP switch.
3.5	Godown wiring scheme	<ul style="list-style-type: none"> • Draw wiring diagram • Connect the circuit as per the diagram. • Observe sequence of operation of switches • Test with 1-phase, 230 V, 50 Hz supply to the circuit, neutral wire to the bottom point of the 1-way switch and phase to the first point of lamp holder
3.6	To control Electrical Bell	<ul style="list-style-type: none"> • Connect the bell through ceiling rose properly. • Make ceiling rose connections properly
4.0	Soldering Practice Of Simple Electronic Circuit	<ul style="list-style-type: none"> • Proper use of Lead and Flux • Maintain proper temperature of soldering iron.
5.0	Demonstrate difference between AC and DC	<ul style="list-style-type: none"> • Connect DC source and measure V & I • Connect proper AC source and measure V & I • Make inferences.
6.0	Practice Resistance measurement	<ul style="list-style-type: none"> • Identifying resistor based on the colour code. • Measuring resistance using multi meter.
7.0	Practice Capacitor measurement	<ul style="list-style-type: none"> • Identifying capacitor based on the colour code. • Handling multimeter.
8.0	Practice Battery voltage measurement	<ul style="list-style-type: none"> • Handling multimeter • Handling Rheostats
9.0	Develop Piping and Thread cutting skills	<ul style="list-style-type: none"> • Identify the size of the rods to be joined. • Perform thread cutting as per the order • Perform thread Cleaning

Reference

1. Electrical work shop By R.P.Singh
2. Experiments in Basic Electrical Engineering by S.K.Bhattacharya , Rastogi- NAI.

PHYSICS LAB PRACTICE

Subject Title	:	Physics Lab Practice
Subject Code	:	EE-109A (common to all branches)
Periods per week	:	03
Total periods per year	:	45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	45

Objectives:

Upon completion of the course the student shall be able to

- 1.0 Practice the Vernier caliper to determine the volume of a cylinder and sphere
- 2.0 Practice the Screw gauge to determine thickness of a glass plate and cross section of a wire
- 3.0 Verify the parallelogram law and Triangle law
- 4.0 Determine the value of acceleration due to gravity using Simple Pendulum
- 5.0 Determine the velocity of sound in air at room temperature
- 6.0 Determine the Focal length and focal power of convex lenses using U-V method
- 7.0 Determine the refractive index of a solid using travelling microscope
- 8.0 Determine the surface tension of a liquid using travelling microscope
- 9.0 Determine the viscosity of a liquid using capillary method
- 10.0 Verify the Boyle's law employing a Quill tube
- 11.0 Determine the specific resistance of wire material using Meter Bridge
- 12.0 Practice the mapping of magnetic lines of force

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(03)	<ul style="list-style-type: none"> • Find the Least count • Fix the specimen in posit • Read the scales • Calculate the volume of given object 	<ul style="list-style-type: none"> • Read the scales • Calculate the volume of given object

<p>2. Hands on practice on Screw gauge(03)</p>	<ul style="list-style-type: none"> • Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass plate and cross section of wire 	<ul style="list-style-type: none"> • Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire
<p>3. Verification of Parallelogram law of forces and Triangle law of forces(03)</p>	<ul style="list-style-type: none"> • Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios 	<ul style="list-style-type: none"> • Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
<p>4. Simple pendulum(03)</p>	<ul style="list-style-type: none"> • Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw I-T and I-T² graph 	<ul style="list-style-type: none"> • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw I-T and I-T² graph
<p>5. Velocity of sound in air –Resonance method (03)</p>	<ul style="list-style-type: none"> • Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonating lengths • Calculate velocity of sound 	<ul style="list-style-type: none"> • Adjust the reservoir level • Find the first and second resonating lengths • Calculate velocity of sound • Calculate velocity of sound at 0⁰ C
<p>6. Focal length and Focal power of convex lens (Separate & Combination) (03)</p>	<ul style="list-style-type: none"> • Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v curves 	<ul style="list-style-type: none"> • Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graph

7. Refractive index of solid using traveling microscope(03)	<ul style="list-style-type: none"> • Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab 	<ul style="list-style-type: none"> • Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope(03)	<ul style="list-style-type: none"> • Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water 	<ul style="list-style-type: none"> • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
9. Coefficient of viscosity by capillary method(03)	<ul style="list-style-type: none"> • Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method 	<ul style="list-style-type: none"> • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water
10. Boyle's law verification (03)	<ul style="list-style-type: none"> • Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value $P \times l$ 	<ul style="list-style-type: none"> • Find the length of air column • Find the pressure of enclosed air • Find the value $P \times l$
11. Meter bridge(03)	<ul style="list-style-type: none"> • Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance 	<ul style="list-style-type: none"> • Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force(03)	<ul style="list-style-type: none"> • Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines 	<ul style="list-style-type: none"> • Draw magnetic lines of force • Locate the neutral points

CHEMISTRY LAB PRACTICE

Subject Title	:	Chemistry Lab Practice
Subject Code	:	EE-109B(common to all branches)
Periods per week	:	03
Total periods per year	:	45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. KMnO_4	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	45

Objectives:

Upon completion of the course the student shall be able to

- 1.0 Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.
- 2.0 Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.
- 3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl
- 4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH
- 5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4
- 6.0 Conduct titrations adopting standard procedures and using Std. KMnO_4 solution for estimation of Mohr's Salt
- 7.0 Conduct titrations adopting standard procedures to determine the acidity of given

- samples of water (One ground water and one surface / tap water, and rain water if available)
- 8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)
 - 9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution
 - 10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)
 - 11.0 Conduct the test using titrimetric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)
 - 12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter
 - 13.0 Conduct the test on given samples of water / solutions
 - a) To determine conductivity
 - b) To adjust the ionic strength of the sample to the desired value
 - 14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU
 - 15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
Familiarization of methods for Volumetric analysis (03)	--	--
Preparation of Std Na_2CO_3 and making different diluted solution (03)	<ul style="list-style-type: none"> ▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions 	<ul style="list-style-type: none"> ▪ Weighting the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Estimation of HCl solution using Std. Na_2CO_3 solution (03)	<ul style="list-style-type: none"> ▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the 	<ul style="list-style-type: none"> ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant
Estimation of NaOH using Std. HCl solution (03)		
Estimation of H_2SO_4 using Std. NaOH solution (03)		

