DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
FIRST YEAR

Subject Code	Name of the Subject	Instruction period / week Theory	Instruction period / week Practical /Tutorial	Total Period / year	Scheme of Examination Duration (hours)	Scheme of Examination Sessional Marks	Scheme of Examination End Exam Marks	Scheme of Examination Total Marks
THEORY:								
CE- 101	English	3	-	90	3			100
CE-102	Mathematics - I	5	-	150	3			100
CE-103	Engineering Physics	4	-	120	3			100
CE-104	Engineering Chemistry & Environmental Studies	4	-	120	3			100
CE-105	Engineering Mechanics	5	-	150	3			100
CE-106	Surveying-I	3	-	90	3			100
PRACTICAL:								
CE- 107	Engineering Drawing	-	6	180	3			100
CE-108	Surveying - I Practice & Plotting	-	6 (4+2)	180	3			100
CE-109	109-A Physics Lab 109-B Chemistry Lab	-	3	90	3 (1.5+1.5)			100 (50+50)
CE- 110	Computer Fundamentals Practice	-	3	90	3			100
	TOTAL	24	18	1260				1000

ENGLISH
(Common to all branches)

Subject Title : ENGLISH
Subject Code : CE - 101
Periods per Week : 03
Periods per Year : 90

TIME SCHEDULE

Sl 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 repots, giving instructions and interpreting graphics is of great importance. Therefore the curriculum C-14 focuses on improving communicative abilities equipping the students to become industry-ready and employable.

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

1.0   Extend their vocabulary in the direction of their future needs
1.1   Locate words, learn spellings, understand meanings
1.2   Pronounce words intelligibly
1.3   Find synonyms and antonyms
1.4   Use affixation
1.5   Comprehend meanings of words by understanding meanings of roots

2.0   Learn various grammatical structures
2.1   Identify and use nouns
2.2   Identify and use pronouns
2.3   Use the present tense
2.4   Use the past tense
2.5   Use the future tense
2.6   Identify and use adjectives
2.7   Identify and use adverbs

2.8	Use prepositions
2.9	Use linkers
2.10	State basic sentence structures
2.11	Construct different types of sentences
2.12	Frame questions to elicit information
2.13	Frame questions for conformation
2.14	Use active voice
2.15	Use passive voice
2.16	Use direct speech
2.17	Use indirect speech
2.18	Identify and correct errors

3.0 Read and comprehend English

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

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

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

5.0 Practice spoken communication suited to various situations.

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

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

ENGINEERING MATHEMATICS – I
(Common to all branches)

Subject Title : **ENGINEERING MATHEMATICS – I**
Subject Code : **CE-102**
Periods per week : **04**
Periods per Semester : **60**

TIME SCHEDULE

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

	Unit III : Co-ordinate Geometry									
13	Straight Lines	4	2	3	1	0	0	0	0	0
14	Circle	4	2	3	1	0	0	0	0	0
15	Conic Sections	5	4	10	0	0	0	0	1	0
Unit – IV : Differential Calculus										
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
Unit - V : Applications of Differentiation										
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	7	3	0	2	2 1/2	3 1/2
	Marks				21	9	0	20	25	35

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

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

UNIT – I

Algebra

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

2.0   Resolve Rational Fraction into sum of Partial Fractions in engineering problems
    2.1   Define the following fractions of polynomials:
            1.   Rational,
            2.   Proper and
            3.   Improper
    2.2   Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$$i)\quad \frac{f(x)}{(x+a)(x+b)(x+c)} \qquad ii)\quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$iii)\quad \frac{f(x)}{(x^2+a)(x+b)} \qquad iv)\quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

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

UNIT – II

Trigonometry

4.0   Understand Trigonometric Ratios
    4.1   Define trigonometric ratios of any angle.
    4.2   List the values of trigonometric ratios at specified values.
    4.3   Draw graphs of trigonometric functions
    4.4   Explain periodicity of trigonometric functions

5.0   Solve simple problems on Compound Angles
    5.1   Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)
    5.2   Give simple examples on compound angles to derive the values of sin15^0, cos15^0 , sin75^0 , cos75^0 ,   tan 15^0 , tan75^0 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 sinA= (1- cos2A)/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 $\sin^{-1}x+\cos^{-1} x = \dfrac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1} x + \tan^{-1} y = \tan^{-1}\left(\dfrac{x+y}{1-xy}\right), \ where \ x \geq 0, y \geq 0, xy < 1$ 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 $\lim\limits_{x \to a} f(x) = l$ and state the properties of limits.

16.2 Mention the Standard limits $\lim\limits_{x\to a}\dfrac{x^n-a^n}{x-a}$, $\lim\limits_{x\to 0}\dfrac{\sin x}{x}$, $\lim\limits_{x\to 0}\dfrac{\tan x}{x}$, $\lim\limits_{x\to 0}\dfrac{a^x-1}{x}$,

$\lim\limits_{x\to 0}\dfrac{e^x-1}{x}$, $\lim\limits_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim\limits_{x\to\infty}\left(1+\dfrac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim\limits_{x\to l}\dfrac{a x^2+b x+c}{\alpha x^2+\beta x+\gamma}$ and $\lim\limits_{x\to\infty}\dfrac{f(x)}{g(x)}$

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

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n, a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx 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) $\sqrt{t^2+\dfrac{2}{t}}$ (ii) $x^2\sin 2x$ (iii) $\dfrac{x}{\sqrt{x^2+1}}$ (iv)

$\log\big(\sin(\cos x)\big)$.

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:

$$i) \quad \frac{f(x)}{(x+a)(x+b)(x+c)} \qquad ii) \quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$iii) \quad \frac{f(x)}{(x^2+a)(x+b)} \qquad iv) \quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

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±B), cos(A±B), tan(A±B),cot(A±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 appoint, 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, logarthmic 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	:	**CE -103**
Periods per week	:	**04**
Total periods per year	:	**120**

TIME SCHEDULE

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

OBJECTIVES

Upon completion of the course the student shall be able to

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

1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis
1.15 State the limitations of dimensional analysis

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

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

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

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

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

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

7.0 Understand the concept of Heat and thermodynamics
7.1 Explain the concept of expansion of gases
7.2 Explain Boyle' s law
7.3 State Charles law in terms of absolute temperature
7.4 Define absolute zero temperature
7.5 Explain absolute scale of temperature
7.6 Define ideal gas
7.7 Derive ideal gas equation
7.8 Define gas constant and Universal gas constant

7.9   Explain why universal gas constant is same for all gases
7.10   State SI unit of universal gas constant
7.11   Calculate the value of universal gas constant
7.12   State the gas equation in terms of density
7.13   Distinguish between r and R
7.14   Explain Isothermal process with the help of P-V and T-Ø diagram
7.15   Explain adiabatic process with the help of P-V and T-Ø 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 capilarity
9.10   Explain the concept of Viscosity
9.11   Provide examples for surface tension and Viscosity
9.12   State Newton's formula for viscous force
9.13   Define co-efficient of viscosity
9.14   Explain the effect of temperature on viscosity of liquids and gases
9.15   State Poiseulle's equation for Co-efficient of viscosity
9.16   Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism
    10.1 Explain the concept of Electricity
    10.2 State the Ohm's law
    10.3 Explain the Ohm's law
    10.4 Define specific resistance, conductance and their units
    10.5 State Kichoff's laws
    10.6 Explain Kichoff's laws
    10.7 Describe Wheatstone's bridge with legible sketch
    10.8 Derive expression for balancing condition of Wheatstone's bridge
    10.9 Describe Meter Bridge with legible sketch
    10.10 Write the formula 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 Hormonic 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 - usical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Condition of good auditorium- Problems

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

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

11. Modern Physics

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

REFERENCE BOOKS

1. Intermediate physics Volume-I   Deepthi
2. Unified physics Volume 1,2,3 and 4   Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I   Resnick & Holiday
4. Text book of applied physics   Dhanpath Roy
5. Fibre optics   D.A Hill

Blue Print for setting question paper at different levels

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

Subject Title　　　:ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
Subject Code　　　:CE -104
Periods per week　:04
Total periods per year:120

Blue Print

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

4. 0   Understand the Principles of Metallurgy
4.1   List at least eight Characteristics of Metals
4.2   Distinguish between Metals and Non Metals
4.3   Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4. Flux and 5. Slag
4.4   Describe the methods of concentration of ore like 1.Hand picking,2. Levigation, and 3. Froth
       Floatation
4.5   Describe the methods involved in extraction of crude metal- Roasting, Calcination and   Smelting.

4.6	Explain the purification of Metals by Electrolytic Refining
4.7	Define an Alloy
4.8	Write the Composition of the following alloys:1.Brass, 2.German silver, and Nichrome
4.9	List the uses of following Alloys: Brass, German silver, Nichrome

5.0   Understand the concepts of Electrochemistry

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

6.0   Understand the concept of Corrosion

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

7. 0   Understand the concept of Water Technology

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

8.0   Understand the concepts of Polymers

8.1	Explain the concept of polymerisation

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

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

B. ENVIRONMENTAL STUDIES
1.1 Define the term environment
1.2 Explain the scope and importance of environmental studies
1.3 Explain the following terms 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere, 5)Pollutant, 6).Pollution, 7).Contaminant receptor - sink, particulates, dissolved oxygen, 8).Threshold limit value, 9).BOD, and 10).COD
1.4 Explain the growing energy needs
1.5 State the differences between renewable and non renewable energy sources- alternative energy sources.
1.6 Define an Ecosystem- biotic component, abiotic component and energy component,
1.7 Define the terms:
    1).Producers, 2).Consumers and 3).Decomposers with examples.
1.8 Explain biodiversity and threats to biodiversity
1.9 Define air pollution
1.10 Classify the air pollutants- based on origin and state of matter
1.11 Explain the causes of air pollution

1.12 Explain the use and over exploitation of forest resources and deforestation
1.13 Explain the effects of air pollution on human beings, plants and animals
1.14 Explain the green house effect - ozone layer depletion and acid rain
1.15 Explain the methods of control of air pollution
1.16 Define water pollution
1.17 Explain the causes of water pollution
1.18 Explain the effects of water pollution on living and non living things
1.19 Understand the methods of control of water pollution.

COURSE CONTENT

A. ENGINEERING CHEMISTRY

1. **Fundamentals of Chemistry**
   Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hand's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements
   Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds
   – Metallic bond
   Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number-calculations, differences between Oxidation Number and Valency

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

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

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

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

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

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

8. **Polymers**

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

9. **Fuels**

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

B. **ENVIRONMENTAL STUDIES**

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

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

REFERENCE BOOKS

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

ENGINEERING MECHANICS

Subject Title : **Engineering Mechanics**
Subject Code : **CE-105**
Periods/Week : **05**
Periods/Semester : **150**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Introduction	10	03	01	---
2.	Forces & Moments	40	26	02	02
3.	Centroid	25	16	02	01
4.	Moment of Inertia	35	26	02	02
5.	Simple Stresses and Strains	40	39	03	03
	Total	150	110	10	08

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

1.0 Understand the basic concepts of Engineering Mechanics
 1.1 Define Mechanics and Engineering Mechanics
 1.2 State the applications of Engineering Mechanics
 1.3 State the branches of Engineering Mechanics
 1.3 Define the terms 1.Statics, 2.Dynamics, 3.Kinetics and 4.Kinematics
 1.4 State the systems of measurements and Units
 1.5 State S.I and M.K.S units of physical quantities used in Civil Engineering

2.0 Understand the concept Equilibrium of Co-Planner forces
2.1 Define the following terms:
    1. Force,
    2. Moment,
    3. Resultant,
    4. Equilibrium of forces,
    5. Equilibrant and
    6. Moment of a couple.
2.2 Distinguish between
    2.2.1 Scalar and Vector quantities,
    2.2.2 Co-planar and non-co-planar forces,
    2.2.3 Parallel and non-parallel forces and

2.2.4 Like and unlike parallel forces.

2.3 Compute the resultant of two co-planar forces acting at a point by

    2.3.1   Law of parallelogram of forces and

    2.3.2   Triangle law of forces

2.4 Explain 'Lami's Theorem'.

    2.41 Solve simple problems using Lami's Theorem

2.5 Solve problems on computation of the resultant of a system of coplanar concurrent forces by

    2.5.1 Law of polygon of forces and

    2.5.2 Resolution of forces

2.6. Solve problems on computation of the resultant of a system of coplanar parallel forces.

2.7. Explain the properties of a couple.

2.8. State the conditions of equilibrium of rigid body subjected to a number of co- planar forces.

    2.8.1. Determine resultant of co-planar concurrent forces by analytical methods.

2.9 List various types of supports (like Simply support, fixed support, hinged support, roller support)

2.10 List various types of beams (like simply supported beams, cantilever, fixed beams, over hanging beams, continuous beams)

2.11 List various types of loading (like point load, uniformly distributed load, uniformly varying load

2.12 To determine support reactions for simply supported beams with point loads and Uniformly distributed loading

3.0 Understand the Centroid

3.1 Define Centroid and Centre of gravity

3.2 Distinguish between Centroid and Centre of gravity

3.3 State the need for finding the Centroid and Centre of gravity for various engineering applications.

3.4 Calculate the positions of Centroid for simple plane figures from first principles

3.5 Explain the method of determining the Centroid by 'Method of moments'.

3.6 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section

3.7 Determine the position of Centroid of built up sections consisting of RSJ'S and flange plates and Plane figures having hollow portions

4.0 Compute the Moment of Inertia and radius of gyration

4.1 Define Moment of Inertia (MI), Polar Moment of Inertia, Radius of gyration

4.2 State the necessity of finding Moment of Inertia for various engineering applications

4.3 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section

4.4 State 1. Parallel axes theorem and 2. Perpendicular axes theorem to determine MI

4.5 Determine MI of standard sections by applying parallel axes theorem.

4.6 Determine MI of built-up sections by applying parallel axes theorem.

4.7 Calculate radius of gyration of standard sections.

4.8 Determine the polar M.I for solid and hollow circular section applying perpendicular axes theorem.

5.0 Calculate the simple Stresses and Strains in structural materials

5.1 Define the following terms:
1. Stress,
2. Strain,
3. Modulus of Elasticity,
4. Longitudinal Strain,
5. Lateral Strain,
6. Poisson's ratio,
7. Modulus of rigidity,
8. Bulk Modulus,
9. working stress,
10. Factor of safety,
11. Resilience,
12. Strain Energy,
13. Proof resilience and
14. Modulus of Resilience

5.2 Distinguish between different kinds of stresses and strains.

5.3 Draw the stress-strain curve for ductile materials (Mild steel) and hence explain the salient points in the curve.

5.4 State Hooke's law and limits of proportionality.

5.5 Solve problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.

5.6 State the relationship among the elastic constants.

5.7 Solve problems on relationship between elastic constants.

5.8 Calculate stresses in simple and composite members under axial loading

5.9 Explain temperature stress, strain, hoops stress, temperature stresses in composite sections.

5.10 Calculate instantaneous stress and strain Energy due to dynamic loads and impact loading.

5.11 Explain the mechanical properties of materials like…..

COURSE CONTENT

1. Introduction
Mechanics-Engineering Mechanics-Applications and branches of Engineering Mechanics- Statics, Dynamics, Kinetics and Kinematics- Systems of measurements and Units- S.I and M.K.S units of physical quantities used in Civil Engineering

2. Forces & Moments
a) Definition of force; vectors and scalars; vector representation of a force; systems of forces; co-planar forces.
b) Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces.
c) Parallel forces – like and unlike – moment of force-its units and sense-couple-moment of a couple – properties of a couple.
d) Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

e) Structural members supporting co planar forces- Types of supports- Types of beams- Types of loading- Determination of support reactions for simply supported beams with point loads and Uniformly distributed loading

3. **Centroid**
   a) Definitions – Centroid, Centre of gravity
   b) Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium.
   c) Determination of location of Centroid of standard sections- T, L, I, Channel section, Z section and built up sections consisting of RSJs and flange plates and plane figures having hollow portion.

4. **Moment of Inertia**
   a) Definition of Moment of Inertia
   b) Perpendicular and parallel axes theorems
   c) Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections
   d) Moment of Inertia of built up sections- T, L, I, Channel section, and Z sections using parallel axis theorem
   e) Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's flange plates, channels & flange plates etc.
   f) Polar Moment of Inertia of solid and hallow circular sections using Perpendicular axis theorem

5. **Simple Stresses and Strains**
   a) Stress and strain – type of stresses and strains
   b) Stress strain curves for ductile materials- mild steel, elastic limit, limit of proportionality, yield point, ultimate stress; breaking stress; working stress factor of safety.
   c) Hooke's law – Young's modulus – deformation under axial load.
   d) Shear stress and Shear Strain – Modulus of rigidity.
   e) Longitudinal and lateral strain-poisson's ratio Bulk Modulus – relationship between elastic constants (proof not required, only problems).
   f) Composite sections – effect of axial loads
   g) Temperature stresses – strains – hoop stress - Temperature stresses in composite sections
   h) Resilience – strain energy-proof resilience – and modulus of resilience – maximum instantaneous stress due to gradual, sudden, and shock loading.
   i) Mechanical properties of materials-elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue, examples of materials which exhibit the above properties.

REFERENCE BOOKS

1. N. H.Dubey, Engineering Mechanics – (Tata Mc Graw Hill)
2. R.S.Kurmi, Engineering Mechanics
3. P.K. Abdul Latheef, Engineering Mechanics
4. Dayaratnam, Engineering Mechanics Statics
5. N. Srinivasulu, Engineering Mechanics

SURVEYING – I

Subject Title : **Surveying – I**
Subject Code : **CE-106**
Periods/Week : **03**
Periods/Year : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay type
1.	Introduction to surveying	12	16	02	01
2.	Chain Surveying	36	42	04	03
3.	Compass Surveying	32	39	03	03
4.	Minor Instruments	10	13	01	01
	Total	90	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Know the basic facts about Surveying
    1.1 State the concept of surveying.
    1.2 State the purpose of surveying.
    1.3 Distinguish between 1. Plane and 2. Geodetic surveying.
    1.4 List the units of linear and angular measurements in Surveying and conversions.
    1.5 List the instruments used for taking linear and angular measurements.
    1.6 Classify different surveys.
    1.7 State the fundamental principles of surveying.
    1.8 State and explain the stages of survey operations.

2.0 Understand the principles of Chain Surveying
    2.1 State the purpose of Chain surveying.
    2.2 State the principle of Chain surveying.
    2.3 Explain the principles used in Chain triangulation.
    2.4 List different instruments used in Chain Surveying.
    2.5 Explain the functions of different instruments used in Chain Surveying.
    2.6 List the points to be followed while selecting the survey stations
    2.7 Define ranging
    2.8 Explain the methods of ranging a line.
    2.9 List the operations involved in chaining on 1. Flat ground, 2.Sloping ground and 3. When high ground intervenes.
    2.10 Describe in detail the method of setting out right angles
        1. With or without cross staff and
        2. Optical square.
    2.11 Explain the

     1. Field work procedure in Chain survey and
     2. Method of recording field observations.
2.12 Know the errors and mistakes in Chain surveying.
2.13 Determine the corrections for measurement due to incorrect length of chain.
2.14 Explain the methods of overcoming different obstacles in chain surveying.
2.15 Explain the method of preparing site plans by Chain Surveying.
2.16 Calculate the areas of irregular boundaries using
     1. Average Ordinate rule,
     2. Trapezoidal rule and
     3. Simpson's rule.

3.0 Principles of Compass Surveying
3.1 State the purpose of Compass surveying.
3.2 State the principles of Compass surveying.
3.2 Identify the parts of Prismatic Compass
3.3 Explain the functions of parts of Prismatic Compass
3.4 Define terms-
     1. Whole Circle Bearing,
     2. Quadrantal Bearing,
     3. True meridian,
     4. Magnetic meridian,
     5. True bearing,
     6. Magnetic bearing,
     7. Dip,
     8. Declination, and
     9. Local attraction.
3.5 Convert Whole Circle Bearing in to Quadrantal Bearing and vice versa.
3.6 Explain the effect of local attraction
3.7 Compute corrected bearings for local attraction.
3.8 Compute the included angles of lines in a Compass traverse.
3.9 Compute the true bearings of lines in a Compass traverse.
3.10 Explain the operations involved in field in compass Surveying
3.11 Explain methods of recording field notes.
3.12 Explain the method of plotting Compass Surveying.
3.13 Explain the method of plotting closed traverse adjusting closing error by Bowditch rule.
3.14 List the errors in Compass surveying.

4.0 Uses and working principles of Minor Instruments
4.1 Explain the need for using Minor instruments
4.2 List various minor instruments used in surveying
4.3 Explain the uses of the following minor instruments:
     1. Abney Level,
     2. Pentagraph and
     3. Electronic Planimeter
4.4 Explain the working principles of
     1. Abney Level,
     2. Pentagraph and 3. Electronic Planimeter

COURSE CONTENT

1.0 Classification and Principles of Surveying
Concept of Surveying-purpose of Surveying-Divisions of surveying- Classification of Surveying based on different criteria– Fundamental principles in Surveying - Measurements- Units and conversions-Instruments used for taking linear and angular measurements- Stages of survey operations-Field work, Office work, Care and adjustments of the instruments.

2.0 Chain Surveying
   a) Purpose and Principle of Chain Survey ing -Suitability of Chain Surveying- Survey stations and their selection-Survey lines and offsets – Instruments used in Chain survey and their function

   b) Ranging a survey line- direct ranging and Indirect ranging – Line ranger- Chaining a line –Duties of leader and follower- Chaining on a sloping ground- Errors and mistakes in ordinary chaining -Correction due to incorrect length of Chain- problems
   c) Different operations in Chain Surveying- Setting out right angles with cross staff and Optical square- Cross staff survey Field work procedure- Recording field notes – field book-Conventional signs.
   d) Obstacles in chaining-methods to overcome obstacles-Problems
   e) Calculations of area – different methods –Average ordinate, Trapezoidal and Simpson's rules.

3.0 Compass Surveying
   a) Introduction, Purpose, principle and uses of compass Survey-Traverse-Open and Closed Traverse –Theory of magnetism-Description working and use of Prismatic compass-Operations in using Compass before taking readings
   b) Concept of Meridian-Types of meridians-Bearing and angle- Designation of bearings- Whole Circle Bearing. Quadrantal Bearing Conversions-
   c) Field work in Compass Survey –field notes-traverse using prismatic compass.
   d) Local attraction-detection and correction, Dip and Magnetic declination- Variation of Magnetic declination -calculation of true bearings-Determination of included angles from the given bearings and vice versa in compass traverse.
   e) Plotting of Compass traverse-closing error and adjustments by Bowditch graphical method.
   f) Precautions in using a Compass-Errors in Compass Surveying.

4.0 Minor instruments
   Purpose of Minor instruments- Various minor instruments- Uses and working principles of Abney Level, Pentagraph and Electronic Planimeter

REFERENCE BOOKS

1.   N.N.Basak, Surveying - Tata Mc Graw Hill
2.   S.K.Duggal, Surveying Vol-I - Mc Graw Hill Edn (India) Pvt Ltd
3.   Kulkarni and Kanetkar, Surveying and levelling Vol –1
4.   B.C. Punmia, Surveying and Levelling Vol. – 1
5.   R.Agor, Surveying and Levelling - Vol –1 Khanna Publishers

ENGINEERING DRAWING

Subject Title	:	Engineering Drawing
Subject Code	:	CE– 107
Periods/Week	:	06
Periods per Year	:	180

TIME SCHEDULE

S. No	Major Topics	Periods	Weight age of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	03	-	-	-
2	Drawing instruments				
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	12	5	1	-
5	Geometrical construction	24	10		1
6	Projection of points, Lines, Planes and solids	30	10		1
7	Orthographic Projection	30	15	1	1
8	Sectional views	18	10		1
9	Auxiliary views	06	5	1	
10	Pictorial drawing	30	10		1
11	Development of surfaces	21	10		1
	Total	**180**	**80**	**04**	**06**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Understand the Importance of Engineering Drawing
   1.1   State the importance of drawing as an engineering communication medium.
   1.2   State the need for 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   Understand the use of Engineering Drawing Instruments
   2.1   Select the correct instruments for drawing lines of different orientation.
   2.2   Select the correct instruments for drawing 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, thicknesses given function.
   2.5   Select and use appropriate scales for a given applications.
   2.6   Identify different drawing sheet sizes as per I.S. and Standard Lay-outs.
   2.7   Prepare Title block as per I.S. Specifications.
   2.8   Identify the steps to be taken to keep the drawing clean and tidy.

3.0   Write Free Hand Lettering and Numbers
     3.1   Write titles using sloping lettering and numerals as per B.I.S (Bureau of Indian standards)
     3.2   Write titles using vertical lettering and numerals as per B.I.S.
     3.3   Select suitable sizes of lettering for different layouts and applications.
     3.4   Make the use of lettering stencils.

4.0   Understand Dimensioning Practice
     4.1   State the need for dimensioning the drawing according to accepted standard.
     4.2   Define "Dimensioning".
     4.3   Identify notations of Dimensioning used in dimensioned drawing.
     4.4   Identify the system of placement of dimensions in the given dimensioned drawing.
     4.5   Dimension a given drawing using standard notations and desired system of dimensioning.
     4.6   Dimension standard features applying necessary rules.
     4.7   Arrange dimensions in a desired method in a given 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.

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 tangent arcs.
     5.3   Construct a Hexagon from the given data.
     5.4   Define ellipse, parabola, hyperbola, involute, cycloid and helix.
     5.5   Construct ellipse by concentric circles method and using a paper trammel.
     5.6   Construct parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
     5.7   State the applications of the above constructions in engineering practice.

6.0   Apply Principles of Projection of points, lines & planes
     6.1   Explain the projection of a point with respect to reference planes (HP & VP)
     6.2   Explain the projections of straight lines with respect to two reference planes.
     6.3   Explain the projections of perpendicular planes.

7.0   Apply principles of Orthographic Projection
     7.1   Explain the principles of Orthographic projection with simple sketches.
     7.2   Prepare orthographic views of a given simple Engineering part in first angle projection.
     7.3   Draw the orthographic views of an object, given its pictorial drawing.
     7.4   Sketch the minimum number of views needed to represent a given object fully.
     7.5   Identify the object, from a number of orthographic views given.
     7.6   Supply the missing view when two other views of an object are given.

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   Draw sectional view for the component in 8.2.

8.4   Apply conventional practices and identify the parts, which should not be shown in section while drawing sectional views.

8.5   Make conventional representation of Engineering materials as per latest B.I.S. Code.

8.6   Apply principles of hatching.

8.7   Draw simple sections (full, half, revolved and removed part) for a range of simple Engineering objects.

8.8   Draw the component from a given set of sectional views.

9.0 Understand the need for Auxiliary Views

9.1   State the need of Auxiliary views for a given Engineering Drawing.

9.2   Sketch the auxiliary views of a given Engineering component to indicate the true shape and size of component.

9.3   Draw the auxiliary views of a given object or set of orthographic views.

10.0 Prepare Pictorial Drawings

10.1   State the need for commonly used type of pictorial drawings.

10.2   Given the objects, draw their orthographic views.

10.3   State the need of isometric scale and isometric projection.

10.4   Prepare Isometric projections and isometric views for the given orthographic drawings.

10.5   Prepare oblique drawing (cavalier, cabinet) of simple Engineering objects from the given data.

10.6   Identify the correct pictorial views from a set of Orthographic drawings.

11.0 Prepare Development Drawings

11.1   State the need for preparing development drawing.

11.2   Prepare development of simple Engineering objects using parallel line and radial line method.

11.3   Prepare development of surfaces of Engineering components like trays, funnels, 90^0 elbows & rectangular ducts.

COURSE CONTENT

NOTE

1.   **I.S. / B.S Latest Specification should invariably be followed in all the topics.**

2.   **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

1.0 Understand the importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing and its importance as a graphic communication

Need for preparing drawing as per standards – SP-46 –1988

Mention of I.S.O and B.I.S – Role of drawing in – Engineering education

Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description – Scales:

Recommended scales – reduced & enlarged – Lines: Types of lines, selection of line thickness – Selection of Pencils – Sheet Sizes: A0, A1, A2, A3, A4, A5 – Layout of drawing sheets in respect of A0, A1, A3 sizes – Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet – To draw "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.
Drawing Plate 1: (Consisting of about two exercises)

To draw geometric shapes (standard) using drawing instruments
To draw layout of sheet and title block.

3.0   Free hand lettering & numbering
Importance of lettering – Types of lettering – Guide Lines for Lettering – Recommended sizes of letters & numbers – Advantages of single stroke or simple style of lettering – Use of lettering stencils
Drawing plate 2: (Consisting of about 5 to 6 exercises)

To print the table of Types of lines as per latest ISI Standards.
To print the table of "Recommended sizes of letters and numerals" – as per Standards.
Selection of suitable size of letters and numbers and draw the given titles, phrases using both vertical and sloping styles.

4.0   Dimensioning practice
Purpose of engineering Drawing – need of I.S.I code in dimensioning –Shape description of an Engineering object -Definition of Dimensioning size description – Location of features, surface finish, fully dimensioned Drawing – Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools – Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions – Chain, parallel, combined, progressive, and dimensioning by co-ordinate methods – The rules for dimensioning standard, features "Circles (holes), arcs, angles, tapers, chamfers, and dimensioning of narrow spaces.
Drawing Plate 3: (Consisting of above 12 to 15 exercises)

Dimensioning a given drawing using the above tools, rules and systems of dimensioning.
Dimensioning practice in various methods of dimensioning stated above.
Dimensioning, given common features listed.
Exercise in identifying the departures made in a given dimensioned drawing from I.S.I. Code of practice.

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 internally or externally and a given line.

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

Hexagon: Inscribing a Hexagon in a circle of given diameter and circumscribing about a given circle, using

i) Set squares.

ii) Compass – given a side to construct a Hexagon using set squares or compass.

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 Engineering application viz. Bolts and Nuts, Projectiles, reflectors P.V. Diagram of a Hyperbolic process – Construction of Ellipse using

i) Concentric circles method.

ii) Paper trammel method.

iii) Construction of parabola by rectangular method.

iv) Construction of Rectangular Hyperbola when the position of a point on the curve is given.

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

Drawing Plate: 4 (Consisting of about 12 to 15 exercises)

Exercises mentioned above at the rate of at least one problem on each "construction".

6.0   Projection of points, lines and planes.

Projecting a point on two planes of projection – Projecting a point on three planes of projection

Projection of straight line.

(a) Parallel to one or both the planes.

(b) Contained by one or both the planes.

(c) Perpendicular to one of the planes.

(d) inclined to one plane only and parallel to other plane.

Projection of perpendicular planes

(a) Plane perpendicular to both HP and VP

(b) 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 in simple positions

7.0   Orthographic Projections

Meaning of Orthographic Projection – Using a viewing Box and a model – Number of views obtained on the six faces of the box – Neat sketches of only 3 views for describing object – Concept of front view, top view, and side views – sketching these views for a number of Engineering 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.

Drawing Plate 5: (Consisting of about 10 to 12 Number of exercises)

Given an engineering object(s) to sketch the three views.

Given the pictorial view of simple objects to sketch the three views in
First and third angle projections.

Given the object (pictorial Drawing) and 3 views identifying the surface
on the views with reference to the object.

Given two views of a simple object – Draw the missing third view.
Drawing Plate 6: (Consisting of about 6 to 8 exercises)

Given the engineering objects (Pictorial views) Drawing the three views n First angle projection.
Identifying the object, when a number of objects and the orthographic views are given (matching exercises).

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) – Meaning of Full, half, revolved and removed, local or partial sections – Hatching – adjacent components (two or more) large areas, a part in different parallel planes – Conventional practices to represent sections of ribs, shafts, bolts, nuts, screws, rivets, spokes, webs, keys, cotters, thin sections etc., as per B.I.S. specifications – Conventional representation of materials as per B.I.S. Standards.
Drawing Plate 7: (Consists of about 8 to 10 exercises)
Preparing conventional representation of materials as per latest / B.I.S. Code.
Given the object (pictorial or orthographic view), and cutting plane line to draw sectional view.
Given the object to select the correct cutting plane line and then to draw the sectional view.
 To identify the object when number of objects and number of sectional views are given (Matching exercise.)

9.0   Auxiliary views

Need for drawing auxiliary views – Explanation of the basic principles of drawing an auxiliary view – explanation of reference plane and auxiliary plane – Partial auxiliary view.
Drawing plate No.8: (Consisting of about 8 exercises)
Given a set of objects or orthographic views state whether an auxiliary view is needed – if required sketch the same.
Given the object and its auxiliary view (partial or full, to sketch the auxiliary plane on the pictorial view)

10.0   Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective – Use of the pictorial drawings – Isometric drawings: Isometric axes, angle between them, meaning of visual distortion in dimensions – Need for an isometric scale, difference between Isometric scale and ordinary scale, difference between Isometric drawing (isometric view and Isometric Projection) and orthographic drawing – Isometric and non-Isometric lines – Isometric drawing of common features like rectangular, square and circular shapes – non-isometric lines – Use of box and offset construction – Oblique drawings: Their use – Cavalier and cabinet drawings – Oblique drawing of common features like rectangular, circular and inclined, surfaces – Selection of the face of the object to be included in the front view.
Draw plate 9: (Consists of about 10 to 12 exercises)

Given the Orthographic views to draw isometric views
Construction of isometric scale

Given the Orthographic views to draw isometric projections
Given the Orthographic views to draw cavalier Drawings
Given the Orthographic views to draw cabinet Drawings

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) When it is inclined to one principal and parallel to the other – Development of simple Engineering common solids like Cubes, prisms, Cylinders, Cones, Pyramid (sketches only) – Types of Development: Parallel line and radial line development – Procedure of drawing development of surfaces of trays, funnels, 90^0 elbow pipes and rectangular ducts.

