

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	Engineering 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 practice	-	6	180	3			100
ME-108	Basic Work shop practice	-	6	180	3			100
ME-109	109-A Engineering Physics Lab practice 109-B Engineering Chemistry Lab practice	-	3	90	3 (1.5+1.5)			100 (50+50)
ME-110	Computer fundamentals Lab practice	-	3	90	3			100
TOTAL		24	18	1260				1000

ENGLISH
(Common to all Branches)

Subject Title : English
Subject Code : ME - 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.

Upon 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 : ME-102
Periods per week : 04
Periods per Semester : 60

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	½
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	½
19	Physical Applications	2	2	5	0	0	0	0	0	½
20	Maxima and Minima	3	4	5	0	0	0	0	0	½
21	Errors and Approximations	2	0	5	0	0	0	0	0	½
	Total	92	58	110	7	3	0	2	2 1/2	3 ½
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-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

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

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:

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

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 : ME -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 (\hat{i} , \hat{j} , \hat{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 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 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 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- 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 : ME -104
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 1/2	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. 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 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. Corrosion

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. Polythene 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 Academy |
| 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 |

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics
Subject Code : ME-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

Upon 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 State the importance of mechanics in engineering.
- 1.3 Review the system of units used.
- 1.4 Explain the concept of force
- 1.5 List the types of forces
- 1.6 Explain the force system
 - a) Co-planar and Non-Coplanar,
 - b) Parallel and Non-Parallel,
 - c) Like and Un like, d) Concurrent and Non-concurrent
- 1.7 Explain the concept of equilibrium
- 1.8 State the parallelogram law of forces
- 1.9 State the triangle law of forces
- 1.10 State the polygon law of forces
- 1.11 State the Lami's theorem.
- 1.12 Explain the concept of free body diagram
- 1.13 Solve the problems involving concurrent coplanar forces
- 1.14 Solve simple problems involving non-concurrent coplanar forces
- 1.15 Solve simple problems using Lami's theorem
- 1.16 Define the term couple and moment of couple with legible sketch.
- 1.17 Explain the properties of a couple
- 1.18 State the condition of equilibrium of a body acted upon by co-planar forces.

2.0 Understand the concept of Friction

- 2.1 Explain 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 State the need for finding the Centroid and Centre of gravity for various engineering applications
- 3.3 Locate the C.G. of a given section.
- 3.4 Explain the method of determining the Centroid by 'Method of moments'
- 3.5 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section
- 3.6 Determine the position of Centroid of built up sections consisting of RSJ'S and flange plates and Plane figures having hollow portions
- 3.7 Explain the meaning of the term moment of Inertia.
- 3.8 Define the term polar moment of inertia
- 3.9 Explain the term radius of gyration
- 3.10 State the necessity of finding Moment of Inertia for various engineering applications
- 3.11 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section
- 3.12 State Parallel axis theorem and perpendicular axis theorem
- 3.13 Determine MI of standard sections by applying parallel axes theorem
- 3.14 Determine MI of standard sections by applying parallel axes theorem
- 3.15 Calculate the moment of Inertia of composite sections.
- 3.16 Calculate radius of gyration of standard sections.
- 3.17 Determine the polar M.I for solid and hollow circular section applying perpendicular axes theorem.
- 3.18 Solve the related numerical problems

4.0 Understand the concept of Dynamics

- 4.1 Define the terms Kinematics and Kinetics
- 4.2 Classify the motion types
- 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 State the D'Alembert's principle
- 4.9 Define the 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 important terms of simple machines
 - a) Machine, b) Mechanical Advantage, c) Velocity Ratio, d) 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 important terms of Basic link mechanism
 - a) Link, b) kinematics pair, c) Kinematic chain, d) 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 and 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) Z - section
 - f) Built up Sections (Simple cases only)

4.0 Dynamics

- 4.1 Definition of Kinematics and Kinetics
- 4.2 Classification of motion
- 4.3 Definition 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 Definition 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 : ME-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

Upon completion of the course the student shall be able to

1.0 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 planing.
- 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.
- 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

2.0 Understand the concept of 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 Write the 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.