Estimation of Mohr's Salt using Std. KMnO_4 (03)		<ul style="list-style-type: none"> ▪ Identifying the end point
Determination of acidity of water sample (03)	<ul style="list-style-type: none"> ▪ flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results 	<ul style="list-style-type: none"> ▪ Making accurate observations
Determination of alkalinity of water sample (03)		
Determination of total hardness of water using Std. EDTA solution (03)		
Estimation of Chlorides present in water sample (03)		
Estimation of Dissolved Oxygen (D.O) in water sample (By titration method) (03)		
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method) (03)	<ul style="list-style-type: none"> ▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions 	<ul style="list-style-type: none"> ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Determination of pH using pH meter (03)		
Determination of conductivity of water and adjusting ionic strength to required level (03)		
Determination of turbidity of water (03)		
Estimation of total solids present in water sample (03)	<ul style="list-style-type: none"> ▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven 	<ul style="list-style-type: none"> ▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDAMENTALS LAB PRACTICE

Subject Title : **Computer Fundamentals Laboratory Practice**
Subject Code : **EE-110 (common to all branches)**
Periods/Week : **03**
Periods/Year : **90**

List of Experiments:

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	01	03
II.	Windows Operating System	02	06
III.	MS Word	09	27
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
Total		30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to widespread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a).To Familiarize with Computer system and hardware connections
b).To start and Shut down Computer correctly
c). To check the software details of the computer
2. To check the hardware present in your computer

II. Windows's operating system (Not for end examination)

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells

15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	<ol style="list-style-type: none"> a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse 	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	<ol style="list-style-type: none"> a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board 	<ol style="list-style-type: none"> a. Login and logout as per the standard procedure b. Operate mouse & Key Board
1 (c).	To Explore Windows Desktop	<ol style="list-style-type: none"> a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support 	<ol style="list-style-type: none"> a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	<ol style="list-style-type: none"> a. Find the details of Operating System being used b. Find the details of Service Pack installed 	Access the properties of computer and find the details
3.	To check the hardware present in your computer	<ol style="list-style-type: none"> a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board 	<ol style="list-style-type: none"> a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required

		<ul style="list-style-type: none"> d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar 	
4.	Working with Files and Folders	<ul style="list-style-type: none"> a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin 	<ul style="list-style-type: none"> a. Create files and folders Rename , arrange and search for the required folder/file b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	<ul style="list-style-type: none"> a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint 	<ul style="list-style-type: none"> a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References- Review-View	<ul style="list-style-type: none"> a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options 	<ul style="list-style-type: none"> a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	<ul style="list-style-type: none"> a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS-word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar 	<ul style="list-style-type: none"> a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.

8.	To practice Formatting techniques	<ul style="list-style-type: none"> a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer 	<ul style="list-style-type: none"> a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers
9.	To insert a table of required number of rows and columns	<ul style="list-style-type: none"> a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table –marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order 	<ul style="list-style-type: none"> a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	<ul style="list-style-type: none"> a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table. 	<ul style="list-style-type: none"> a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	<ul style="list-style-type: none"> a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes. 	Use Mail merge feature
12.	To use Equations and symbols features.	<ul style="list-style-type: none"> a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document 	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS- EXCEL	<ul style="list-style-type: none"> a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- Ribbon-Worksheets- Formula Bar-Status Bar 	<ul style="list-style-type: none"> a. Familiarize with excel layout and use b. Use various features available in toolbar
10.	To Insert objects, clipart and Hyperlinks	<ul style="list-style-type: none"> d. Create a 2-page document. &Insert hyperlinks and t Bookmarks. e. Create an organization chart f. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table. 	<ul style="list-style-type: none"> a) Insert hyperlinks &Bookmarks b) Create organization charts/flow charts
11.	To Use Mail merge feature	<ul style="list-style-type: none"> c. Use mail merge to prepare individually addressed letters 	Use Mail merge feature

	of MS Word	d. Use mail merge to print envelopes.	
12.	To use Equations and symbols features.	d. Explore various symbols available in MS Word e. Insert a symbol in the text f. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	c. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button-Ribbon-Worksheets- Formula Bar-Status Bar d. Use Quick Access Toolbar- Title Bar-	a) Familiarize with excel layout and use b) Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit
15.	To edit spreadsheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column	a. Format Excel sheet b. Insert headers & footers and print

		<ul style="list-style-type: none"> d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print 	
21.	To familiarize with Ribbon layout & features of PowerPoint 2007.	Use various options in Home, insert, design, animation, slideshow, Review & View in the PowerPoint	Access required options in the tool bar
22.	To create a simple PowerPoint Presentation	<ul style="list-style-type: none"> a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide 	<ul style="list-style-type: none"> a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	<ul style="list-style-type: none"> a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation 	<ul style="list-style-type: none"> a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	<ul style="list-style-type: none"> a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects 	<ul style="list-style-type: none"> Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	<ul style="list-style-type: none"> a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art 	Create organizational charts and flow charts using smart art
26.	To insert a Table	<ul style="list-style-type: none"> a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend 	Insert tables and format
27.	To insert a Charts/Graphs	<ul style="list-style-type: none"> a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart i. Format a Chart Background 	Create charts and Bar graphs, Pie Charts and format.
28.	To Insert audio & video, Hyper links in	<ul style="list-style-type: none"> a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings 	<ul style="list-style-type: none"> a. Insert Sounds and Video in appropriate format. b. Add narration to the slide

	a slide Add narration to the slide	c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like <i>Entrance, Emphasis, Motion Paths &Exit</i>	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

**DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
(FIRST YEAR)**

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical /Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
ME-101	English	3	-	90	3			100
ME-102	Mathematics - I	5	-	150	3			100
ME-103	Engineering Physics	4	-	120	3			100
ME-104	Engineering Chemistry & Environmental Studies	4	-	120	3			100
ME-105	Engineering Mechanics	4	-	120	3			100
ME-106	Workshop Technology	4	-	120	3			100
PRACTICAL:								
ME-107	Engineering Drawing	-	6	180	3			100
ME-108	Basic Work shop practice	-	6	180	3			100
ME-109	109-A Physics Lab 109-B Chemistry Lab	-	3	90	3 (1.5+1.5)			100 (50+50)
ME-110	Comp. fundamentals practice	-	3	90	3			100
TOTAL		24	18	1260				1000

ENGINEERING MECHANICS

Subject Title	:	Engineering Mechanics
Subject Code	:	M-105
Periods/Week	:	04
Periods per year	:	120

TIME SCHEDULE

S No.	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1	Statics	22	21	02	1 ½
2	Friction	18	16	02	01
3	Geometrical properties of sections	22	18	01	1 ½
4	Dynamics	28	26	02	02
5	Simple machines	20	21	02	1 ½
6	Basic Link Mechanisms	10	08	01	½
	Total	120	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to