Drawing plate No. 10: (Consists of about 10 exercises)

Development drawings by "Parallel – line" method such as prisms and Cylinders (Truncated)

Development drawing by "Radial – line "method such as cones and pyramids (Truncated)

Development drawings of a tray, funnel, 90^0 elbow and rectangular duct

REFERENCE BOOKS

1. N.D.Bhatt, Engineering Drawing
2. A.C. Parkinson (Metric Edition), A First Year Engineering Drawing
3. T.T.T.I., Madras, T.S.M. & S.S.M on Technical Drawing
4. Bureau of Indian Standards, SP-46-1998
5. R.C.Mouli, V.Rama Rao and M. Venkateswarlu, Introduction to Engineering Drawing

6. Gary Robert Bertoline, Introduction to graphics for Engineering (Fourth edition), Tata McGraw Hill
7. Gary Robert Bertoline, Fundamentals of Graphics Communication (Sixth edition)
8. Albert Boundy, Engineering Drawing 7th Edition
9. P I Varghese, Engineering Graphics, Tata McGraw Hill

SURVEY-I PRACTICE & PLOTTING

Subject Title   :   **Survey – I practice & plotting**
Subject Code   :   **CE-108**
Periods/Week   :   **06 (4+2)**
Periods/Year   :   **180**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Chain surveying	60
2.	Compass Surveying	60
3.	Minor instruments	12
4.	Plotting	48
	Total	180

OBJECTIVES
Upon completion of the course the student shall be able to
1.0   Apply standard Practices to perform chain survey in the field and to plot from field data
   1.1   Practice unfolding and folding a chain.
   1.2   Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book..
   1.3   Perform direct ranging on level ground and measure the distance between two given stations using line ranger.
   1.4   Perform indirect ranging and measure the distance between two given stations when a high ground intervenes to prevent intervisibility of ends of line.
   1.5   Set out a right angle to a given chain line by using chain only.
   1.6   Set and measure offsets for a given chain line by
          1. Perpendicular offsets and 2.Oblique offsets.
   1.7   Perform triangulation survey of a given area with chain and cross staff and record all necessary nearby details.
   1.8   Calculate the area bounded by the given points by chain triangulation and compare the result with the area calculated from plotting.
   1.9   Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.
   1.10   Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.

   2.0   Apply Principles to Perform compass survey and plot from   field data
   2.1   Identify the parts of a prismatic Compass
   2.2   Set up the compass at a station and carry out temporary adjustments.
   2.3   Take bearings of two points from instrument station and calculate the included angle.
   2.4   Perform an open compass survey with Compass and Chain.
   2.5   Perform a closed traverse with compass and chain.

2.7 Plot the closed traverse from field data and adjust for closing error by Bowditch rule.

2.8 Determine the area bounded by the given points by the method of Radiation.

2.9 Determine the distance between two accessible points involving single setting of the instrument.

2.10 Determine the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Learn from demonstration of various minor instruments

3.1 Demonstrate Abney level for taking angle of elevation and depression

3.2 Demonstrate Pentagraph to reduce and enlarge a given map and drawing.

3.3 Demonstrate Electronic Planimeter for measuring areas of irregular shape.

4.0 Apply principles of mapping from the field work and plot the from the field work measurements.

4.1 Understand the importance and relation between field work and plotting.

Key competencies to be achieved by the student

S.No	Experiment title	Competencies	Key competencies
1	a) Practice unfolding and folding of a chain b) Ranging a survey line by direct ranging and determine the distance between two points	a) Hold both the handles in the left hand and throwing the chain swiftly with the right hand in the forward direction. b) Fixing the ranging rod vertically in the ground c) Range by eye	---
2	a) Range a survey line by a line ranger b) Range a survey line by indirect ranging and determining the distance between two points	a) Move the instrument backward and forward at right angles to the line until two images appear one above the other exactly in the same vertical line. b) Observe the images of the ranging rods A and B in upper and lower prisms at the same time. c) Ensure the ranging rods at end stations are visible from the selected intermediate positions	Move the instrument backward and forward at right angles to the line until two images appear one above the other exactly in the same vertical line.
3	Set and measure perpendicular and oblique offsets	a) Measure the chainage accurately b) Hold the cross staff vertically and viewing both	Hold the cross staff vertically and viewing both the slits to coincide with chain line

			and object line
		the slits to coincide with chain line and object line c) Measure the length of Oblique offsets accurately.	
4	Calculate area of a given boundary by Cross staff survey	a) Run the chain line through the centre of the field. b) Take perpendicular and oblique offsets	Take perpendicular and oblique offsets
5	Perform triangulation survey of a given area with chain and cross staff.	a) Measure the length of base line accurately b) Measure the offsets correctly c) Record the field work observations correctly	a)Select the stations for full visibility b) Measure the length of base line accurately c) Accurately set the offsets
6	Perform chain traverse survey of a given area with chain and cross staff	a) Select main survey stations with clear intervisibility b) Measure the length of base line accurately c) Measure the offsets correctly d) Record the field work observations correctly	e) Select main survey stations with clear intervisibility b) Accurately set the offsets
7	Set up the compass at a station and carry out temporary adjustments	a)Fix the compass with tripod stand over the station b) Center the compass c) Level the compass	Centering the compass over the ground station
8	Taking bearings of the given traverse	a) Observe and record the bearings correctly b) Detect the local attraction, if any	Taking the bearings accurately
9	Perform an open traverse survey with Compass and Chain	a) Bisecting the object accurately with the cross hair b) Measure the fore and back bearings of the traverse legs by Prismatic compass after fixing the local magnetic meridian	Bisecting the object accurately with the cross hair
10	Perform a closed traverse survey with Compass and Chain and adjust for closing error by Bowditch method.	a) Bisecting the object accurately with the cross hair b) Measure the fore and back bearings of the traverse legs by Prismatic compass after fixing the local magnetic meridian	Bisecting the object accurately with the cross hair
PLOTTING			
11	Determine the area bounded by the given points by the	Calculate included angles from a given bearings and	Calculate included angles from a given

	method of Radiation	check for sum of included angles	bearings and check for sum of included angles
12	Determine the distance between two accessible points involving single setting of the instrument	Locate a point from which both the accessible points are visible.	Locate a point from which both the accessible points are visible.
13	Determine the distance between two inaccessible points involving setting of the instrument at two stations	Select at least two accessible and intervisible stations and measure the distance and take the bearings	Select at least two accessible and intervisible stations and measure the distance and take the bearings
	DEMONSTRATION		
14	Demonstrate Abney level for taking angle of elevation and depression	a) Measure the vertical angle by directing the instrument towards the object and exactly bisecting with cross wires b) Measure the slope of the ground	----
15	Demonstrate Pentagraph to reduce and enlarge a given map and drawing.	Keep two arms equal and for every position, the two arms should remain as parallelogram	----
16	Demonstrate Electronic Planimeter for measuring areas of irregular shape.	Move the tracing point gently and exactly along the boundary line	----

COURSE CONTENT

Chain Surveying
  a) Practice unfolding and folding of a chain.
  b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.
  c) Ranging a survey line using a line ranger
  d) Chaining a line involving indirect ranging.
  e) Setting and measuring the offsets-Perpendicular and Oblique offsets
  f) Measurement of land areas –cross staff survey
  g) Chain triangulation around the building covering a small area with other details taking offsets and recording.
  h) Chain triangulation involving a road with other details taking offsets and recording.
  i) Chain traversing to survey an area bounded by more than three stations.

Compass Surveying
  a) Setting up the compass – observations of bearings
  b) Calculation of included angles from the observed bearings
  c) Traversing with prismatic compass and chain – open Traverse – Recording.
  d) Traversing with prismatic compass and chain- closed traverse - recording.
  e) Plotting the closed traverse from field data and adjust for closing error by Bowditch rule.
  f) Determination of the area bounded by the given points by the method of Radiation

g)   Determination of the distance between two accessible points involving single setting of the instrument

h)   Determination of the distance between two inaccessible points involving setting of the instrument at two stations.

Minor Instruments

a)   Demonstration of Abney level for taking angle of elevation and depression

b)   Demonstration of Pentagraph to reduce and enlarge a given map and drawing.

c)   Demonstration of Electronic Planimeter for measuring areas of irregular shape.

Plotting

a)	Conventional signs in Surveying	2 Exercises
b)	Plotting of perpendicular and oblique offsets	1 Exercise
c)	Plotting of land surveys – Chain and cross-staff Surveying – Calculation of areas	4 Exercises
d)	Plotting of chain triangulation Surveying of small areas around Buildings.	4 Exercises
e)	Chain traversing to survey an area bounded by more than three stations	2 Exercises
f)	Plotting of closed traverse by Compass surveying – location of Details and adjusting error by Bow ditch method.	2 Exercises 3 Exercises
f)	Plotting of open traverse by Compass surveying and locating details	2 Exercises.
g)	Compass survey by method of radiation- calculation of area	1 Exercise
h)	Determination of the distance between two accessible points involving single setting of the instrument	1 Exercise
l)	Determination of the distance between two inaccessible points involving setting of the instrument at two stations.	2 Exercises

----

Total   24 Exercises

ENGINEERING PHYSICS LAB PRACTICE

Subject Title	:	**Engineering Physics Lab Practice**
Subject Code	:	**Common -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	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the volume of given object	• Read the scales • Calculate the volume of given object
2. Hands on practice on Screw gauge	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire	• 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	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum	• 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 l-T and l-T^2 graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and l-T^2 graph
5. Velocity of sound in air –Resonance method	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound • Calculate velocity of sound at 0^0 C

Name of the Experiment	Competencies	Key competencies
6. Focal length and Focal power of convex lens (Separate & Combination)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v curves	• 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	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope	• 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	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
9. Coefficient of viscosity by capillary method	• 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	• 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	• 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 x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force	• 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	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

ENGINEERING CHEMISTRY LAB PRACTICE

Subject Title : **Engineering Chemistry Lab Practice**
Subject Code : **Common -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_2CO_3 and making different diluted solution.	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength to	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Practice volumetric measurements (using pipetts, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0   Practice making standard solutions with pre weighted salts and to make desired dilutions using appropriate techniques.

3.0   Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl

4.0   Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0   Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0   Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
    a) To determine conductivity
    b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
Familiarization of methods for Volumetric analysis	--	--
Preparation of Std Na_2CO_3 and making different diluted solution	- 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	- Weighting the salt to the accuracy of .01 mg - Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette - Making appropriate dilutions
Estimation of HCl solution using Std. Na_2CO_3 solution Estimation of NaOH using Std. HCl solution Estimation of H_2SO_4 using Std. NaOH solution	- 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	- 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 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)	• 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	• 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		
Estimation of total solids present in water sample	• 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	• Measuring the accurate volume and weight of sample • Filtering and air drying without losing any filtrate • Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LAB PRACTICE
(Common to all branches)

Subject Title : Computer Fundamentals Laboratory Practice
Subject Code : CE-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....	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	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	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	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References-Review-View	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	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	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	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	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	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	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	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	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.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	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.	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	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	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

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	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	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	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	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	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	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	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	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	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	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	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
III Semester (SECOND YEAR)

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE-301	Mathematics - II	4	-	60	3			100
CE-302	Mechanics of Solids	4	-	60	3			100
CE-303	Hydraulics	5	-	75	3			100
CE-304	Surveying - II	3	-	45	3			100
CE-305	Construction Materials	4	-	60	3			100
CE-306	Construction Practice	4	-	60	3			100
PRACTICAL:								
CE-307	Civil Engineering Drawing - I	-	6	90	3			100
CE-308	Surveying - II Practice & Plotting	-	6 (4+2)	90	3			100
CE-309	Material Testing Practice	-	3	45	3			100
CE-310	Hydraulics Practice	-	3	45	3			100
	TOTAL	24	18	630	-			900

ENGINEERING mATHEMATICS – II
(Common to all branches)

Subject Title : **Engineering Mathematics - II**
Subject Code : **CE-302**
Periods/Week : **03**
Periods/Semester : **60**

Blue Print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
				R	U	App	R	U	App
	Unit - I								
1	**Indefinite Integration**	18	34	2	1	0	1	1	1/2
	Unit - II								
2	**Definite Integration and its applications**	17	31	0	1	1	0	1	1 1/2
	Unit - III								
3	**Differential Equations of first order**	15	29	2	1	0	1/2	1/2	1
	Unit - IV								
4	**Statistical Methods**	10	16	1	1	0	1	0	0
	Total	60	110	5	4	1	2 1/2	2 1/2	3
			Marks:	15	12	3	25	25	30

R: **Remembering type** 40 marks
U: **Understading type** 37 marks
App: **Application type** 33 marks

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

Unit-I

1.0   Use Indefinite Integration to solve engineering problems
   1.1   Explain the concept of Indefinite integral as an anti-derivative.
   1.2   State the indefinite integral of standard functions and properties of Integrals $\int$ (u + v) *dx* and $\int ku\ dx$ where *k* is constant and *u, v* are functions of *x.*
   1.3   Solve integration problems involving standard functions using the above rules.
   1.4   Evaluate integrals involving simple functions of the following type by the method of   substitution.
         i*)* $\int f(ax + b)\ dx$ where   f(x) dx is in standard form*.*
         ii) $\int [f(x)]^n\ f\ '(x)\ dx$
         iii) $\int f\ '(x)/[f(x)]\ dx$
         iv) $\int f\ \{g(x)\}\ g\ '(x)\ dx$
   1.5   Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.
   1.6   Evaluate the integrals of the form $\int Sin^m \theta\ Cos^n\ \theta.\ d\theta$ where m and n are positive integers.
   1.7   Evaluate integrals of powers of *tan x* and *sec x.*
   1.8   Evaluate the Standard Integrals of the functions of the type

$$i)\ \frac{1}{a^2 + x^2},\ \frac{1}{a^2 - x^2},\ \frac{1}{x^2 - a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2 + x^2}},\ \frac{1}{\sqrt{a^2 - x^2}},\ \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii)\sqrt{x^2 - a^2},\ \sqrt{x^2 + a^2},\ \sqrt{a^2 - x^2}$$

   1.9   Evaluate the integrals of the type

$$\int \frac{1}{a \pm bSin\theta}d\theta, \int \frac{1}{a \pm b\cos\theta}d\theta\ \text{and}\ \int \frac{1}{a\cos\theta \pm b\sin\theta \pm c}d\theta\ .$$

   1.10   Evaluate integrals using decomposition method.
   1.11   Evaluate integrals using integration by parts with examples.
   1.12   State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.
   1.13   Evaluate the integrals of the form $\int e^x [f(x) + f\ '(x)]\ dx.$

Unit-II

2.0   Understand definite integral and use it in engineering applications
   2.1   State the fundamental theorem of integral calculus
   2.2   Explain the concept of definite integral.
   2.3   Calculate the definite integral over an interval.
   2.4   State various properties of definite integrals.
   2.5   Evaluate simple problems on definite integrals using the above properties.
   2.6   Explain definite integral as a limit of sum by considering an area.
   2.7   Find the areas under plane curves and area enclosed between two curves using integration.
   2.8   Obtain the volumes of solids of revolution.

2.9   Obtain the mean value and root mean square value of the functions in any given interval.

2.10   Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and   provide some examples.

Unit –III

3.0   Solve Differential Equations in engineering problems
   3.1   Define a Differential equation, its order, degree
   3.2   Form a differential equation by eliminating arbitrary constants.
   3.3   Solve the first order first degree differential equations by the following methods:
         i.   Variables Separable.
         ii.   Homogeneous Equations.
         iii.   Exact Differential Equations
         iv.   Linear differential equation of the form dy/dx + Py = Q,
                 where P and Q are functions of x or constants.
         iv.   Bernoulli's Equation (Reducible to linear form.)
   3.4   Solve simple problems leading to engineering applications

Unit –IV

4.0   Use Statistical Methods as a tool in data analysis
   4.1   Recall the measures of central tendency.
   4.2   Explain the significance of measures of dispersion to determine the degree of heterogeneity of the data.
   4.3   Find the measures of dispersion – range, quartile deviation, mean deviation, standard   deviation for the given data.
   4.4   Explain the merits and demerits of the above measures of dispersion.
   4.5   Express relationship between measures of dispersion
   4.6   Find the coefficient of variation
   4.7   Explain bivariate data.
   4.8   Explain the concept of correlation between two variables and co-varience.
   4.9   Explain coefficient of correlation and its properties
   4.10   Calculate the coefficient of correlation between two variables.
   4.11   Find rank correlation co-efficient.

COURSE CONTENT

Unit-I

Indefinite Integration
1. Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of
  indefinite integral. Integration by substitution or change of variable. Integrals of the form
  $\sin^m\theta . \cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec
  x and   powers of tan x, sec x by substitution.

  Evaluation of integrals which are reducible to the following forms :

$$i) \frac{1}{a^2 + x^2} , \frac{1}{a^2 - x^2} , \frac{1}{x^2 - a^2}$$

$$ii) \frac{1}{\sqrt{a^2 + x^2}} , \frac{1}{\sqrt{a^2 - x^2}} , \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii) \sqrt{x^2 - a^2} , \sqrt{x^2 + a^2} , \sqrt{a^2 - x^2}$$

Integration by decomposition of the integrand into simple rational, algebric functions. Integration by parts , Bernoulli's rule.

Unit-II
Definite Integral and its applications
2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit –III

Differential Equations
3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Unit –IV

Statistical Methods
4. Revise measures of central tendency, measures of dispersion: range, quartile deviation, mean deviation, standard deviation for the given data, merits and demerits, relationship between measures of dispersion, coefficient of variation, bivariate data, concept of correlation, covariance, coefficient of correlation and its properties, rank correlation co-efficient.

REFERENCE BOOKS
1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. Statistical Methods Vol.I, Das, Tata McGraw-Hill
4. Statistics, 4/e, Schaum's Outline Series (SIE), McGraw-Hill

MECHANICS OF SOLIDS

Subject Title	:	**Mechanics of Solids**
Subject Code	:	**CE-302**
Periods/Week	:	**04**
Periods/Semester	:	**60**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Shear force and Bending Moment	15	29	03	02
2.	Theory of simple bending	17	29	03	02
3.	Deflection of beams	18	32	04	02
4.	Thin cylindrical shells	05	10	-	01
5.	Torsion	05	10	-	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Determine Shear Force and Bending Moment of simple beams analytically
    1.1   Define
            a) Cantilever beam
            b) Simply supported beam
            c) Fixed beam
            d) Continuous beam
            e) Overhanging beam
    1.2   Define
            a) Point Load
            b) Uniformly Distributed Load
    1.3   Describe
            a) Roller support
            b) Hinged support
            c) Fixed support
    1.4   Calculate reactions at rollers/hinged and fixed supports for
            1. Simply Supported beams,
            2. Cantilever beams and
            3. Overhanging beams.

1.5 Explain
    a) Shear Force and
    b) Bending Moment

1.6 Explain sign conventions used for drawing
    1. Shear Force and
    2. Bending Moment

1.7 Deduce the relationship among the rate of loading, shear force and bending moment

1.8 Determine Shear Force and Bending Moments on
    1.Cantilever and
    2.Simply Supported beams
    for simple cases of loading (Point Load, Uniformly Distributed Load) analytically

1.9 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD)

1.10 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams

1.11 Define point of contra flexure

1.12 Determine the Shear Force, Bending Moment and point of contraflexure for overhanging beams

1.13 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for overhanging beams

2.0 Understand the Effect of Loading on Beams

2.1 Define simple / pure bending

2.2 Explain the process of simple bending

2.3 Define
    a) Neutral layer
    b) Neutral axis
    c) Radius of curvature

2.4 List the assumptions made in the theory of simple bending.

2.5 Derive the bending equation for simple bending

2.6 Prove that the neutral axis passes through centroid of cross section

2.7 Define
    a) Bending Stress
    b) Moment of Resistance

2.8 Sketch bending stress distribution across the depth of the beam for any cross section.

2.9 Explain bending stress distribution across the depth of the beam for any cross section.

2.10 Define
    a) Modulus of section
    b) Flexural rigidity

2.11 Derive the formula for section modulus of (solid and hollow sections)
    a) Square Section
    b) Rectangular Section
    c) Circular Section

2.12 Calculate section modulus based on above formulae

2.13 Solve problems on theory of simple bending for
    1. Symmetrical and
    2. Unsymmetrical sections
    to calculate

a) Moment of Resistance or
b) Load carried or
c) Dimensions of cross section.

2.14 State formula for calculation of Shear Stress in any layer of a cross section (Derivation of formulae not required)

2.15 Draw shear distribution across
   a) Rectangular section
   b) Solid circular section
   c) I - section
   d) T - section

2.16 Determine shear stress at any layer and draw shear stress distribution diagram across
   a) Rectangular section
   b) I - section

2.17 Determine the maximum shear stress in circular, rectangular and square sections (Derivation of formulae not required)

3.0 Understand Deflection of Beams under Loading

3.1 Draw the deflected shapes of different beams (like rectangular, square, circular beams)

3.2 Define
   a) Elastic curve
   b) Slope
   c) Deflection

3.3 Distinguish between strength and stiffness of a beam.

3.4 Derive relation between slope, deflection and radius of curvature

3.5 Derive the equations for maximum slope and deflection by double integration method for:
   a) Cantilever beams with point loads and uniformly distributed loads
   b) Simply supported beams with central point load or uniformly distributed load throughout.

3.6 Calculate the maximum slope and deflection in simply supported and cantilever beams using the above formulae

3.7 Explain Mecaulay's method (for Simply supported beams) to find the slope and deflections

3.8 Compute the maximum slope and deflection for Simply Supported beam carrying point loads and uniformly distributed loads by Mecaulay's method

3.9 Explain the moment area method for slope and deflection

3.10 Define
   a) Mohr's theorem-I
   b) Mohr's theorem-II

3.11 Derive formulae for maximum slope and deflection of standard cases by moment area method

3.12 Compute the maximum slope and deflections for
   1. Cantilever and
   2. Simply Supported Beams
   by Mohr's theorem-I and Mohr's theorem-II (moment area method)

4.0 Understand the effects of Internal pressure on welded and riveted thin cylinders

4.1 Define thin Cylinder

4.2 Explain failures of thin Cylinders

4.3   Explain 1.Longitudinal and 2. Hoop stresses in the cylinder under internal pressure
4.4   State the formulae for longitudinal and hoop stresses in
        1. Riveted and
        2.Welded thin cylinders
4.5   Calculate the longitudinal and hoop stresses in the cylinder under internal pressure, given the dimensions of the
        1. Riveted and 2. Welded thin cylinders
4.6   Calculate the thickness of a thin cylinder (riveted / welded)
4.7   State the formulae for strains and changes in dimensions of a thin cylinder
4.8   Calculate the changes in dimensions of a thin cylinder under internal pressure

5.0   Understand the effects of pure Torsion on Solid and Hollow Circular Shafts
5.1   Define pure Torsion
5.2   List the assumptions made in the pure Torsion
5.3   State the formula for pure Torsion of a circular shaft (Derivation not required)
5.4   Solve the problems on Torsion applying Torsion formula
5.5   Explain
        a) Polar modulus
        b) Torsional rigidity
5.6   State the formula for power transmitted by the circular shaft
5.7   Solve the problems on power transmitted by
        1. solid and 2.Hollow circular shafts

COURSE CONTENT

1.0 Shear force and bending Moment
   a) Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and continuous.
   b) Types of supports – Roller – Hinged – Fixed,
   c) Explanation of S.F and B.M. at a section
   d) Relation between rate of loading SF and BM
   e) Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams, overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure.
   f) Drawing S.F. and B.M diagrams by analytical methods – location of points of contra flexure.

2.0 Stresses in Beams
   a) Theory of simple bending – assumptions – Neutral axis – Bending stress distribution – Moment of resistance – curvature of beams – Bending equation – strength of beams – Rectangular, circular, and L sections practical applications – simple problems.

   b) Shear stress in beams – Equation for shear stress in a layer of a beam (Derivation of formula not required) – Shear Stress distribution diagrams for various beam sections such as rectangular, solid circular and I sections – Problems.

3.0 Deflection of Beams
     a) Deflected shapes of beams with different support conditions – Strength and stiffness of beams – Relation between curvature, slope and deflection
     b) Double integration method – Derivation of standard cases – Problems
     c) Macaulay's method for slope and deflection – Simply supported beam under concentrated and uniformly distributed loads – Problems.
     d) Mohr's theorems for slope and deflection – Cantilevers and simply supported beams with symmetrical loading – Problems.

4.0 Thin Cylinders
     a) Thin cylinders – Failure of thin cylinders.
     b) Longitudinal and Hoop stresses in welded and riveted cylinders – Equations of stresses in thin cylinders (Derivation of formula not required) – Calculation of thickness in thin cylinders under internal pressures – Problems.
     c) Strains and changes in dimensions (δd, δl, δv) of thin cylinders – Problems.

5.0 Torsion
     a) Pure torsion – Assumptions – Torsion formula (Derivation not required) – Solid and hollow circular shafts subjected to pure torsion – Simple problems – Shear stress distribution in shafts.
     b) Power transmitted by circular shafts – Problems

REFERENCE BOOKS

1. R.K. Rajput, Mechanics of Solids
2. S. Ramamurtham, Strength of Materials
3. Dr. B.C. Punmia, S.M and T.S
4. N. Srinivasulu, S.M and T.S
5. R.S. Khurmi Strength of Materials
6. D.S. Prakash Rao, Introduction to Strength of Materials
7. D.S. Prakash Rao, Strength of Materials (A practical approach) Vol–I
8. R.K. Bansal, Strength of Materials
9. Y. Ram Mohan Rao, S.M. and T.S.
10. B.K. Sarkar, Strength of Materials
11. L.S. Negi, Strength of Materials
12. S.S. Ratan, Strength of Materials

HYDRAULICS

Subject Title : **HYDRAULICS**
Subject Code : **CE-303**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S.No	Major Topics	No. of periods	Weightage of marks	Short Type	Essay Type
1.	Properties of Fluids	04	03	1	-
2	Fluid pressure and its measurements	10	13	01	01
3.	Flow of Fluids	08	13	01	01
4.	Flow through orifice and mouth pieces	10	13	01	01
5.	Flow over notches and weirs	10	16	02	01
6.	Flow through pipes	10	18	1	11/2
7.	Flow through open channels	12	18	1	11/2
8.	Pumps& Turbines	08	13	1	1
9.	Hydro electric power plants	03	03	1	-
	TOTAL	75	110	10	08

OBJECTIVES

Upon completion of course the student shall be able to

1.0 Understand the properties of Fluids
    1.1 Explain the scope and importance of hydraulics in Civil Engineering.
    1.2 Define fluid
    1.3 List examples of fluids.
    1.4 Differentiate ideal and real fluids.
    1.5 Distinguish between fluids & liquids.
    1.6 Define
        1. Mass density,
        2. Specific weight,
        3. Specific gravity,

4. Adhesion,
5. Cohesion,
6. Surface tension,
7. Capillarity,
8. Compressibility,
9. Dynamic Viscosity,
10. Kinematic viscosity and
11. Vapour pressure.

1.7   State the standard Values for pure water and mercury for
1. Mass density,
2. Specific weight, and
3. Specific gravity

1.8   State the units for the above properties.

1.9   State formulae of dynamic viscosity, capillarity surface tension of water drop and soap bubble.

1.10 Explain the practical application of surface tension.

2.0   Understand methods of measurement of liquid pressure and calculate total pressure and centre of pressure on hydraulic structures

2.1   Define 1.Atmospheric pressure, 2.Gauge pressure and 3.Absolute pressure.

2.2   States the relation between the above three pressures

2.3   Describe the following pressure measuring instruments
1. Piezometers, manometers,
2. U- tube and
3. Differential manometers.

2.4   Compute the pressure of a flowing fluid given the readings on
piezometers- simple manometers- differential and inverted differential manometers.

2.5   Define 1. Total Pressure and 2. Centre of Pressure.
State the formulae for total pressure and centre of pressure on the following surfaces immersed in a liquid at rest:
1. Horizontal plane,
2. Vertical plane and
3. Inclined plane

2.6   Calculate total pressure and centre of pressure for the above plane surfaces for the given conditions.

2.7   Determine total pressure and centre of pressure for hydraulic structure (like sluice gates, dams, lock gates).

3.0   Comprehend the General Principles of flow of the Liquids and Bernoulli's theorem.

3.1   State the different types of flow of liquids

3.2   Define
1.Uniform flow ,
2.Non-uniform flow,
3.Steady flow,
4.Unsteady flow,
5.Laminar flow and
6.Turbulent flow.

3.3   Distinguish between different types of flow of liquids.

3.4   Define discharge

3.5   State units of discharge

3.6   State one dimensional continuity equation.

3.7 Compute the discharge/velocity at a section of flowing liquid in pipe for the given conditions.

3.8 Explain the following energies of liquid in motion
   1. Datum head,
   2. Pressure head and
   3. Velocity head.

3.9 State Bernoulli's theorem of total energy of a liquid in motion.

3.10 State the equation for Bernoulli's theorem of total energy of a liquid in motion.

3.11 List the limitations of Bernoulli's theorem.

3.12 Compute the pressure / velocity at a section of flowing liquid in pipe for the given conditions using Bernoulli's equation.

3.13 List three practical applications of Bernoulli's theorem ,

3.14 Describe the working principle of
   1. Venturimeter,
   2. Orifice meter and
   3. Pitot tube.

3.15 State the formulae to calculate the actual discharge of flowing liquid through 1.Venturimeter and 2.Orifice meter.

3.16 Compute the actual discharge of flowing liquid through,
   1. Venturimeter and 2.Orifice meter (numerical problems)

4.0 Comprehend the general principles of the flow of liquids through orifices and mouth pieces.

   4.1 Define orifice

   4.2 List different types of orifices

   4.3 Differentiate large orifice and small orifice

   4.4 Define
      1. vena- contracta,
      2. Cc,
      3. Cv, and
      4. Cd (Hydraulic coefficients).   .

   4.5 State the relation between above three coefficients.

   4.6 State the formulae for actual, theoretical discharges through small orifice

   4.7 Calculate the discharge, Cc, Cv ,Cd for given conditions-Numerical Problems

   4.8 Derive formula for discharge through Large Rectangular Orifice.

   4.9 Calculate discharge through Large Rectangular Orifice for given conditions-Numerical Problems.

   4.10 State the equations with notations for discharge through
      1. Fully submerged Orifice and
      2. Partially submerged Orifice

   4.11 Compute discharge for the above two orifices for the given conditions-Numerical problems.

   4.12 State the formula for time of emptying of a prismatic tank by an orifice

   4.13 Compute the time of emptying of a prismatic tank by an orifice

   4.14 Define mouth piece.

   4.15 Differentiate mouth piece and orifice.

   4.16 Classify mouth pieces.

   4.17 State the formulae for discharge for different types of mouth pieces.

   4.18 Calculate discharge through a mouth piece for given data-Numerical Problems.

5.0 Comprehend the general principles of the flow of liquids over notches and weirs

    5.1   Define a notch

    5.2   List different types of notches.

    5.3   State the formulae for the discharge over following notches:

            1. Rectangular,

            2. Triangular and

            3. Trapezoidal notches.

    5.4   Calculate the discharge through the above notches from the given data

    5.5   Define weir

    5.6   list different types of weirs.

    5.7   State the formulae for discharge over 1. Sharp crested and 2. Broad crested weirs.

    5.8   State the formulae for discharge over above weirs with modifications for end contractions and velocity of approach.

    5.8   Determine the discharge over sharp crested and broad crested weirs under given conditions - Numerical Problems.

    5.10   Write the formulae to determine the discharge for rectangular weir 1. Francis, and 2. Bazin's empirical formula

    5.11   Determine the discharge over rectangular weir using above two formulae for given data - Numerical Problems

6.0 Comprehend the General Principles of the flow of liquids through Pipes

    6.1   List various losses that occur when water flow through pipes.

    6.2   Differentiate Major loss and Minor losses.

    6.3   State formulae to compute loss of head due to friction using 1. Chezy, and 2. Darcy

    6.4   Solve numerical problems in pipes based on the above two formulae for given data- Numerical problems.

    6.5   State formulae for head loss due to various minor losses.

    6.6   Compute the above minor losses of head for given data –Numerical problems.

    6.7   Define

            1.Hydraulic gradient line and

            2.Total energy line.

    6.8   Calculate discharge through Parallel and Compound (series) Pipes connected to reservoir for given data- Numerical Problems.

    6.9   Define

            1.Critical velocity and 2. Reynold's number.

    6.10   State whether the flow is laminar or turbulent based on Reynold's number.

7.0 Design a section of open channel flow

    7.1   Define open channel flow

    7.2   Differentiate open channel flow and pipe flow

    7.3   Define

            1. Wetted perimeter and

            2. Hydraulic mean depth/radius.

    7.4   State

            1.Chezy's formula and

2.Manning's formula
for uniform flow through open channels

7.5 List the Values of 'C' for different surfaces.
7.6 State the following formulae to evaluate 'C'
1.Kutter's, formula,
2.Manning's formula and
3.Bazin's formula
7.7 Calculate Velocity and Discharge in a channel using Chezy's and Manning's formulae for given conditions-Numerical problems.
7.8 Define most economical section of a channel.
7.9 List the conditions for most economical section of
1.Rectangular channel and
2.Trapezoidal channel
7.10 Design rectangular channel sections for the given conditions
7.11 Design trapezoidal channel sections for the given conditions

8.0 Understand the working principles of pumps and water turbines
8.1 Define Pump
8.2 List different types of Pumps
8.3 Describe the parts of Reciprocating Pump with a sketch.
8.4 Describe the working principle of
1.Single acting and 2.Double acting reciprocating pumps.
8.5 List the functions of air vessels for reciprocating pumps.
8.6 Describes the different parts of centrifugal pumps.
8.7 Explain the working principle of centrifugal pump.
8.8 Define priming
8.9 Explain the necessity of priming.
8.10 Explain the use of
1.Foot valve and 2.Strainer in a centrifugal pump.
8.11 Describe
1. Jet pump
2. Air lift pump and
3. Deep well pump
8.12 List the uses of
1. Jet pump
2.Air lift pump and
3.Deep well pump
8.13 Define Turbine
8.14 List types of turbines.
8.15 List the examples of
1. Impulse and 2. Reaction turbines.
8.16 Differentiate between Impulse and Reaction turbines.
8.17 Explain the working principle of Pelton wheel turbine.
8.18 Describe the Parts of Francis Turbine.
8.19 Explain the purpose of draft tube
8.20 List types of draft tubes.

9.0 Understand the functions of components of Hydro-Electric Power Plants
9.1 Sketch a typical layout of hydro-electric power plant installation.
9.2 List different components of hydro-electric power plant installation.
9.3 Define surge tank
9.4 List the functions of surge tank.

COURSE CONTENT

1.0 Properties of liquids
- a) Scope and importance of hydraulics in Civil Engineering
- b) Fluids – classification - ideal and real fluids.
- c) Difference between fluids and liquids.
- d) Properties of liquids.
- e) Formulae for Dynamic viscosity, Kinematic viscosity, surface tension of water and soap bubble, capillarity.

2.0 Liquid pressure and its measurement
- (a) Atmospheric pressure, gauge pressure and absolute pressure and relationship.
- (b) Pressure measuring Instruments – Piezometer- Manometers – U-tube, inverted U-tube and differential manometers -Description.
- (c) Measurement of the Pressure of a flowing liquid – Piezometer - simple, differential and inverted differential manometers.
- (d) Total pressure and Centre of pressure on plane surface immersed in liquid – i) Horizontal ,ii) Vertical iii) inclined plane surfaces and Practical Applications.
- (e) Numerical Problems on Total pressure and Centre of pressure.