3.0 Understand the concept of 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.
- 3.7 List the ingredients in foundry sand.
- 3.8 List the various types of patterns.
- 3.9 State the sequence of pattern making operations.
- 3.10 Identify the colour codes.
- 3.11 List the various moulding processes.
- 3.12 State the need and types of cores.
- 3.13 Describe the casting processes.
- 3.14 Identify the defects in casting.
- 3.15 Describe special casting processes.

4.0 Mechanical working of metals

- 4.1 Define mechanical working of metals.
- 4.2 Differentiate cold working with hot working.

- 4.3 Illustrate the working principle of hot rolling, piercing, spinning, extrusion and drawing.
- 4.4 State advantages and limitations of hot working.
- 4.5 Identify various cold working processes such as rolling, bending and squeezing.
- 4.6 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.

1.1.2 Striking tools:

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

1.1.3 Holding devices

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

1.1.4 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.

1.1.5 Carpentry Processes

Marking, measuring, sawing, chiselling, planing, boring, grooving, rebating & moulding.

1.1.6 Carpentry joints

Halving Joint, mortise and tenon joint, bridle joint, butt joint.

dowel joint, tongue & groove joint, screw & slot joint, dovetail joint, corner joint.

1.1.7 **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.

1.2 **Fitting**

1.2.1 **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.

1.2.2 **Striking Tools**

Hammers: Parts, ball peen, cross peen, straight peen hammers, soft hammer, sizes, specifications and uses.

1.2.3 **Holding Devices**

Vices: Bench vice, leg-vice, hand vice, pin vice, tool maker's vice, pipe vice, care of vices, specifications and uses.

1.2.4 **Marking Tools**

Surface plate, V-block, angle plate, try square, scribe, punch, prick punch, centre punch, number punch, letter punch, specifications and uses.

1.2.5 **Miscellaneous Tools**

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

1.2.6 **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.

1.2.7 **Fitting Operations**

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

1.3 **Forging**

1.3.1 **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.

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

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

1.3.4 **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.

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

1.4 **Sheet Metal Work**

1.4.1 Metals used for sheet metal work.

1.4.2 **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.

1.4.3 **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.

1.4.4 **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.

1.4.5 **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 Promoters) |
| 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 : ME-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 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 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 componentDifferentiate between Auxiliary view and apparent view
8.	Sectional views	<ul style="list-style-type: none">Differentiate between true shape and apparent shape of sectionUse 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.

(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 : **ME -108**
Periods/Week : **06**
Periods Per Year : **180**

TIME SCHEDULE

S.No	Major Title	No of Periods
1.	Fitting shop	36
2.	Forging shop	39
3.	Carpentry shop	51
4.	Sheet metal work	51
	Test	03
	Total	180

OBJECTIVES

Upon completion of the course the student shall be able to

- Practice the required operations in Fitting Shop
- Practice the required operations in Forging Shop
- Practice the required operations in Carpentry Shop
- Practice the required operations in Sheet metal Shop

Competencies and Key competencies to be achieved by the student.

Title of the Job	Competencies	Key Competencies
Fitting shop 1. Marking and Chipping on Mild steel flat of 12 mm thick (12)	<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 	<ul style="list-style-type: none"> • Mark the dimensions • Remove the material by chipping from MS flats
2. Cutting with hack saw of MS flats of 6mm thick (06)	<ul style="list-style-type: none"> – Check the raw material for size – Fix the work piece in vice – Mark the work as per given dimensions – Perform dot punching – Load and unload hack saw blade from its frame – Use the hack saw to perform cutting operation 	<ul style="list-style-type: none"> • Load and unload hack saw blade from its frame • cut the work as per marked dimensions using Hack saw
3. Drilling, chamfering and on a MS flat of 2 mm thick (06)	<ul style="list-style-type: none"> – Check the raw material for size – Apply the chalk on the surface and on all sides of the flat – Layout the dimensions and mark the lines using dot punch – Chamfer the edges through filing – Locate the hole centres using odd leg callipers and centre punching – Identify appropriate drill bit – Load and unload drill bit from the machine 	<ul style="list-style-type: none"> • Load and unload drill bit from the machine • Identify appropriate taps • Tap the hole