1.0 Understand the concept of Statics

- 1.1 Explain the meaning of mechanics in engineering.
- 1.2 Understand the importance of mechanics in engineering.
- 1.3 Review the system of units used.
- 1.4 Understand the concept of force, types of forces and force systems
- 1.5 Understand the concept of equilibrium
- 1.6 Explain the parallelogram law of forces, triangle law of forces, polygon law of forces and Lami's theorem.
- 1.7 Understand the concept of free body diagram
- 1.8 Solve the problems involving concurrent coplanar forces
- 1.9 State the term couple and moment of couple with legible sketch.
- 1.10 State the condition of equilibrium of a body acted upon by co-planar forces.
- 1.11 Solve simple problems involving non-concurrent coplanar forces

2.0 Understand the concept of Friction

- 2.1 Understand the concept of friction
- 2.2 State the laws of friction
- 2.3 Identify the machine members in which friction exists and desirable
- 2.4 Resolve the forces acting on bodies moving on horizontal plane.
- 2.5 Resolve the forces acting on bodies moving along the inclined planes.
- 2.6 Solve the related numerical problems

3.0 Understand the Geometric Properties of Sections

- 3.1 Define the terms Centre of Gravity, Centre of Mass and Centroid.
- 3.2 Locate the C.G. of a given section.
- 3.3 Explain the meaning of the term moment of Inertia.
- 3.4 State perpendicular axis theorem
- 3.5 State Parallel axis theorem
- 3.6 Prove perpendicular axis theorem
- 3.7 Prove Parallel axis theorem
- 3.8 Calculate the moment of Inertia of composite sections.
- 3.9 Explain the term radius of gyration.

4.0 Understand the concept of Dynamics

- 4.1 Define the terms Kinematics and Kinetics
- 4.2 Classification of motion
- 4.3 Define the terms displacement, velocity and acceleration
- 4.4 State the Newton's Laws of motion (without derivation)
- 4.5 Solve the problems related to the rectilinear motion of a particle
- 4.6 Explain the Motion of projectile
- 4.7 Solve the numerical problems
- 4.8 D'Alembert's principle
- 4.9 Define Law of conservation of energy
- 4.10 Explain the Work-Energy principle
- 4.11 Define the Law of conservation of momentum
- 4.12 Explain the Impulse –momentum equation
- 4.13 Solve the problems using the above principles
- 4.14 Explain the Rotary motion of particle
- 4.15 Define Centripetal force.
- 4.16 Define Centrifugal force.
- 4.17 Differentiate Centripetal and Centrifugal forces
- 4.18 Describe simple harmonic motion.
- 4.19 Explain the application of simple harmonic motion in engineering.

5.0 Comprehend the Principles involved in Simple Machines

- 5.1 Define the terms Machine, Mechanical Advantage, Velocity Ratio and Efficiency.
- 5.2 Illustrate the use of three classes of simple lever.
- 5.3 Show that an inclined plane is a simple machine to reduce the effort in lifting loads.
- 5.4 Derive expression for VR in cases of wheel & axle, Weston Differential pulley blocks, pulleys, Worm & Worm wheel crabs, screw jack, rack & pinion.
- 5.5 Compute the efficiency of a given machine.
- 5.6 Compute effort required to raise or lower the load under given conditions.
- 5.7 Interpret the law of machine.
- 5.8 State the conditions for self-locking and reversibility.
- 5.9 Calculate effort lost in friction and load equivalent of friction.
- 5.10 Evaluate the conditions for maximum M.A. & Maximum efficiency.

6.0 Understand the concept of Basic Link mechanism

- 6.1 Define terms like link, kinematics pair, kinematic chain, Mechanism & machine
- 6.2 Explain kinematic pair and kinematic chain with the help of legible sketch
- 6.2 List examples for Lower and Higher pairs.
- 6.3 List examples of inversion.

COURSE CONTENT

1.0 Statics

- 1.1 The meaning of word mechanics.
- 1.2 Application of Mechanics to Engineering.
- 1.3 System of Units.
- 1.4 Definition and specification of force
- 1.5 System of forces
- 1.6 Resolution of force
- 1.7 Equilibrium and Equilibrant.
- 1.8 Statement of Parallelogram law of forces, triangle law of forces, polygon law of forces and Lami's theorem
- 1.9 Drawing the free body diagram
- 1.10 Numerical problems related to concurrent coplanar forces
- 1.11 Couple and moment of a couple
- 1.12 Condition for equilibrium of a rigid body subjected to number of coplanar non-concurrent forces.
- 1.13 Related Numerical problems

2.0 Friction

- 2.1 Definition of static friction, dynamic friction and impending friction
- 2.2 laws of solid and liquid friction
- 2.3 Derivation of limiting angle of friction and angle of repose
- 2.4 Resolution of Forces considering Friction when a body moves on horizontal plane.
- 2.5 Resolution of Forces considering Friction when a body moves on inclined plane.
- 2.6 Numerical examples on the above cases

3.0 Geometric Properties of Sections

- 3.1 Definition and explanation of the terms Centre of Gravity, Centre of Mass and centroid
- 3.2 Centroid of square, rectangle, triangle, semi-circle and trapezium (formulae only without derivations)
- 3.3 Centre of gravity of composite sections by analytical method only (T-Section, L-Section I-section and channel section).
- 3.4 Moment of Inertia.
 - a) Definition and Explanation.
 - b) Theorems of Moment of Inertia.
 - i) Parallel axes theorem.
 - ii) Perpendicular axes theorem.
 - c) Moment of Inertia for simple Geometrical Sections, Rectangular, circular and triangular section
 - d) Radius of Gyration.