3.0 Flow of liquids
- (a) Types of Flow – Uniform flow, non-uniform flow, stream line flow, turbulent flow, steady flow and unsteady flow.
- (b) Rate of flow or discharge-continuity equation – one dimensional – Principle - Numerical Problems.
- (c) Energies of liquid in motion – datum head – pressure head and velocity head.
- (d) Total energy of liquid in motion – Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem - Numerical Problems.
- (e) Practical applications of Bernoulli's theorem - venturi meter - orifice meter - pitot tube.
- (f) Numerical Problems on venturi meter and orifice meter.

4.0 Flow through Orifices and Mouth Pieces
- (a) Orifice-types of Orifices-difference of small and large orifice-Determination of discharge through small Orifice - Vena Contracta.-Hydraulic coefficients (Cv,Cc,Cd) – relation -(No derivation) - Numerical Problems.
- (b) Large Rectangular Orifice- Derivation of formula for discharge- Numerical Problems.
- (c) Flow through fully submerged and partially submerged orifices-explanation-formula for discharge- Numerical Problems.
- (d) time of emptying of a prismatic tank by an orifice- Numerical Problems.
- (e) Mouth piece-Difference between Orifice and Mouth piece.
- (f) Types of Mouth pieces – equations for discharge-determination of discharge through a Mouth piece from the given details.

5.0 Flow over Notches and Weirs
   Notches
- (a) Notch - types of notches - rectangular, triangular and trapezoidal notches

(b) Formulae for the discharge over rectangular, triangular and trapezoidal notches-Numerical problems (Derivation of formulae not required)

Weirs

(c) Weir - types of weirs – sharp crested and broad crested weirs

(d) Formulae for the discharge over a sharp crested and broad crested weirs - Numerical problems (Derivation of formulae not required)

(e) Equations of discharge for the above weirs with velocity of approach and end contractions.

(f) Empirical formulae for discharge over rectangular weir-Francis formula-Bazins formula- Numerical problems (Derivation of formulae not required).

6.0 Flow thorough pipes

a) Major and minor losses.

b) Frictional loss in pipes - Chezy's formula and Darcy's formula (without proof) - Numerical problems.

c) Minor Losses - Loss of head at entrance and exit of pipe, loss of head due to sudden enlargement, sudden contraction – Formulae - simple problems.

d) Hydraulic gradient and total energy line.

e) Discharge through parallel pipes and compound pipes (series) connected to a reservoir.

f) Laminar and turbulent flow in pipes - critical velocity and Reynold's number – significance (no problems).

7.0 Flow through open Channels

a) Open channel flow - differences between open channel flow and pipe flow.

b) Geometric properties of channel - Wetted perimeter and hydraulic mean depth.

c) Discharge through open channel –Chezy's formula (derivation not necessary).
   Numerical problems

d) Value of 'C' for different surfaces.

e) Empirical formulae for value of C.
   1. Kutter's formula.
   2. Manning's formula
   3. Bazin's formula.

f) Conditions for Most economical section of a channel-rectangular and trapezoidal sections - Design of cross sections- problems.

8.0 Pumps and Turbines

Pumps

a) Pumps – types - reciprocating pumps and centrifugal pumps.

b) Reciprocating pumps- singe acting and double acting pumps- description and working – functions of air vessels.

c) Centrifugal pumps-description of parts – working – priming.

d) foot valve and strainer.

e) Other type of pumps-jet, airlift and deep well pumps – brief description - uses.

Turbines

a) Classification of turbines-impulse and reaction turbines.

b) Impulse turbine -Pelton Wheel, description and working(without problems)

c) Reaction turbines- Francis and Kaplan turbines

d) Description and working of Francis turbine (without problems).
e) Draft tube- purpose and types.

10.0   Hydro-electric Installation
a) Sketch a typical layout of a hydro electric power plant - components – Intake works, Pressure tunnel, penstock, surge tank, anchor blocks and tailrace.
b) Functions of surge tank.

REFERENCE BOOKS

1.   Reya & Rao, Hydraulics

2.   Modi & Sethi, Hydraulics & Fluid Mechanics

3.   Bansal, Fluid Mechanics &Hydraulics

4.   Fluid Mechanics and Hydraulic Machines

* * *

SURVEYING – II

Subject Title   : **Surveying – II**
Subject Code   : **CE-304**
Periods/Week   : **03**
Periods/Semester   : **45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Leveling	30	68	6	5
2.	Theodolite Survey	15	42	4	3
	Total	45	110	10	8

OBJECTIVES

Upon completion of this course student shall be able to

1.0.   Understand the principles of levelling for different engineering purposes
    1.1.   Define levelling
    1.2.   List the types of levelling instruments
    1.3.   Define
        1. Datum or Datum plane,
        2. Reduced level,
        3. Level surface,
        4. Horizontal surface,
        5. Vertical Line and
        6. Station.
        7. Mean sea level
        8. Bench Mark
    1.4.   List the component parts of a dumpy level and their functions
    1.5.   List the temporary adjustments of a dumpy level.
    1.6.   Explain the steps involved in performing Temporary adjustments of a dumpy level.
    1.7.   Define
        1. Back sight,
        2. Fore sight,
        3. Intermediate sight,
        4. Change Point
    1.8.   List types of levelling staves
    1.9.   List the Errors in levelling
    1.10.   Enumerate 1. Natural and 2. Instrumental errors
    1.11.   List the Precautions to be taken to prevent errors in levelling
    1.12.   Tabulate the levelling field data
    1.13.   State two types of methods of reducing levels

1.14. Compare height of instrument and Rise and fall methods
1.15. Compute reduced levels by height of instrument and Rise and fall methods, and apply check
1.16. Explain the effect of Errors due to
    1. Curvature and 2. Refraction
1.17. Compute the error due to
    1. Curvature,
    2. Refraction and
    3. Combined error. and the
1.18. Apply correction to be applied for the above errors.
1.19. List the types of Levelling
1.20. Describe in detail 1. Profile levelling and 2. Reciprocal levelling
1.21. List the errors eliminated in reciprocal levelling
1.22. Derive the formula for true difference in elevation and true error between two points in reciprocal levelling
1.23. Calculate true difference in elevation in reciprocal levelling and collimation error in reciprocal levelling
1.24. Calculate collimation error in reciprocal levelling
1.25. List the fundamental lines of dumpy level
1.26. state the relationship among fundamental lines of dumpy level
1.27. Explain permanent adjustments of a dumpy level (one peg method only)
1.28. Define
    1. Contour,
    2. Contour interval and
    3. Horizontal equivalent
1.29. List the Characteristics
1.30. List the uses of contours
1.31. List the methods of contouring
1.32. Describe Block contouring and radial contouring
1.33. Describe Radial contouring
1.34. Explain the interpolation of contours
1.35. Explain the method of tracing contour gradient / alignment of hill road

2.0. Understand the principles of theodolite surveying
2.1. List the uses of a theodolite
2.2. List the types of theodolites
2.3. Differentiate between transit and non transit theodolites
2.4. List the parts of a transit theodolite
2.5. Explain the functions of parts of a transit theodolite.
2.6. Define
    1. Face left observation,
    2. Face right observation,
    3. Swing of telescope,
    4. Telescope normal and
    5. Telescope inverted
2.7. List the fundamental lines of a transit thedolite
2.8. Explain the relationship of fundamental lines of theodolite
2.9. Explain the method of temporary adjustments of a transit theodolite for taking observations.
2.10. Read the reading of vernier and least count

2.11. Explain the method of measuring the horizontal angle by repetition method

2.12. Rule out the page of a theodolite field book

2.13. Calculate the angle by the method of repetition

2.14. List the errors eliminated in repetition method

2.15. Explain the method of measuring of horizontal angle by reiteration method

2.16. Rule the page of a theodolite field book

2.17. Explain the method of calculating angles by method of reiteration

2.18. Explain the method of measurement of
1. Direct angles and
2. Deflection angles

2.19. Explain the Steps involved in setting out angles using a theodolite.

2.20. Explain the method of measurement of Vertical angles

2.21. Explain the method of measurement of magnetic bearing of a line

2.22. Explain the methods of prolonging a given survey line

2.23. Explain the method of conducting traverse survey by
1. Included angles method,
2. Deflection angles method and
3. Magnetic bearing method

2.24. Check the angular measurements and apply corrections in a closed traverse

2.25. Define 1. Latitude and 2. Departure of a line

2.26. Compute the latitudes and departures of survey lines of a closed traverse

2.27. Calculate the error of closure of a closed traverse

2.28. List the following omitted measurements of a closed traverse
1. Length and bearing of one side,
2. Length of one side and bearing of another side,
3. Length of two sides and
4. Bearing of two sides

2.29. Calculate the omitted measurements when Length and bearing of one side only is omitted.

2.30. Balance the closing error by
1. Bowditch rule and
2. Transit rule.

2.31. Enumerate the difference between consecutive and independent co-ordinates

2.32. Calculate the consecutive and independent co-ordinates of stations of a closed traverse

2.33. Calculate the area of a closed Traverse by independent co-ordinates

2.34. List the types of errors in theodolite surveying.

COURSE CONTENT

1. **Levelling**
   a) Levelling – Types of levelling instruments – component parts of a dumpy level and their functions – Definitions of important terms used in Levelling – level surface, level line, plumb line, horizontal line, axis of telescope, line of collimation, back sight, fore sight, intermediate sight, station and change point – Temporary adjustments of a dumpy level – types of Levelling Staves
   b) Bench marks – different types of bench marks

c) Booking of readings in field book – Determination of Reduced levels by height of instrument and Rise and Fall methods – Comparison of methods – Problems.

d) Errors in levelling – natural and instrumental errors – Precautions

e) Errors due to curvature and refraction and combined correction – problems

f) Classification of Levelling – detailed description of profile levelling and reciprocal levelling – Problems on Reciprocal levelling.

g) Contouring – contour, contour interval and horizontal equivalent – Characteristics of contours – methods of contouring – Block contouring – Radial contouring – interpolation of contours – uses of Contour maps – tracing of contour gradient or alignment of a hill road – Marking alignment of roads, railways and canals.

h) Fundamental lines of dumpy level and their relations – Permanant adjustments of a dumpy level (one peg method without problems)

2. Theodolite

a) Principles of theodolite surveying
   i. Component parts of a transit theodolite and their functions – Definitions of technical Terms – Station, face left, face right, swinging the telescope, transiting.
   ii. Fundamental lines of a transit theodolite – Horizontal axis, vertical axis, axis of telescope, axis of plate levels, axis of altitude bubble, line of collimation – Conditions of adjustments.
   iii. Temporary adjustments of a transit theodolite.
   iv. Measurement of horizontal angles by repetition and reiteration method
   v. Measurement of vertical angles
   vi. Booking readings
   vii. Measurement of magnetic bearings, deflection angles, direct angles – Prolonging a straight line – by single transiting, double transiting and fore sighting methods
   viii. Errors in theodolite work.

b) Theodolite Traversing
   i) Traversing with theodolite by included angles method, deflection angles method and magnetic bearing method.
   ii) Checks for closed and open traverse.
   iii) Traverse computations – Latitude and departure – closing error – balancing a closed traverse by Bowditch rule and transit rule – omitted measurements in a closed traverse – problems on omitted measurements (Length and bearing of one side only omitted) – consecutive and independent coordinates - area of closed traverse.

REFERENCE BOOKS
1. Dr. B.C.Punmia, Surveying - I & II
2. S.K. Husain, Surveying
3. P Kanetkar, Surveying and levelling - I & II
4. A.V.R.J. Sharma and Kamala, Surveying - I & II
5. Dr.C.Venkat Ramaiah, Text book of surveying

CONSTRUCTION MATERIALS

Subject Title : **Construction Materials**
Subject Code : **CE-305**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Stones	07	13	01	01
2.	Bricks	07	13	01	01
3.	Clay products & Sand	08	16	02	01
4.	Cement	07	13	01	01
5.	Mortars & Concrete	16	26	02	02
6.	Surface protective materials	07	13	01	01
7.	Timber, Plastics, Glass & Asbestos	08	16	02	01
	Total	60	110	10	08

OBJECTIVES
Upon completion of the course the student shall be able to
1.0 Understand selection of stones and their acceptability for construction work

1.1 Classify rocks (Physical classification only)
1.2 List the characteristics of good building stone.
1.3 List the common varieties of stone used in different items of construction and their suitability for construction works (like Granite, marble, Kadapa slabs, Shahabad stones)
1.4 Explain the purpose of dressing stones.

2.0 Understand the acceptability of bricks for construction work
2.1 State common sizes of bricks – IS specifications.
2.2 List the steps involved in the manufacture of bricks.
2.3 Explain the need for burning bricks.
2.4 Explain the method of burning bricks in a continuous kiln.
2.5 List the characteristics of good bricks.
2.6 List the standard tests on bricks
2.7 Explain the followings tests conducted on bricks
1. Water absorption and 2. Compressive strength

2.8 Explain the uses of the following types of bricks for construction purposes -
1.Refractory bricks,
2. Fly ash bricks,
3. Precast Solid Concrete Blocks,
4. Hollow concrete blocks, and
5. High quality building blocks.

3.0 Understand suitability of tiles, pipes and building sand for Construction
3.1 State the common variety of tiles used for different purposes.
3.2 List the characteristics of good tiles.
3.3 List the uses of porcelain and glazed tiles.
3.4 State the uses of stone ware pipes.
3.5 List the characteristics of good sand.
3.6 State the functions of building sand.
3.7 State the percentage of bulkage allowance for construction work.
3.8 State the need for the quarry dust as a substitute of sand.

4.0 To check the quality of cement for construction work
4.1 State the chemical composition of cement.
4.2 State rough and ready methods of examining cement
4.3 Explain the method of manufacture of cement by dry process only.
4.4 Classify cements
4.5 List the uses of various cements
4.6 State the standard tests for cement.
4.7 Explain the following tests on cement
1. Fineness,
2. Consistency,
3. Setting times and
4. Soundness of cement.
4.8 State grades of cement and their compressive strengths.
4.9 State the importance of blended cement
4.10 Explain the application of blended cement with fly ash and blast furnace slag.

5.0 Understand the principles of preparation of mortars and Concrete
5.1 Explain 1.Fine aggregate and 2.Coarse aggregate.
5.2 Explain the purpose of water absorption and sieve analysis tests conducted on fine and coarse aggregate.(Procedure of tests not necessary).
5.3 Classify mortars.
5.4 List the different proportion of mortars for various works.
5.5 Explain the method of preparation of cement mortar
5.6 Explain the use of super plasticiser for improving workability and higher strength.
5.7 List the ingredients of 1.Plain concrete and 2.Reinforced concrete.
5.8 State the usual proportions of plain and reinforced concrete for different items of work.
5.9 Define
1. Hydration of cement
2. Water cement ratio
3. Workability

4. Curing

5.10   Explain the importance of 1.Hydration of cement and 2.water cement ratio.

5.11   Explain the method of preparing concrete.

5.12   List the steps involved in the procedure of mixing, conveyance, placing, and compaction and curing of concrete.

5.13   List different curing compounds

5.14   List the methods of curing suitable for different surfaces.

5.15   List different tests conducted for determining the workability of concrete

5.16   Explain the procedure of conducting the following tests on concrete
1. Slump test, and
2.Compressive strength

5.17   List the types of admixtures used in concrete

5.18   List uses of admixtures used in concrete.

5.19   Explain about ready mix concrete.

5.20   List the advantages and disadvantages of ready mix concrete.

5.21   List the uses of the following materials for improved durability and better resistance to adverse exposure conditions.
1. Fly ash,
2. Quarry dust

6.0   Understand the selections and applications of Surface Protective Materials

6.1   Give the composition of
1. Paints,
2. Enamels and
3. Varnishes.

6.2   List the types of the following surface protective materials:
1. Paints,
2. Enamels,
3. Varnishes,
4. Distempers,
5. Emulsion,
6. French polish and
7. Wax Polish.

6.3   List the uses of surface protective materials

7.0   Understand the selections and applications of Wood, Plastics, Glass and Asbestos for construction work

7.1   List the characteristics of good timber.

7.2   Define seasoning.

7.3   Explain the importance of seasoning of timber

7.4   Name the common varieties of timber used in A.P for various Civil Engineering work.

7.5   State various types of wood products used in construction work.

7.6   List the uses of wood products used in construction work.

7.7   List the uses of fibre reinforced plastic.

7.8   List merits and demerits of plastics.

7.9   List the merits and demerits of asbestos products.

7.10   Explain suitability of different types of glasses as a building material.

7.11   List the merits and demerits of glass.

7.12   Explain suitability of Powder coated Aluminium and Steel sheets as building material.

COURSE CONTENT

1) Stones
    a) Classification of rocks, physical classification.
    b) Characteristics of good building stone.
    c) Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones.
    d) Dressing of stones – purpose.

2) Bricks
    a) Method of manufacture of bricks – continuous kiln process
    b) ISI specification for bricks IS-1077-1971.
    c) Characteristics of good bricks.
    d) Testing of bricks as per IS-3495-1966 – tests on water absorption and compressive strength of bricks.
    e) Refractory bricks and their uses.
    f) Fly ash bricks.

3) Clay products & Sand
    a) Tiles –Types of tiles roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite.
    b) Characteristics of good tiles.
    c) Porcelain – glazed tiles (uses only).
    d) Stone ware pipes – uses.
    e) Characteristics of good sand, Functions of sand.
    f) Bulking of sand – percentage of bulking – bulk age allowance to be permitted.
    g) Crushed stone powder as substitute of sand.

4) Cement
    a) Chemical composition of cement.
    b) Rough and ready method of testing cement.
    c) Methods of manufacture of cement – Dry process.
    d) Classification of cement – ordinary Portland cement, quick setting cement, white cement –Rapid hardening cement, Low heat cement, High alumina cement, Blast furnace slag cement and Pozzolana cement – uses of different types of cement.
    e) Tests for cement as per ISI – fineness, consistency, setting time, soundness tests.
    f) Blended cement.

5) Mortars & Concrete
    a) Fine aggregate and course aggregate – Water absorption and sieve analysis of fine and coarse aggregates.
    b) Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar.
    c) Different proportions of mortars for various works.
    d) Preparation of cement mortar.
    e) Ingredients of plain concrete.
    f) Proportioning – usual proportions for different item of work. Foundation, Footings, Columns, Slabs & Beams for ordinary buildings.
    g) Plain concrete and reinforced concrete.
    h) Water cement ratio – factors effecting water cement ratio.

i) Workability – Slump test on fresh concrete, hardened concrete – compressive strength test on hardened concrete.

j) Admixtures – definition – types – 1) Chemical admixtures – Plasticizers (water reducers), super plasticizers, air entraining agents, accelerators, retarders and bonding admixtures – 2) Mineral admixtures – i) Pozzolanas - fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakaoline – ii) Gas forming – Powered zinc, powdered aluminium and hydrogen peroxide – uses.

k) Method of preparation of concrete – Hand and machine mixing.

l) Procedure of mixing, conveyance, placing compaction, and curing of concrete.

m) Curing –different curing compounds - methods – suitability

n) Introduction to ready mix concrete – Advantages and disadvantages.

o) Use of fly ash, quarry dust.

6) Surface Protective Materials
a) Composition of Paints, enamels, varnishes.
b) Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

7) Timber, Plastics, Glass and Asbestos
a) Characteristics of good timber.
b) Seasoning of timber – Importance.
c) Common varieties of timber used for different items of work – Doors and windows, form work, centring with particular references of A.P.
d) Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board.
e) Types of plastics – fibre reinforced plastics for plastic doors and windows and water tanks.
f) Use of asbestos – manufacture of asbestos sheets and pipes .
g) Types of glasses and uses.

REFERENCE BOOKS

1. S. Unnnikrishna Pillai & Devdas Menon, Reinforced Concrete Design (Third edition) (McGraw Hill Education (India) Private Limited)
2. C B R I, Building materials & components
3. Kulakarni, Building materials
4. N.Sreenivasulu, Construction materials
5. Duggal S. K, Building Materials
6. S.P. Arora & S. P. Bindra, Building Material & Construction

CONSTRUCTION PRACTICE

Subject Title	:	**Construction Practice**
Subject Code	:	**CE-306**
Periods/Week	:	**04**
Periods/Semester	:	**60**

TIME SCHEDULE

S. NO.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Classification of buildings and Foundations	12	26	02	02
2.	Masonry	07	13	01	01
3.	Doors, Windows and Lintels, Sunshades	07	13	01	01
4	Roofs and Floorings	11	16	02	01
5	Scaffolding and Stair Cases	07	13	01	01
6.	Protective, decorative finishes and Termite proofing	08	16	02	01
7.	Energy management and Energy audit of building	05	10	-	01
8.	Solar energy utilization in buildings	03	03	01	-
	Total	60	110	10	08

OBJECTIVES

Upon completion of course the student shall be able to

1.0 Know the classification of Buildings and design of foundations as per NBC
   1.1 List the components of a building
   1.2 Explain the functions of the components of a building
   1.3 Classify the buildings according to National Building Code with examples.
   1.4 Explain the investigations required for foundation as per N.B.C.
   1.5 Describe the following with line diagrams –
      1. Spread footings,
      2. Raft foundation,
      3. Pile foundation and
      4. Well foundation.
   1.6 Explain the following terms:
      1. Bearing capacity of soil,

2. Safe bearing capacity of soil. and
3. Ultimate bearing capacity of soil.
1.7   State the loads to be considered in design of foundation.
1.8   List rules for minimum depth, width of foundation and thickness of   concrete bed for spread footing foundation.
1.9   Explain the method of constructing spread footing foundation.
1.10   List the causes of dampness at basement level.
1.11   List the effects of dampness at basement level
1.12   List the measures for prevention of dampness at basement level.

2.0   Understand the construction of masonry work
2.1   List different types of stone masonry.
2.2   Explain the different types of stone masonry.
2.3   State the general principles to be observed in stone masonry construction
2.4   Explain the following terms in brick masonry.:
1. Bond,
2. Course,
3. Header, and
4. Stretcher
2.5   List general principles of brick masonry.
2.6   Explain with sketches, English bond for alternate layers brick masonry of various wall thicknesses.
2.7   Explain masonry with Precast concrete solid blocks, Hollow blocks, high quality building blocks maintaining bond with sketches.

3.0   Understand the types and principles of doors, windows, ventilators, Lintels and sunshades
3.1   State the principles of locating doors, windows and ventilators in buildings.
3.2   Explain with sketches common and special types of doors, windows and ventilators.
3.3   List the uses of different types of doors, windows and ventilators.
3.4   Explain the fittings and fastenings of doors, windows and ventilators.
3.5   Explain the functions and types of lintels.
3.6   Explain the functions of sunshades, canopy, sun-breakers and porticos.
3.7   Explain about thin lintel developed by CBRI with simple sketches.

4.0   Understand methods of construction and finishes of different types of roofs and floorings
4.1   State the functions of roofs.
4.2   State the classification of roofs.
4.3   State the classification of trusses based on material and shape.
4.4   Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses.
4.5   Explain with sketches A type, B type steel trusses using structural angles and tubular sections as per the provisions of IS code.
4.6   State the common and decorative ceilings used in construction work.
4.7   Explain the method of fixing Plaster of Paris and fibre glass ceilings.
4.8   State the component parts of flooring.
4.9   State the functions of flooring.
4.10   List the requirements of good floor.

4.11 Explain method of construction of C.C flooring, stone slab flooring, tiled flooring, mosaic flooring, Ceramic flooring, and Marble flooring.

5.0 Understand scaffolding and types of Stair cases
5.1 State the purpose of scaffolding.
5.2 Define scaffolding and mention the types.
5.3 List the component parts of tubular scaffolding.
5.4 Sketch and explain about tubular scaffolding.
5.5 State the advantages of tubular scaffolding.
5.6 State the principles of locating stairs.
5.7 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.
5.8 Draw the line diagrams of different stairs.

6.0 Understand Protective, decorative finishes and Termite Proofing
6.1 State the objects of plastering.
6.2 State the methods of plastering.
6.3 State the steps in providing cement plastering on masonry walls.
6.4 State the use of wall putty as a decorative finish on masonry walls.
6.5 State the objects of pointing.
6.6 State the types of pointing.
6.7 State the objects of painting.
6.8 Explain the method of painting new and old walls surfaces.
6.9 State the paints suitable for painting wood work and steel work.
6.10 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.
6.11 Define termite proofing.
6.12 Explain the method of termite proofing.

7.0 Appreciate the concept of energy management and energy audit of buildings
7.1 Explain the possible ways of energy management in buildings.
7.2 State the aims of energy management of buildings.
7.3 Distinguish among energy auditing schemes.
7.4 State the response to audit questionnaire.
7.5 Explain energy surveying and audit report.
7.6 Formulate the energy flow charts.

8.0 Understand the concept of solar energy utilization in buildings
8.1 Explain the passive concepts in heating and cooling.
8.2 List the various solar energy utilities like solar water heaters, solar air heaters, solar cookers and solar PV panels.

COURSE CONTENT

1) Classification of Buildings and foundations
a) Component parts of a building –Their functions.
b) Classification of buildings according to National building code.
c) Site investigation for foundation as per N.B.C, Trial pit, auger boring.
d) Bearing capacity of soils –safe and ultimate bearing capacity.
e) Spread footing foundation for columns and walls.
f) Raft foundation.

g) Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile.
h) Well foundation – component parts – sinking of well foundation.
i) Different loads to be considered for the design of foundation as per IS 875 – 1987.
j) Spread foundation – Depth of foundation by Rankin's formulae– width of foundation – Thickness of concrete bed.
k) Construction of foundation – (spread footing foundation only).
l) Causes, effects and prevention of dampness at basement level.

2) Masonry
a) Classification of stone masonry – Ashlar, Random rubble and Coursed Rubble Masonry – general principles to be observed while constructing stone masonry
b) Brick Masonry – Bonds in brick masonry – (English bond only) for various wall thicknesses – General principles to be observed in construction of brick masonry.

3) Doors, Windows, Lintels and Sunshades
a) Doors and windows – parts of door window – positioning.
b) Common types of doors-panelled, Glazed and Flush doors.
c) Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding doors, referring to A.P.D.S.S for size of doors and windows.
d) Windows – Panelled and Glazed.
e) Ventilators – fixed, swinging type and louvered.
f) Fittings and fastenings for doors and windows.
g) Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel.
h) Sunshade, canopy and sun breakers – lintel cum sunshade.

4) Roofs and Floorings
a) Roof – functions of roofs.
b) Classification of roofs – flat roofs – pitched roofs.
c) Different types of trusses – classification based on material and shape king post truss, queen post truss, fan roof truss, north light roof truss, steel trusses of A type and B type using angular and tubular sections as per IS code.
d) Weather proof course on R.C.C. roof.
e) Decorative ceilings for auditoriums – method of fixing Plaster of Paris –Fibre glass.
f) Parts of flooring – Requirements of a good floor.
g) Methods of constructing flooring – cement concrete flooring, stone slab (Kadapa slab, Shahabad stone) floorings, cement plaster flooring, Tiled flooring, mosaic flooring.

5) Scaffolding, Stairs and staircases
a) Scaffolding – Purpose and types – tubular scaffolding only.
b) Location of stairs.
c) Types of different stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

6) **Protective, decorative finishes and Termite proofing**
   a)   Plastering – purpose – Types of plastering – procedure for plastering. external finishing – sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing.
   b)   Pointing – purpose –Types of pointing
   c)   Painting – objects – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.
   d)   White washing – colour washing – Distempering – internal and external walls.
   e)   Termite proofing – method.

7) **Energy Management and Energy Audit of Buildings**
   a)   Introduction to Energy Management and Energy Audit of Buildings
   b)   Aims of energy management of buildings
   c)   Types of energy audit
   d)   Energy audit questionnaire
   e)   Response
   f)   Energy surveying and audit report
   g)   Energy flow charts

8) **Solar Energy Utilization in Building**
   a)   Passive concepts – Heating and cooling concepts
   b)   Solar energy utilities – Solar water heaters, solar air heaters, solar cookers and solar PV panels.

REFERENCE BOOKS

1.   N.B.C, National Building code

2.   S.P. Arora & S.P. Bindra, Building Construction
3   Sushil Kumar, Building Construction
4.   S.C.Rangawala, Building Construction
5.   Explanatory handbook on Masonry code, SP20
6.   Nainan P. Kurian, Design of foundation structures principles and practice

CIVIL ENGINEERING DRAWING-I

Subject Title : Civil Engineering Drawing - I
Subject Code : CE-307
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Introduction	9	08	02	-
2.	Residential Buildings	45	24	1	1
3.	Public and Industrial Buildings	21	28	1	1
4	Working drawings	15		1	
	Total	90	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & Part-B 2X20=40 marks

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Apply standard practices in drawing different components of building
    1.1   Sketch the conventional signs of
        1. Civil Engineering materials,
        2. Plumbing and
        3. Electrical fixtures.
    1.2   Draw the cross section of load bearing wall and name all components below and above ground level.
    1.3   Draw the plan of one Brick wall meeting at corner showing alternative courses of header and stretchers in English bond.
    1.4   Draw the following views of a fully panelled door and label the parts
        1. Elevation and
        2. Sectional plan
    1.5   Draw the following views of fully panelled window and glazed window and label the parts.
        1. Elevation and
        2. Sectional plan
    1.6   Draw the following views of glazed window and label the parts.
        1. Elevation and
        2. Sectional plan

1.7 Draw the elevation of the following trusses and label the parts with the given data(details of joints not required)
1. King post truss and
2. Queen post truss

2.0 Understand the requirements of setbacks and orientation principles for planning residential buildings as per local bye laws and NBC

2.1 Draw the site plan of a residential building as per local bye-laws.

2.2 Draw the following views of single storyed load bearing type residential building from the given line diagram and set of specifications for
A) One room with veranda B) one bedroom house C) two bedroom house
1. Plan,
2. Section and
3. Elevation

2.3 Draw the following views of single storied framed structure type residential building from the given line diagram and set of specifications for
A) one bedroom house B) two bedroom house
1. Plan,
2. Section and
3. Elevation

2.4 Draw the following views of a dog legged stair with given specifications.
1. Plan, and
2. Section

2.5 Draw the following views of two- storied residential building (framed Structure) from the given the line diagram and set of specifications.
1. Plans of first and second floors and
2. Elevation

2.6 Prepare the drawings in the standard format for obtaining sanction from a local body for a residential building (Two storyed, two bed room building) including a rain water harvesting structure

3.0 Draw the line diagrams (to a scale) of public and Industrial buildings
3.1 Rural hospital of 10 beds capacity
3.2 Hostel for 50 students
3.3 Primary school of 250 to 300 students
3.4 Apartments - Plan of one floor with 6 to 10 units @ 90 –150 sq.m /unit

4.0 Working drawings
4.1 Prepare a working drawing for the purpose of marking the width of foundation for the given plan of a building
4.2 Calculate the following for the given plan of a building
1. Plinth area,
2. Carpet area and
3. Floor area ratio/ Floor spaces Index.

COURSE CONTENT

1.0 Introduction

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall showing all the components below and above the ground level.

1.3 Plan of one brick wall meeting at a corner showing odd and even courses in English bond,

1.4 Plan and Cross section of a Fully panelled door

1.5 Plan and Cross section of a Fully panelled window and glazed window showing all the component parts

1.6 Elevation of King post and Queen post trusses with the given Data (details of joints not required)

2.0 Residential Buildings

2.1 Setbacks and orientation principles for planning residential buildings as per local bye laws and NBC

2.2 Single storied two bed room load bearing residential building

2.3 Single storied framed structure two bedroom residential building

2.4 Two-storied residential building (framed structure type)

2.5 Dog legged stair

2.6 The standard format for obtaining sanction from local body for a residential Building (up to two bedroom building–G+1 floors) including a rainwater harvesting structure.