<p>4.Tapping and Dieing on a MS flat of 2 mm thick (06)</p>	<ul style="list-style-type: none"> – Check the raw material for size – Identify appropriate tap and die – Secure the tap in the wrench – Tap the hole – Hold the bar in bench vice – Fix the die in die stock – Cut external threads using a Die – Check the fit for accuracy 	<ul style="list-style-type: none"> • Secure the tap in the wrench • Tap the hole • Fix the die in die stock • Cut external threads using a Die
<p>5.Assembling of two pieces, matching by filing (06)</p>	<ul style="list-style-type: none"> – Cut the pieces to size using hack saw – File surface of flat for trueness – Mark the surfaces as per dimensions – Dot punch the marked lines – Cut with hack saw as per marked lines – Smoot the surfaces with file – Assemble the two pieces 	<ul style="list-style-type: none"> • Identify appropriate file • File the specimen • Assemble two pieces

Title of the Job	Competencies	Key Competencies
Forging shop 6.Conversion of Round to Square (09)	<ul style="list-style-type: none"> – Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape 	<ul style="list-style-type: none"> • Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
7.Conversion of Round to Hexagon (09)	<ul style="list-style-type: none"> – Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape 	<ul style="list-style-type: none"> • Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
8.Preparation of a Chisel from round rod (09)	<ul style="list-style-type: none"> – Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape 	<ul style="list-style-type: none"> • Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
9.Preparation of a ring and hook from M.S round (06)	<ul style="list-style-type: none"> – Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape 	<ul style="list-style-type: none"> • Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
10.Preparation of a hexagonal bolt and nut (06)	<ul style="list-style-type: none"> – Identify the holding and striking tools – Heat the specimen to the appropriate temperature – Remove the specimen and hold it on the anvil – Hammer the specimen to the required shape 	<ul style="list-style-type: none"> • Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape

Title of the Job	Competencies	Key Competencies
<p>Carpentry Shop</p> <p>11.Cutting of wood with hand saw (06)</p>	<ul style="list-style-type: none"> – Identify the orientation of grains – Select appropriate saw for cutting in each of the directions viz. across and along the grains – Select appropriate work holding device – Handle appropriate measuring and marking tools(Steel rule, Try square, Marking gauge) – Mark dimensions on work using Marking gauge – Fix the work in the vice – Perform cutting along the grains using Rip saw – Change the position of work in the vice – Perform cutting perpendicular the grains using cross cut saw 	<ul style="list-style-type: none"> • Identify the orientation of grains • Mark dimensions on work using marking gauge • Perform cutting along and perpendicular the grains using appropriate saw
<p>12.Planning of wood(06)</p>	<ul style="list-style-type: none"> – Identify the direction for planning wood stock – Select appropriate jack plane – Prepare the jack plane for planning (Load and unload the blade of a jack plane – Select appropriate work holding device – Perform marking on work using appropriate tool – Fix the work in the vice – Plane the surfaces on all four sides using jack plane 	<ul style="list-style-type: none"> • Identify the direction for planning wood stock • Prepare the jack plane for planning • Plane the surfaces on all four sides using jack plane