- 3.5 Calculation of Moment of Inertia and Radius of Gyration of
 - a) I – Section.
 - b) Channel Section.
 - c) T – Section.
 - d) L – Section (Equal & unequal lengths)
 - e) Built up Sections (Simple cases only)

4.0 Dynamics

- 4.1 Defination of Kinematics and Kinetics
- 4.2 Classification of motion
- 4.3 Defination of displacement, velocity and acceleration
- 4.4 Laws of motion (without derivation)
- 4.5 Solving the problems related to the rectilinear motion of a particle
- 4.6 Motion of projectile and solving the numerical problems
- 4.7 Newton’s laws of motion.
- 4.8 D’Alembert’s principle
- 4.9 Defination Law of conservation of energy
- 4.10 Work-Energy principle
- 4.11 Law of conservation of momentum
- 4.12 Impulse –momentum equation
- 4.13 Solving the kinetic problems using the above principles
- 4.14 Rotary motion of particle and laws of motion
- 4.15 Definition and Differentiate Centripetal and Centrifugal forces.
- 4.16 Simple harmonic motion.
- 4.17 Definition of the terms frequency, time period, amplitude and circular frequency
- 4.18 SHM equation, natural frequency
- 4.19 Simple problems on SHM

5.0 Simple Machines

- 5.1 Definition of Simple machine, and uses of simple machine, levers and inclined plane.
- 5.2 Fundamental terms like mechanical advantage, velocity ratio and efficiency.
- 5.3 Expressions for VR in case of Simple/Differential pulley/pulleys of 3 systems, Worms and Worm wheel, Rack and pinion, Winch crabs, &Screw jack.
- 5.4 Conditions for reversibility and self locking.
- 5.5 Law of Simple Machine.
- 5.6 Effort lost in friction, Load Equivalent of Friction Max. M.A. and Max. efficiency.

6.0 Basic Link Mechanism

- 6.1 Definition of terms: link, kinematic pair, kinematic chain, mechanism, structure and machine.
- 6.2 Quadric cycle chain and its inversions.
- 6.3 Slider Crank chain and its inversion.

REFERENCE BOOKS:

1	Engineering Mechanics	by	Singer	B.S.Publications
2	Engineering Mechanics	by	Basudeb Bhattacharya –	Oxford Publishers
3	Engineering Mechanics	by	A Nelson	Mc Graw Hill Publishers
4	Engineering Mechanics	by	I.B.Prasad	
5	Engineering Mechanics	by	R.S.Khurmi	S.Chand & Comp
6	Theory of Machines	by	S.S.Rathan	TMH P

WORKSHOP TECHNOLOGY

Subject Title	:	Workshop Technology
Subject Code	:	M - 106
Periods per Week	:	04
Periods per Year	:	120

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Basic Workshop tools & operations				
	(1) Carpentry	20	16	2	1
	(2) Fitting	25	26	2	2
	(3) Forging	15	13	1	1
	(4) Sheet metal	12	13	1	1
2	Drilling	10	13	1	1
3	Foundry	22	16	2	1
4	Mechanical working of metals	16	13	1	1
	Total	120	110	10	08

OBJECTIVES

Up on completion of the course the student shall be able to comprehend the following

1. Comprehend the use of Basic workshop tools and its operation

- State the importance of workshop processes.
- List the various workshop processes and explain briefly about each.

1.1 Carpentry

- Identify various carpentry tools.
- Distinguish between marking tools, measuring tools and cutting tools.
- List work holding devices.
- Explain wood working processes viz., sawing, chiselling and planning.
- Explain the use of carpentry joints such as lap joint, dovetail joint, mortise and tenon joint with legible sketch
- Explain the working of wood working machines.

1.2 Fitting

- List various fitting tools.
- Distinguish between marking and measuring tools.
- List cutting tools.
- List various work holding devices.
- List various checking and measuring instruments.

- f. Explain fitting operations such as marking, sawing, chipping, filing, grinding, drilling and tapping with legible sketch

1.3 Forging

- a. List various tools used in black-smithy.
- b. List equipment used in a forging shop.
- c. Explain the important smithy operations
- d. Explain the working principle of machine forging
- e. Explain machine forging operations such as upsetting, drawing down and punching with legible sketch
- f. Explain the working principle of forging press with legible sketch.
- g. List the forging defects

1.4 Sheet Metal

- a. List various marking tools in sheet metal work
- b. List various stakes
- c. List various measuring tools used in sheet metal work.
- d. List various sheet metal joints.
- e. Describe sheet metal operations such as shearing, bending, drawing and squeezing.
- f. Differentiate between riveting, soldering & brazing.

2. Drilling

- 2.1 State the working principle of drilling.
- 2.2 List out different types of drilling machines.
- 2.3 Draw the line diagrams of the sensitive and radial drilling machines.
- 2.4 Identify the parts of these machines.
- 2.5 Describe the functions of each part.
- 2.6 Specifications of drilling machines.
- 2.7 Write the nomenclature of the drill bit.
- 2.8 Write the geometry of twist drill.
- 2.9 List the functions of twist drill elements.
- 2.10 List the different operations on drilling machine.

3. Foundry

- 3.1 Acquaint with foundry as a manufacturing process.
- 3.2 State the advantages of casting over other process.
- 3.3 State the limitations of the process.
- 3.4 List the various hand moulding tools.
- 3.5 State the properties of good moulding sand.
- 3.6 State the types of moulding sands. List the ingredients in foundry sand.
- 3.7 List the various types of patterns.
- 3.8 State the sequence of pattern making operations.
- 3.9 Identify the colour codes.
- 3.10 List out the various moulding processes.

- 3.11 State the need and types of cores.
 - 3.12 Describe the casting processes.
 - 3.13 Identify the defects in casting.
 - 3.14 Describe special casting processes.
- 4. Mechanical working of metals**
- 1.1 Define mechanical working of metals.
 - 1.2 Differentiate cold working with hot working.
 - 1.3 Illustrate the working principle of hot rolling, piercing, spinning, extrusion and drawing.
 - 1.4 State advantages and limitations of hot working.
 - 1.5 Identify various cold working processes such as rolling, bending and squeezing.
 - 1.6 State advantages and limitations of cold working.

COURSE CONTENT

1 Introduction

Methods of manufacturing processes - casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop processes - carpentry, fitting, hand forging, machine forging, sheet metal work, cold and hot working of metals.

1.1 Carpentry

1.1.1 **Marking & measuring tools:** scales, rules, fourfold wooden rule, flexible measuring rule (tape), straight edge, try square, bevel square, combination square, marking knife, marking gauge, mortise gauge, cutting gauge, wing compass, trammel, divider, outside calliper, inside calliper, odd leg calliper, spirit level, plum bob, specifications- uses.

1.1.2 Cutting Tools

Saws: rip saw, cross cut saw (hand saw), panel saw, tenon or back saw, dovetail saw, bow saw, coping saw, compass saw, pad or keyhole saw, specifications & uses.

Chisels: Firmer chisel, bevelled edge firmer chisel, parting chisel, mortise chisel, inside and outside gauges, specifications and uses.

Planes: Jack plane (wooden jack plane, metal jack plane), rough plane, smoothing plane, rebate plane, plough plane, router, spoke shave, special planes and their specifications and uses.

Boring Tools:

Gimlet, braces- wheel brace, ratchet brace, bit-shell bit, twist bit (auger bit), expansive bit, centre bit, router bit, countersink bit, drill, reamer their specifications & uses.