3.0 Public and industrial buildings

Draw the line diagrams only showing the functional requirements of

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 sq.m / unit

4.0 Working drawings

4.1 Working drawing for the purpose of marking from the given plan and width of foundation.

REFERENCE BOOKS

1. Chakraborthy, Civil Engineering Drawing-I
2. N.Srinivasulu, Civil Engineering Drawing-I

SURVEYING –II Practice

Subject Title : **SURVEYING –II Practice**
Subject Code : **CE-308**
Periods/Week : **06**
Periods/Semester : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Levelling	36
2.	Theodolite Survey	24
3.	Plotting	30
	Total	90

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Perform different methods of levelling
  1.1 Identify the component parts of a dumpy level / Auto level
  1.2 Study different types of levelling staves
  1.3 Perform temporary adjustments of a dumpy level / Auto level for taking observations
  1.4 Practice taking staff readings and recording them in level field book
  1.5 Take staff readings for differential levelling
  1.6 Compute the difference in elevation between two stations (take invert levels also)
  1.7 Conduct fly levelling and determine RLs of required stations
  1.8 Determine the true difference in elevation between two far off stations by conducting reciprocal levelling
  1.9 Determine the collimation error of a dumpy level by conducting reciprocal levelling
  1.10 Conduct profile levelling along a route and compute the RLs at various stations
  1.11 Conduct profile levelling by taking cross sections across a route and compute the RLs at various stations
  1.12 Conduct profile levelling along a route by taking readings along both LS and CS and compute the RLs
  1.13 Conduct block levelling for the given area
  1.14 Locate the contour Points by direct (Radial) method in the field

2.0   Perform Theodolite Surveying

2.1   Identify the component parts of a theodolite
2.2   Perform temporary adjustment of theodolite.
2.3   Measure horizontal angles
2.4   Record the observations in the field book.
2.5   Measure horizontal angle by repetition method
2.6   Measure horizontal angles by reiteration method
2.7   Measure Vertical angles
2.8   Prolong a given survey line by double transiting method
2.9   Measure the horizontal distance between two inaccessible points using theodolite
2.10   Measure bearing of a survey line
2.11   Conduct theodolite traversing (closed),
2.12   Compute latitudes and departures
2.13   Calculate the area of traverse

3.0   Plotting

3.1   Plot the LS and CS along a route from the data of profile levelling,
3.2   Mark the formation level by selecting suitable gradient,
3.3   Calculate the depth of cutting and filling
3.4   Prepare the Contour map from block levelling by interpolation
3.5   Measure the horizontal distance between two inaccessible points by plotting the data observed in theodolite survey
3.6   Plot the closed traverse of theodolite, distribute the closing error by Bowditch / transit rule
3.7   Calculate the area of traverse

KEY Competencies to be achieved by the student

S.No	Experiment Title	Competency	Key Competency
1	Study of dumpy level / Auto level	Hold the instrument and fix on tripod Identify parts and their functions	Spread the tripod on ground properly for easy levelling and stability.
2	Study of levelling staves	Fold and unfold operations, Observe reading to the accuracy of 5 mm, Hold Levelling staff to the plumb while taking observation	Operate foot screws, Adjust eyepiece Focus the object glass
3	Temporary adjustments of dumpy level	Spread the tripod on ground properly for easy levelling and stability. Operate foot screws, Adjust eyepiece Focus the object glass	
4	Recording observations on level field book	Enter Back Sight, Fore Sight and Intermediate Sight in appropriate positions Apply the methods of calculating reducing levels by Height of instrument method and Rise and fall method Find RL when staff is inverted Apply arithmetic check	
5	Differential Levelling & Fly Levelling	Take observations Locate proper position of change point to avoid cumulative errors	Locate proper position of change point to avoid cumulative errors
6	Reciprocal Levelling	Take observations	
7	Profile leveling	Spreading chain along the required route Take readings at intervals along the route and cross sections	Take readings at intervals along the route and cross sections
8	Block Levelling	Divide area into small square blocks using chains Take readings at corners of each square	
9	Locate the contour Points by direct method in the field	Position the staff along the radial line to get the pre-calculated staff reading for a particular RL of a contour Measure the distances of the located points Measure the bearings of all radial lines	Position the staff along the radial line to get the pre-calculated staff reading for a particular RL of a contour
10	Study of transit Theodolite	Hold the instrument and fixing on tripod Identify parts and their functions Conduct operations like swinging and transiting	Center the instrument exactly over station using plum bob and by moving legs Operate foot screws to level Adjust eyepiece Focus the object glass
11	Temporary adjustments	Spread the tripod on ground properly for easy levelling and stability	

		Center the instrument exactly over station using plum bob and by moving legs Operate foot screws to level Adjust eyepiece Focus the object glass	
12	Measurement of horizontal angle by Repetition method Reiteration method and Measurement of bearing	Operate lower and upper clamps and their tangent screws read the vernier accurately Record the observations at their appropriate positions on page of theodolite field book	Operate lower and upper clamps and their tangent screws read the vernier accurately
13	Measurement of Vertical angles	Operate vertical circle clamp and its tangent screw Record the observations at their appropriate positions on page of theodolite field book	Operate vertical circle clamp and its tangent screw
15	Measurement of horizontal distance between two inaccessible points	Measure horizontal angles and horizontal distances	Measure horizontal angles and horizontal distances
16	Closed traverse	Measure of bearing of one line Measure of horizontal angles and horizontal distances	Measure of bearing of one line Measure of horizontal angles

COURSE CONTENT

1. **Levelling**
   a) Study of dumpy level, levelling staves – performing Temporary adjustments of level.
   b) Taking staff readings of various stations – booking of readings in level field book.
   c) Differential and Fly levelling – calculation of reducing levels by height of collimation and Rise & Fall methods (inverted levels also)
   d) Reciprocal levelling – True difference in elevation and collimation error.
   e) Contouring – block levelling and locating contour points by Radial method

2.0 Theodolite surveying
   a) Study of transit Theodolite- Temporary adjustments of a transit theodolite.
   b) Measurement of horizontal angles by repetition and reiteration methods - Recording the observations in field book
   c) Measurement of vertical angles – Recording the observations in field book
   d) Prolong a given survey line by double transiting method
   e) Determination of horizontal distance between two inaccessible points.
   f) Theodolite Traversing by included angles method

3.0 Plotting

a) Plotting the LS and CS of a route from the data of profile levelling, marking the formation level by selecting suitable gradient, calculate the depth of cutting and filling

b) Preparation of contour maps from block levelling

c) Measurement of horizontal distance between two inaccessible points by plotting the data observed in theodolite survey

d) Plot the closed traverse of theodolite, distributing the closing error by Bowditch / transit rule and calculate the area of traverse

MATERIAL TESTING PRACTICE

Subject Title	:	**MATERIAL TESTING PRACTICE**	
Subject Code	:	**CE-309**	
Periods/Week	:	**03**	
Periods/Semester	:	**45**	

TIME SCHEDULE

S.No.	Topics	No. of periods
1	Tests on bricks	05
2	Tests on Cement	10
3	Tests on Aggregates	15
4	Tests on metals	15
	Total	45

OBJECTIVES

Upon completion of this course the student shall be able to

**1.0   Understand the standard tests on bricks to find their suitability in construction
         Water absorption test on bricks**
1.1   State the significance of water absorption test on bricks
1.2   State the standards on water absorption of bricks used for various construction
         works
1.3   Explain the procedure for conducting water absorption test on bricks
1.4   Perform water absorption test on bricks

         Crushing Strength test on bricks

1.5   State the significance of crushing strength test on bricks
1.6   State the standards on crushing strength of bricks used for various construction
         works
1.7   Explain the procedure for conducting crushing strength test on bricks
1.8   Perform crushing strength test on bricks
1.9   Compare observations of crushing tests conducted on different types of bricks like
         clay bricks, fly ash bricks, concrete blocks

**2.0   Determine suitability of cement for given conditions of workability and
         strength
         Fineness Test on cement**
2.1   State the significance of workability and Compression tests in field.

2.2   State the method of preparing sample and the number of

         samples required for given work.

2.3   Use apparatus required for conducting fineness test on cement

2.4   State the standards on fineness of cement

2.5   Explain the procedure for conducting the fineness test on cement

2.6   Conduct the fineness test on cement and record the observations

Normal Consistency Test on Cement

2.7   State the significance of normal consistency of cement

2.8   Use apparatus required for conducting normal consistency test on cement sample

2.9   Explain the procedure for conducting normal consistency test on cement sample

2.10   Perform the normal consistency test on cement sample

2.11   Draw the inference from the observations of normal consistency of fresh cement and old cement samples of same and different grades

Setting Time Test on cement

2.12   State the significance of setting times on construction activity

2.13   State the standards on initial and final settings times of various types of cements

2.14   Use apparatus required for conducting initial and final setting times of given cement sample

2.15   Explain the procedure for conducting initial and final setting times of given cement sample

2.16   Perform the initial time test on cement sample

2.17   Draw the inference from the observations of initial setting times of fresh and old cement samples of same and different grades

Compressive Strength of cement

2.19   State the significance of compressive strength of cement used for various   civil engineering works

2.20   State various grades of cement available in the market based on compressive strength of the cement

2.21   State the standards on compressive strengths of different types of cements used in construction

2.22   Use apparatus required for conducting compressive strength test on given cement sample

2.23   Explain the procedure for conducting compressive strength test on given cement sample

2.24   Perform the compressive strength test on given cement sample

2.25   Draw the inference by comparing the observations of compressive strength test on fresh and old cement samples

3.0   Determine suitability of different aggregate used for various civil engineering works

Water absorption test on sand

3.1 Study the significance of water absorption of sand used for construction

3.2 State standards on water absorption of sand

3.3 Use apparatus required for conducting water absorption test on given sand sample

3.4 Explain the procedure for conducting water absorption test on given sand sample

3.5 Perform water absorption test on given sand sample

Test on Bulking of sand

3.6 Study the effect of bulking of sand on quantities of material and quality mortar and concrete

3.7 Study the significance of bulking of sand on strength and durability properties of mortar and concrete

3.8 Use apparatus required for conducting bulking of sand test on given sand sample

3.9 Explain the procedure for conducting bulking of sand test on given sand sample

3.10 Draw the inferences from the observations of bulking of sand tests conducted fine, medium and coarse sands

3.11 Study the field method of adjustment for bulking of fine aggregate

Test on determination of bulk density and percentage of voids in Coarse and Fine aggregate

3.12 Use apparatus required for conducting test to determine bulk density of coarse and fine aggregate

3.13 Perform tests to determine bulk density of coarse and fine aggregate

3.14 Study the effect of voids in coarse and fine aggregates on strength and durability properties of mortar and concrete

3.15 Use apparatus required for conducting tests to find percentage of voids present in aggregate

3.16 Perform tests to determine percentage of voids present in aggregate

Sieve analysis of coarse and fine aggregates

3.17 Study the significance sieve analysis of fine and coarse aggregates on properties of concrete

3.18 Study of grading limits of fine aggregate as per IS: 383-1970

3.19 Use apparatus required for conducting sieve analysis of fine aggregate

Field method to determine fine silt in aggregate

3.20 Study of effect of silt in aggregate on properties of cement mortar and concrete

3.21 Use apparatus required for determining the silt content in aggregate

3.22   Explain the field method to determine quantity of silt content in aggregate

3.23   Perform the test to determine the content of fine silt in aggregate

4.0   Understand the standard tests on metals

Tension test on mild steel rod

4.1   Study the properties of mild steel used as reinforcement in concrete

4.2   State the standards on reinforcement steel as per IS Code

4.3   State various tests conducted on mild steel by using UTM

4.4   Explain the tension test on Mild steel specimen

4.5   Perform tension test on mild steel using UTM

4.6   Study the behaviour of the steel with increasing load

4.7   Draw inferences from tests on different grades of steel

Torsion test on mild steel rod

4.7   Study the significance of torsion test on mild steel

4.8   Explain the torsion test on mild steel specimen

4.9   Perform torsion test on mild steel

Hardness test on metals

4.10   Study the significance of hardness of metals

4.11   Explain the hardness test by Brinell/Rockwel testing machine

4.12   Perform hardness test on given steel and brass samples

4.13   Study hardness of different metals with variation surface smoothness of metals

Izod/Charpy Impact test on metals

4.14   Study of effect of impact loading over structures made of different metals

4.15   Explain method of Izod/Charpy impact test on Mild steel and brass specimen

4.16   Perform Impact test on Mild steel and brass specimens by sing Izod/Charpy Testing machine

Deflection test on beam

4.17   Use apparatus required for conducting deflection tests on steel and wooden beams

4.18   Perform deflection test on steel and wooden beams at different positions of loading

Deflection test on helical springs

4.19   State different types of springs used for different engineering purposes

4.20   State apparatus used for conducting deflection test on closely coiled helical spring

4.21   Perform deflection test on closely coiled helical spring

KEY Competencies to be achieved by the student

S.No	Experiment Title	Competency	Key Competency
1	Water Absorption on bricks	Taking weight of dry bricks and wet bricks	
2	Crushing strength test on bricks	1. Preparation of 1:1 cement mortar and application cement mortar over top and bottom faces of brick 2. Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs 3. Recording the load at FAILURE	Preparation of 1:1 cement mortar Application of load gradually at the rate 14 N/mm^2 per minute till failure a occurs
3	Fineness test on cement	Taking weight of cement sample and its residue	
4	Normal consistency test on cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's scale/noting down the plunger penetration	Preparation of sample in the mould Reading of Vicat's scale/noting down the plunger penetration
5	Setting times of cement	1. Measurement of required percentage of water to cement accurately 2. Preparation of sample in the mould 3. Reading of Vicat's scale/noting down the needle penetration 4. Recording time at required needle penetration	Preparation of sample in the mould Reading of Vicat's scale/noting down the needle penetration
6	Compressive strength test on cement	1. Taking weights of different grades of standard sand and cement accurately 2. Addition of required percentage of water to cement accurately 3. Application of load at required rate and recording of load at failure accurately	Application of load at required rate and recording of load at failure accurately
7	Water absorption of sand	Accurate weighing of dry sand and wet sand	
8	Bulking of sand	1. Measuring of sand and water accurately	Measuring of increasing in volume of sand

		2. Addition of water to sand in accurate increments	
		3. Measuring of increasing in volume of sand	
9	Determination of necessary adjustment for bulking of fine aggregate by field method	Measurement of volume of sand accurately	--
10	Bulk density and Percentage of voids in coarse and fine aggregates	1. Taking of weight of cylindrical metal measure accurately	Taking weight of aggregate and containers
		2. Calculating of bulk density of coarse and fine aggregates both in loose and compacted states	
		3. Taking weight of aggregate and containers	
11	Sieve analysis of coarse and fine aggregate	1. Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate	Correct arrangement of sieves used for the sieve analysis of fine or coarse aggregate
		2. Weighing of residue in each sieve accurately	
12	Field method of determining fine silt in aggregate	1. Measuring sand by graduated cylinder accurately	--
		2. Measuring correct quantity of water to be added to sand	
13	Tension test on mild steel rod	1. Marking of gauge length on the MS Rod	Fixing the specimen correctly in between jaws Application of load at required rate carefully
		2. Fixing the specimen correctly in between jaws	
		3. Application of load at required rate carefully	
		4. Measuring the load at failure accurately	
14	Torsion test on mild steel rod	1. Measurement of length and diameter of specimen accurately	Application of load accurately Measuring the angle of rotation accurately
		2. Application of load accurately	
		3. Measuring the angle of rotation accurately	
15	Brinell/Rockwell	1. Placing of specimen at exact position	--
		2. Application and release of load at required rate	
16	Izod/Charpy test on mild steel/brass	1. Preparation of standard specimen and fixing the specimen in the right position of anvil	Preparation of standard specimen and fixing the specimen in the right position of anvil

		2. Recording down the reading by observing the appropriate scale	
17	Deflection test on beams	1. Measuring the dimensions of specimen accurately	Measurement of deflection accurately
		2. Application of load at exact point of application	
		3. Measurement of deflection accurately	
18	Test on helical coiled springs	1. Measurement of diameter of coil wire, diameter of coil and no. of coils accurately	Measurement of deflection of springs
		2. Measurement of deflection of springs	

COURSE CONTENT

1. Tests on Bricks

  a) Water absorption

  b) Crushing strength

2. Tests on Cement

  a) Fineness test
  b) Normal consistency test
  c) Setting times of cement
  d) Compressive strength of cement.

3. Tests on Aggregates

  (a) Water absorption of Sand
  (b) Bulking of Sand
  (c) To determine necessary adjustment for bulking of fine aggregate by
      Field method
  (d) Bulk density and Percentage of voids in Coarse and fine aggregates
  (e) Sieve analysis of coarse and fine aggregates
  (f) Field method to determine fine silt in aggregate

4. Tests on Metals

  (a) Tension test on mild steel rod
  (b) Torsion test on mild steel rod
  (c) Brinell/Rockwel - hardness test on steel and Brass with different surface finish
  (d) Brinell/Rockwel - hardness test on steel and Brass with different surface finish
  (e) Izod/Charpy tests on mild steel/brass.
  (f) Deflection Test on beam (Steel beam or wooden beam)
  (g) Test on closely coiled helical spring

HYDRAULICS PRACTICE

Subject Title   :   **HYDRAULICS PRACTICE**
Subject Code   :   **CE-310**
Periods/Week   :   **03**
Periods/Semester   :   **45**

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Determination of Hydraulic Coefficients / factors / Constant / Verification of Principles / Laws	36
2.	Study on Hydraulic Machines	09
	Total	45

OBJECTIVES

Upon completion of the course the learner shall be able to

1.1   Determine coefficient of discharge of a small orifice by constant head method and variable head method.
  1.1.1   State the principle / law / apparatus / equipment required for testing.
  1.1.2   Perform test and record observations.
  1.1.3   Draw inferences on the relationship between parameters.
  1.1.4   Draw a graph between Q vs $H^{1/2}$.

1.2   Determine coefficient of discharge of a small orifice by variable head method.
  1.2.1   State the principle / law / apparatus / equipment required for testing.
  1.2.2   Perform test and record observations.
  1.2.3   Draw inferences on the relationship between parameters.
  1.2.4   Draw a graph between Q vs $H^{1/2}$.

1.3   Determine the hydraulic coefficients of an orifice.
  1.3.1   State the Relationship.
  1.3.2   Conduct test and record observations.
  1.3.3   Draw Conclusions.

1.4   Determine coefficient of discharge of a mouthpiece by constant head method.
  1.4.1   State the principle/law /apparatus/equipment required for testing.
  1.4.2   Perform test and record observations.
  1.4.3   Draw inferences on the relationship between parameters.
  1.4.4   Draw a graph between Q vs $H^{1/2}$.

1.5 Determine coefficient of discharge of a rectangular notch.
    1.5.1   State the Aim /apparatus/equipment required for testing.
    1.5.2   Perform test and record observations.
    1.5.3   State field application.
    1.5.4   Draw a graph between Q vs $H^{3/2}$.

1.6 Determine coefficient of discharge of a triangular notch.
    1.6.1   State the Aim /apparatus/equipment required for testing.
    1.6.2   Perform test and record observations.
    1.6.3   State Field application.
    1.6.4   Draw a graph between Q vs $H^{5/2}$.
    1.6.5   Compare results with rectangular notch.

1.7 Determine coefficient of discharge of a trapezoidal notch.
 1.7.1   State the Aim /apparatus/equipment required for testing.
    1.7.2   Perform test and record observations.
    1.7.3   State field application.
    1.7.4   Draw inferences comparing the result s with rectangular notch and
             triangular notch.

1.8 Verify Bernoulli's theorem.
    1.8.1   States the principle/law /apparatus/equipment required .
    1.8.2   Perform test and record observations.
    1.8.3   State Inference and application.
    1.8.4   Plot Hydraulic gradient line and Total energy line.

1.9 Determine coefficient of discharge of a venturimeter.
    1.9.1   State the Aim /apparatus/equipment required .
    1.9.2   Perform test and record observations.
    1.9.3   State Practical application.
    1.9.4   Draw a graph between Q vs $H^{1/2}$.

1.10 Determine friction factor in pipe flow.
    1.10.1   State the Aim /apparatus/equipment required .
    1.10.2   Perform test and record observations.
    1.10.3   State Importance of friction factor in pipe design.

1.11 Determine Chezy's constant in open channel flow.
    1.11.1   State the Aim / apparatus / equipment required .
    1.11.2   Perform test and record observations.
    1.11.3   State Importance in design of section of open channel.

 2.0 Study on Hydraulic machines.

 2.1 Study on Reciprocating pump.
2.1.1   Identify the component parts of a reciprocating pump.
2.1.2   State the functions of each component.
2.1.3   State field applications.

Study on Centrifugal pump
2.2.1   Identify the component parts of a reciprocating pump
2.2.2   State the functions of each component
2.2.3   State field applications and compare with Reciprocating pump.

2.3   Study on Hydraulic Turbines
2.3.1   Identify the component parts of Pelton wheel, Francis or Kaplan turbines.
2.3.2   State function of each component
2.3.3   State field applications.

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competency	Key Competency
1	Coefficient of discharge of small orifice by constant head.	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$
2.	Coefficient of discharge of small orifice by variable head	Note readings of head at intervals. Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	
3	Hydraulic coefficients of orifice.	Regulate flow. Note co-ordinate values and measure volume Operate stop clock accurately State the relation.	
4.	Coefficient of discharge of mouth piece by constant head.	Regulate the flow Operate stop clock accurately graph between Q vs H1/2	
5.	Coefficient of discharge of rectangular notch.	Note readings of head Operate stop clock accurately Draw graph between Q vs$H^{3/2}$	
6.	Coefficient of discharge of triangular notch	Note readings of head Operate stop clock accurately Draw graph between Q vs $H^{5/2}$	
7	Coefficient of discharge of trapezoidal notch	Note readings of head Operate stop clock accurately Compare the results with rectangular and triangular notch.	
8	Verify Bernoulli's theorem	Note readings of head at various locations Plot hydraulic gradient line and total energy line	

9	Coefficient of discharge of venturimeter.	Note readings of head Operate stop clock accurately Draw graph between Q vs $H^{1/2}$	Regulate the flow Operate stop clock accurately Draw graph between Q vs $H^{1/2}$
10	Friction factor in pipe flow.	Note readings of head Observe the significance of friction factor of pipe flow.	. Observe the significance of friction factor of pipe flow.
11	Chezy's constant	Note readings of head Observe the significance in design of section of open channel	

COURSE CONTENT

LIST OF EXPERIMENTS

I   Determination of Hydraulic Coefficients/factors/Constant/Verification of Principles/ Laws
1. Determination of coefficient of discharge of a small orifice by constant head method
2. Determination of coefficient of discharge of a small orifice by variable head Method
3. Determination of C_c of an orifice by finding C_v and C_d.
4. Determination of coefficient of discharge of a mouthpiece by constant head method.
5. Determination of coefficient of discharge of a triangular notch.
6. Determination of coefficient of discharge of a rectangular notch.
7. Determination of coefficient of discharge of a trapezoidal notch.
8. Verification of Bernoulli's theorem.
9. Determination of coefficient of a discharge of a venture meter.
10. Determination of friction factor in pipe flow.
11. Determination of Chezy's constant in open channel flow.

II Study of Fluid machines
12. Study on reciprocating pump and   centrifugal pump.
13. Study on turbines – Pelton / Francis / Kaplan.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
IV Semester

TIME SCHEDULE

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE - 401	Mathematics - III	4	-	60	3			100
CE - 402	Theory of Structures	5	-	75	3			100
CE - 403	Quantity Surveying - I	5	-	75	3			100
CE - 404	Surveying – III	4	-	60	3			100
CE - 405	Transportation Engineering	5	-	75	3			100
PRACTICAL:								
CE - 406	CAD Practice		6	90	3			100
CE - 407	Building Services Drawing	-	3	45	3			100
CE - 408	Communication skills Lab Practice	-	3	45	3			100
CE - 409	Surveying - III Practice Communication Skills Practice	-	7	105	3			100
	TOTAL	23	19	630				900

THEORY OF STRUCTURES

Subject Title	:	THEORY OF STRUCTURES
Subject Code	:	CE-402
Periods/Week	:	05
Periods/Semester	:	75

TIME SCHEDULE

Sl. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Answer Type
1	Columns and Struts	15	23	01	02
2	Dams and Retaining walls	20	32	04	02
3	Statically indeterminate beams	25	39	03	03
4	Stresses in Frames	15	16	02	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0. Understand the behaviour of columns under vertical loads

   1.1 Define : i) Compression member ii) Axial Loading
   1.2 List different types of compression members
   1.3 Define : i) Buckling / Critical / Crippling Load ii) Actual length
         iii) Least radius of gyration   iv) Safe load   v) Factor of safety
   1.4 Calculate least radius of gyration for solid / hollow circular, square and rectangular sections
   1.5 List different end conditions used for a column
   1.6 Define i) Effective / equivalent length   ii) Slenderness ratio
   1.7 List the effective lengths of columns for different end conditions
   1.8 Calculate the slenderness ratio for a given column/strut
   1.9 Classify columns based on slenderness ratio or length and lateral dimensions
   1.10 Distinguish between Long and short columns.
   1.11 State Euler's formula for crippling load of a column / strut (derivation not required)
   1.12 Derive an expression showing limitations of Euler's formula.
   1.13 Solve problems on limitations of Euler's formula

1.14   Calculate crippling and safe loads on a column / strut with simple / built up section using Euler's formula

1.15   Explain the validity of Rankine's formula for short and long columns using basic Rankine's empirical formula

1.16   Obtain Rankine's formula for crippling load of a column / strut from basic empirical formula

1.17   Calculate crippling or safe loads on a column / strut with simple / built up section using Rankine's formula

1.18   Calculate the ratio of strengths of hollow and solid circular columns loaded under same conditions

1.19   Design a hollow circular cross section of a column for the given data

1.20   Obtain the expression for pressure distribution at the base of a column, subjected to eccentric load about one axis only

1.21   Compute the pressure distribution at the base of a column, subjected to an eccentric load about one axis only

1.22   Define the core of a column

1.23   Calculate core for circular / square / rectangular columns and draw the shapes of core

2.0.   Understand the Stability of Retaining walls and dams under the action of lateral pressures

2.1.   Define a dam/ retaining wall.

2.2.   List the forces acting on a dam / retaining wall.

2.3.   Derive the formula for maximum and minimum stress intensities at the base of a Trapezoidal dam with vertical water face.

2.4.   Sketch the stress distribution at the base of a dam / retaining wall for different conditions

2.5.   Calculate the stress intensity at base of a rectangular / Trapezoidal dam with or without free board

2.6.   List the conditions for stability of a dam / retaining wall

2.7.   Define middle third rule

2.8.   Define minimum base width of a dam / retaining wall

2.9.   Derive the formula for minimum base width of a dam without free board to avoid tension at the base for the following sections
1. Trapezoidal section 2. Rectangular section 3.Triangular section

2.10.   Calculate the minimum base width based on above formulae

2.11.   Calculate the minimum base width of a trapezoidal dam with vertical water face and having free board to avoid tension and sliding.

2.12.   Explain the procedure to find the stresses at the base of a dam with battered water face

2.13.   Calculate the stresses at the base of a dam with inclined water face

2.14.   Solve the problems on checking the stability of a dam with vertical / inclined water face

2.15.   Define: i) Angle of repose of soil   ii) Angle of Surcharge   iii) Active earth pressure   iv) Passive earth pressure

2.16.   Differentiate between active earth pressure and passive earth pressure

2.17.   Compute the lateral earth pressure on a retaining wall having soil face vertical with levelled earth, surcharged earth and with levelled earth and UDL

2.18.   Calculate the stresses at the base of a retaining wall for the above cases

2.19. Calculate the minimum base width of a retaining wall with vertical soil face and levelled earth to avoid tension and sliding at base

2.20. Calculate the stresses at the base of a retaining wall with levelled earth and soil face inclined

2.21. Check the stability of a retaining wall with soil face vertical and having leveled / surcharged earth OR with soil face inclined and having levelled earth

2.22. State Rankine's formula for minimum depth of foundation

2.23. Calculate minimum depth of foundation for walls and columns using Rankine's formula

3.0. Understand the effects of Loading on propped cantilevers, fixed and continuous beams

3.1. Differentiate between a statically determinate and indeterminate structure.

3.2. Define degree of static indeterminacy

3.3. Calculate degree of static indeterminacy for
1. Propped cantilever,
2. Fixed beam and
3. Two span continuous beam

3.4. Calculate prop reaction of propped cantilever subjected to UDL throughout OR a single point load between fixed and propped ends

3.5. Calculate SF and BM values and draw SFD and BMD for a propped cantilever with above type of loading only.

3.6. Calculate the location of point of contra flexure in propped cantilever for above loading.

3.7. State the merits and demerits of fixed beams.

3.8. Derive the conditions required for the analysis of fixed beams by moment area method.

3.9. Derive the formulae for the fixed end moments due to central point load or UDL throughout on a fixed beam.

3.10. Draw SFD and BMD for a fixed beam with above type of loading only.

3.11. State the formulae for maximum deflection in a fixed beam due to above loading.

3.12. Calculate the maximum deflection in a fixed beam using above formulae.

3.13. State the merits and demerits of continuous beams.

3.14. State the equation based on theorem of three moments.

3.15. Calculate support moments and span moments for a two span continuous beam with simply supported or over hanging ends only, subjected to central point load or UDL throughout on each span, using theorem of three moments.

3.16. Calculate the support reactions for above type of continuous beams.

3.17. Draw SFD and BMD for two span continuous beams, using theorem of three moments.

3.18. Define stiffness factor, distribution factor and carry over factor.

3.19. Calculate stiffness factor and distribution factor at an intermediate support of a beam or non-hinged joint.

3.20. Calculate span moments and support moments for two span or three span continuous beams with different end conditions, carrying central point load or UDL throughout on each span, using moment distribution method

3.21. Draw BMD only for the two span or three span continuous beams with the above type of loading and end conditions, using moment distribution method.

4.0. Understand the effect of Dead and Live loads on statically determinate frames
  - 4.1. Define a frame.
  - 4.2. Classify the fames based on 1. Number of members and 2. Number of joints.
  - 4.3. Show the sign convention for different types of stresses in members of a truss / frame
  - 4.4. Explain the rules for assuming the direction of stresses in the members.
  - 4.5. Explain the method of calculating stresses / forces in the members of a truss / frame by the method of joints.
  - 4.6. Calculate the stresses / forces in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of joints and prepare force table.
  - 4.7. Explain the method of calculating stresses / forces in the members of a truss / frame by the method of sections.
  - 4.8. Differentiate method of joints and method of sections.
  - 4.9. Calculate the stresses in the members of a simply supported or cantilever truss / frame subjected to DL & LL at nodal points by the method of sections and prepare force table.

COURSE CONTENT

1.0   Columns and struts
  - a)   Short and long columns – Axial loading only – solid circular, Hollow circular, Rectangle and I section and Built up columns – different end conditions – slenderness ratio – calculation of safe load on columns by Euler's and Rankine's formula – Effective length, radius of gyration and slenderness ratio - limitation of Euler's formula – strength of columns – problems – stress distribution at the base of column due to eccentric load about one axis- problems – core of a column

2.0   Dams and retaining walls
  - a)   Introduction – rectangular dams – trapezoidal dams having water face vertical and inclined – Conditions for the stability of a dam – conditions to avoid tension in the masonry dam at its base, to prevent the over – turning of the dam, the sliding of dam and to prevent the crushing of masonry at the base of the dam – Minimum base width of a dam.
  - b)   Active and passive earth pressure – Angle of internal friction – Angle of surcharge – calculation of active earth pressure by Rankine's formula with and without surcharge.
  - c)   General conditions of stability of retaining walls – middle third rule – Distribution of pressure on foundation of retaining walls – calculation of minimum base width.
  - d)   Calculation of minimum depth of foundation by Rankine's formula.

3.0   Statically indeterminate beams
  - a)   Statically determinate and indeterminate structures – definition – degree of static indeterminacy
  - b)   Cantilever beam with UDL on whole span and propped at free end – cantilever beams with point load between fixed and propped ends – Calculation of prop reaction – SFD and BMD.

c) Fixed Beams: Introduction-Sagging and hogging Bending moments – merits and demerits – Determination of Fixed end moments by moment Area method – standard cases – fixed beams subjected to symmetrical concentrated loads – Fixed beams subjected to U.D.L throughout – sketching B.M.D. and S.F.D – problems (without sinking of props) – Max deflection formulae of fixed beams subjected to central point load and U.D.L throughout (No derivation) – problems.

d) Continuous Beams: Merits and demerits – Continuous beams – effect of continuous supports – support moments – Clapeyron's Theorem of three moments – equation (without derivation) – continuous beams with central point load or U.D.L. throughout for each span – problems on two span continuous beams with simply supported or over hanging ends only – Reaction at supports in continuous beams – sketching S.F.D. and B.M.D (Beam with varying moments of inertia, supports at different levels not included)

e) Moment distribution Method (Hardy cross method) – Introduction - Sign conventions – stiffness factor – carry over factor – Distribution factor – Application to continuous beams of Two span and three span with central point load or UDL throughout on each span (for any type of end support) - sketching B.M.D. only (beam with varying moments of inertia, supports at different levels not included)

4.0 Stresses in frames

Frames – Definition – classification based on number of members and number of joints – Determination of forces in members of statically determinate pin jointed frames – method of sections and method of joints – Application to simple frames and trusses (simply supported and cantilever) under loads at joints.

REFERENCE BOOKS

1. Strength of Materials by S.Ramamurtham
2. S.M and T.S – by B.C. Punmia
3. Strength of Materials – by R.S. Khurmi
4. Graphical Methods in structural analysis by D S Prakash Rao
5. Structural Analysis – A Unified Approach by D S Prakash Rao
6. Mechanics of solids by – R.K .Rajput
7. Strength of Materials – by R.K. Bansal
8. Strength of Materials – R.Subramanian Oxford University Press

QUANTITY SURVEYING - I

Subject Title   :   **Quantity Surveying - I**
Subject Code   :   **CE- 403**
Periods / week   :   **05**

Periods / Semester   :   **75**

Time Schedule

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction, Units and Specifications	08	16	02	01
2	Earth work calculations	20	29	03	02
3	Types of estimates of buildings	15	26	02	02
4	Preparation of detailed estimates	32	39	03	03
	Total	75	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Understand basic concepts of   Quantity Surveying, Units and Specifications

    1.1   Define:
       a) Quantity Surveying
       b) Estimate
    1.2   State the need for quantity surveying
    1.3   State different types of estimates
    1.4   Explain the need for different estimates
    1.5   Distinguish among element of structure, item of a work & materials of construction
    1.6   List the duties of Quantity Surveyor
    1.7   State the units of measurements, data and payment for different items of work and materials using I S : 1200
    1.8   State two types of taking out measurement.
    1.9   Explain Centre Line Method – Long and Short   Wall Method
    1.10   Explain the process of taking measurements for different works and tolerances
    1.11   Define specifications
    1.12   State the need for specifications

1.13   State different types of specifications
1.14   Give the general specifications for important items of work

2.0   Compute the volumes of earth work and reservoir capacity
    2.1   Explain terms:
        a) Embankment
        b) Cutting
        c) Volume of earth work
    2.2   Define:
        a) Lead
        b) Lift
    2.3   State the standard values of 1.Lead and 2. Lift
    2.4   Calculate the lead and lift for a given section
    2.5   List different methods of computing the areas and volumes
    2.6   Explain:
        a) Mean sectional area method
        b) Mid sectional area method
        c) Trapezoidal rule
        d) Prismoidal rule
    2.7   State the limitations of prismoidal rule
    2.8   Determine the areas of an embankment for a given data
    2.9   Determine the areas of a cutting for a given data
    2.10   Prepare detailed estimates for earth work for roads, canals and earthen bunds
    1.11   Compute gross and effective capacity of a reservoir from the areas of different elevations

3.0   Understand different types of estimates
    3.1   State different types of estimates
    3.2   Explain:
        a) Approximate or preliminary estimate
        b) Detailed estimate
        c) Abstract estimate
    3.3   State the methods of preparing approximate estimates
    3.4   Explain:
        a) Plinth area method
        b) Cubic content method
        c) Service unit method
    3.5   Prepare approximate estimates for residential and non-residential buildings with given data of size / capacity and rates considering cost of building services and other over heads
    3.6   Differentiate between detailed estimate and abstract estimate
    3.7   Write formats of detailed estimate and abstract estimate

4.0   Prepare detailed estimates for various Civil Engineering Structures
    4.1   State the information required for preparation of detailed estimates of a building
    4.2   State different methods of taking out quantities
    4.3   Explain different methods of taking out quantities
    4.4   Prepare the detailed estimates for various buildings from the given drawings, specifications and site conditions:

a) Compound wall and Steps
b) Single Room Building
c) Single Room with Verandah
d) Single storied Residential building with one bed room (1 BHK)
e) Single storied Residential building with two bed rooms (2 BHK)
f) Three Bed room building (3 BHK)
g) Two storied residential building
h) Buildings with Sloped roofs like pitched roof, lean to roof, hipped & valley roof
i) Primary school building

4.5 Prepare the estimation of a steel roof truss for an Industrial building

COURSE CONTENT

1. Introduction of Unit measurements and Specifications
- a) Quantity surveying – Definition of estimate – Need for estimation – Types of estimates – Approximate estimate – Detailed estimate – Abstract estimate – Duties of Quantity Surveyor – Elements of a structure – Item of Work – Materials of construction – Line diagram for preparation of abstract estimate
- b) Units of measurements for various items of civil engineering works as per IS :1200
- c) Degree of accuracy in measurement – Deductions for openings in masonry, RCC and Plastering – Painting coefficients
- d) Different Methods of taking out quantities – Centre Line Method – Long and Short Wall Method
- d) Specifications – Necessity – Types of specifications – General specifications of:
  - i) Earth works
  - ii) Brick / Stone Masonry with C.M
  - iii) Reinforced Cement Concrete
  - iv) Plastering with C.M
  - v) Floor finishes with ceramic tiles and marbles
  - vi) White washing / Colour washing

2. Earth Work Calculations
- a) Lead and Lift – Initial and subsequent values
- b) Mid- Ordinate Method – Mean Sectional Area Method – Trapezoidal Rule – Prismoidal Rule for computing volumes in level sections for roads and Canals
- c) Taking out quantities from Longitudinal Section and Cross Section in cutting and embankment of level sections
- d) Capacity of Reservoir from the table of areas and contours

3. Types of Estimates of Buildings
- a) Types of estimates – Preliminary or Approximate Estimate – Detailed Estimate – Abstract Estimate – Definitions – Formats for detailed and abstract estimates.
- b) Preliminary or Approximate Estimate – Plinth area method – Cubic rate method – Service Unit method
- c) Problems in Preliminary estimate

4. Preparation of detailed estimates for various Civil Engineering structures with loading bearing walls
   a) Compound wall and steps
   b) Single Room Building
   c) Single Room with Verandah
   d) Single storied Residential building with one bed room (1 BHK)
   e) Single storied Residential building with two bed rooms (2 BHK)
   f) Three Bed room building (3 BHK)
   g) Two storied residential building
   h) Buildings with Sloped roofs like pitched roof, lean to roof, hipped & valley roof
   i) Estimation of a steel roof truss
   j) Primary school building

REFERENCE BOOKS

1. Estimating and Costing   - B.N. Dutta
2. Estimating and Costing   - S. C. Rangawala
3. Estimating Construction Costs   - Robert L. Peurifoy & Garold D. Oberlender

* * *

SURVEYING – III

Subject Title	:	Surveying – III
Subject Code	:	CE - 404
Periods/Week	:	04
Periods/Semester	:	60

TIME SCHEDULE

Sl. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1	Trigonometric levelling	10	23	01	02
2	Tacheometry	15	26	02	02
3	Curves	15	26	02	02
4	Electronic Surveying Instruments	10	19	03	01
5	Total Station	10	16	02	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of this course the student shall be able to

1.0   Understand the principles of Trigonometrical   Levelling
   1.1.   Define of trigonometrical levelling
   1.2.   Enumerate the different cases that occur in trigonometrical levelling to find the elevation and distance of a given object (base of the object accessible or inaccessible)
   1.3.   Derive formula for finding height and elevation of an object when the base of the object is accessible.
   1.4.   Calculate the height and elevation of an object when the base of the object is accessible.
   1.5.   Derive the formula to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane
   1.6.   Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are in the same vertical plane

1.7. Describe the procedure to find the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.

1.8. Calculate the distance and elevation of the object when the base of the object is inaccessible and instrument stations and object are not in the same vertical plane.