Title of the Job	Competencies	Key Competencies
<p>Contd.,,,</p> <p>13.Chiselling of wood (06)</p>	<ul style="list-style-type: none"> - Select appropriate chisels and saw - Select appropriate work holding device - Select appropriate measuring and marking tools - Fix the work in the vice - Mark the position of grooves on work using marking gauge - Cut sides of grooves by hand saw - Chip the material using firmer chisel by applying pressure with mallet - Finish the grooves with rasp file 	<ul style="list-style-type: none"> • Select appropriate chisels and saw • Mark the position of grooves on work using marking gauge • Cut sides of grooves by hand saw • Chip the material using firmer chisel by applying pressure with mallet
<p>14.Preparation of a Dove tail joint (09)</p>	<ul style="list-style-type: none"> - Select the appropriate cutting tools and work holding devices - Plane the wooden pieces on all sides - Mark at an angle of 75° with bevel square - Trim the dovetail by chisel to exact size - Cutt the dovetail groove on second piece - Finish the groove - Assemble the two pieces to prepare dovetail halving joint by using mallet 	<ul style="list-style-type: none"> • Trim the dovetail by chisel to exact size • Mark at an angle of 75° with bevel square • Cutt the dovetail groove on second piece • Assemble the two pieces to prepare dovetail halving joint by using mallet
<p>15.Preparation of Mortise and Tenon joint (09)</p>	<ul style="list-style-type: none"> - Select the appropriate cutting tools and work holding devices - Plane the two pieces to the required size using jack plane - Mark the dimensions to make Tenon using mortise gauge - Cut tenon with tenon saw along the marked lines 	<ul style="list-style-type: none"> • Mark the dimensions to make Tenon and mortise on two pieces using mortise gauge • Cut tenon with tenon saw along the marked lines

Title of the Job	Competencies	Key Competencies
<p>Contd.,,, Preparation of Mortise and Tenon joint</p>	<ul style="list-style-type: none"> – Use firmer chisel to remove the excess material to set finished tenon – Mark the dimension to make mortise on the second piece with mortise gauge – Use mortise chisel to provide recess in the second piece to accommodate tenon – Assemble the two pieces by fitting the tenon into mortise 	<ul style="list-style-type: none"> • Use mortise chisel to provide recess in the second piece to accommodate tenon • Assemble the two pieces by fitting the tenon into mortise
<p>16.Wood turning on lathe (06)</p>	<ul style="list-style-type: none"> – Select appropriate tools – Plane the four corners of the work piece using jack plane – Mark the centres of the work on either side – Mount the work between head stock & tailstock centres – Fix the tool in the tool post & Position it in appropriate height – Start the lathe to make the work piece to revolve at desired speed – Feed the bevel gauge against the rotating work to get the required size and shape – Use outside callipers to check the diameter of the pin – Use parting off tool to reduce the diameter on either ends of the pin – Remove the rolling pin between centres and cut off excess material on either sides 	<ul style="list-style-type: none"> • Mark the centres of the work on either side • Fix the tool in the tool post & Position it in appropriate height • Start the lathe to make the work piece to revolve at desired speed • Feed the bevel gauge against the rotating work to get the required size and shape

Title of the Job	Competencies	Key Competencies
Contd.,,, 17.Preparation of any household article (ex: stool) (09)	<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 	<ul style="list-style-type: none"> • Prepare the drawings of a stool required for a particular drawing table • Identify the operations to be made and their sequence • Perform operations to produce pieces of joint • Assemble all joints as per the drawing

Title of the Job	Competencies	Key Competency
Sheet metal Work 18.Practice on cutting of sheet (06)	<ul style="list-style-type: none"> – Cut the required sheet from the stock using snip – Mark the dimensions on the sheet using scribe & steel rule – Draw the circular shapes using divider – Perform rough cutting of the curved shapes using chisel and finish cutting using snips – Cut the straight edges using straight snips 	<ul style="list-style-type: none"> • Identify the marking and cutting tools • Cut the sheet of different shapes using appropriate tools
19.Formation of joints like grooved joint, locked groove joint (06)	<ul style="list-style-type: none"> – Cut the sheet in to two halves – Form the flange on the sheet by folding the sheet along scribed lines using mallet & stakes – Perform bending edges of sheets applying moderate pressure using mallet – Inter lock the bent edges and apply pressure with mallet to make required joint 	<ul style="list-style-type: none"> • Identify the marking and cutting tools • Cut the sheet • Perform bending along the marked lines.