1.1.3 Striking tools:

Hammers - Warrington hammer, claw hammer, mallet, specifications & uses.

1.1.4 Holding devices

Bench vice, bench stop, bench hold fast, sash cramp (bar cramp) G- cramp, Hand screw, specifications & uses.

- 1.1.5 **Miscellaneous tools**
Rasps and files, scraper, oilstone, glass paper, pincer, screw driver, cabinet screw driver, ratchet-screw driver, saw set, oil stone slip. specifications and uses.
- 1.1.6 **Carpentry Processes**
Marking, measuring, sawing, chiselling, planning, boring, grooving, rebating & moulding.
- 1.1.7 **Carpentry joints**
Halving Joint, mortise and tenon joint, bridle joint, butt joint. dowel joint, tongue & groove joint, screw & slot joint, dovetail joint, corner joint.
- 1.1.8 **Wood working machines**
Wood working lathe (wood turning lathe), circular saw, band saw, wood planer, sanding machine, belt sander, spindle sander, disc sander and grinder, specifications and uses.

1.3 **Fitting**

- 1.3.1 **Cutting tools**

Chisels: Flat chisel, cross cut chisel, half round chisel, diamond point chisel, side chisel, specifications and uses.

Files: Different parts of a file – sizes and shapes - flat file, hand file, square file, pillar file, round file, triangular file, half round files, knife edge file, needle file – specifications and uses.

Scrapers: Flat, triangular, half round scrapers, specifications & uses.

Saws: Hand hacksaw - solid frame, adjustable frame, specifications & uses, hand hacksaw blades. Power hack saw – description(horizontal reciprocating type), power hacksaw blade, specifications and uses, teeth set - saw material.

Drill bits: Flat drill, straight fluted drill, twist drill, parallel shank, tapered shank, specifications & uses.

Reamer: Hand reamer, machine reamer, straight and spiral flutes reamers, specifications and uses.

Taps: Hand taps - taper tap, plug tap and bottoming tap, specifications and uses.

Dies & Sockets: Dies- solid, adjustable - specifications and uses.
- 1.3.2 **Striking Tools**
Hammers: Parts, ball peen, cross peen, straight peen hammers, soft hammer, sizes, specifications and uses.
- 1.3.3 **Holding Devices**
Vices: Bench vice, leg-vice, hand vice, pin vice, tool maker's vice, pipe vice, care of vices, specifications and uses.
- 1.3.4 **Marking Tools**
Surface plate, V-block, angle plate, try square, scribe, punch, prick punch, centre punch, number punch, letter punch, specifications and uses.

1.3.5 **Miscellaneous Tools**

Screw drivers, spanners, single ended & double ended, box type, adjustable spanners, cutting pliers, nose pliers, allen keys, specifications and uses.

1.3.6 **Checking and measuring instruments**

Checking instruments.

Callipers: Outside&Inside callipers, hermaphrodite (odd leg) calliper with firm joint, spring callipers, transfer calliper sizes & uses, dividers - sizes & uses.

Measuring instruments:

Combination square, bevel protractor, universal bevel protractor, sine bar, universal surface gauge, engineer's parallels, slip gauges, plane gauge, feeler gauge, angle gauge, radius & template gauge, screw pitch gauge, telescopic gauges, plate & wire gauge, ring and plug gauges, snap gauges specifications & uses, vernier callipers, vernier height gauge, vernier depth gauge, micrometer - outside & inside, stick micrometer, depth micrometer, vernier micrometer, screw thread micrometer specifications and uses.

1.3.7 **Fitting Operations**

Marking, sawing, chipping, filing, scrapping, grinding, drilling, reaming, tapping and dieing.

1.4 **Forging**

1.4.1 **Hand forging tools:** Anvil, swage block, hand hammers - types; sledge hammer, specifications and uses, tongs - types, specifications & uses, chisel - hot & cold chisels specifications & uses. swages - types and sizes, fullers, flatters, set hammer, punch and drift - sizes and uses.

1.4.2 **Equipment:** Open and closed hearth heating furnaces, hand and power driven blowers, open and stock fire, fuels-charcoal, coal, oil gaseous fuels.

1.4.3 **Smith Operations:** Upsetting, drawing down, setting down, punching, drifting, bending, welding, cutting, swaging, fullering and flattering.

1.4.4 **Machine Forging:** Need of machine forging, forging hammers - spring hammer, pneumatic hammer, drop hammer, forging press, hydraulic press - line diagram, machine forging operations - drawing, upsetting, punching, tools used in machine forging.

1.4.5 **Forging defects:** Types and remedies.

1.5 **Sheet Metal Work**

1.5.1 Metals used for sheet metal work.

1.5.2 **Sheet metal hand tools:**

Measuring tools - steel rule, circumference rule, thickness gauge, sheet metal gauge, straight edge, scribe, divider, trammel points, punches, chisels, hammers, snips or shears, straight snip,

double cutting shear, squaring shear, circular shear, bench & block shears.

Stakes: Double seaming stake, beak horn stake, bevel edged square stake, Hatches stake, needle stake, blow Horn stake, hollow mandrel stake, pliers (flat nose and round nose), grocers and rivet sets, soldering iron, specifications & uses.

1.5.3 **Sheet Metal Operations**

Shearing: Cutting off, parting, blanking, punching, piercing, notching, slitting, lancing, nibbling and trimming.

Bending: Single bend, double bend, straight flange, edge hem, embossing, beading, double hem or lock seam.

Drawing: Deep drawing, shallow or box drawing.

Squeezing: Sizing, coining, hobbing, ironing, riveting.

1.5.4 **Sheet Metal Joints**

Hem Joint: single hem, double hem & wired edge, seam joint -lap seam, grooved seam, single seam, double seam, dovetail seam, burred bottom seam or flanged seam.

1.5.5 **Fastening Methods**

Rivetting, soldering, brazing & spot welding.

2 **Drilling**

2.1 **Type of drilling machines:** sensitive & radial and their constructional detail and specifications.

2.2 **Drill bits:** Terminology - geometry of twist drill - functions of drill elements.

2.3 **Operations:** Drilling, reaming, boring, counter boring, counter sinking, tapping, spot facing and trepanning.

3 **Foundry.**

3.1 **Introduction:** Development of foundry as a manufacturing process, advantages and limitations of casting over other manufacturing processes.