2.0 Understand the principle of Tacheometry to find the elevations and distances of stations

2.1 Define tacheometry

2.2 List the uses of tacheometry

2.3 Explain the principles of stadia tacheometry

2.4 Explain the advantage of use of Analogue table

2.5 List the different methods of tacheometry

2.6 Define staff intercept

2.7 List the constants of tacheometry in stadia tacheometry

2.8 Derive the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical

2.9 Derive the formulae to determine the elevation of the staff station using stadia tacheometry, when the line of collimation is horizontal with staff held vertical

2.10 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is horizontal with staff held vertical.

2.11 Explain the procedure for determining tacheometric constants

2.12 State the use of analytic lense

2.13 Write the formulae to determine the horizontal distance of staff station from the instrument station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation)

2.14 Write the formulae to determine the elevation of the staff station using stadia tacheometry When the line of collimation is inclined with staff held vertical (without derivation)

2.15 Calculate the horizontal distance of staff station from the instrument station and its elevation when the line of collimation is inclined with staff held vertical.

2.16 Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are lying in the same vertical plane) using stadia tacheometry

2.17 Compute the horizontal distance and difference in elevations between any two staff stations (instrument station and staff stations are not lying in the same vertical plane) using stadia tacheometry

2.18 Explain the principle of Tangential Tacheometry

2.19 Enumerate the difference between Stadia and tangetial tacheometries

2.20 Derive the formula to determine the distance of staff station from the instrument station and elevation of the staff station by tangential tacheometry

2.21 Compute the horizontal distance of staff station from instrument station and its elevation by tangential tacheometry

2.22 Compute the horizontal distance and difference in elevations between any two staff stations using tangential tacheometry (instrument station and staff stations are lying in the same vertical plane)

2.23 Compute the horizontal distance and difference in elevations between any two staff stations using tangential tacheometry (instrument station and staff stations are not lying in the same vertical plane)

3.0 Understand the method of setting out simple curves

3.1 List the types of horizontal curves

3.2 Define Simple curve

3.3 Define degree of curve and state the relation between the radius and degree of curve according to chord length / arc length

3.4 Calculate degree of curve using above relations

3.5 Sketch a simple circular curve and show its elements

3.6 Define various elements of a simple circular curve

3.7 Compute the length of curve, tangent length, length of long chord and mid ordinate, apex distance and chainages at salient points of a curve

3.8 List the linear and angular methods of curve setting

3.9 Explain the procedure for setting out a curve by linear methods

3.10 Explain the procedure for setting out a curve by angular methods

3.11 Calculate the data required for setting out a curve for above methods and Prepare the curve tables

4.0 Understand the principles and uses of Electronic Surveying instruments

4.1 List the modern surveying instruments

4.2 Explain the principle of EDM

4.3 Explain the features of electronic theodolite and distomat

4.4 State the uses of electronic theodolite and distomat

4.5 Define GPS

4.6 Explain the working principle of GPS

4.7 Explain the segments of GPS

4.8 Enumerate the types of GPS receivers

4.9 Explain taking coordinates of various points using GPS

4.10 List the applications of GPS in civil Engineering

4.11 List merits and demerits of GPS

4.12 Define GIS

4.13 State the components of GIS

4.14 List the types of data used in GIS

4.15 Explain the data used in GIS

4.16 Define map

4.17 List the types of map projections

4.18 List the uses and applications of GIS in civil Engineering

4.19   State the principle of Photogrammetry
4.20   Explain the types of terrestrial photogrammetry
4.21   Explain the use of stereoscope in photogrammetry

5.0   Understand the principles of total station
5.1   List the parts of total station and their functions
5.2   Explain the setting up total station for taking observations
5.3   List the uses of total station
5.4   Explain the procedure for measurement of distances and angles
5.5   Explain procedure of taking multiple number of observations on a single
         station
5.6   Explain the procedure for measurement of area with single station setup
5.7   Explain the procedure of traversing using total station
5.8   Explain the orientation of total station by resection method
5.9   Explain establishing TBM by station elevation method
5.10   Explain Staking out a point, line and an arc
5.11   List the steps involved in marking the centre line for a typical residential
         building
5.12   Explain the procedure for LS and CS for proposed road / canal/ pipe line

COURSE CONTENTS

1.0 Trigonometric levelling
a)   Principle and necessity of Trigonometric levelling
b)   Elevations and distances of objects whose base is accessible or inaccessible, with
        instruments stations and object in the same vertical plane or in different vertical
        planes.

2.0 Tacheometry
a) Tacheometry – principle – uses – types – stadia and tangential tacheometries
b) Stadia Tacheometry with staff held vertical and line of collimation horizontal or
      inclined – elevations and distances of staff stations – determination of Tacheometric
      constants - Tachometric tables - problems
c) Tangential Tachometry – uses – Finding elevation and distances – Problems.

3.0 Curves

a) Curves – types of horizontal curves – simple, compound and reverse curves –
      degree of curve – formulae for degree of curve using 20m / 30m chain – elements of
      simple circular curve – Point of commencement of curve, point of tangency, forward
      and back tangents, point of intersection, angle of intersection, deflection angle,
      length of curve, tangent length, long chord, mid ordinate, normal chord and sub
      chord
b) Calculation of elements of simple circular curve

c) Method of curve setting – chain and tape methods – offsets from long chord method, successive bisection of arcs method, off sets from tangent (radial and Perpendicular offsets) method and off sets from chords produced method – angular methods – single and double theodolite methods

d) Preparation of curve table for curve setting – problems.

4.0 Electronic Survey instruments and GPS and GIS

a) Principle and uses of EDM – Electronic theodolite and distomat – uses

b) Global positioning system (G.P.S) – principle – segments – space, control and user segments – receivers – observation and data processing - applications in Civil Engineering – advantages and disadvantages of GPS

c) Geographical Information System (GIS) – definition – Map – Map projections – types data used – use and application of GIS in Civil Engineering.

d) Introduction to Photogrammetry – types of Photogrammetry – basic principles – terrestrial photogrammetry – stereo and plane table photogrammetries – stereoscope

5.0   TOTAL STATION

a) Parts and functions – setting up total station for taking observations - Use of Total Station - Measurement of distances and angles - multiple number of observations on a single station - measurement of area with single station setup - orientation of total station by resection method - establishing TBM by station elevation method - marking the centre line for a typical residential building - LS and CS for proposed road / canal / pipe line

REFERENCE BOOKS

1	Surveying I & II	by B.C.Punmia
2	Surveying	by S.K. Husain
3	Surveying and levelling I & II	by -T .P Kanetkar
4	Surveying - I & II	by A. V.R.J. Sharma and Kamala
5	Text book of surveying	by Dr.C.Venkata Ramaiah

TRANSPORTATION ENGINEERING

Subject Title : **Transportation Engineering**
Subject Code : **CE-405**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S.No	Major Topics	No of periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Highways and Soil Mechanics	21	16	02	01
2	Highway Surveys and Traffic Engineering	10	23	01	02
3	Highway Constructions and Maintenances	12	23	01	02
4	Introduction and Permanent way of Railways	10	13	01	01
5	Station yards and Maintenance of Railways	07	16	02	01
6	Bridges, Culverts and Cause ways	15	19	03	01
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the basics of Highways and Soil Mechanics
   1.1. State the importance of transportation engineering.
   1.2. State the importance of I.R.C
   1.3. List the functions of I.R.C
   1.4. Classify roads as per I.R.C
   1.5. Defines:
      1. Width of pavement,
      2. Shoulder,
      3. Formation width,
      4. Right of way,
      5. Camber,
      6. Gradient,
      7. Super elevation, and
      8. Sight distance.
   1.6. Explain the components of a road with a sketch.
   1.7. State the three types of gradients
      1. Ruling gradient,
      2. Limiting gradient and
      3. Exceptional gradients and their recommended values.
   1.8. State recommended values of gradients by I.R.C

1.9. State the need for providing super elevation
1.10. Write the formula for super elevation
1.11. State the need for curves in highways.
1.12. State the different types of horizontal curves adopted in road
1.13. State the different types of vertical curves adopted in road
1.14. List physical properties of soils
1.15. Define the following physical properties of soils:
    1. Plasticity,
    2. Cohesion,
    3. Consolidation,
    4. Compaction,
    5. Permeability and
    6. Compressibility
1.16. State the different systems of classification of soils
1.17. Explain the textural classification soils with sketches as per I S Classification of soils.
1.18. In respect of soils, define:
    1. Ultimate bearing capacity of soil,
    2. Safe bearing capacity, and
    3. Net safe bearing capacity.
1.19. State the presumptive bearing capacity values and the codes equation for the calculation of bearing capacity as per IS code.

2.0 Understand Highway Survey and Traffic Engineering
2.1 Define alignment of road.
2.2 State the factors influencing selection of alignment for a road in plain and hilly areas.
2.3 List the surveys required for fixing alignment.
2.4 State the different data required for the preparation of highway project.
2.5 Explain various engineering surveys conducted to fix the alignment of a road.
2.6 State the importance of traffic census/traffic surveys.
2.7 List various traffic surveys conducted.
2.8 Explain the following with neat sketches:
    1. Traffic islands and
    2. Interchanges.
2.9 State types of pavement markings with sketches.
2.10 State the functions of pavement markings with sketches
2.11 State the purpose of traffic signs
2.12 State the functions of traffic signs with sketches.

3.0 Understand Highway construction and Maintenance
3.1 State the need for road drainage.
3.2 Explain the methods of providing surface and sub-surface drainage.
3.3 State the materials used in construction of different types of roads
3.4 List the tests on Bitumen.
3.5 State the equipment/machinery used in construction of different roads.
3.6 Explain the methods of construction of different types of roads.
3.7 Explain the maintenance of WBM of roads.
3.8 Explain the different types of joints used in C.C roads with sketches.
3.9 State the need for joints in C.C roads.

4.0   Understands Introduction and Permanent way of Railways
    4.1   State the advantages of Railways.
    4.2   Define gauge and
    4.3   Classify gauges.
    4.4   State   the component parts of a permanent way
    4.5   List the functions of each component parts of a permanent way
    4.6   State the requirements/characteristics of
            1. Good rail,
            2. Rail joint,
            3. Sleeper and
            4. Ballast.
    4.7   State the different types of
            1. Rails,
            2. Joints,
            3. Rail fittings,
            4. Sleepers,
            5. Ballast,
            used in Indian Railways with sketches (wherever required).

5.0   Understand Station yard and Maintenance of Railways
            Describe different types of turnouts with sketches.
    5.1   Describe different types of crossings with sketches
    5.2   Classify stations.
    5.3   State different maintenance measures of a railway track.
    5.4   State the duties of a permanent way inspector.

6.0   Understands Bridges, Culverts and Cause ways
    6.1   Classify bridges based on materials, position of bridge floor and form/type of super structure.
    6.2   State the factors influencing selection of site for a bridge.
    6.3   State the data required for preparation of bridge project.
    6.4   Define:
            1. Waterway,
            2. Linear waterway,
            3. Afflux,
            4. Vertical clearance,
            5. Scour depth, and
            6. Free board.
    6.5   State the formulae for economical span and afflux.
    6.6   State component parts of a bridge sub-structure with sketches
    6.7   List the functions of a bridge sub-structure
    6.8   Distinguish between deck and through bridge.
    6.9   Draw different types of bridge super structures.
    6.10   List different types of 1. Causeways and 2. Culverts.
    6.11   State suitability of different types of culverts
    6.12   State suitability of different types of causeways.
    6.13   Sketch different types of causeways
    6.14   Sketch different types of culverts

COURSE CONTENT

1.   Introduction of Highway and Soil Mechanics
a)   Importance of transportation engineering – I.R.C. – Classification of roads as per I.R.C.
b)   Cross section of a road structure – sub grade – sub-base, base and wearing course-Width of pavement, shoulder, formation width, right of way, road boundaries – road widths for different classification of roads, traffic lane widths-camber – recommended I.R.C values of camber for different roads.
c)   Gradients – Ruling gradient, limiting and exceptional gradients – Recommended I.R.C values of gradients.
d)   Super elevation – Necessity – Curves – necessity of curves in roads – transition curves – details of alignment for horizontal and vertical curves.
e)   Physical properties of soil like plasticity, cohesion, consolidation, compaction, Permeability and compressibility.
f)   Soil moisture content – Specific gravity and density.
g)   Types of soils – residual soil – transported soil – sand – silt – clay – peat – Till – Tull – loess – Bentonite – Soils in India
h)   Different systems of classification of soils – Textural classification – I S classification of soils
i)   Bearing Capacity – Definition – Importance in foundation design
j)   Presumptive bearing capacity (values only)
k)   Code equation for computing bearing capacity (no derivation)

2.   Highway Surveys and Traffic Engineering
a)   Alignment – Factors influencing alignment of road in plain and hilly areas – Highway surveys – Reconnaissance, preliminary and final location surveys.
b)   Traffic census and its importance.
c)   Road intersections – At grade intersections-Types–Traffic islands – Channelizing islands – Round about – Interchange – Fly over – Diamond intersections – Clover Leaf junction.
d)   Pavement marking and Kerb markings.
e)   Traffic signs – Informatory signs – Mandatory signs – Cautionary signs.

3.   Highway constructions and Maintenance
a)   Purpose of road drainage – Surface and sub-surface drainage – Typical cross section of highway in cutting and embankment.
b)   Water bound macadam roads – Materials used – Machinery used in the construction – Construction procedure – Maintenance of W.B.M road.
c)   Bitumen – Properties – Tests on Bitumen (Flash Point and consistency tests) – Bitumen roads-Different types – Surface dressing – interface treatments-seal coat, tack coat, prime coat, premix – Full grout and semi-grout – methods – Construction procedure.
d)   Cement concrete roads-Longitudinal joints–Transverse joints –Construction joints – Construction of cement concrete roads – Machinery used for construction.

4.   Introduction and permanent way of Railways
a)   Importance of Railways – Gauge – Types of gauges.

      b)   Structure of permanent way-Different types of rails- requirements of a good rail.

      c)   Rail joints – Types of joints – Requirements of good rail joint – Fixtures and fastenings of rails – coning of wheels.

      d)   Sleepers – Definition –Functions –-Types of sleepers–characteristics of a good sleeper – Spacing of sleepers – Sleeper density.

      e)   Ballast – Definition – Function – Characteristics of good ballast.

5.   **Station yards and Maintenance of Railways**

      a)   General description and sketches for turnout – General layout of a simple left hand and right hand turnout and different crossings.

      b)   General idea with sketches of station yards – Marshalling yard, goods yard, passenger yard and loco yard.

      c)   Maintenance of track – Duties of P.W.I (permanent way inspector).

6.   **Bridges, Culverts and Causeways**

      a)   Bridges – Classification based on material, position of bridge floor and form/type of superstructure – Selection of site for a bridge.

      b)   Technical terms waterway, Afflux, vertical clearance, linear waterway, freeboard for bridges and culverts – Economical span – Scour depth .

      c)   Pier, abutment, wing wall and approaches – Functions of each.

      d)   Deck and Through bridges – Sketches and suitability of different types of bridges – Masonry bridges – R.C.C beam and slab bridges, Plate girder bridges, pre stressed concrete bridges, steel trussed bridges and suspension Bridges.

      e)   Sketches and suitability of different culverts – slab culverts, pipe culverts and box culverts – Types of cause ways – Low level causeway and high level causeway.

REFERENCE BOOKS

1.   Highway Engineering   by   S.C.Rangawala
2.   Railway Engineering   by   S.C.Rangawala
3.   Bridge Engineering   by   S.C.Rangawala
4.   Highway Engineering   by   Khanna and Justo
6.   Railway Engineering   by   Saxena
7.   A Text book of Road Engineering   by   Basu and Bhattacharjee

CAD PRACTICE

Subject Title   : CAD PRACTICE
Subject Code   : CE - 406
Periods/Week   : 06
Periods/semester   : 90

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Introduction to Computer aided Drafting	06
2.	Practice on CAD software	24
3.	Geometric Constructions	15
4.	Preparation of 2-D drawings using CAD Software	21
5.	Preparation of 3-D drawings using CAD software	24
	Total	90

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the importance of Computer Aided Drafting (CAD)
    1.1   State the applications and advantages of CAD
    1.2   State the advantages of CAD
    1.3   State the features of CAD as drafting package
    1.4   State the hardware requirements to run CAD

2.0 Practice to start the CAD, drawing editor and selects/enters CAD Commands to perform any operations
    2.1   Study the drawing editor screen.
    2.2   Practice the methods of selecting/entering commands to start new drawing accessing CAD commands by selecting from menus, tool bars and entering Commands on command line.
    2.3   Set the limits of the drawing to get the needed working area.
    2.4   Practice the 'setting commands' Grid, Snap, & Ortho Commands.
    2.5   Practice 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon and spline.
    2.6   Dimension the given figures.
    2.7   Practice 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
    2.8   Practice 'construct commands' – offset, array, Divide measure.

2.9 Practice 'edit commands' – Undo, Redo, Oops, Copy Clip, Paste Clip, Del.
2.10 Practice 'view commands' – Redraw, Regen, Zoom, Pan.
2.11 Practice 'Hatch commands' – Bhatch, Hatch.
2.12 Practice 'insert commands' – Block, Wblock, Insert, Minsert.

3.0 Practice Geometric Constructions using CAD commands
3.1 Practice dividing a line into number of segments.
3.2 Practice drawing external/internal common tangents for circles of same/different radii.
3.3 Practice drawing external/internal common arcs for circles of same/different radii.
3.4 Practice construction of ellipse, parabola, hyperbola, cycloid, and helix.

4.0 Practice 2-D drawings using CAD Software
4.1 Practice conventional signs used in civil engineering.
4.2 Practice drawing elevation of panelled door partly panelled and partly glazed door/window shutter.
4.3 Practice drawing cross section of Load bearing wall showing different components.
4.4 Practice drawing Plan, Elevation, section and site plan of one roomed building.
4.5 Practice drawing Plan, Elevation, section and site plan of 2BHK building.
4.6 Practice drawing Double line diagram of primary school building.
4.7 Practice drawing Plan of Rural Hospital.
4.8 Practice drawing typical floor Plan of Apartment.

5.0 Practice 3-D drawings using CAD Software
5.1 Practice different views under view option.
5.2 Practice Solid creation and Solid editing options available in CAD.
5.3 Practice drawing different 3D solid objects.
5.4 Practice drawing3D views of pyramids and isolated column footing.
5.5 Practice drawing Simple spread/wall foundation.
5.6 Practice drawing single/double roomed building in 3D.

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1.	Introduction to computer	• Open/close Auto CAD program • Understands Auto CAD Graphic User Interface(GUI) and various toolbars
2	Practice on CAD software	• Practices the methods of selecting/entering commands • Sets the limits of the drawing • Learns Draw commands • Learns Modify commands • Learns Edit commands • Learns View commands • Learns Hatch commands • Learns Dimensioning Commands
3	Geometric Constructions	• Draws simple geometrical shapes like circles, tangents
4	Preparation of 2-D drawings using CAD Software	• Draws 2-D drawings
5	Preparation of 3-D drawings using CAD software	• Learns 3-D commands • Draws simple 3-D elements • Draws 3-D views of Isolated Column footing • Draws 3-D views of wall foundation • Draws 3-D views Single roomed and double roomed building in 3D

COURSE CONTENT

1.0   Introduction to computer aided drafting (CAD)

      a)   Computer graphics
      b)   Definition of CAD
      c)   Applications of CAD
      d)   Advantages of CAD
      e)   Introduction to CAD as drafting package

2.0   Practice on CAD

      a)   Study of drawing editor screen
      b)   List the methods to access CAD commands.
      c)   Practice of setting up of drawing area using utility commands, and using setting commands.
      d)   Practice entity draw commands.
      e)   Draw the given geometrical figures using draw commands.
      f)   Practice of Modify commands.

g)   Practice of construct commands.
h)   Practice of edit commands
i)   Practice of view commands.
j)   Practice of Hatch commands.
k)   Practice of insert commands.
l)   Dimension the figures using dimensioning commands.
m)   Practice of Print/Plot commands

3.0   Geometric Constructions

a)   Divide a line into number of segments.
b)   Draw an external/internal common tangent for two given circles of same/different radii.
c)   Draw external/internal arcs for two given circles of same/different radii.
d)   Construct ellipse, parabola, hyperbola, cycloid, and helix.

4.0   Preparation of 2-D drawings using CAD Software

a)   Draw conventional signs, symbols used in civil   engineering drawing.
b)   Draw the elevation of fully paneled door, partly glazed and partly paneled door/window shutter.
c)   Draw the section of a load bearing wall.
d)   Prepare Building Drawing – One roomed building with site plan.
e)   Prepare Building Drawing - 2BHK building with site plan.
f)   Prepare plan of primary school Building.
g)   Prepare Plan of Rural Hospital building.
h)   Prepare a typical floor plan of Apartment consisting G+5 floors.

5.0   Preparation of 3-D drawings using CAD Software

a)   Practice 3D commands. – View commands – solids command – solid editing/modify commands.
b)   Draw 3-D view of different simple objects.
c)   Draw 3D view of Isolated Column footing.
d)   Draw 3D view of wall foundation.
e)   Draw Single roomed roomed building in 3D.
f)   Draw double roomed building in 3D.

BUILDING SERVICES DRAWING

Subject Title	:	Building Services Drawing
Subject Code	:	CE- 407
Periods / week	:	03
Periods / Semester	:	45

TIME SCHEDULE

Sl.No.	Major Topics	Periods	Weightage of Marks	Short Answer Type	Essay Answer Type
1.	Plumbing	15	41	02	01
2.	Electrical	15		02	
3.	Mechanical	15	19	01	01
	Total	45	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & Part-B 2X20=40 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Label the component parts in plumbing
    1.1   Draw the water supply and sanitary pipe network diagram for a   toilet
    1.2   Draw the water supply and sanitary pipe network diagram for a Kitchen room
    1.3   Draw the pipe networking diagram for a motor room
    1.4   Draw the plan and cross section sharing the water supply and
          drainage connections from water main to a residential building
    1.5   Draw 1. Plan and 2. Cross section of a rain water harvesting pit in a
           residential building

2.0   **Label the component parts in electrical connections**
    2.1   Draw the wiring diagram for the following:
        (a)   Two way switch
        (b)   Connection to three phase motors
        (c)   Connections in the Distribution board
    2.2   Draw the electrical layout diagram for a given residential building

3.0   Label the component parts in mechanical connections

   3.1 Draw 1. Plan and 2. Cross section of a lift well and motor room sharing the lift machine accessories.

   3.2 Draw 1. Plan and 2. Cross section of ducting air conditioning system for a given room.

   3.3   Draw the typical layout of a solar water heating system.

COURSE CONTENT

I.0   Plumbing

   1.1 Water supply and sanitary connections to a toilet

   1.2 Water supply and sanitary connections to a kitchen room

   1.3 Layout and network diagram fro a motor room

   1.4 Water supply connections to a residential building

   1.5 Rain water harvesting pit

   1.6 Septic tank with details of connections to a soak pit

2.0   Electrical engineering drawing

   2.1   Labeling the parts of electrical connections in a residential building.

         a)   Two way switch

         b)   Three phase motor

         c)   Distribution board

   2.2 Layout of a residential building and labeling the component parts.

3.0 Mechanical Engineering Drawing

   3.1 Lift well and motor room

   3.2 Ducting air conditioning system for a room

   3.3 Solar water heater system

REFERENCE BOOKS

1.   Building Technology and valuation by TTTI, Madras; Tata McGraw Hill Publishing Company Limited, New Delhi.

2.   Services in Building Complex by Er. V.K. Jain Khanna; Khanna Publishers – Delhi.

Communication Skills Lab Practice
(Common to all branches)

Subject title   :   Communication skills Lab Practice
Subject code   :   CE- 408
Periods per week   :   03
Periods per semester :   45

Introduction :
 In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Objectives :
On completion of the course the students will be able to
- Strengthen their listening skills
- Strengthen their speaking skills

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3	10	10	20
2	Listening II	3			
3	Introducing oneself	3	50	30	80
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3			
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Competencies and key competencies to be achieved by the student

Topic	Teacher's input/ methodology	Students competence
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, sequencing
Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language,	Expressing opinion, agree/ disagree, fluency,Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing,PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.
Note:
* This subject   is a theory subject.
** The workload should be calculated as theory workload.
***Examinations in the subject will be treated as a practical one.

SURVEYING – III PRACTICE

Subject Title   : **SURVEYING – III PRACTICE**
Subject Code   : **CE - 409**
Periods/Week   : **06**
Periods/semester   : **90**

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Field Exercises using Theodolite	20
2.	Setting out curves	15
3.	Field Exercises using Total Station	40
4.	Global Positioning System	10
5.	Digitization of Maps	05
	Total	90

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0. **Perform the operations using Theodolite**
     Determine the Height and Reduced Level of an object whose base is accessible.
    1.2   Determine the Height and Reduced Level of an object whose base is inaccessible. (Object, instrument stations are in the same vertical plane)
    1.3   Determine constants 'K' and 'C'.
    1.4   Determine Horizontal Distance and Elevation by principle of stadia Tacheometry.

2.0. **Sets out Simple curve**
    2.1   Using Chain and Tape.
    2.2   Using One Theodolite.
    2.3   Using Two Theodolites.

3.0. **Field Exercises using Total Station**
    3.1   Study of component parts, accessories and functions Total Station.
    3.2   Initialization of Total Station over ground station and measure the distance between two given points.
    3.3   Measure area of given field.
    3.4   Conduct traversing survey (closed Traverse).
    3.5   To find Height and width of an elevated object.

3.6   To determine the elevation of Instrument point by making observation to point with known elevation.

3.7   To measure multiple sets (rounds) of observations.

3.8   To perform a station setup on a known point by making observations to one or more back sight points.

3.9   To establish the position of an occupied point relative to a base line or a boundary line.

3.10   To mark or establish points, Lines and Arcs on the ground.

3.11   To mark Centre line of a building on the ground.

3.12   L.S and C.S of proposed road/canal/pipe line on the ground.

3.13   Understand post processing.

3.14   To plot contour map of an area using surfer software.

4.0.   Global positioning system

4.1   Identifies the parts and the functions of Global Positioning System.

4.2   Determines the Coordinates of various points on the ground.

4.3   Linking the G.P.S data with Total Station.

5.0.   Digitization of Maps

5.1   Study the concept of digitization.

5.2   Digitization of any given contour map.

5.3   Digitization of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc.,

KEY competencies to be achieved by the student

S.NO.	Experiment Title	Key Competency
1.	Field Exercises using Theodolite a) Ex 1.1 b) Ex1.2 c) Ex1.3 d) Ex1.4	• Finds the height and reduced level of an object whose base is accessible • Finds the height and reduced level of an object whose base is inaccessible • Calculates constants K &C • Finds Horizontal Distance and Elevation of an object
2	Setting out curves a) Ex 2.1 b) Ex 2.2 c) Ex 2.3	• Sets out a given simple curve using chain and tape • Sets out a given simple curve using one Theodolite • Sets out a given simple curve using Two Theodolite
3.	Field Exercises using Total Station a) Ex3.1 b) Ex3.2	• Places total station on tripod, checks batteries and switches on total station • Centering of total station over a given point and sighting reflecting prism to measure distance • Measure area of given field • Conduct traversing survey (closed Traverse) and gets plotting

S.NO.	Experiment Title	Key Competency
	c) Ex3.3 d) Ex3.4 e) Ex3.5 f) Ex3.6	• Finds Height and width of an elevated object • Finds the elevation of Instrument point by making observation to point with known elevation • Understands errors by taking multiple sets (rounds) of observations • Knows station setup on a known point by making observations to one or more back sight points • Establish the position of an occupied point relative to a base line or a boundary line • Establish points, Lines and Arcs on the ground • Locates Centre line of a building on the ground • Collects data for L.S and C.S of proposed road/canal/pipe line on the ground • Understand post processing • Plots contour map of an area using SURFER software
S.NO.	Experiment Title	Key Competency
4	Global Positioning System a) Ex 4.1 b) Ex4.2 c) Ex4.3	• Identifies the parts and the functions and learns operating GPS • Determines the Coordinates of various points on the ground • Linking the G.P.S data with Total Station
5	Digitization of Maps a) Ex5.1 b) Ex5.2 c) Ex5.3	• Understands software • Digitizes of any given contour map. • Digitizes of given Town map and creating different layers for roads, railways, water supply lines and drainage lines etc.,

COURSE CONTENT

1.0. Field Exercises using Theodolite
    a) Determination of Height and Reduced Level of Top and Bottom of Accessible Object.

b) Determination of Distance and Elevation of an inaccessible object involving two instrument stations.
c) Determination of Constants of Tacheometer.
d) Determination of Horizontal distance and elevation by stadia Tacheometry.

2.0. Setting out curves
a) Setting out a simple curve by chain and tape method.
b) Setting out a simple curve by one Theodolite and two Theodolite methods.

3.0. Field Exercises using Total Station.
a) Study of the Total Station equipment.
b) Station setup and measuring distance.
c) Measurement of area.
d) Traversing with total station.
e) Height and width of the elevated object.
f) Orientation of Total Station by resection method.
g) Establishing T.B.M by Station Elevation Method.
h) Measure rounds (multiple sets of observations on a single station).
i) Station setup plus.
j) Refline.
k) Staking out a point, line and an arc.
l) Marking of the centre line for proposed residential building.
m) L.S and C.S of a proposed road/Canal/pipeline.
n) Contouring.
o) Post processing.

4.0. Global positioning system.
a) Applications of Global Positioning System
b) Parts and the functions of G.P.S.
c) Finding the Coordinates of various points on the ground.
d) Linking G.P.S data with Total Station.

5.0. Digitization of Maps.
a) Introduction – uses and applications.
b) Raster to vector conversion – scanning - Digitization.
c) Digitization of contour map from scanned picture.
d) Digitization of Town maps – showing the different layers for roads, railways, water supply lines and drainage lines etc,.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
V Semester

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE-501	Design & Detailing of R.C. Elements	5	-	75	3			100
CE-502	Environmental Engineering - I	4		60	3			100
CE-503	Quantity Surveying - II	5	-	75	3			100
CE-504	Irrigation Engineering	5	-	75	3			100
CE-505	Project Management for Construction	4	-	60	3			100
PRACTICAL:								
CE-506	Computer Applications for Project Management		3	45	3			100
CE-507	Civil Engineering Drawing - II	-	6	90	3			100
CE-508	Life skills	-	3	45	3			100
CE-509	Field practices	-	7	105	3			100
	TOTAL	23	19	630				900

DESIGN AND DETAILING OF R.C. ELEMENTS

Subject Title : **DESIGN AND DETAILING OF R.C. ELEMENTS**
Subject Code : **CE-501**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S.No	Major **Topics**	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction to R.C.C and Principles of Working Stress Method	08	10	-	01
2.	Philosophy of Limit State Design	04	06	02	-
3.	Analysis and Design of Rectangular Beams	15	26	02	02
4.	Design of Slabs	12	16	02	01
5.	Analysis of T-beams	08	13	01	01
6.	Design of continuous slabs and beams	10	16	02	01
7.	Design of columns	10	13	01	01
8.	Design of footings	08	10	-	01
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Understand the Loads to be considered and importance of IS Codes and principles of working stress design
   1.1 Differentiate Cement concrete and reinforced cement concrete.
   1.2 Explain the need for reinforcement in plain concrete
   1.3 List the advantages and disadvantages of R.C.C.
   1.4 List the material used in R.C.C. and their functions in R.C.C.
   1.5 State the reasons for using steel as reinforcement.
   1.6 List the different codes used in RCC
   1.7 List the Loads to be considered in the design of R.C. elements.
   1.8 State the different methods of designing R.C. elements.
   1.9 State the different grades of concrete and different permissible stresses in concrete (Working Stress Method) as per IS 456 – 2000.
   1.10 Differentiate the nominal mix concrete and design mix concrete.
   1.11 Write the equations of tensile strength and modulus of elasticity of concrete as per IS 456 – 2000.
   1.12 State the following properties of concrete:
       1. Poisson's ratio,
       2. Creep,
       3. Shrinkage,
       4. Workability and
       5. Unit weight.
   1.13 List different types of steel and their permissible stresses in steel (Working Stress Method) as per IS 456 – 2000.
   1.14 State modulus of elasticity and unit weight of steel.