Title of the Job	Competencies	Key Competency
20.Preparation of a rectangular open type tray (09)	<ul style="list-style-type: none"> – Draw the development of the object to be made – Place the pattern on the sheet – Mark the dimensions using scribe – Shear the required piece from the stock using straight snips – Mark the lines on the sheet to form bends – Strengthen the sides of sheet by single hem using hatchet stake – Form the sheet in to desired shape using stakes – Seam the corners by inserting laps of the adjacent sides with single hem 	<ul style="list-style-type: none"> • Drawing development of objects • Cut the sheet • Seam the corners by inserting laps of the adjacent sides with single hem
21.Preparation of hollow cylinder (06)	<ul style="list-style-type: none"> – Draw the development of the object to be made – Place the pattern on the sheet – Mark the dimensions using scribe – Shear the required piece from the stock using straight snips – Mark the lines on the sheet to form bends – Strengthen the sides of sheet by single hem on top & bottom side using hatchet stake – Form the flat sheet into cylindrical shape by cylindrical stake and apply pressure using mallet – Prepare single hem on to longitudinal sides in opposite directions – Inter lock the sides and apply pressure to make a strong joint 	<ul style="list-style-type: none"> • Identify the marking and cutting tools • Drawing development of objects • Cut the sheet • Inter lock the sides and apply pressure using mallet to make a strong joint

Title of the Job	Competencies	Key Competency
22.Preparation of pipe elbow (09)	<ul style="list-style-type: none"> – Draw the development of a cylindrical pipe truncated at an angle of 45° on one side – Scribe the lines on the sheet by placing the pattern on it – Cutt the sheet over the marked dimensions using curved snips – Hem the straight side of the sheet and flange the curved side – Fold the edges of joining sides – Form the sheet into cylindrical shape using stakes – Seam the sides using mallet – Repeat the similar operation for making the second pipe – Butt the treated portions of the cylindrical pipes at rectangles – Seam the two pipes – Solder the joint to make leak proof 	<ul style="list-style-type: none"> • Draw the development of a cylindrical pipe truncated at an angle of 45° on one side • Cutt the sheet over the marked dimensions using curved snips • Form the sheet into cylindrical shape using stakes

Title of the Job	Competencies	Key Competency
23.Preparation of funnel (09)	<ul style="list-style-type: none"> – Draw the development of upper conical part – Place the pattern on the sheet and cut to required size – Hem the upper side of the sheet – Flange out the bottom side of the sheet – Fold the edges of the joining sides – form the sheet into conical shape using appropriate stake and mallet – Repeat the similar operation for making the bottom part – Seam the top conical part and bottom conical part to obtain required funnel 	<ul style="list-style-type: none"> • Draw the development of upper and bottom conical parts • Place the pattern on the sheet and cut to required size • form the sheet into conical shape using appropriate stake and mallet • Seam the top conical part and bottom conical part to obtain required funnel
24.Preparation of utility articles such as dust pan, kerosene hand pump (06)	<ul style="list-style-type: none"> – Draw the development of given dust pan – Scribe the lines on the sheet and cut to required size – Hem all the four sides to strengthen the edges – Form the sheet into designed shape using suitable stakes and mallet – Solder the corner lap joints to make the required dust pan 	<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

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.

REFERENCE BOOKS

- | | | | |
|----|-----------------------------------|----|-------------------------|
| 1. | Manufacturing Technology (Vol I) | by | P N Rao (Mc Graw Hill) |
| 2. | Principles of Foundry Technology | by | P L Jain (Mc Graw Hill) |

**ENGINEERING PHYSICS LAB PRACTICE
(Common to all Branches)**

Subject Title : **Engineering Physics Lab Practice**
Subject Code : **ME-109 A**
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
(Common to all Branches)

Subject Title : **Engineering Chemistry Lab Practice**
Subject Code : **ME -109 B**
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 ₂ CO ₃ and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na ₂ CO ₃ solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H ₂ SO 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. Na₂ CO₃ 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 H₂SO₄

- 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	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 FUNDAMENTALS LAB PRACTICE
(Common to all Branches)

Subject Title : Computer Fundamentals Laboratory Practice
Subject Code : ME-110
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	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	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse & Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	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	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	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	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	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 paint 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	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 d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	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