3.2 **Foundry equipment:**

Hand moulding tools: shovel, riddle, rammers, trowels, slicks, lifter, strike - off bar, spruepin bellow, swab, gate cutter, mallet, vent rod, draw spike, rapping plate or lifting plate, pouring weight, gagger, clamps, spirit level, moulding boxes, snap box & flash box.

3.3 **Sands:** Properties of moulding sand - porosity, flowability, collapsibility, adhesiveness, cohesiveness and refractoriness.

3.4 **Types of moulding sand :** green sand, dry sand, loam sand, facing sand, backing sand, parting sand, core sand, system sand their ingredients and uses.

3.5 **Pattern making:** Materials such as wood, cast Iron, aluminium, brass, plastics their uses and relative advantages, classification of patterns such as solid (one piece), two piece and three pieces, split patterns, gate patterns and shell patterns, sequence in pattern making, pattern allowances and colour codes.

- 3.6 **Cores:** Need of cores, types of cores.
- 3.7 Casting: green sand and dry sand moulding, cement bonded moulding, shell moulding, ceramic moulding, defects in castings and their remedies.
- 3.8 Special casting processes: (Principles and applications only) die casting – hot chamber and cold chamber, centrifugal casting, CO₂ process, investment casting.

4 **Mechanical working of metals**

- 4.1 **Introduction:** Hot working and cold working
- 4.2 **Hot working processes:** rolling - types of rolling, two high mill, three high mills, four high mills, piercing or seamless tubing, drawing or cupping, spinning, extrusion - direct or forward extrusion, indirect or backward extrusion, tube extrusion, Impact extrusion.
- 4.3 Effects of hot working of metals, advantages & limitations of hot working of metals.
- 4.4 **Cold working process:**
Rolling, drawing - wire drawing, tube drawing, bending, roll forming, angle bending, spinning, extrusion, squeezing, cold heading, thread rolling, peening.
- 4.5 Effects of cold working of metals, advantages & limitations of cold working.

REFERENCE BOOKS

- | | | | |
|----|-----------------------------------|----|--|
| 1. | Production Technology | by | Jain & Gupta (Khanna Publiahers) |
| 2. | Elementary Workshop Technology | by | Hazra Chowdary & Bhattacharya
(Media Promotors) |
| 3. | Manufacturing Technology (Vol I) | by | P N Rao (Mc Graw Hill) |
| 3. | Workshop Technology Vol I & II | by | Raghuvamshi |

ENGINEERING DRAWING

Subject Title	:	Engineering Drawing
Subject Code	:	M – 107
Periods/Week	:	06
Periods Per Year	:	180

TIME SCHEDULE

S.No	Major Topics	No. of Drawing plates	Periods	Weightage of Marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	--	03	-	-	-
2	Engineering Drawing Instruments	01	03	-	-	-
3	Free hand lettering & Numbering	01	06	5	1	-
4	Dimensioning Practice	01	09	5	1	-
5	Geometrical constructions	03	21	15	1	1
6	Projection of points, Lines, Planes & Solids	03	21	10	-	1
7	Auxiliary views	01	06	5	1	-
8	Sectional views	04	27	10	-	1
9	Orthographic Projection	04	33	10	-	1
10	Pictorial drawing	04	30	10	-	1
11	Development of surfaces	03	21	10	-	1
Total		25	180	80	04	06

The Course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

Pre-Requisite: Clear visualization and sound pictorial intelligence

OBJECTIVES

On completion of this subject the student shall be able to

1.0 Understand the basic concepts of Engineering Drawing

- 1.1 State the importance of drawing as an engineering communication medium.
- 1.2 State the necessity of I.S. Code of practice for Engineering Drawing.
- 1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

- 2.0 Use of Engineering Drawing Instruments (No. of drawing plates: 01)**
- 2.1 Select the correct instruments and draw lines of different orientation.
 - 2.2 Select the correct instruments and draw small and large Circles.
 - 2.3 Select the correct instruments for measuring distances on the drawing.
 - 2.4 Use correct grade of pencil for different types of lines, thickness and given function.
 - 2.5 Select and use appropriate scales for a given application.
 - 2.6 Identify different drawing sheet sizes as per I.S. and Standard Lay-outs.
 - 2.7 Prepare Title block as per I.S. Specifications.
 - 2.8 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

- 3.0 Write Free Hand Lettering and Numbers (No. of drawing plates: 01)**
- 3.1 Write titles using sloping lettering and numerals as per B.I.S (Bureau of Indian standards)
 - 3.2 Write titles using vertical lettering and numerals as per B.I.S.
 - 3.3 Select suitable sizes of lettering for different layouts and applications.
 - 3.4 Practice the use of lettering stencils.

Drawing plate 2: (Having 5 to 6 exercises)

- 4.0 Understand Dimensioning Practice (No. of drawing plates: 01)**
- 4.1 State the need of dimensioning the drawing according to accepted standard.
 - 4.2 Define "Dimensioning".
 - 4.3 Identify notations of Dimensioning used in dimensioned drawing.
 - 4.4 Identify the system of placement of dimensions in the given dimensioned drawing.
 - 4.5 Dimension a given drawing using standard notations and desired system of dimensioning.
 - 4.6 Dimension standard features applying necessary rules.
 - 4.7 Arrange dimensions in a desired method given in a drawing.
 - 4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

Drawing Plate 3: (Having 08 to 10 exercises)

- 5.0 Apply Principles of Geometric Constructions**
(No. of drawing plates: 03)
- 5.1 Divide a given line into desired number of equal parts internally.
 - 5.2 Draw tangent lines and arcs.
 - 5.3 General method to construct any polygon.
 - 5.4 Introduction to conics
 - 5.5 Construction of ellipse, parabola and hyperbola by general method
 - 5.5 Construct ellipse by concentric circles method
 - 5.6 Construct parabola by rectangle method, rectangular hyperbola, involute, cycloid and helix from the given data.
 - 5.7 State the applications of the above constructions in engineering practice.