1.15   State the assumptions made in Working Stress Method as per IS 456 – 2000.
1.16   Define modular ratio, know
1.17   Write the equation of modular ratio in working stress method
1.18   Sketch the stress distribution and transformed area of R.C. section.
1.19   Define:
      1. Effective depth,
      2. Neutral axis,
      3. Lever arm and
      4. Moment of resistance.
1.20   Describe the following with sketches:
      1. Balanced section,
      2. Under reinforced section and
      3. Over reinforced sections
1.21   Calculate the following for a singly reinforced rectangular beam:
      1. Neutral axis,
      2. Lever arm and
      3. Moment of resistance
1.22   Design a singly reinforced rectangular beam subjected to flexure.

2.0   Introduction to Limit state Design
2.1   Define Limit State.
2.2   State different limit states.
2.3   Distinguish 'strength' and 'service ability' limit states
2.4   Know the different IS: 456 – 2000 code provisions for Limit state method of design.
2.5   Define 1. 'characteristic strength' of materials and 2. 'characteristic loads'
2.6   Differentiate 'Nominal Mix' and 'Design Mix'
2.7   Explain the role of partial safety factors in limit state design.
2.8   Define 1.'Design strength of materials' and 2. 'Design loads'
2.9   State the assumptions made in the limit state design.
2.10   State the differences between the working stress method and limit state method of design of R.C. elements.

3.0   Understand the principles of analysis and design of singly reinforced and doubly reinforced R.C.C rectangular beams, by limit state method.
3.1   Sketch stress diagram and strain diagram for a singly reinforced rectangular beam indicating appropriate stress and strain values in compression zone and tension zone of the beam, also the strain value at the junction of parabolic and rectangular stress blocks.
3.2   Calculate the depth of rectangular and parabolic stress blocks.
3.3   Calculate the total compressive force and total tensile force resisted by the singly reinforced rectangular beam.
3.4   Calculate the depth of neutral axis from the equilibrium condition
3.5   Define lever arm
3.6   write the equation for lever arm for a singly reinforced rectangular beam.
3.7   Explain - why the over reinforced sections are not recommended?
3.8   Calculate the maximum depth of neutral axis.
3.9   Calculate the limiting value of moment of resistance with respect to concrete and steel
3.10   Calculate the limiting percentage of steel.

3.11   Know the general design requirements for beams in limit state design as per IS 456 – 2000
(Effective span, limiting stiffness, minimum tension reinforcement, maximum tension reinforcement, maximum compression reinforcement, spacing of main bars, Cover to reinforcement, side face reinforcement.)

3.12   Calculate the depth of neutral axis for a given section and decide whether the section is balanced or under reinforced or over reinforced and calculate the moment of resistance for the respective case.

3.13   Calculate the area of steel for a given beam with given cross section and loading.

3.14   Design a singly reinforced beam as per IS 456 – 2000 for flexure only with the given grade of steel and concrete and check the designed beam for deflection as per IS 456 – 2000.

3.15   Explain the effect of shear on beam.

3.16   Explain the shear stress distribution across a homogeneous section and reinforced concrete section with sketches..

3.17   Explain the design shear strength and maximum shear stress in different grades of concrete as per IS 456 – 2000.

3.18   Explain the need for shear reinforcement and different forms of shear reinforcement provided in beams.

3.19   explain the critical section for shear.

3.20   Calculate the shear strength of concrete, shear resistance of vertical stirrups, shear resistance of bent up bars as per IS 456 – 2000.

3.21   State the minimum shear reinforcement and maximum spacing of shear reinforcement as per IS 456 – 2000.

3.22   Calculate the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups.

3.23   Design the shear reinforcement for beams.

3.24   Design a singly reinforced beam as per IS 456 – 2000 with the given grade of steel and concrete and check the designed beam for shear and deflection as per IS 456 – 2000 and design the shear reinforcement as per 456 – 2000.

3.25   State the situations which require doubly reinforced beams.

3.26   Determine the moment of resistance for a given doubly reinforced section (given d'/d – f_{sc} values)

3.27   Design a doubly reinforced beam with the given data.

3.28   Calculate the allowable working load on singly reinforced beam for the given span. and doubly reinforced beam for the given span.

3.29   Calculate the allowable working load on doubly reinforced beam for the given span.

3.30   Calculate the development length of bars in compression, tension, and the curtailment position for main tension bars.

3.31   State the importance of anchorage values of reinforcement.

3.32   Design a singly / doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading, for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code.

3.31   Design a independent lintel subjected to triangular loading.

4.0 Understand the principles involved in the design of R.C.C slabs by Limit state method.

4.1 Distinguish one-way slabs and two way slabs.

4.2 List the types of slabs based on support condition.

4.3 Explain the general design requirements of slabs as per IS 456 – 2000.

4.4 Explain the functions of distribution steel in slabs.

4.5 Sketch the general reinforcement details for a 1) one way slab simply supported on two parallel sides and 2) one way slab simply supported on four sides. 3) two way simply supported slab 4) one way continuous slab, 5) cantilever slab continuous over a support and 6) slab cantilevering from the top of a beam.

4.6 Explain the edge strip and middle strip of a two way slab.

4.7 Sketch the general reinforcement details for a continuous two way slab for its edge strip and middle strip using straight bars and bent up bars.

4.8 Design one-way slab for given grades of materials, loads and span for flexure and including shear check, check for deflection using stiffness criteria.

4.9 Explain Load distribution in two-way slabs. Design two-way slab with different end conditions for flexure including shear using B.M and S.F coefficients. Provide torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria.

4.10 Classify the stairs based on the structural behavior or support condition.

4.11 Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only)

5.0 Understand the principles involved in the analysis of T-beams

5.1 Distinguish a T- beam and a L- beam.

5.2 List the advantages of a T- beam.

5.3 Write formula for effective width of flange of a T- beam and L- beam as per IS 456 – 2000.

5.4 Calculate the effective width of flange of an isolated T- beam as per IS 456 – 2000.

5.5 Describe the three cases of determining Neutral axis of T-beams with sketches and notations.

5.6 Calculate the depth of neutral axis and moment of resistance of the given Tee section using the expressions given in the code.

5.7 State the minimum and maximum reinforcement in T- beams as per 456 – 2000.

6.0 Understand the principles involved in the design of Continuous beams and slabs

6.1 Explain the behavior of continuous beams and slabs subjected to loading.

6.2 List the advantages of continuous beams or slabs.

6.3 Draw the line diagram of a continuous beam or slab and indicate the bending moment and shear force values at salient points as per IS 456 – 2000.

6.4 Sketch the position of sagging (+ve) and hogging (-ve) bending moments along the continuous beam or slab.

6.5 Sketch the general reinforcement details for a continuous beam or slab.

6.6 Calculate the B.M and S.F of continuous beams and slabs (Minimum of three spans) at critical sections using B.M and S.F coefficients given in the code.

6.7 Design a continuous beam or slab as per code at a given section only.

7.0   Understand Analysis and Design of columns
    7.1   Define a column/ compression member
    7.2   Differentiate among
             1. Column,
             2. Strut,
             3. Pedestal and
             4. Post
    7.3   explain the need for providing reinforcement in column.
    7.4   Explain the behavior of column under loading
    7.5   Classify the columns based on type of reinforcement.
    7.6   Classify the columns based on type of loading.
    7.7   State the effective length of column for different end conditions as per theory and as per code.
    7.8   Classify the columns based on slenderness ratio.
    7.9   Define effective length of a column.
    7.10   State the slenderness limits for column to avoid buckling of column.
    7.11   State the minimum eccentricity of column.
    7.12   Calculate the load carrying capacity of a short column with lateral ties and with helical reinforcement as per IS 456 – 2000.
    7.13   Differentiate between short and long columns and understand their failure behavior.
    7.14   Explain the design requirements of columns as per IS 456 – 2000.
    7.14   Design a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).

8.0   Understand Design of Footings
    8.1   Define Footing
    8.2   State different types of Footings (Square/ Rectangular Isolated footings of Uniform/Tapered sections).
    8.2   State the Rankine's formula for minimum depth of foundation.
    8.3   State the code provisions for the design of R.C.C footings.
    8.3   Explain the procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.
    8.5   Design isolated square footing of uniform thickness under a column for flexure only.

  Note: Students may be encouraged to use design aid SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

COURSE CONTENT

1.0   Introduction to R.C.C and Principles of working stress method
    1.1   Introduction to R.C.C, advantages and disadvantages of R.C.C., Loads to be considered and Introduction to I.S Codes and Assumptions in working stress method.
    1.2   Behavior of concrete and steel under working loads.
    1.3   Modular ratio – critical percentage of steel.
    1.4   Balance, under reinforced, over reinforced sections.
    1.5   Critical and actual neutral axis depth of singly reinforced beams.
    1.6   Moment of resistance of simply supported singly reinforced beam sections.

1.7   Design of singly reinforced rectangular beam for flexure.

2.0   Philosophy of limit state Design
2.1   Codes of practice of R.C.C design
2.2   Characteristic compressive strength, modulus of elasticity of concrete.
2.3   Nominal Mix – Design Mix – differences.
2.4   Loads to be adopted in R.C.C. design – dead load, Live load, wind load(as per IS 875-1987) and earth quake loads(as per IS-1893).
2.5   Strength and serviceability limit states, characteristic strength of materials and characteristic loads and partial safety factors.
2.6   Design strength of materials and design loads.
2.7   Assumptions made in the limit state design.

3.0   Analysis and design of Rectangular beams
3.1   Stress-strain diagram of singly reinforced RCC beam.
3.2   Depth of neutral axis, lever arm.
3.3   Moment of resistance of singly reinforced Rectangular section – balanced, under reinforced.
3.4   Critical percentage of steel.
3.5   Calculation of moment of resistance of the given section and design of singly reinforced rectangular beam for the given load as per IS 456-2000.
3.6   Doubly reinforced sections - necessity, use.
3.7   Calculation of neutral axis and moment of resistance for the given section and grades of concrete and steel (no derivation of the equations).
3.8   Shear in singly reinforced beams - nominal shears stress, permissible shear stress.
3.9   Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars.
3.10   Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations).
3.11   Development of bond stress in reinforcing bars.
3.12   Design bond stress - development length – bond and anchorage concepts and their importance.
3.13   Curtailment of tension reinforcement.
3.14   Simple problems on development length.
3.15   Design of simply supported singly and doubly reinforced rectangular beam for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16).
3.16   Design of an independent lintel subjected to triangular loading.

4.0   Design of slabs
4.1   Slabs as structural and functional members
4.2   One way and two way slabs
4.3   Minimum reinforcement and maximum spacing of reinforcement – concrete cover -stiffness criterion- stiffness ratios for simply supported, cantilever and continuous slabs.
4.1   One way and two way slabs with various end conditions as per I.S:456 code.
4.2   Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading.
4.4   Check for deflection using simplified approach of stiffness criteria.

4.5   Design of two-way slabs with different end conditions, using B.M and S.F coefficients for the unrestrained and restrained conditions as per code.

4.6   Design of torsion reinforcement for the restrained slabs – Deflection check using stiffness criteria - Use of design aids (SP-16).

4.7   Detailing of reinforcement in stairs spanning longitudinally.

5.0   Design of T-beam

5.1   Conditions needed for design of a beam as T-Section–advantages Code provisions for effective flange width - three cases of tee beams.

5.2   Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations).

5.3   Calculation of the moment of resistance of tee section using the equations given in the code – Use of design aids(SP16).

6.0   Design of Continuous beams and Slabs

6.1   Behavior of continuous members and advantages of continuous beams and slabs.

6.2   Determination of B.M and S.F of continuous beams and slabs of minimum three spans using BM & SF coefficients given in the code-Use of design aids(SP-16).

6.3   Design the tension and shear reinforcement at a given section only.

7.0.   Design of columns

7.1   Definition of column – Difference between Column and Pedestal.

7.2   Types of columns (Long and Short) - effective length for different end conditions.

7.3   Code provisions for design of columns- square, rectangular and circular columns with lateral ties

7.4   Determination of Load carrying capacity of short column- square, rectangular, circular, helically reinforced column subjected to axial load only.

7.5   Design of short square, rectangular and circular columns (with lateral ties only).

8.0   Design of Footings

8.1   Footings - Need for footings

8.2   Footings under isolated columns – loads on footings

8.3   Code provisions for design of footings - size of footings for given bearing capacity

8.4   Procedure of checking the footing for one-way shear, two-way shear, bearing stress and for development length.

8.5   Design of an isolated square footing of uniform thickness under a column for flexure only.

REFERENCE BOOK

1.   I.S:456- 2000
2.   I.S:875-1987
3.   Limit state design of R.C.C structures' by Ashok K.Jain, Nem chand brothers, Roorkee.
4.   'Limit state Design of concrete structural elements', continuing Education module prepared by N.I.T.T.T.R Chennai and published by I.ST.E continuing

education cell, university Visveswaraiah College of Engineering, (UVCE)Campus, Palare Road, Bangalore – 560001.

5. Structural Engineering(RCC) by S. Ramamrutham.
6. Structural Engineering (RCC) by Vazirani and Ratwani.
7. R.C.C Structural Engineering by Guru charan Singh.
8. Reinforced Concrete Structures by I.C.Syal and A.K.Goyal
9. Limit state design of reinforced concrete by P.C. Verghese
10. Concrete technology and practice by M.S Shetty
11 SP:34 - Handbook on concrete reinforcement and detailing.
12 Structural Design & Drawing by N. Krishna Raju (Universities press)
13 Reinforced Concrete Design by S, Unnikrishnan Pillai & Devdas Menon
14 Reinforced Concrete Design by S.N. Sinha (Tata Mc Graw Hill)

ENVIRONMENTAL ENGINEERING – I

Subject Title	:	**Environmental Engineering - I**
Subject Code	:	**CE-502**
Periods/Week	:	**04**
Periods/Semester	:	**60**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Environment and Ecology	04	03	01	-
2.	Water Supply Scheme	06	16	02	01
3.	Sources and Conveyance of Water	12	26	02	02
4.	Quality and Purification of Water	18	29	03	02
5.	Distribution System	20	36	02	03
	Total	60	110	10	08

OBJECTIVES
Upon completion of the subject the student shall be able to

1.0   Know about Environment and Ecology
   1.1   Define Environment.
   1.2   Define 1. Ecology and 2. Ecosystem.
   1.3   Understand the various global environmental issues.
   1.4   Define
          1. Acid rain,
          2. Green house effect,
          3. Global warming and
          4. Ozone layer depletion
   1.5   List the causes and effects of
          1. Acid rain,
          2. Green house effect,
          3. Global warming and
          4. Ozone layer depletion
   1.6   Differentiate renewable and non-renewable energy sources
   1.7   List examples for renewable and non-renewable energy sources.
   1.8   List the components of Ecosystem.
   1.9   Explain the flow of matter and energy in an ecosystem.
   1.10   List the factors affecting the stability of an ecosystem.
   1.11   Explain the concept of sustainable development.

2.0   Know the scheme of water supply.
   2.1   Explain the need for water supply schemes in the present day civil life.
   2.2   Explain the connection between water supply engineering and public health.
   2.3   State the need of protected water supply.
   2.4   List the objectives of a protected water supply scheme.

2.5   Draw the flow chart of a typical water supply scheme of a town.
2.6   List the factors affecting per capita demand of a town/ city.
2.7   State the requirements of water for various purposes:
    1. Domestic purpose,
    2. Industrial use,
    3. Fire fighting
    4. Commercial and institutional needs and
    5. Public use.
2.8   Explain the variation in demand for water supply.
2.9   Estimate the quantity of water required by a metropolitan area.
2.10   State the per capita demand for a small town for various purposes with a population of 50000
2.11   State the need for forecasting population in the design of water supply scheme.
2.12   State different methods of forecasting of population
2.13   Work out simple problems on forecasting population by different methods.

3.0   Understand the different sources and conveyance of water.

3.1   State the common sources of water for a water supply scheme
3.2   state different types of surface sources of water.
3.3   state different types of sub surface sources of water.
3.4   State the merits and demerits of surface and ground water sources for a water supply scheme of a town.
3.5   State the salient features of various surface sources.
3.6   Define
    1. Aquifer,
    2. Aquiclude and
    3. Ground water table.
3.7   Classify wells according to construction.
3.8   Define
    1. Draw down,
    2. Critical depression of head,
    3.Circle of influence,
    4. Cone of depression,
    5. Confined aquifer,
    6. Unconfined aquifer and
    7. Specific yield.

3.9   Explain the procedure for determining yield of a well by pumping tests
    (Constant Pumping and Recuperation Tests)
3.10   Explain the following with sketches:
    1. Infiltration galleries.
    2. Infiltration wells.
3.11   Describe the intakes for collection of water (reservoir intake, river intake, canal intake and lake intake) with sketches
3.12   Explain different methods of conveyance of water.
3.13   Explain as to why the raw water is carried from its source to city treatment plant through pressure conduits only.
3.14   List the merits of different types of pipes used for conveyance of water.
3.15   List the demerits of different types of pipes used for conveyance of water.

3.15 Explain different joints used for connecting pipes with sketches

1.16 Describe the standard method followed in laying and testing the water supply mains.

4.0 Understand the Quality as per IS code and methods of purification of water

4.1 State different types of impurities present in water.

4.2 State the need for laboratory tests for testing water.

4.3 Explain the method of obtaining samples for testing.

4.4 Explain different tests for analyzing quality of water with their significance.

4.5 Define
1. E-coli index and
2. Most Probable Number (MPN).

4.6 Explain the significance of E-Coli in water analysis.

4.7 Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.

4.8 State the various water borne diseases in India.

4.9 State the maximum acceptable limits of the following for the public drinking water:
1. Turbidity,
2. Hardness,
3. Nitrates and
4. Fluorides

4.10 State the objectives of treatment of water.

4.11 Sketch the overall layout of a water treatment plant indicating the different stages.

4.12 List the points to be considered in the location and layout of treatment plant.

4.13 State the objects of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation,
4. Filtration and
5. Disinfection.

4.14 Explain the process of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation and
4. Filtration

4.15 Describe different types of sedimentation tanks.

4.16 Describe the construction and operation of
1. Slow sand filters,
2. Rapid sand filters and
3. Pressure filters and compares them.

4.17 Compare
1. Slow sand filters,
2. Rapid sand filters and
3. Pressure filters

4.18 List the type of filters suitable for
1. Public purpose,
2. Industrial use and
3. Swimming pools.

4.13   Define disinfection of water
4.14   Explain the need for disinfecting water
4.14   Explain the methods of disinfection of water.
4.15   Explain different forms and points of Chlorination.
4.16   List the substances responsible for causing colour, taste and odour in water.
4.17   Explain the temporary hardness and permanent hardness of water
4.18   Explain various methods of removal of hardness of water.

*NOTE: no design of treatment units.

5.0 Understand the systems of distribution and Water supply arrangements in Buildings

5.1   State the requirements of good distribution system.
5.2   Classify distribution system.
5.3   Explain different systems of distribution with sketches
5.4   State different methods of water supply system.
5.5   Explain different methods of water supply system with their merits and demerits.
5.6   List the merits of water supply system
5.6   State the necessity for service reservoirs.
5.7   Draw sketches of rectangular overhead service reservoir showing all accessories.
5.8   Explain with sketches the different layouts in distribution system.
5.9   List the merits and demerits of layouts with their suitability for a given locality.
5.10   List various appurtenances used in a distribution system of water supply system to a town.
5.11   Explains with sketches the location and functioning of various appurtenances used in a distribution system of water supply.
5.12   Explain methods of detecting leakages.
5.13   Explain methods of rectification and prevention of leakages in water supply mains.
5.14   Define terminology used while making water supply arrangements in buildings.
5.15   State the principles in laying pipelines within the premises of a building.
5.16   Explain the general layout of water supply connections of buildings with mains and suggests a suitable interior water supply arrangements for single and multi-storied buildings as per I.S Code.
5.17   State the general precautions to be taken in plumbing work for buildings.
5.18   Describe the constructional details and uses of different fittings: ferrule, goose neck, stopcock.

COURSE CONTENT

1. Environment and Ecology

1.1   Environment – Biosphere – Atmosphere – Acid rain, Green house effect , global warming – Ozone layer depletion.

1.2 Renewable and non-renewable energy sources with examples.

1.3 Ecology and Ecosystem – components of ecosystem – Flow of matter in an ecosystem (food pyramid) – Flow of energy in an ecosystem –Ecological balance and stability of an ecosystem – Sustainable development with examples.

2. Introduction to Water Supply Scheme and Quantity of water

2.1 General importance of water supply.

2.2 Development of Water supply.

2.3 Need for protected Water supply.

2.4 Flow chart of a typical water supply scheme.

2.5 Total quantity of water for a town, per capita demand and factors affecting demand.

2.6 Water requirements for domestic purposes, industrial use, fire fighting, commercial and institutional needs, public use.

2.7 Variation in demand - peak demand – seasonal, daily and hourly variation.

2.8 Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

3. Sources and Conveyance of Water

3.1 Surface source- Lakes, streams, rivers and impounded reservoirs.

3.2 Underground sources-springs, wells, infiltration wells and galleries.

3.3 Yield from wells by constant pumping and recuperation tests. (No problems required)

3.4 Comparison of surface and subsurface sources.

3.5 Types of intakes:
   (i) Reservoir intake;
   (ii) River intake;
   (iii) Canal intake.
   (iv) Lake intake.

3.6 Conveyance of water-open channels, aqueduct pipes.

3.7 Pipe Materials - C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type.

3.8 Pipe joints - spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes.

3.9 Pipe Laying and testing-Leak detection-prevention-rectification.

4. Quality and Purification of water.

4.1 Impurities of water - need for laboratory test – sampling- grab and composite sampling.

4.2 Tests of water - physical, chemical and bacteriological tests – P**H** value of water.

4.3 Standard quality for domestic use and industrial purposes.

4.4 Flow diagram of different treatment units.

4.5 Aeration - methods of aeration.

4.6 Sedimentation - plain sedimentation and sedimentation with coagulation.

4.7 Filtration - Construction and operation of slow sand rapid sand pressure filters.

4.8 Disinfection of water - necessity and methods of chlorination , pre-chlorination, break point chlorination

4.9 Colour, taste and odour control

4.10 Hardness – Types of Hardness - Removal of hardness.
NOTE: No design of treatment units

5. Distribution system and water supply arrangements in a Building.

5.1 General requirements, systems of distribution - gravity system, combined system, direct pumping.

5.2 Methods of supply - Intermittent and continuous.

5.3 Storage - underground and overhead-service reservoirs - necessity and accessories.

5.4 Types of layout - dead end, grid, radial and ring system their merits and demerits and their suitability.

5.5 Location and functioning of:
 (i) Sluice valves.
 (ii) Check valves or reflux valves.
 (iii) Air valves.
 (iv) Drain valves or blow-off valves
 (v) Scour valves.
 (vi) Fire Hydrants.
 (vii) Water meters.

5.6 Water supply arrangements in building:
Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap.

5.7 General lay out of water supply arrangement for single and multi-storeyed buildings as per I.S Code of practice-general principles and precautions in laying pipelines within the premises of a building.

5.8 Connections from water main to building with sketch.

5.9 Water supply fittings, their description and uses - stopcock, ferrule, goose neck etc.

REFERENCE BOOKS

1. Environmental Engineering – G.S. Birdie
2. Elements of Public Health engineering – K.N. Duggal
3. Environmental Engineering – Baljeet Kapoor
4. Public Health Engineering – S.K. Hussain
5. Water supply and sanitary Engineering – V.N. Vazirani.
6. Environmental Engineering --N.N.Basak /TMH
7. Water Supply Engineering - S.K. Garg

QUANTITY SURVEYING II

Subject Title	:	**Quantity Surveying - II**
Subject Code	:	**CE-503**
Periods / week	:	**05**
Periods / Semester	:	**75**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Detailed estimate of RCC elements	08	13	01	01
2.	Estimation of quantity of steel in RCC elements	09	16	02	01
3.	Analysis of Rates and Abstract Estimates	22	29	03	02
4.	Detailed estimates of Roads and Culverts	18	26	02	02
5.	Detailed estimates of Irrigation and Public Health Engineering works.	18	26	02	02
	Total:	75	110	10	08

OBJECTIVES

Upon completion of the SUBJECT the student shall be able to

1.0   Prepare the estimate for RCC Structural elements
1.1   Explain types of staircases
        a) Dog legged staircase
        b) Open well staircase
1.2   Prepare detailed estimates of
        1. Dog legged staircase and
        2. Open well staircase.

2.0   Prepare the estimates for steel reinforcement for different R.C.C elements

2.1   State different methods of estimation of steel required for R C C work involved in a building
2.2   Explain different methods of estimation of steel required for R C C work involved in a building

2.3 State covers for RCC items as per IS 456 : 2000
2.4 Distinguish between straight bars and cranked bars used in simply supported beams
2.5 Distinguish between main reinforcement and distribution reinforcement used in RCC slabs
2.6 Compute the quantity of steel reinforcement for different elements of R.C.C works in a building by preparing a bar bending schedule

3.0 Understand the Analysis of Rates and Abstract estimations
3.1 Define analysis of rates
3.2 Explain the purpose of analysis of rates
3.3 Explain the following in rate analysis:
   a) Standard data book
   b) Standard schedule of rates
   c) Standard data sheet
3.4 Explain cost of material at source
3.5 Explain cost of material at site
3.6 Explain the following terms:
   a) Blasting charges
   b) Seinorage charges
   c) Cess charges
   d) Stacking charges
   e) Water charges
   f) Crushing charges
   g) Lead charges
3.7 Compute rate of an item of work
3.8 Explain different types of labour wages as per latest SSR
3.9 Define lead statement
3.10 Prepare the format for Lead Statement
3.11 Prepare Lead Statement and data for different items of work
3.12 Prepare the unit rates for finished items of works using standard data and SSR
3.13 Tabulate the material requirement of mortars and concrete of different proportions
3.14 Prepare abstract estimate for the following buildings:
   a) Single bedroom building (1 BHK)
   b) Two bedroom building with verandah (2 BHK)
   c) Three bedroom building (3 BHK)

4.0 Prepare detailed estimates of roads and culverts
4.1 Prepare a detailed estimate for different types of roads and culverts
4.2 State the items involved in the abstract estimates of roads and culverts

5.0 Prepare the detailed estimates of irrigation and public health engineering structures
5.1 Prepare a detailed estimate for the following items:
   a) Open well
   b) R.C.C. overhead tank
   c) Septic tank with soak pit / dispersion trench
   d) Tank sluice with tower head
5.2 State the items to be included in the abstract estimates of above structures

COURSE CONTENT

1.0 Detailed estimate of RCC elements:
    R C C Doglegged – Open well stairs

2.0 Estimation of quantities of steel in R C C elements:
    a) Simply supported singly reinforced R C C beams / Lintel
    b) Simply supported one- way slab
    c) R C C column with square footing
    d) Preparation of Bar bending schedule for above

3.0 Analysis of Rates and Abstract Estimates:
    a) Cost of materials at source and at site
    b) Standard Schedule of Rates of different materials in buildings works
    c) Types of labour – Wages as per S S R
    d) Lead and Lift – Preparation of Lead Statement
    e) Data Sheets – Standard data for materials and labour components for different items of work
    f) Preparation of unit rates for finished items of works using Standard data and S S R
    g) Methods of calculating quantities of ingredients of various proportions of cement concrete.
    h) Provisions for different building services and other over head charges
    i) Prepare abstract estimate for:
        i) Single bedroom building (1 BHK)
        ii) Two bedroom building with verandah (2 BHK)
        iii) Three bedroom building (3 BHK)

4.0 Detailed Estimates of Roads and Culverts:

    a) Gravel Road
    b) Water bound macadam road
    c) Surface dressing with bitumen
    d) Cement concrete road
    e) Pipe culvert
    f) R C C slab culvert with i) straight returns and ii) splayed wing walls
    g) Different items in abstract estimate (Labour charges, Traffic diversion etc)

5.0 Detailed Estimates of Irrigation and Public Health Engineering works:
    a) Open well with masonry staining
    b) R C C over head tank
    c) Septic tank with soak pit / dispersion trench
    d) Tank sluice with tower head.
    e) Different items to be included in the abstract estimates of the above

REFERENCE BOOKS
1. Estimating and Costing   - B.N. Dutta

2. Estimating and Costing   - S. C. Rangawala

3. Estimating Construction Costs   - Robert L. Peurifoy & Garold D. Oberlender

IRRIGATION ENGINEERING

Subject Title : **Irrigation Engineering**
Subject Code : **CE-504**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Nature and scope of Irrigation Engineering	5	13	01	01
2.	Elements of Hydrology	5	13	01	01
3.	Head works	15	23	01	02
4.	Gravity dams and Earth dams	15	23	01	02
5.	Distribution works	15	16	02	01
6.	Soil Erosion, Water logging and River Training works	10	10	--	01
7.	Water Management	5	06	02	--
8.	Watershed Management	5	06	02	--
	Total	75	110	10	08

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the Nature and scope of Irrigation
1.1 Define Irrigation
1.2 Understand the necessity of irrigation.
1.3 List advantages of irrigation.
1.4 List disadvantages of irrigation
1.5 State different types of irrigation
1.6 Explain Perennial Irrigation
1.7 Explain Inundation Irrigation
1.8 Distinguish between
    1. Perennial and inundation irrigation,
    2. Flow and Lift irrigation, and
    3. Storage and Direct irrigation.
1.9 State Principal crops in India and their seasons
1.10 Explain Kharif crops
1.11 Explain Rabi Crops
1.12 Define the following terms:
    1. Duty,
    2. Delta,
    3. Base period and
    4. Crop period
1.12 Explain different methods of expressing duty
1.13 State the relationship between duty and delta.

1.14   Explain the factors affecting duty
1.15   State the requirement for precise statement of duty
1.16   State the duty figures for principal crops
1.17   Solve simple problems on duty

2.0 Understand the basic concepts of Hydrology
2.1   Explain the term Precipitation
2.2   State different types of rain gauges
2.3   Describe Simon's rain gauge
2.4   Explain the method of measurement of rainfall using Simon's Rain gauge
2.5   Describe Float type automatic recording rain gauge
2.6   Explain method of measurement of rainfall using float type automatic rain gauge
2.7   Explain precautions in setting and maintenance of rain gauges
2.8   State uses of rain fall records
2.9   Describe Hydrological cycle
2.10   Explain method of average annual rainfall of an area by Theisson's Polygon method
2.11   Solve the problem on calculation of average annual rainfall by Theisson's Polygon method
2.12   Define the following:
        1. Catchment,
         2. Intercepted catchment,
        3. Free   catchment and
        3. Combined catchment area
2.13   State the characteristics of
        1. Good catchment,
        2. Average catchment and
        3 .Bad catchment
2.14   Explain the term Run-off
2.15   Explain factors affecting runoff
2.16   Understand nature of catchment and runoff coefficient
2.17   Explain methods of estimating runoff using empirical formulae
2.18   Solve the problems on estimating run-off
2.19   Understand the term maximum flood discharge
2.20   Explain the methods of determining maximum flood discharge from rain fall records
2.21   State Ryve's and Dicken's Formulae
2.22   Understand HFL marks and gauge reading
2.23   Solve simple problems on estimating maximum flood discharge
2.24   Explain River gauging
2.24   Explain the importance of river gauging
2.25   Lists the factors for selecting suitable site for a gauging station

3.0 Understand head works for a diversion scheme and protective works for resisting percolation
3.1   Classify of head works
3.2   State the suitability of different types of head works under different conditions
3.3   State the factors for selecting suitable site for diversion head works
3.4   Describe the component parts of Diversion works with sketch
3.5   Describe with sketch the component parts of a weir
3.6   Distinguish between barrages and Weirs
3.7   Describe head regulator with sketch
3.8   Describe scouring sluice with sketch

3.9 Describe flood banks and other protective works
3.10 Define the following terms:
1. Percolation,
2. Percolation gradient,
3. Uplift and
4.Scour.
3.11 Explain percolation gradient
3.12 Explain uplift pressure
3.13 Explain the effects of percolation on irrigation works

4.0 Understand basic ideas about reservoirs, gravity dams and Earth dams
4.1 Distinguish between Rigid dams and Non-rigid dams
4.2 State factors influencing selection of site for reservoirs and dams.
4.3 Define the terms:
1. Full reservoir level,
2. Maximum water level,
3. Top bund level,
4. Dead storage,
5. Live storage,
6. Free board,
7. Gravity dam and
8. Spillway.
4.4 Explain the causes of failure of gravity dams and their remedies.
4.5 Distinguish between low and high dams.
4.6 Draw the elementary profile of a gravity dam for a given height
4.7 Draw the practical profile of a low dam.
4.8 Explain uplift pressure
4.9 Explain need for drainage galleries with sketches
4.10 Explain construction and contraction joints with sketches
4.11 State need and types of grouting of foundations
4.12 Explain the method of grouting of foundations in gravity dams
4.13 State different types of spillways and their suitability and draw sketches
4.14 State the situations in which earth dams are suitable
4.15 State the three types of earth dams with sketches of typical cross sections
4.16 Explain causes of failure of earthen dams and their precautions
4.17 Explain the terms with sketches
1.Saturation gradient and
2. Phreatic line
4.18 Explain drainage arrangements in earth dams with a neat sketch
4.19 State the method of constructing rolled fill earth dams and their maintenance.
4.20 Explain breach filling in earthen dams
4.21 Explain the maintenance of earth dams

5.0 Understand basic ideas about canals & cross masonry works
5.1 Classify canals.
5.2 State the different methods of canal alignment and the situations in which each is suitable.
5.3 Sketch typical cross sections of canals
1. In cutting,
2. Embankment and
3. Partial cutting.

5.4   Explain balanced depth of cutting and its necessity
5.5   State the need for canal lining
5.6   State advantages of canal linings
5.7   State disadvantages of canal linings
5.8   Explain different types of canal linings
5.9   Explain the maintenance required for canals and their regulation
5.10   Explain Lacey's regime theory and Kennedy's silt theory(only explanation of formulae)(No problems)
5.11   Compare Lacey's and Kennedy's silt theories
5.12   State different types of cross masonry works (cross regulator, drainage & Communication) and their objectives.
5.13   State need for cross drainage works
5.14   Describe the following with sketches
    1. Aqueduct,
    2. Super passage,
    3. Under tunnel, siphon,
    4. Level crossing and
    5. Inlet and outlet

6.0 Understand the soil erosion, water logging and River training works
6.1   Explain terms:
    1. Soil erosion,
    2. Reclamation, and
    3. Water logging.
6.2   State causes of soil erosion
6.3   State ill effects of soil erosion
6.4   Explain various methods of prevention of soil erosion.
6.5   State causes of water logging
6.3   State ill effects of water logging
6.4   Explain various methods of prevention of water logging
6.5   State methods of land reclamation.
6.6   State different stages of flow of rivers
6.7   Explain characteristics of Delta Rivers
6.8   Explain term meandering of river
6.9   State objectives of river training works
6.10   Explain various types of groynes and bell's bunds with sketches

7.0 Understand the principles of water management
7.1   State soil-water plant relationship.
7.2   Describe the following irrigation methods:
    1. Broader irrigation,
    2. Check basin irrigation,
    3. Furrow irrigation,
    4. Sprinkler irrigation and
    5. Drip irrigation
7.3   Explain on farm development
7.4   Describe 1. Warabandi system and 2. Water user associations
7.5   State the duties of water user associations

8.0 Understand the basic ideas about watershed management

8.1   Explain the concept of
        1. Water shed and
        2. Water shed management

8.2   State the need for watershed management

8.3   List the objectives of watershed management

8.4   State need for watershed development in India

8.5   Describe different approaches to water shed management

8.6   Explain water harvesting

8.7   Explain methods of 1. Rain water harvesting and 2. Catchment harvesting

8.8   Explain soil moisture conservation methods

8.9   Explain method water harvesting through check dams

8.10   Explain different methods of artificial recharge of ground water

8.11   Explain artificial recharges of ground water using percolation tanks

COURSE CONTENT

1. **Nature and scope of Irrigation Engineering**
   a) Definitions-necessity of irrigation-advantages and disadvantages-Perennial and Inundation irrigation-Flow and Lift irrigation-Direct and Storage irrigation.
   b) Principal crops-Kharif and Rabi crops-Dry and wet crops.
   c) Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta- factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

2. **Elements of Hydrology**
   a) Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area – Theissen's polygon method.
   b) Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off - Nature of catchment, run off coefficient - Methods of estimating run off Empirical formulae -
   c) Maximum flood discharge - Methods of determining maximum flood discharge from rainfall records, Ryve's and Dicken's formulae, H.F.L Marks, Gauge reading – Simple problems on M.F.D.
   d) River gauging – Importance – Site selection for river gauging

3. **Head Works**
   a) Classification of head works-storage and diversion, head works - their suitability under different conditions-suitable site for diversion works - general layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir.
   b) Barrages and Weirs.
   c) Head Regulator-scouring sluice-flood banks and other protective works.
   d) Percolation-Percolation gradient-uplift pressures-effect of percolation on irrigation works.

4. **Gravity dams and Earth dams**
   a) Dams-rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam-low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - grouting of foundations - spillways
   b) Earth dams – situations suitable for Earth Dams types of earth dams-causes of failure of earth dams and precautions –saturation gradient and pyretic line-drainage arrangements-construction details of earth dams-breaching sections-breach filling-maintenance of earth dams.

5. **Distribution works**
   a) Canals-classification-different methods of canal alignment-typical cross section of canal in cutting embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting-canal lining-necessity - types –maintenance of canals.

b) Lacey's regime Silt Theory and Kennedy's Silt Theory(only explanation of formulae)- Comparison of two theories (No problems)
c) Cross drainage works - Necessity – General description of aqueducts – Super passage – under tunnel - siphon level crossing- Inlet and outlet.

6. **Soil erosion, Water logging and River Training works**
a) Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation.
b) Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works- List out the various types of groynes and Bell's bunds.

7. **Water management**
Soil-water plant relationship-Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations & Warabandi system.

8. **Watershed Management**
a) Introduction - Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management.
b) Water Harvesting: Rainwater harvesting, Catchment harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

REFERENCE BOOKS
1. Irrigation Engineering by B.C Punmia
2. Irrigation Engineering and Water power Engineering by Birdie.
3. Irrigation Engineering by S.K.Garg
4. Irrigation Engineering by Basak-TMH

PROJECT MANAGEMENT FOR CONSTRUCTION

Subject Title : **Project Management for Construction**
Subject Code : **CE-505**
Periods/ week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer type	Essay Type
1.	Introduction	3	3	1	0
2.	Organizational Aspects	10	16	2	1
3.	Management Tools	15	26	2	2
4.	cts and Tenders and Arbitration	17	36	2	3
5.	gement of Resources in Construction	6	13	1	1
6.	reneurship	6	13	1	1
7.	Human Relations and Professional Ethics	3	3	1	0
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Understand the importance of project management
    1.1.   Define Management.
    1.2.   State the functions of Management.
    1.3.   State the need for scientific Management of projects.
    1.4.   Describe the fields level management.
    1.5.   Describe the sequencing of work

2.0   Understand the importance of Organizational Aspects
    2.1.   Explain the organizational structure of any Engineering department (Government).
    2.2.   List the duties of different officers of an Engineering department.
    2.3.   Define
        1. Preliminary estimate,
        2. Detailed estimate,
        3. Administrative approval and
        4. Technical sanction.
    2.4.   State the limit of powers of sanction by various officers in an Engineering Department (Government).
    2.5.   Give the Organizational structure of a public sector construction company.
    2.6.   Compare the Head quarters versus Regional and Project Management.
    2.7.   List the duties of Chief Engineer in a construction company.
    2.8.   List the duties of a Resident Engineer.

3.0 Understand the importance of Organizational Aspects

3.1. Define 1. CPM and 2. PERT.
3.2. State the advantages of CPM and PERT.
3.3. Explain the use of bar chart and its limitations
3.4. Define:
   1. Network,
   2. Activity,
   3. Event,
   4. Duration,
   5. Dummy activity,
   6. EST,
   7. EFT,
   8. LST,
   9. LFT,
   10.Total float,
   11. Free float and
   12. Critical path.
3.5. Prepare network diagram using basic rules of network formation.
3.6. Calculate time on CPM network identifying critical activities, critical path, free float and total float.
3.7. State the limitations of CPM.
3.8. Distinguishe between CPM and PERT.

4.0 Understand different contract, Tendering systems and Arbitration

4.1. Define contract
4.2. State the contents of a contract document.
4.3. Explain different contract systems available for construction works.
4.4. List the merits and limitations of each of the contract systems.
4.5. List the general conditions of contract for a civil engineering- construction project.
4.6. Define tender.
4.7. Explain the need for calling of tenders.
4.8. List the steps involved in fixing up agency through tender system.
4.9. Draft a tender notice for a work
4.10. Prepare tender documents.
4.11. Explain the need of earnest money and security deposits.
4.12. Prepare a comparative statement.
4.13. Explain the method of selecting a contractor from the tenders.
4.14. List out the conditions of contract agreements.
4.15. Define 1. Dispute and 2. arbitration.
4.16. Explain the scope for disputes in a construction industry.
4.17. State the need for arbitration.
4.18. List the qualifications of an arbitrator.
4.19. List the advantages of arbitration.

5.0 Understand the principles of management of Resources like Materials, Plant and Equipments and Money

5.1. Explain the scope of materials management.
5.2. Classify the common building materials based on the procurement.
5.3. Explain different Stages of materials management.

5.4. Explain the points to be observed in the storage of perishable and non-perishable store materials.
5.5. Explain the terms
1. Indent,
2. Invoice and
3.Bin card.
5.6. Explain the importance of verification of stores.
5.7. Explain the need for mechanization.
5.8. Explain the need for optimum utilization of plant and equipment.
5.9. Explain the financial impact of mechanization.
5.10. Explain about the preventive maintenance of plant and equipment.
5.11. Explain the importance of training of operators.
5.12. Explain the need for overhauling or replacement.
5.13. Explain the requirements of centering, shuttering and scaffolding
5.14. State the importance of finance as a resource.
5.15. State the purposes of cost control.
5.16. Explain the different stages at which cost control can be achieved.
5.17. Explain the financial control at head office level and site level.

6.0 Understand the role and characteristics of an entrepreneur
6.1. Define
1. Entrepreneur and
2. Entrepreneurship.
6.2. Outline the concepts of entrepreneurship.
6.3. State the role of entrepreneur in economic development.
6.4. List the characteristics of an entrepreneur.
6.5. Evaluate the risks and rewards of an entrepreneur.
6.6. State the role of financial institutions in entrepreneurial development.

7.0 Understand the role of Human relations and professional ethics in construction Industry
7.1. State role of
1. Human relations and
2. Performance in organization.
7.2. State the role of Interpersonal relationship for effective work culture.

COURSE CONTENT

1.   **Introduction**
     Definition and concept of management – need for scientific management of projects – need for attitudinal change – Scope and characteristics of construction Industry.

2.   **Organizational Aspects**
     Govt. organizations: Organizational structure of P.W.D. – duties of various officers – Preliminary estimates – detailed estimate – budget provision – administrative approval and technical   sanction – powers of sanction.

     Public sector organizations: Organizational structure of a construction company – Head quarters versus   Regional and Project Management–Duties of Chief Engineer –   preparation of bids – duties of Resident Engineer.

3.   **Management Tools**
     Different Management Tools – Gantt Bar chart, modified Gantt bar chart – Limitations of bar charts – Introduction CPM and PERT – advantages of CPM and PERT – terms used in CPM – formation of network – Basic rules – Problems on determination of critical path – limitations of CPM – comparison of CPM and PERT.

4.   **Contracts, Tenders and Arbitration**
     Contracts – Legality of contracts – contract document – types of contracts – piece work contracts – item rate contracts – Lump sum contracts – percentage contracts – negotiated rates – departmental execution of works – merits and limitations of each contract system – conditions of contract for civil engineering works.

     Tenders – Necessity of tenders – Sealed tenders – tender notice – tender documents – Earnest Money and Security Deposits – Opening of tenders – comparative statement – acceptance of tenders – work order – contract agreement – conditions of contract.

     Arbitration – Disputes – disputes in construction industry – arbitration – need for arbitration – arbitrator – qualifications of arbitrator – advantages of arbitration.

5.   **Management of Resources in Construction Industry**
     Materials management – Scope – Classification of common building materials based on the procurement – procedural formalities for acquisition – stages of materials management.

     Plant and Equipment – Need for mechanization – Optimum utilization of plant and equipment – Financial impact of mechanization – Preventive maintenance – Overhauling and replacement – Centering, shuttering and scaffolding requirements. Financial Management – Finance as Resource – Purpose of cost control – stages of cost control – pre contract stage and post contract stage – Financial control at head office level and site level.

6.   **Entrepreneurship**
     Entrepreneur – concept, definition, role, expectation – characteristics of entrepreneur – risk and rewards of an entrepreneur – role of financial institution in entrepreneurial development.

7.   Human Relations and Professional Ethics
Human relations and performance in organization – Understand self and others for effective behavior – Interpersonal relationship for effective work culture – Need for professional ethics.

REFERENCE BOOKS

1.   Management in construction Industry   –   P.Dharwadker.
Oxford & IBH Publishing Co. Pvt., Ltd.,
2.   Construction Management And Accounts –   V.N.Vazirani & S.P. Chandola.
Khanna Publishers.
3.   Construction Planning and Management .   - U.K. Shrivastava
Galgotia Publications Pvt. Ltd., New Delhi.
4.   Construction Management and Planning -B. Sengupta & H. Guna
Tata Mc. Grao Hill Publishing Company Ltd.
5.   Construction Management and Accounts.- Harpal Singh.
Tata Mc. Graw Hill Publishing Company Ltd.

COMPUTER APPLICATIONS FOR PROJECT MANAGEMENT

Subject Title   **: COMPUTER APPLICATIONS FOR PROJECT MANAGEMENT**
Subject Code   **: CE - 506**
Periods/Week   **: 03**
Periods/semester   **: 45**

TIME SCHEDULE

S.No.	Major Topics	No. of Periods
1.	Introduction to Project Management Software and Building Services softwares.	03
2.	Practice on Project Management software	12
3.	Practice on Software for Building Services	15
4.	Structural Design Drawings using STADD / SCADSS	15
	Total	45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   **Understand Project Management Software and Building Services soft wares**
     1.1   State the features of Project management software.
     1.2   State the applications of Project management software.
     1.3   State the features of Building services soft ware.

2.0   **Practice Project Management software**
     2.1   Understand various menus available in MS-Project.
     2.2   Understand input data.
     2.3   Understand various commands to execute the given input data.
     2.4   Prepare schedules for resource allocation.
     2.5   Prepare networks for execution of projects.

3.0   **Practice on Software for Building Services**
     3.1   Understand various menus available in 4M-IDEA-BIM software.
     3.2   Prepare Layout of HVAC design for a given multistoried building plan using 4M-IDEA software.
     3.3   Prepare Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software.
     3.4   Prepare Layout of Electrical design for a given multistoried building plan using 4M-IDEA software.
     3.5   Prepare Layout of Lift design for a given multistoried building plan using 4M-IDEA software.

3.6   Prepares layout of fire fighting design for a given multistoried building plan using 4M-IDEA software.

4.0   Prepare Structural and Irrigation Drawings using CAD
    4.1   Prepare R.C.C Drawings
        4.1.1. Singly reinforced Rectangular beam
        4.1.2. T-beam
        4.1.3. Slab
        4.1.4. Column with Footing.

    4.2   Prepare Structural Steel Drawings
        4.2.1. Built-up beams
        4.2.2. Beam-column connection
        4.2.3. Slab base and Gusseted base.

    4.3   Prepare Irrigation Drawings
        4.3.1. Earthen Bunds
        4.3.2. Slab Culvert
        4.3.3. Pipe Culvert.

KEY Competencies to be achieved by the students

S.NO	Experiment Title	Competencies	Key Competency
1.	Introduction to Project Management Software and Building Services softwares.	• Learns the applications of Project management software. • Learns the applications of Building services soft ware	• Learns the applications of Building services soft ware
2	Practice on Project Management software	• Learns various menus available in MS-Project • Learns inputting data • Learns various commands to execute the given input data • Prepares schedules for resource allocation • Prepares networks for execution of projects	• Learns various commands to execute the given input data • Prepares schedules for resource allocation • Prepares networks for execution of projects
3	Practice on Software for Building Services	• Learns various menus available in 4M-IDEA-BIM software. • Prepares Layout of HVAC design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software. • Prepares Layout of Electrical design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of Lift design for a given multistoried building plan using 4M-IDEA software • Prepares Layout of fire fighting design for a given multistoried building plan using 4M-IDEA software	• Prepares Layout of HVAC design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of water supply and sewerage design for a given multi storied building using 4M-IDEA software. • Prepares Layout of Electrical design for a given multistoried building plan using 4M-IDEA software. • Prepares Layout of Lift design for a given multistoried building plan using 4M-IDEA software • Prepares Layout of fire fighting design for a given multistoried building plan using 4M-IDEA software
4	Preparation of Structural and Irrigation Drawings using CAD	• Draws R.C.C • Draws Structural Steel Drawings • Draws Irrigation Drawings	• Draws R.C.C • Draws Structural Steel Drawings • Draws Irrigation Drawings

COURSE CONTENT

1.0 Introduction to Project Management and Building Service soft wares.
a) Importance of Project Management software and Building Services Software.
b) Available Project Management soft wares – MS-project, Primavera Project Planner.
c) Features of MS-Project software.
d) Available Building services soft wares – 4M IDEA BIM (Building Information Modelling) software.
e) Features of 4M IDEA BIM (Building Information Modelling) software.

2.0 Practice on Project Management software.
a) Study various Menus available in MS-Project.
b) Identify various activities for a given project.
c) Input data required for the given project.
d) Prepare schedules using MS-Project for resources like men, material, machinery, money.
e) Calculate duration of project and Critical Path
f) Generate various reports for the supervision of the project.

3.0 Practice on Software for Building Services
a) Components of Building information Model (BIM) like 4M software.
   i. For Heat, Ventilation and Air conditioning design
   ii. For Water supply and sewage design
   iii. For Electrical design
   iv. For Design of lifts
   v. For design of Fire fighting System
   vi. For Gas supply pipes design
b) Prepare Layout of HVAC design for a given multistoried building plan.
c) Prepare Layout of water supply and sewerage design for a given multistoried building plan.
d) Prepare Layout of Electrical design for a given multistoried building plan.
e) Prepare Layout of Lift design for a given multistoried building plan.
f) Prepare Layout of fire fighting design for a given multistoried building plan.

4.0 Preparation of Structural and Irrigation Drawings using CAD
a) R.C.C Drawings - Singly reinforced Rectangular beam – T-beam – Slab – Column with Footing.
b) Structural Steel Drawings – Built-up beams – Beam-column connection – Slab base and Gusseted base.
c) Irrigation Drawings – Earthen Bunds – Slab Culvert – Pipe Culvert.

CIVIL ENGINEERING DRAWING – II

Subject Title	:	Civil Engineering Drawing - II
Subject Code	:	CE - 507
Periods/Week	:	06
Periods/semester	:	90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Culverts	15	12	1	01 (25marks)
2.	Bridges	15	12	1	
3.	Public health engineering drawings	12	16	1	
4.	Irrigation drawings	48	20	2	01 (15marks)
	Total	90	60	05	02

Note: All questions are to be answered. Part-A 5X4=20 marks & part-B 25+15=40 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Draw different views of culverts

1.1   Draw the plan, cross sectional elevation and longitudinal sectional elevation of
     1. Pipe culvert,
     2. R.C.C slab culvert and
1.2   Identify the component parts of the pipe culvert and R C C slab culvert from the given set of specifications.

2.0. Draw different views of T. Beam bridge
2.1   Label the component parts of a given R.C.C. T-beam bridge.
2.2   Draw the sectional elevation, plan and cross section of Two span R.C.C T-beam bridge from the set of given specifications.

3.0   Draw the component parts of Public health Engineering works
3.1   Draw the sectional elevation, plan and cross section of public health Engineering works.

4.0   Draw the different views of irrigation Engineering structure
4.1   Draw the sectional elevation, plan and cross section of different Irrigation engineering structures.

COURSE CONTENT

1. Simple Culvert

   Draw the plan, cross-sectional elevation and longitudinal sectional elevation of
   1. Pipe culvert (Single Pipe)
   2. R.C.C slab culvert with square returns.
   3. R.C.C slab culvert with splayed wings

2. Bridges

   1. Two-Span R.C.C T-beam bridge with square return walls.
   2. Two-Span R.C.C T-beam bridge with splayed wing walls and Return walls.
   3. Details of bearings used in steel bridges, R.C.C. bridges and P.S.C. bridges (sketches not to scale).

3. Public health engineering drawings
   1. Septic tank with details of connection to a dispersion trench/soak pit
   2. R.C.C overhead rectangular tank.(four columns with accessories).

4. Irrigation engineering drawings

   1. Earthen bunds – Three types.
   a) Homogeneous type b) Zoned embankment type c) Diaphragm type
   2. Tank surplus weir with splayed wing walls.
   3. Canal drop (notch type)
   4. Head sluice (Head wall type)
   5. Tank sluice with tower head.
   6. Canal regulator

REFERENCE BOOKS
1. Civil Engineering Drawing-II   by A. Kamala.
2. Civil Engineering Drawing-II   by Chakraborthy

LIFE SKILLS

Subject Title	:	Life Skills
Subject Code	:	CE-508
Periods/ Week	:	03
Periods/Semester	:	45

TIME SCHEDULE

SI No.	Major Topics	No. of periods		
		Theory	Practical	Total
1.	Concept of life skills	03	00	03
2.	Enhancing self esteem	01	02	03
3.	Goal setting	01	02	03
4.	Positive attitude	01	02	03
5.	Managing emotions	1 1/2	4 1/2	06
6.	Stress management	1 1/2	4 1/2	06
7.	Time management	1/2	2 1/2	03
8.	Interpersonal skills	01	02	03
9.	Creativity	01	02	03
10.	Problem solving and Decision making skills	01	02	03
11.	Assertiveness	1 1/2	4 1/2	06
12.	Leadership skills &Team spirit	1 1/2	11/2	03
	TOTAL	15 1/2	29 1/2	45

Note: No Written Examination

The students may be asked to Demonstrate 1 or 2 skills from unit 2 to unit 12.
Marks: Internal – 40;
      External - 60

OBJECTIVES

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

1.0   Understand the concept of life skills
    1.1   Define Life skills
    1.2   Explain need and impact of Life skills programme
    1.3   List the elements of Life skills
    1.4   Identify the sources of Life skills

2.0   Understand the concept of Self esteem
    2.1   Define the term self esteem
    2.2   Explain the concept of self esteem

2.3　List the characteristics of High self esteem
2.4　List the characteristics of Low self esteem
2.5　Explain the advantages of High self esteem
2.6　Explain the behavior patterns of low self esteem
2.7　Explain the causes of Low self esteem
2.8　List the steps to build a positive self esteem

Practicals

Exp No	Exercise	Activity (Questionnaire / Game and Role play)
1.	Identifying the Behavior	• Identifying the behavior patterns of low self-esteem people.
2.	Practice Positive Self Esteem	• Steps to build a positive self esteem

3.0　Understand the concept of Goal setting
3.1　Define the term Goal
3.2　Explain the significance of Goal setting
3.3　Explain the following concepts
　　　a) Wish　b) Dream　c) Goal
3.4　Explain the reasons for not setting goals
3.5　Explain the effective goal setting process
3.6　List the barriers to reach goals

Practicals

Exp No	Exercise	Activity
1	Differentiate among Wish, Dream and Goal	• Drawing a picture of Your Self/ Your Country/ Your Society after 10yrs. • Discussion: Setting Personal Goals • Story Telling • Identifying of barriers • Analysis of barriers • Overcoming Barriers

4.0　Practice positive attitude
4.1　Define Attitude
4.2　Explain the concept of positive attitude
4.3　Explain the concept of negative attitude
4.4　Explain the affects of negative attitude
4.4　Identify the attitude of self and peers
4.5　Explain the effect of peers on self and vice-versa.
4.6　List the steps to enhance positive attitude
4.7　Explain the strategies to enhance positive attitude

Practicals

Exp No	Exercise	Activity (Psychological Instrument/ Game & Role play)
1.	Identify Positive attitude	• To study & to identify the attitude of self and peers. • List & practice the strategies to enhance positive attitude.
2	Observe	• Positive attitudes of self and Peers • Negative attitudes of self and Peers
3	Practice Strategies to enhance Positive attitude	• Celebrating the success • Listing the successes

5.0   Practice managing emotions
   5.1   Explain the concept of emotion
   5.2   List the different types of emotions
   5.3   Differentiate between positive and negative emotions
   5.4   Identify the type of emotion
   5.5   Explain the causes of different types of emotions.
   5.6   Implement the methods to manage major emotions (anger / depression)
   5.7   Define Emotional Intelligence.
   5.8   Explain the method to enhance emotional Intelligence.

Practicals

Exp No	Exercise	Activity (Story / simulated situational act /GD & Role play)
1.	Identify the Type of Emotion	• To identify the type and to study the cause of the emotion.
2	Managing Emotions	• Managing major emotions -Anger and Depression

6.0   Practice stress management skills
   6.1   Define Stress
   6.2   Explain the concept of stress
   6.3   List the Types of stress
   6.4   Explain the causes of stress
   6.5   Comprehend the reactions of stress
           a) Physical   b) Cognitive   c) Emotional   d) Behavioral
   6.6   Explain the steps involved in coping with the stress by
           a) Relaxation   b) Meditation   c) Yoga
   6.7   Practice the stress relaxing techniques by the 3 methods.
           a) Relaxation   b) Meditation   c) Yoga
   6.8   Comprehend the changing personality and cognitive patterns.
   6.9   Observe the changing personality and cognitive patterns.

Practicals

Exp No	Exercise	Activity(Questionnaire /Interview and practice)
1	Identify the type of stress	• To study & to identify the type and causes of stress.
2	Stress –Relaxation Techniques	• Practice some simple Stress –Relaxation Techniques, Meditation, Yoga.

7.0   Practice Time management skills

    7.1   Define Time management.
    7.2   Comprehend the significance of Time management.
    7.3   Explain the strategies to set priorities.
    7.4   List the steps to overcome barriers to effective Time management.
    7.5   Identify the various Time stealers.
    7.6   Explain the Time-Management skills.
    7.7   List different Time-Management skills.
    7.8   Comprehend the advantages of Time-Management skills.

Practicals

Exp No	Exercise	Activity (Group work and Games)
1	Identify Time stealers	• Assign a activity to different Groups – Observe the time of accomplishing the task, Identify the time stealers.
2.	Practice Time-Management skills	• Perform the given tasks- Games

8.0   Practice Interpersonal skills

    8.1   Explain the significance of Interpersonal skills.
    8.2   List the factors that prevent building and maintaining positive relationships.
    8.3   Advantages of positive relationships.
    8.4   Disadvantages of negative relationships

Practicals

Exp No	Exercise	Activity
1	Identify Relationships	• Positive Relationships, Negative Relationships – Factors that affect them- Through a story
2.	Practice Rapport building	• Exercises on Rapport building • Developing Correct Body Language

9.0   Understand Creativity skills

    9.1   Define Creativity
    9.2   List the synonyms like Invention , Innovatioin, Novelty
    9.3   Distinguish between Creativity , Invention, innovation, and novelty
    9.4   Discuss the factors that lead to creative thinking like observation and imitation , improvement etc.

9.5 Distinguish between Convergent thinking and divergent Thinking

9.6 Explain various steps involved in Scientific approach to creative thinking namely a) Idea generation b) Curiosity c) Imagination d)Elaboration e) Complexity

f). Abstract ion and simplification g). Divergent Thinking h) Fluency i). Flexibilty

j).Persistance k).Intrinsic Motivation l).Risk taking   m).Projection/empathy n).Originality o). Story telling p). Flow.

List the Factors affecting the creativity in Individuals.

9.7 Give the concept of Vertical thinking and lateral thinking.

9.8 Explain the importance of Lateral thinking.

9.9 Compare lateral thinking and Vertical thinking

Practicals

Exp No	Exercise	Activity (Games and Group work)
1	Observe any given object	• Identifying finer details in an object
2.	Imagine	• Imagining a scene • Modifying a story (introduce a twist) • Improving a product • Finding different uses for a product
3	Skills	• Making paper craft
4	Product development	• Brain storming session
5	Developing originality	• Come up with original solutions for a given problem

10.0 Understand Problem solving and decision making skills

10.1 Define a Problem

10.2 Analyze the performance problems

10.3 Categorize the problems

10.4 List the barriers to the solutions to problems.

Practicals

Exp No	Exercise	Activity (Brainstorming – checklist technique free association, attribute listing)
1	Gather the facts and Data and Organizing the information.	• Information gathering and organizing • Identifying the solutions to the problem • Identifying the barriers to the solutions • Zeroing on Optimum solution
2.	Problem solving	• Games on Problem solving

11.0 Understand Assertive and non Assertive behavior

11.1 List the 3 types of Behaviors 1. Assertive 2. Non assertive (passive) 3. Aggressive behaviour 4.Submissive behaiviors

11.2 Discuss the personality of a person having above behaviours

11.3 Explain the usefulness of assertive behavior in practical situations.

11.4 Explain the role of effective communication in reflecting assertive attitude

11.5   Give examples of Assertive statements a) Assertive request b) assertive NO
11.6   Explain the importance of goal setting
11.7   Explain the method of Conflict resolution.
11.8   Discuss the methods of controlling fear and coping up with criticism.

Practicals

Exp No	Exercise	Activity (Simulated situational act)
1	Observation of behavior	• Identifying different personality traits from the body language
2.	Practicing assertiveness	• Write statements • Reaction of individuals in a tricky situation • Facing a Mock interview • Detailing the characteristics of peers • setting goals – Games like throwing a coin in a circle • Giving a feedback on a)Successful program b) Failed project • Self disclosure
3	Skills	• Dealing with a critic • Saying NO • Dealing with an aggressive person
4	Simulation	• Role play- skit 1. Assertive statements 2. goal setting 3. self disclosure

12.0   Practice Leadership skills
12.1   Explain the concept of leadership
12.2   List the Traits of effective leader
12.3   Distinguish between Managing and leading
12.4   List the 3 leadership styles
12.5   Compare the above styles of leadership styles
12.6   Discuss choice of leadership style
12.7   Explain the strategies to develop effective leadership.
12.8   Explain the importance of Decision making
12.9   Explain the procedure for making effective decisions.

Practicals

Exp No	Exercise	Activity (Games and Group work)
1	Observation	• Questionnaire
2.	Identification of a Leader	• Give a task and observe the leader • Discuss the qualities and his /her leadership style • Ask the other members to identify the leadership qualities

		• Reflection on the self	
3	Skills	• Decision making – followed by discussion	
4	Building Team spirit	• Motivation – Intrinsic and Extrinsic Training- Communication- Challenge	

Competencies for Practical Exercises

S.No	Title	Competency	Key competencies
1.	Concept of life skills	• Explain need and impact of Life skills	
2.	Enhancing self esteem	• Follow the steps to build a positive self esteem	
3.	Goal setting	• Practice the effective goal setting process	
4.	Positive attitude	• Practice the steps to enhance positive attitude. • Observe the effects of peers on self and vice-versa.	Practice the steps to enhance positive attitude
5.	Managing emotions	• Practice the steps to manage emotional intelligence • Identify different types of emotions • Exercise control over Emotions	• Identify different types of emotions
6.	Stress management	• Practice stress management techniques	
7.	Time management	• Practice Time management techniques	
8.	Interpersonal skills	• Identify positive and Negative Relations	
9.	Creativity	• Lead a small group for accomplishment of a given task. • Build positive relationships.	• Build positive relationships.
10.	Problem solving and decision making skills	• Identify the various Problem solving and decision making skills • Make appropriate Decision	• Identify the various Problem solving and decision making skills
11.	Assertive and non Assertive behavior	• Practice Assertive and non Assertive behavior	
12.	Leadership skills	• Exhibit Leadership skills	• Exhibit Leadership skills

COURSE CONTENT

1.0   Concept of life skills
Definition of life skills, Need and impact of life skills programme

2.0   Enhancing self esteem
Concept, Characteristics of high and low self esteem people, Advantages of high self esteem, Causes of low esteem- Identification of behavior patterns of low self esteem – Practice session of Questionnaire / Game -Steps to build a positive self esteem – Practice session of Role play

3.0   Goal setting
Significance of goal setting, Concepts of Wish, Dream, and Goal Identify Wish, Dream, and Goal and differentiate among them Reasons for not setting the goals, Barriers to reach goals, Identify Barriers Effective goal setting process & Practice Effective goal setting

4.0   Positive attitude
Concept ,affects of negative attitude, attitude of self and peers, effect of peers on self and   vice-versa, steps to enhance positive attitude, strategies to enhance positive attitude

5.0   Managing emotions
Problem-definition, performance problems ,Categorize the problems, barriers to the solutions to problems.

6.0   Stress management
concept of stress, Types of stress, causes of stress, reactions of stress, coping with the   stress, stress relaxing techniques, changing personality and cognitive patterns

7.0   Time management
Definition, significance of various Time stealers, Time management, strategies to set priorities, steps to overcome barriers, Time-Management skills- its advantages.

8.0   Interpersonal skills
Significance of Interpersonal skills,positive relationships- Advantages, negative relationships- Disadvantages

9.0   Creativity
Definition, Invention, Innovation, Novelty,creative thinking , observation and imitation
,   improvement,Expertise ,skill, and motivation, components of Creativity ,Convergent thinking and divergent Thinking, various steps involved in Scientific approach to creative thinking namely , Factors affecting the creativity in Individuals, Vertical thinking and   lateral thinking.

10.0   Problem solving and decision making skills
Definition, performance problems –analysis, categorizing,barriers to the solutions to problems.

11.0   Assertive and non Assertive behavior

Types of Behaviors – their characteristics, need for controlling and avoiding aggressive behaviors, making and refusing an assertive request – their evaluation, importance of goal setting, method of giving feed back.

12.0   Leadership skills

Concept , importance, Role of a Leader in an Organization, Traits of effective leader, Managing and leading, leadership styles-their Comparison, theories of leadership, strategies to develop effective leadership, importance of Decision making, concept of ethical leadership and moral development.

REFERENCEBOOKS

1.Robert NLussier, Christopher F. Achua Leadership: Theory, Application, & Skill development: Theory, Application.

FIELD PRACTICES

Subject Title : **Field Practices**
Subject Code : **CE-509**
Periods/Week : **07**
Periods/Semester : **105**

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Marking for the earth work of a pillar	07
2.	Marking for the earth work for the junction of two walls	07
3.	Marking the centre line of a one roomed building	07
4.	Marking for the earth work of a simple two roomed building	07
5.	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	07
6.	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	07
7.	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	07
8.	Supervisory skills of Plastering of a wall.	07
9.	Supervisory skills for construction of Cement Concrete Flooring.	07
10.	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	07
11.	Placement of reinforcement in an Isolated Column Footing with proper cover.	07
12.	Positioning of shuttering to the column reinforcement	07
13.	Placement of reinforcement for sun shade (with specific attention of location).	07
14.	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	07
15.	Placement of reinforcement for slab (with specific attention of chairs). OR Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	07
	Total	105

SLILLS

After completion of the subject, the student shall be able to

1.0   Marking for the earth work of a pillar
1.1   Note down the measurements of pillar at superstructure and measurements of earth work excavation.
1.2   Mark the centre lines of pillar in either direction.
1.3   Mark the size of pillar with reference to the centre lines.
1.4   Mark the size by pouring the lime.

2.0   Marking for the earth work of a junction of a wall

2.1   Read the width of walls at super structure from drawing.
2.2   Mark the centre line of main walls from the markings on burjis.
2.3   Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
2.4   Transfer the same by pouring the lime on the centre line.

3.0   Marking the centre line of a one roomed building
3.1   Read the width of walls at super structure and width of earth work excavation from drawing.
3.2   Mark the centre line of main wall from the markings on burjis.
3.3   Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
3.4   Mark the width of walls with reference to centre lines of walls.
3.5   Transfer the same by pouring the lime to proceed for excavation.
3.6   Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
3.7   Transfer the same by pouring lime to proceed for excavation.

4.0   Marking for the earth work of a simple two roomed building
4.1   Prepare the centre line diagram from a given drawing.

4.2   Note down width of earthwork excavation.

4.3   Mark the centre lines on the ground with the help of plumb bob.

4.4   Check the accuracy by measuring length of two diagonals and their equality.

4.5   Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.

4.6   Transfer the same by pouring lime to proceed for excavation.

5.0   Marking for the centre line of a one room in a residential building with reference to the given point using Total Station
5.1   Place the total station at the point of known co-ordinates.

5.2   Perform temporary adjustments.

5.3   Key in the known co-ordinates of the point.

5.4   Place the target prism on the ground to locate the first corner point of known/calculated co-ordinate of centre line of the room.

5.5   Transfer the first corner point on to the ground.

5.6   Repeat the procedure to locate the second, third, fourth corner points of known co-ordinates and transfer the poi nts on to the ground.

6.0   Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning

6.1   Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).

6.2   Place the measured quantity of sand to a suitable stack on an impervious hard surface.

6.3   Spread the cement uniformly over the sand stack.

6.4   Dry mix both sand and cement thoroughly to a uniform colour.

6.5   Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes.