Drawing Plate -4: Draw one plate having problems up to construction of polygon

Drawing Plate -5: Draw one plate having problems of construction of conics

Drawing Plate -6: Draw one plate having problems of construction of involute, cycloid and helix

**6.0 Apply Principles of Projection of points, lines, planes & solids
(No. of Drawing Plate: 03)**

- 6.1 Visualize the objects
- 6.2 Introduction to I-angle and III-angle projections
- 6.3 Draw the projection of a point with respect to reference planes (HP & VP)
- 6.4 Draw the projections of straight lines with respect to two references Planes (up to lines parallel to one plane and inclined to other plane)
- 6.5 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)
- 6.6 Draw the projections of solids (up to axis of solids parallel to one plane and inclined to other plane)

Drawing Plate -7: Draw one plate having problems up to projection of points and Lines (15 exercises)

Drawing Plate -8: Draw one plate having problems of projection of planes (6 exercises)

Drawing Plate -9&10: Draw Two plates having problems of projection of solids (total 10 exercises)

7.0 Understand the need for auxiliary views

- 7.1 State the need of Auxiliary views for a given engineering drawing.
- 7.2 Draw the auxiliary views of a given engineering component
- 7.3 Differentiate between auxiliary view and apparent view

Drawing plate No.11: (Having 4 exercises)

8.0 Appreciate the need of Sectional Views

- 8.1 Explain the need to draw sectional views.
- 8.2 Select the section plane for a given component to reveal maximum information.
- 8.3 Explain the positions of section plane with reference planes
- 8.4 Differentiate between true shape and apparent shape of section
- 8.5 Draw sectional views and true sections of regular solids discussed in 6.0
- 8.6 Apply principles of hatching.

Drawing Plate – 12: Draw one plate having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection (No. of plates: 04)

- 9.1 Explain the principles of orthographic projection with simple sketches.
- 9.2 Prepare an Engineering drawing of a given simple engineering part in first angle projection.
- 9.3 Draw the orthographic view of an object from its pictorial drawing.
- 9.4 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 13 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

- 10.1 State the need of pictorial drawings.
- 10.2 Differentiate between isometric scale and true scale.
- 10.3 Prepare Isometric views for the given orthographic drawings.

Drawing plate 14: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

- 11.1 State the need for preparing development drawing.
- 11.2 Prepare development of simple engineering objects using parallel line and radial line method.
- 11.3 Prepare development of surface of engineering components like trays, funnel, 90° elbow & rectangular duct.

Drawing plate No. 15: (Having 10 exercises)

KEY competencies to be achieved by the student

S.No	List of Practical	Key Competency
1.	Importance of Engineering Drawing	<ul style="list-style-type: none"> Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	<ul style="list-style-type: none"> Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	<ul style="list-style-type: none"> Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	<ul style="list-style-type: none"> Dimension a given drawing using standard notations and desired system of dimensioning
5.	Geometrical construction	<ul style="list-style-type: none"> Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	<ul style="list-style-type: none"> Draw the projection of a point, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	<ul style="list-style-type: none"> Draw the auxiliary views of a given Engineering component Differentiate between Auxiliary view and apparent view
8.	Sectional views	<ul style="list-style-type: none"> Differentiate between true shape and apparent shape of section Use conventional representation of Engineering materials as per latest B.I.S. Code. Apply principles of hatching. Draw simple sections of regular solids
9.	Orthographic Projection	<ul style="list-style-type: none"> Draw the minimum number of views needed to represent a given object fully.
10.	Pictorial drawing	<ul style="list-style-type: none"> Differentiate between isometric scale and true scale. Draw the isometric views of given objects,.
11.	Development of surfaces	<ul style="list-style-type: none"> Prepare development of Surface of Engineering components like trays, funnel, 90⁰ elbow & rectangular duct.

COURSE CONTENT

NOTE

1. **I.S. / B.S Latest Specification should invariably be followed in all the topics.**
2. **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention of I.S.O and B.I.S-Role of drawing in - engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet, Drawing plate:

Lay out of sheet – as per SP-46-1988 to a suitable scale.

Simple Exercises on the use of Drawing Instruments. Importance of Title Block.

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering Recommended sizes of letters & numbers - Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, need of I.S.I code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing - Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features “Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application.

Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

i) To draw tangent arc of given radius to touch two lines inclined at given

angle (acute, right and obtuse angles).

ii) Tangent arc of given radius touching a circle or an arc and a given line.

iii) Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon: construction of any regular polygon of given side length using general method

Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process,

Construction of any conic section of given eccentricity by general method

Construction of ellipse by concentric circles method

Construction of parabola by rectangle method

Construction of rectangular hyperbola

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

6.0 Projection of points, lines and planes & solids

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.

(a) Parallel to both the planes.

(b) Perpendicular to one of the planes.

(c) inclined to one plane and parallel to other planes

Projection of regular planes

(a) Plane perpendicular to HP and parallel to VP and vice versa.

(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of regular solids

(a) Axis perpendicular to one of the planes

(b) Axis parallel to VP and inclined to HP and vice versa.

7.0 Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

8.0 Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object -Concept of front view, top view, and side view sketching these views for a number of engg objects -Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a

means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines - Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines - Use of box and offset methods

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work -Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays funnels, 90° elbow pipes and rectangular ducts.

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)

Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)

Engineering Drawing by N.D.Bhatt.

T.S.M. & S.S.M on “ Technical Drawing” prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

BASIC WORKSHOP PRACTICE

Subject Title	:	Workshop Practice
Subject Code	:	M -108
Periods/Week	:	06
Periods Per Year	:	180

OBJECTIVES

Up on completion of the course the student shall be able to

FITTING SHOP

1. Acquaint with marking and measuring tools.
2. Perform marking, cutting and sawing on M.S. flats of 6 mm thick.
3. Perform drilling, chamfering and tapping operations .
4. Perform assembling of two pieces.

FORGING SHOP

1. Identify the various holding and striking tools.
2. Explain the method of hot forming
3. Identify the correct forging temperatures for metals
4. Prepare different sections from round bars.
5. Prepare components like rings, hooks, hexagonal bolt etc.

CARPENTRY SHOP

1. Draw the grain structure of wood grains
2. Identify the appropriate marking and measuring tools.
3. Use of appropriate cutting tools.
4. Prepare various joints like lap, half lap and dovetail joints.
5. Prepare round objects on wood turning lathe.
6. Prepare simple household article.

SHEET METAL WORK

1. Identify various marking and measuring tools used in sheet metal work.
2. Identify various types of stakes and snips.
3. Perform various sheet metal joints
4. Perform various sheet metal operations.
5. Practice the development of surfaces to prepare funnel, elbow etc...
6. Prepare simple utility articles.

FOUNDRY

1. Prepare moulding sand.
2. Make use of foundry tools.
3. Prepare moulds for couplings, connecting rods, pulleys.
4. Prepare cores for hallow jobs by using different core boxes.
5. Practice the casting and fettling aspects of the above.
6. Practice the melting and casting process of aluminium to prepare some castings

KEY competencies to be achieved by the student.

FITTING SHOP

Title of the Job	Key Competency
Marking and Chipping on Mild steel flat of 12 mm thick	<ul style="list-style-type: none">- Identify appropriate measuring tool- Handle appropriate marking tool- Handle appropriate chipping tool- Mark the dimensions- Remove the material by chipping from MS flats
Cutting with hack saw of MS flats of 6mm thick	<ul style="list-style-type: none">- Use the hack saw while cutting MS flats- Load and unload hack saw blade from its frame
Marking, Cutting, drilling, chamfering and tapping on a MS flat of 2 mm thick	<ul style="list-style-type: none">- Locate the hole on M.S. plate- Identify appropriate drill bit- Load and unload drill bit from the machine- Identify appropriate taps- State the specifications of taps and drill- Tap the hole
Assembling of two pieces, matching by filing	<ul style="list-style-type: none">- Identify appropriate file- State the specifications of a file- File the specimen

FORGING SHOP

Title of the Job	Key Competency
Conversion of Round to Square	<ul style="list-style-type: none">- Heat the specimen to the appropriate temperature- Identify the holding and striking tools- Hammer the specimen to the required shape
Conversion of Round to Hexagon	<ul style="list-style-type: none">- Heat the specimen to the appropriate temperature- Identify the holding and striking tools- Hammer the specimen to the required shape
Preparation of a Chisel from round rod	<ul style="list-style-type: none">- Heat the specimen to the appropriate temperature- Identify the holding and striking tools- Hammer the specimen to the required shape
Preparation of a ring and hook from M.S round	<ul style="list-style-type: none">- Heat the specimen to the appropriate temperature- Identify the holding and striking tools- Hammer the specimen to the required shape
Preparation of a hexagonal bolt and nut	<ul style="list-style-type: none">- Heat the specimen to the appropriate temperature- Identify the holding and striking tools- Upset the cylindrical rod- Hammer the specimen to the required shape

CARPENTRY SHOP

Title of the Job	Key Competency
Cutting of wood with hand saw	<ul style="list-style-type: none">- Identify the orientation of grains- Identify appropriate saw for cutting in each of the directions viz. across and along the grains- Handle appropriate measuring and marking tools- Perform cutting operation
Planning of wood	<ul style="list-style-type: none">- Identify the direction for planing wood stock- Load and unload the blade of a jack plane- Remove the material with the jack plane
Chiselling of wood	<ul style="list-style-type: none">- Identify the direction for chiseling wood stock- Use the chisel to remove the material
Preparation of a Dove tail joint	<ul style="list-style-type: none">- Use the chisel to remove the material- Finish the specimen with rasp file
Preparation of Mortise and Tenon joint	<ul style="list-style-type: none">- Use the chisel to remove the material- Finish the specimen with rasp file
Wood turning on lathe	<ul style="list-style-type: none">- Identify the various parts of a wood turning lathe- State the specifications of a turning lathe- Turn the specimen on the lathe
Preparation of any household article (ex: stool)	<ul style="list-style-type: none">- Prepare the drawings of a stool required for a particular drawing table- State the specifications of the wood stock required- Identify the type of joints to be made- Identify the operations to be made and their sequence- Perform operations to produce pieces of joint- Assemble all joints as per the drawing

SHEET METAL WORK

Title of the Job	Key Competency
Practice on cutting of sheet	<ul style="list-style-type: none">- Identify the marking and cutting tools- Cut the sheet
Formation of joints like grooved joint, locked groove joint	<ul style="list-style-type: none">- Identify the marking and cutting tools- Cut the sheet- Perform bending along the marked lines.
Preparation of a rectangular open type tray	<ul style="list-style-type: none">- Identify the marking and cutting tools- Drawing development of objects- Cut the sheet- Perform bending along the marked lines.
Preparation of hollow cylinder	<ul style="list-style-type: none">- Identify the marking and cutting tools- Drawing development of objects- Cut the sheet- Perform bending along the marked lines and form the joint
Preparation of pipe elbow	<ul style="list-style-type: none">- Identify the marking and cutting tools- Drawing development of objects- Cut the sheet- Perform bending along the marked lines and to form the elbow
Preparation of funnel	<ul style="list-style-type: none">- Identify the marking and cutting tools- Drawing development of objects- Cut the sheet- Perform bending along the marked lines and to form the funnel
Preparation of utility articles such as dust pan, kerosene hand pump	<ul style="list-style-type: none">- Identify the marking and cutting tools- Drawing development of objects- Cut the sheet- Perform bending along the marked lines and to form the article

FOUNDRY SHOP

Title of the experiment	Key competency
Moulding and Casting of solid bearing	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Cut the gates and runners- Pour the sufficient quantity of molten metal
Moulding and Casting of flange coupling	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Prepare and place the core- Cut the gates and runners- Pour the sufficient quantity of molten metal
Moulding and Casting of split bearing	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Cut gates and runners- Allow proper alignment of cope over drag- Pour the sufficient quantity of molten metal
Moulding and Casting of connecting rod	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Prepare and place the core- Cutting of gates and runners- Pouring the sufficient quantity of molten metal
Moulding and Casting of V-pulley	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Cut gates and runners- Pour sufficient quantity of molten metal
Moulding and Casting of Gear pulley	<ul style="list-style-type: none">- Select the suitable sand and its mix for the mould- Cut gates and runners- Pour sufficient quantity of molten metal

COURSE CONTENT

FITTING SHOP

1. Marking and chipping on Mild – steel flat 12 mm thick.
2. Cutting with hack saw, M.S. Flats of 6 mm thick.
3. Marking, cutting, drilling, Chamfering and tapping on a M.S. Flat 12 mm thick.
4. Assembling of two pieces, Matching by filing (6 mm thick M.S. Plate)

FORGING SHOP

1. Conversion of round to square.
2. Conversion of round to Hexagon.
3. Preparation of chisel from round rod.
4. Preparation of ring and hook from M.S. round.
5. Preparation of a hexagonal bolt and nut.

CARPENTRY SHOP

1. Cutting of wood with hand saw.
2. Planning of wood.
3. Planning and chiseling of wood.
4. Orientation of wood grain.
5. Preparation of dovetail joint.
6. Mortise and tenon joint.
7. Wood turning on a lathe.
8. Preparation of one household article.

SHEET METAL WORK

1. Practice on cutting of sheet
2. Formation of joints like grooved joints, locked groove joint
3. Preparation of a rectangular open type tray
4. Preparation of hollow cylinder
5. Preparation of pipe elbow
6. Preparation of mug.
7. Preparation of funnel
8. Preparation of utility articles such as dustpan, kerosene hand pump.

FOUNDRY

Moulding and casting of

1. Solid bearing
2. Flange coupling
3. Split bearing
4. Connecting rod
5. V – pulley
6. Gear pulley