6.6   Continue the mixing to bring the mortar to a stiff paste of working consistency.

7.0   Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality

7.1   Soak the bricks in water and air dry before their use.
7.2   Prepare C.M of specified proportion and keep ready for use
7.3   Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall.
7.4   Arrange the quion header in line with the two perpendicular threads
7.5   Arrange the queen closure adjacent to quoin header.
7.6   Continue one layer with headers on one face and stretchers on the perpendicular face to the true line.
7.7   Continue the next layer with stretchers on headers and headers on stretchers.
7.8   Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers.
7.9   Place the bricks, with frog at the top.
7.10   Fill the vertical joint in each layer with mortar using trowel.

8.0   Supervisory skills of Plastering of a wall

8.1   Prepare the surface by raking the joints and brushing the efflorescence if any by brushing and scraping dust and loose mortar.
8.2   Remove efflorescence if any by brushing and scraping.
8.3   Wash the surface thoroughly with water and keep the surface wet before commencement of plastering.
8.4   Complete the ceiling plaster before commencement of wall plaster
8.5   Fill all put log holes in advance of the plastering.
8.6   Start plastering from top and work down towards the floor.
8.7   Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges.

8.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob.

8.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific thickness.

8.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges.

8.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture.

8.12 Avoid excessive use of trowel or over working the float.

9.0 Supervisory skills for construction of Cement Concrete Flooring

a. Base Concrete
9.1 Use cement concrete of specified mix

9.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level.

9.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath.

9.4 Provide a slope of 1:30 for floors in water closet portion.

9.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water.

b. Finishing
9.6 Follow the finishing of the surface immediately after the cessation of beating.

9.7 Allow the surface till moisture disappears from it.

9.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted.

9.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green.

9.10 The cement slurry shall be properly processed and finished smooth.

9.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement.

9.12 Cure the surface for a minimum period of 10 days.

9.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps.

9.14 Plug the traps while laying and open after curing and cleaning.

10.0 Supervisory skills of fixing of floor trap, gully trap and their connections to drain.

10.1 Identify the Floor trap and Gully trap

10.2 Identify the location of fixing the floor trap and gully trap

10.3 Connect the floor trap to the drain pipe.

10.4 Fix the joint using proper filler and adhesive material such that the joint is water tight.

10.5 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick.

10.6 Prepare a mix of concrete 1:5:10 and jointing of gully outlet gully outlet to the branch drain is done

10.7 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain

10.8 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1.

11.0 Placement of reinforcement for an Isolated Column Footing

11.1 The grill of column footing should be kept ready as per design data.

11.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the burjis.

11.3 Mark centre of the outer reinforcing rods of footing in either direction.

11.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete.

11.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods.

11.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom.

12.0 Positioning of shuttering to the column reinforcement

12.1 Place the column reinforcement with chairs or cover blocks over the foundation mat.

12.2 Prepare the reinforcement as per the drawing.

12.3 Check for the verticality of column reinforcement with plumb bob

12.4 Provide lateral support for the column reinforcement to keep them in position.

12.5 Prepare the shuttering and apply waste oil inside surfsce of the shuttering box and fastenings

12.6 Place the shuttering box around the column and fix the fastenings.

12.7 Check for the verticality of shuttering with plumb bob

13.0 Placement of reinforcement for sun shade (with specific attention of location)

13.1 Prepare the reinforcement as per design

13.2 Prepare the centering for sun shade

13.3 Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover

13.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above   the reinforcement

13.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc.

14.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)

14.1 Read the reinforcement details from the bar bending schedule

14.2 Prepare the shuttering for the stairs as per the design.

14.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule.

14.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks.

14.5 Exercise care in the placement of reinforcement of at the junction of waist and loading slab.

14.6 Tie the distributors parallel to raisers at the specified spacing

15.0 Placement of reinforcement for slab (with specific attention of chairs)
  15.1 Prepare the reinforcement as per design
  15.2 Rest the reinforcement in slabs on bar chairs
  15.3 Securely fix to the bar chairs so that it won't move when concrete is placed around it.
  15.4 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.
  15.5 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars.

16.0 Placement of reinforcement for a beam column junction (with specific attention to Earth quake resistance design)
  16.1 Read the reinforcement details from the bar bending schedule
  16.2 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement.
  16.3 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..
  16.5 . Show enlarged details at corners, intersection of beams and column junction
  16.6 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed.
  16.7 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time
  16.7 Stagger such individual splices within the bundle.
  16.8 Make sure that hooked and bent up bars can be placed and have adequate concrete protection.

Key competencies to be achieved by the student

S.No	Experiment title	Key competency
1	Marking for the earth work of a pillar	Mark the size of pillar with reference to the centre lines
2	Marking for the earth work for the junction of two walls	Mark the centre line of main walls from the markings on burjis
3	Marking the centre line of a one roomed building	Mark the centre line of cross wall perpendicular to main wall
4	Marking for the earth work of a simple two roomed building	Check the accuracy by measuring length of two diagonals and their equality.
5	Marking for the centre line of a one room in a residential building with reference to the given point using Total Station	Transfer the first corner point on to the ground.
6	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	Dry mix both sand and cement thoroughly to a uniform colour
7	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and	Arrange the quoin header in line with the two perpendicular

	check for horizontality and verticality.	threads
8	Supervisory skills of Plastering of a wall.	Complete the ceiling plaster before commencement of wall plaster
9	Supervisory skills for construction of Cement Concrete Flooring.	The cement slurry shall be properly processed and finished smooth
10	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	Fix the joint using proper filler and adhesive material such that the joint is water tight.
11	Placement of reinforcement in an Isolated Column Footing with proper cover.	Mark centre of the outer reinforcing rods of footing in either direction.
12	Positioning of shuttering to the column reinforcement	Place the shuttering box around the column and fix the fastenings
13	Placement of reinforcement for sun shade (with specific attention of location).	Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
14	Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).	Exercise care in the placement of reinforcement of at the junction of waist and loading slab.
15	Placement of reinforcement for slab (with specific attention of chairs).	Locate reinforcing bars and mesh so that there is enough ro between the bars to place and compact the concrete.
16	Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings..

COURSE CONTENT

1. Marking for the earth work of a pillar.
2. Marking for the earth work for the junction of two walls.

3. Marking the centre line of a one roomed building

4. Marking for the earth work of a simple two roomed building.

5. Marking for the centre line of a one room in a residential building with

reference to the given point using Total Station.

6. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.
7. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
8. Supervisory skills of Plastering of a wall.
9. Supervisory skills for construction of Cement Concrete Flooring.
10. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
11. Placement of reinforcement in an Isolated Column Footing with proper cover.
12. Positioning of shuttering to the column reinforcement.
13. Placement of reinforcement for sun shade (with specific attention of location).
14. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
15. Placement of reinforcement for slab (with specific attention of chairs).
16. Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).

REFERENCE

1. CPWD SPECIFIATIONS, Govt of India Vol I&II, 2009
2. Practical Civil engineering hand book – Kale and Shaw
3. Building Construction – Bindra & Arora
4. National Building Code- BIS publication

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
VI Semester

TIME SCHEDULE

Subject Code	Name of the Subject	Instruction period / week		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CE- 601	Steel Structures	5	-	75	3			100
CE -602	Environmental Engineering - II	4	-	60	3			100
CE -603	Construction Technology & Valuation	5	-	75	3			100
CE -604	Construction Failures & Repairs	5	-	75	3			100
CE -605	Quality Control & Safety in Construction	4	-	60	3			100
PRACTICAL:								
CE- 606	Civil Engineering Workshop	-	3	45	3			100
CE -607	S.E. Drawing	-	6	90	3			100
CE -608	Construction Technology Practice	-	3	45	3			100
CE -609	Project Work	-	7	105	3			100
TOTAL		23	19	630				900

DESIGN OF STEEL STRUCTURES

Subject Title : **DESIGN OF STEEL STRUCTURES**
Subject Code : **CE-601**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S.No	Major **Topics**	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction and Fundamentals of Limit State Design of Steel structures	02	03	01	-
2.	Design of fillet welded joints	06	13	01	01
3.	Design of Tension members	09	16	02	01
4.	Design of Compression members, Columns &Column bases	20	36	02	03
5.	Design of Beams	15	26	02	02
6.	Design of Roof trusses	08	16	02	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 Know the Introduction and fundamentals of limit state design of steel structures
  1.1 State common types of steel structures.
  1.2 State the merits and demerits of Steel Structures.
  1.3 State the demerits of Steel Structures
  1.4 List the loads considered in the design of steel structures as per I.S:875-1987.
  1.5 Describe various types of loads to be considered in the design of steel structures.
  1.6 Understand the code of practice I.S. 800-2007
  1.7 List physical properties of structural steel.
  1.8 List mechanical properties of structural steel
  1.9 Sketch different types of rolled steel sections
  1.10 Classify cross sections of class 1 to 4
  1.11 List types of elements.
  1.12 Explain the Concept of Limit State Design.
  1.13 Define 'limit state'.
  1.14 State types of limit states.
  1.15 Define the following terms:
    1. Characteristic action,
    2. Design action and
    3. Design strength.

1.16   State the partial safety factor values for loads in limit state of strength and serviceability.

1.16   State the partial safety factor values for materials in limit state.

1.17   State the deflection limits for
1. Simply supported beam,
2. Cantilever beam and
3. Purlins

2.0   Understand the principles of design of Fillet Welded Joints

2.1   State different types of joints.
2.2   Differentiate the welded joints and Riveted joints
2.3   Sketch the different forms of welded joints.
2.4   Explain the features of a fillet welded joint.
2.5   State stresses in welds as per I.S.800-2007.
2.6   State formula for design strength of a fillet welded joint.
2.7   Calculate the design strength of a fillet welded joint.
2.8   Design a fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.
2.9   Design a fillet welded joint for a single angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.
2.10   Design a fillet welded joint for a double angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

2.0   Understand the principles of design of Tension Members

3.1   Define ' tie'
3.2   State the applications of tension members.
3.3   Sketch different forms of tension members.
3.4   Understand the behaviour of tension members.
3.5   State the different modes of failures
3.6   Describe different modes of failures of tension members with sketches
3.7   State the maximum values of effective slenderness ratios as per code.
3.8   Determine the net effective area of single angle connected to gusset plate by welding.
3.9   Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding
3.10   Understand design procedure of tension members.
3.11   Design a single angle tension member connected by welding only.

4.0   Understand the principles of design of Compression Members, Columns and Column bases

4.1   Understand the compression members
4.2   State different types of compression members (like column,strut)
4.3   Sketch different forms of compression members.
4.4   Understand the behaviour of compression members –
4.5   Classify cross sections.
4.6   Distinguish between actual length and effective length.
4.7   Define the terms 1. Least radius of gyration and 2. Slenderness ratio.
4.8   State effective lengths to be used for different end conditions.
4.9   Understand buckling class of cross section like 1. Imperfection factor and

2. Stress reduction factor for different buckling classes – column buckling curves.

4.10 State maximum values of effective slenderness ratios as per code
4.11 Understand the design compressive stress for different column buckling classes.
4.12 Determine the design strength of compression members
4.13 Understand design procedure of compression members.
4.14 Design columns with I sections and built up channel sections.
4.15 Understand design details - effective sectional area – codal provisions for angle struts.
4.16 Design single angle and double angle struts.
4.17 Understand codal provisions of single / double lacing and battening for built-up columns.
4.18 Design a slab base along with a cement concrete pedestal also design the welded connection.

5.0 Understand the principles of design of Steel Beams
5.1 Understand the concept of limit state design of beams
5.2 Define the terms:
   1. Elastic moment of resistance,
   2. Plastic moment of resistance,
   3. Elastic section modulus,
   4. Elastic section modulus and
   5. Shape factor.
5.3 Determine the shape factor values for rectangular, T, I section
5.4 Understand the behaviour of steel beams.
5.5 Classify beams based on lateral restraint of compression flange.
5.6 Determine the design strength in bending (flexure) and in shear.
5.7 List the factors affecting lateral stability – influence of type of loading.
5.8 Distinguish between web buckling and web crippling.
5.9 Understand the beams failure by flexural yielding – types.
5.10 List the types of beams failure by flexural yielding
5.11 Understand laterally supported beam – holes in tension zone – shear lag effects – design bending strength.
5.12 Understand laterally unsupported beam – lateral torsional buckling of beams (theoretical concept only – no problems).
5.13 Explain effective length of compression flanges.
5.14 Understand concept of shear in beams – resistance to shear buckling.
5.15 Understand shear buckling design methods like 1. Simple post critical method and 2. Tension field method.
5.16 Understand the design of simple beams with solid webs.
5.17 Understand component parts of plate girders with sketches
5.18 Describe different types of Stiffeners with their suitability.
5.19 Design laterally supported simply supported beam considering all codal requirements.

6.0 Understand the principles of design of Roof Trusses

6.1 List types of trusses – 1. Plane trusses and 2.Space trusses.
6.2 Understand the situations where roof trusses are used.
6.3 Sketch different types of roof trusses with their suitability for a given span.

6.4   Sketch a roof truss and name the component parts.

6.5   Understand the configuration of trusses like1. Pitched roof and 2. Parallel chord trapezoidal trusses.

6.6   Understand cross sections of truss members.

6.7   Understand the loads on roof trusses as per I.S – 875.

6.8   Explain the method of calculating the wind load on roof trusses..

6.9   Determine loads at nodal points of a given roof truss due to dead load, live load and wind load , given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and internal pressure coefficients.

COURSE CONTENT

1.0 Introduction and fundamentals of limit state design of steel structures

1.1   Merits and demerits of steel structures.

1.2   Loads considered in the design of steel structures as per I.S:875 -1987.

1.3   Introduction to I.S. 800-2007 - Mechanical properties of structural steel – yield stress (f_y), ultimate tensile stress (f_u) and maximum percent elongation (table -1 of IS:800-2007)

1.4   Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements –internal elements, outstands and tapered elements.

1.5   Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2.0 Design of Fillet Welded Joints

2.1   Different types of joints – lap joints – butt joints.

2.2   Differentiation of welded joints and riveted joints.

2.3   Different forms of welded joints – sketches of fillet and butt weld joints.

2.4   Fillet welded joint – detailed sketch showing the component parts.

2.5   Stresses in welds as per I.S.800-2007 – Codal requirements of welds and welding.

2.6   Problems on calculation of strength of a fillet welded joint.

2.7   Design of fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.

2.8   Design of fillet welded joint for single or double angles carrying axial loads.

3.0 Design of Tension Members

3.1   Introduction to tension members and different forms of tension members.

3.2   Behaviour of tension members.

3.3   Different modes of failures – gross section yielding, net Section rupture and block shear failure.

3.4   Maximum values of effective slenderness ratios as per code.

3.5   Calculation of net effective sectional area of single angle with welded connection only.

3.6   Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only.

3.7   Design procedure of tension members.

3.8 Problems on design of tension members single angle with welded connection only.

4.0 Analysis and design of Compression Members, columns and column Basis
4.1 Introduction to compression members - different forms of compression members.
4.2 Behaviour of compression members – classification of cross sections - Classification of cross sections – class 1 (plastic) class2 (compact) class3 (semi compact) and class4 (slender).
4.3 Effective lengths to be used for different end conditions – table 11 of I.S:800.
4.4 Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves.
4.5 Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes.
4.6 Calculation of design strength of compression members – problems.
4.7 Design procedure of compression members – problems on simple sections only (no builtup sections).
4.8 Design details - effective sectional area – codal provisions for angle struts – single angle and double angle – discontinuous and continuous struts.
4.9 Codal provisions of single / double lacing and battening for built-up columns (no problems).
4.10 Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5.0 Analysis and design of Steel Beams
5.1 Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor.
5.2 Behaviour of steel beams – design strength of in bending (flexure).
5.3 Factors affecting lateral stability – influence of type of loading-web buckling and web crippling.
5.4 Beams failure by flexural yielding – types.
5.5 Laterally supported beam – holes in tension zone – shear lag effects -– design bending strength
5.6 Laterally unsupported beam – lateral tensional buckling of beams - (theoretical concept only – no problems).
5.7 Effective length of compression flanges.
5.8 Concept of shear in beams – resistance to shear buckling.
5.9 Shear buckling design methods - simple post critical method – tension field method.
5.10 Design of laterally supported simple beams with solid webs.
5.11 Component parts of plate girders with sketches – brief description of different types of stiffeners.
5.12 Design of laterally supported simply supported beam considering all codal requirements.

6.0 Design of Roof Trusses
6.1 Types of trusses – plane trusses, space trusses.
6.2 Sketches of different roof trusses with their suitability for a given span.
6.3 Cross sections of truss members.
6.4 Loads on roof trusses as per I.S – 875.

6.5   Determination of loads at nodal points of a given roof truss due to dead load, live load and wind load, given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and I nternal pressure coefficients.– problems.

REFERENCE BOOKS

1.   Code of practice: IS 800-2007
2.   Limit state Design of Steel Structures by S.K. Duggal/TMH
3.   Structural steel design by M.L.Gambhir/TMH
4.   Design of Steel Structures by N.Subramanian
5.   Design of Steel Structures by S.S.Bhavikatti
6.   Structural Engineering by A.P.ArulManickam
7.   Teaching Resource Material : http://www.steel-insdag.org
8.   Teaching Resource Material : http://www.nptel.iitm.ac.in

ENVIRONMENTAL ENGINEERING – II

Subject Title : **Environmental Engineering - II**
Subject Code : **C-602**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Sanitary Engg & Quantity of Sewage	08	16	02	01
2	Laying of Sewers & Sewers appurtenances	08	19	03	01
3	Characteristics of Sewage, treatment & disposal	17	26	02	02
4	Solid waste disposal and Sanitation in buildings	12	23	01	02
5	Rural Water Supply and Sanitation	06	13	01	01
6	Air Pollution	05	13	01	01
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Understand the basics of sanitary engineering and Quantity of sewage

1.1   State the objectives of sewage disposal works.
1.2   Define the terms:
        1. Sewage,
        2. Sewer and
        3. Sullage.
1.3   Explain the the following:
        1. Sewerage,
        2. Refuse and
        3. Garbage
1.4   List the objectives of sewerage works.
1.5   List the various methods of sewage collection works.
1.6   Compare conservancy system with water carriage system.
1.7   Explain the different sewerage systems.
1.8   Compare the systems of sewerage with each other.
1.9   Know which system of sewerage is preferable for towns with small and
         evenly distributed rainfall.
1.10   Understand which system of sewerage is used for a city like Hyderabad.
         Justify the choice.
1.11   State the main constituents of sewage for calculating quantity.
1.12   Define Dry weather flow.
1.13   State the factors affecting dry weather flow.
1.14   State the factors affecting the quantity of storm sewage.

1.15 Explain the variation in rate of sewage.
1.16 Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae.
1.17 List the requirements of good surface drains.
1.18 Describe different types of surface drains with their merits and demerits.
1.19 State the limiting velocities of flow in sewers.
1.20 Works out simple problems on design of sewers running half full only.
1.21 Explain the use of nomograms in detail in the design of sewers.

2.0 Understand the Types of sewers, laying of sewers and appurtenances
2.1 State various shapes of sewers.
2.2 Explain the circular sewer with a sketch
2.3 list any two merits and demerits OF circular sewer
2.4 Mention different materials used for sewers.
2.5 State any two merits and demerits for each type of sewer.
2.6 Explain the method of laying the sewers as per given alignment.
2.6 Know, why is it necessary to provide sewer appurtenances on the sewer lines.
2.7 List the various sewer appurtenances on a sewer line.
2.8 Explain the necessity of providing manhole in sewer line with the help of sketch.
2.9 Explain the construction, function and location of the different sewer appurtenances.
2.10 Know ,why is it necessary to ventilate the sewers and how is it done.
2.11 State the situations under which sewage pumping is necessary.
2.12 Explain the component parts of a pumping station and factors influencing its location.
2.13 Explain the construction and working of Shone's ejector with the help f a sketch.
2.14 Know ,how the testing of sewers is done.
2.15 Understand ,why explosions occur in sewer lines and how they can be prevented.

3.0 Understand the characteristics of sewage
3.1 Define strength of sewage.
3.2 Describe the method of sampling sewage.
3.3 State the physical, chemical and biological characteristics of sewage.
3.4 Define C.O.D and B.O.D
3.5 State the significance of the following tests to Analyse sewage.
i) Solids   (ii) C.O.D.   (iii) B.O.D.   (iv) PH-Value   (v) Chlorides.
3.6 State the characteristics of industrial waste water.
3.7 Explain the principles of treatment of industrial wastewater.
3.8 State the objects of sewage treatment.
3.9 Draw the conventional sewage treatment plant of a town and indicate the main function of each unit.
3.10 State the function of screens, skimming tanks and grit chambers.
3.11 Explain briefly the working of screens, grit chambers, skimming tanks.
3.12 Describes with sketch wherever necessary the following treatment works.
    a)   sedimentation tank.
    b)   Trickling filters.

c) Activated sludge process.
d) Oxidation ditch.
e) Oxidation pond.
f) Aerated lagoons.
g) Anaerobic lagoons.
h) Sludge digesters

3.13 Compare activated sludge process and trickling filters.
3.14 List out various methods of sludge disposal.
3.15 Explain the methods of sludge disposal.
3.16 Explain with sketch the treatment of sewage by septic tank and soak pit.
3.17 Determine the dimensions of a sedimentation tank and a septic tank for given data.
3.18 List the various methods of sewage disposal.
3.19 Explain the methods of disposal of sewage.

4.0 Know the methods of disposal of solid wastes and Sanitation in Building
4.1 Define the term' Refuse'
4.2 State the classification of solid wastes.
4.3 Explain the methods of disposal of solid wastes.
4.4 State any two merits and two demerits for each of the solid waste disposal methods.
4.5 Know, what is meant by composting.
4.6 Explain the methods of composting.
4.7 List the equipments required for preparation of compost by mechanical composting.
4.8 State the aims of building drainage .
4.9 State the requirements of good drainage system in buildings.
4.10 Know about the terms: soil pipe, waste pipe, vent pipe, anti- syphonage pipe.
4.11 Describe the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storied).
4.12 Explain with sketches the different types of plumbing systems.
4.13 Describe different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.
4.14 Explain the procedures involved in the inspection, testing and maintenance of sanitary fittings.

5.0 Knows the methods of rural sanitation
5.1 Explain the process of disinfection of wells by two pot method.
5.2 List the different types of sanitary latrines.
5.3 Explain the methods of rural sanitation.
5.4 Describe with sketches the construction of sanitary latrines in rural areas.
5.5 State the advantages of bio-gas plant.
5.6 State the factors on which the production of bio-gas depends.
5.7 Describe the construction and working of K.V.I.C.model bio-gas plant with a neat sketch.
5.7 Describe the construction and working of Janata model bio-gas plant with a sketch.
5.9 Know about vermi composting.
5.10 Describe briefly the procedure of vermi composting and mention its advantages.

6.0   Know the effects of air pollution and its control
6.1   Define the term air pollution.
6.2   State the sources of air pollution.
6.3   Explain the natural and manmade sources of air pollution.
6.4   List the effects of air pollution.
6.5   Explain the effects of air pollution on human health and vegetation.
6.6   Explain the effects of air pollution on atmosphere and materials.
6.7   List the methods of control of air pollution.
6.8   Explain the method of prevention of air pollution at source.
6.9   List the various types of controlling devices and equipment.
6.10   Explain briefly with sketches the methods of controlling air pollution by controlling devices and equipment.
6.11   Describe briefly the control of air pollution by stacks.
6.12   Explain the method of prevention of air pollution by vegetation.

COURSE CONTENT

1.   Introduction and Quantity of Sewage

a)   Object of providing sewerage works.
b)   Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage.
c)   System of sewage disposal - conservancy and water carriage systems.
d)   Types of sewerage systems and their suitability – separate, combined and partially separate systems.
e)   Quantity of discharge in sewers, dry weather flow, variability of flow.
f)   Determination of storm water flow – run off co-efficient, time of concentration, rational method and empirical formulae for run-off.
g)   Surface drainage - requirements, shapes, laying and construction.
h)   Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae .
i)   Use of nomograms as per I.S.1742 to determine the unknown values of gradient, diameter, discharge and velocity.

2.   Laying of Sewers and Sewer Appurtenances
a)   Different shapes of cross section for sewers – circular and non-circular – merits and demerits of each.
b)   Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes.
c)   Laying of sewers - setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling.
d)   Brief description, location, function and construction of
   i)   Manholes.
   ii)   Drop manholes.
   iii)   Street inlets.
   iv)   Catch basins.
   v)   Flushing tanks.
   vi)   Regulators.
   vii)   Inverted siphon.

e) Necessity of pumping sewage - location and component parts of a pumping station.

3. Sewage Characteristics

a) Strength of sewage, sampling of sewage, characteristics of sewage; physical, chemical and biological.
b) Analysis of sewage - significance of the following tests for (No details of tests)
   (i) Solids, (ii) C.O.D, (iii) B.O.D., (iv) PH - Value, (v) Chlorides.
c) Characteristics of Industrial waste water–principles of treatment, Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning.
d) Preliminary treatment - Brief description and functions of following units.
   (i) Screens, (ii) Skimming tanks and (iii) Grit chambers.
e) Primary treatment - Brief description and functions of Plain sedimentation, simple problems on the design of sedimentation tanks.
f) Secondary treatment - Brief description of
   (i) Trickling filters (ii) Activated sludge process (iii) Oxidation ditc
   (iv) Oxidation pond (v) Aerated lagoons (vii) Anaerobic lagoons
g) Sludge digestion – Process and methods of sludge disposal.
h) Miscellaneous treatments-septic tank.
i) Sewage disposal - dilution, disposal on to lands, ground water recharge, reuse etc.

4. Solid Waste Disposal and Sanitation in Buildings
a) Methods of disposal - uncontrolled dumping, tipping or sanitary land fill – Incineration - composting.
b) Preparation of compost - equipments required such as storage hoppers, grinders conveyors etc., in mechanical composting.
c) Aims of building drainage and its requirements – General layout of sanitaryfittings to a house - drainage arrangements for single and multi storeyed buildings as per IS code of practice-plumbing systems.
d) Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti siphonage - Inspection, testing and maintenance of sanitary fittings.

5. Rural Water Supply and Sanitation
a) Disinfection of wells.
b) Rural sanitation and sanitary latrines, biogas production technology -brief description and operational details of bio-gas plants using animal waste, night soil and agricultural wastes -KVIC and JANATA models- merits and demerits-maintenance of biogas plant.
c) Vermi composting –procedure -advantages

6. Air Pollution
a) Definition - sources of air pollution – effects of population.
b) Control of air pollution – methods - air pollution control at source – zoning – installation of controlling devices and equipment : internal separators, gravity settling chambers, cyclones, fabric filters, wet collection devices : cyclonic

scrubbers, venture scrubbers, electrostatic precipitators - brief description of the above equipment – air pollution control by stacks – by vegetation.

REFERENCE BOOKS

1. Environmental Engineering – G.S. Birdie
2. Elements of Public Health engineering – K.N. Duggal
3. Environmental Engineering – Baljeet Kapoor
4. Public Health Engineering – S.K. Hussain
5. Environmental Engineering – Ramachandraiah
6. Water supply and sanitary Engineering – V.N. Vazirani.
7. Environmental Engineering --N.N.Basak/TMH

CONSTRUCTION TECHNOLOGY AND VALUATION

Subject Title   : Construction Technology and Valuation
Subject Code   : CE-603
Periods per Week   : 05
Periods per Semester : 75

TIME SCHEDULE

S No	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Concrete Technology	20	29	3	2
2.	Pre stressed Concrete	10	13	1	1
3.	Form Work and Reinforcement	08	13	1	1
4.	Construction Machinery and Equipment	08	13	1	1
5.	Building Services	09	13	1	1
6.	Earth quake resistant Structures	06	13	1	1
7.	Building Valuation	14	16	2	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0   Understand the concrete Technology
      1.1   State the ingredients of Concrete.
      1.2   Define 1. Workability and 2. Water/Cement ratio
      1.3   Explain the relation between strength of concrete , workability and water/cement ratio
      1.4   Understand 'Grades' of concrete.
      1.5   State the grades of concrete recommended for different types of works.
      1.6   Differentiate 'Normal strength concrete and High strength concrete'
      1.7   Differentiate between 'Ordinary Concrete and Controlled Concrete'
      1.8   State the functions of Admixtures in concrete
      1.9   List out different admixtures being used.
      1.10   State the Principles of Concrete Mix Design.

1.11   State the factors affecting variability of concrete strength.
1.12   Explain the procedure of Concrete Mix design using IS Code method
1.13   Understand the following special concretes
      1. Fiber Reinforced Concrete,
      2. Fal-G-Concrete,
      3. Light weight concrete,
      4. High density concrete,
      5. Polymer concrete and
      6. Self compacting concrete
1.14   Understand concreting under special exposure conditions like
      1. Under- water concreting,
      2. Cold weather concreting,
      3. Hot weather concreting and
      4. Concreting in high rise buildings
1.15   Explain 'Micro concrete' and 'Shotcrete'.
1.16   State the need for Expansion and Construction joints in concrete structures.
1.17   Explain the method of providing various joints in RCC roofs.

2.0   Understand the Pre stressed concrete
2.1   Understand fundamental principles of prestressed concrete.
2.2   State the materials and permissible stresses.
2.3   List the losses of prestress.
2.4   Explain the methods of 1. Pre stressing and 2. Post- tensioning systems.

3.0   Understand Form work and Reinforcement
3.1   State the Objectives of Formwork.
3.2   State the requirements of formwork.
3.3   List the loads to be considered for the design of formwork.
3.4   Draw the formwork arrangements for
      1. Slab and Beam system,
      2. Column and
      3. Wall
3.5   State the merits of Steel formwork over Timber formwork.
3.6   State the demerits of Steel formwork over Timber formwork.
3.7   State the chemical composition of structural steel as per IS.
3.8   State different types of steels used for concrete reinforcement along with their mechanical properties.
3.9   Explain the bond mechanism in plain and deformed bars.

4.0   Understand the Construction Machinery and Equipment
4.1   Understand the need for mechanization and construction activities
4.2   State different types of construction equipment
4.3   Explain the uses of different construction equipment
4.4   State the factors to be considered for the selection of type of construction equipment.

5.0   Understand the Buildings services

5.1   Explain the hot water supply distribution using solar water heating system.
5.2   State the requirements of good lighting in building.
5.3   Define the terms 1. Glare and 2. Day light factor

5.4   State the precautions to be taken to avoid glare in building
5.5   State the requirements of good electrical wiring.
5.6   List the power rating of different domestic electrical appliances.
5.7   List the different types of electrical wirings.
5.8   State the objectives of electrical earthing.
5.9   Explain the method of earthing
5.10   State the requirements of good ventilation.
5.11   Explain 1. Natural ventilation and 2. Artificial ventilation.
5.12   State the functions of
         1. Sunshades,
         2. Louvers,
         3. Sun breakers and
         4.Blinds
5.13   State the principles of fire protection in buildings.
5.14   State the causes of fire.
5.15   Explain about fire fighting.
5.16   State different fire detectors and fire extinguishers.
5.17   State different fire extinguishers
5.18   State different fire resistant building materials.
5.19   Explain about air conditioning.
5.20   State different types of cooling systems.

6.0   Understand Earth quake resistant structures.
6.1   List causes seismic waves, basic terminology
6.2   Explain 1. Magnitude, 2. Intensity and 3. Energy release
6.3   Characteristics of earthquake
6.4   Understand basic terminology of Earthquake
6.5   Explain seismic zoning
6.6   Explain seismic construction with brick stone masonry buildings as per codal provisions.
6.7   Explain seismic construction with stone masonry buildings as per codal provisions.
6.8   Understand seismic construction and detailing of R.C. buildings as per codal provisions.

7.0   Understand the concept of Building Valuation
7.1   Define the terms: 1. Value and 2. Cost and price
7.2   State the need for valuation.
7.3   Explain the following terms:
         1. Depreciation,
         2. Sinking fund,
         3. Annuity and
         4. Capitalized value
7.4   Lists different methods of valuation of buildings.
7.5   Explains different methods of valuation of buildings.
7.6   State methods of rent fixation of building.
7.7   Explain methods of rent fixation of building.

COURSE CONTENT

1.0 Concrete Technology
- a) Introduction – Ingredients of Concrete – Properties of Concrete – Workability-Factors influencing workability –Water/Cement Ratio-Relation between Strength of concrete and Water/Cement Ratio.
- b) Curing of Concrete-Method of curing.
- c) Grade of concrete-Controlled concrete and Ordinary concrete-Normal strength concrete and High strength concrete
- d) Admixtures – Types of admixtures –Accelerators-Retarders-Plasticizers – Super plasticizers- Uses.
- e) Mix design – Factors influencing mix design – Methods of Mix design – IS 10262-2009 method of mix design.
- f) Special Concretes – fiber reinforced Concrete – Fal G-Concrete, high density Concrete, Light weight Concrete, polymer Concrete and micro Concrete – Self Compacting Concrete-Properties – uses.
- g) Concreting under special exposure condition – cold weather Concreting – hot weather Concreting – under water concreting – Shortcrete – Concreting in high rise buildings.
- h) Joints – Necessity of joints – Joints in RCC roofs – Expansion joint – Contraction joint – Construction joint.

2.0 Prestressed Concrete
- a) Introduction – Basic principles – Systems of prestressing – Types of prestressing – Advantages and Disadvantages.
- b) Requirements of steel and concrete for prestressed concrete.
- c) Losses of Prestress.
- d) Tensioning devices – Method of Prestressing – Pretensioning system – Post tensioning systems – Freyssinet, Magnel-Blaton, Gifford Udal and LeeMcal Systems.

3.0 Form work and reinforcement
- a) Objectives of form work – Loads acting on form work – Component parts of ordinary form work for columns, beams and slabs.(with sketches)
- b) Types of formwork based on the material used –Wooden form work-Steel form work.
- c) Cleaning and treatment of forms – Stripping time – tolerances.
- d) Slip form work for towers and Form work for Lining of canals.
- e) Reinforcement – types – Properties as per IS.
- f) Bending, Fixing, Placing, Tieing and Welding.

4.0 Construction machinery and equipment
- a) Need for use of construction Machinery.
- b) Factors affecting selection of equipment.
- c) Types – Crawler and Pneumatic tyred.
- d) Excavation equipments – Tractors, Bulldozer, Grader, Scrapper, Shovel, Dragline, Clamshell, Dredgers – description-Uses.
- e) Compaction equipments – Rollers, Tamping roller – Smooth wheeled roller – Pneumatic tyred rollers – Vibrating compactors – Description – uses.
- f) Hauling equipments – Trucks, Dump trucks, Dumpers.

g)   Cranes –Tower cranes.
h)   Conveying equipments – Belt conveyors.

5.0   Building Services
a)   Hot water supply using solar water heating system.
b)   Lighting requirements in a building – daylight factor – glare.
c)   Electrical services – Requirements of good electrical wiring – types of electrical wirings – earthing – methods.
d)   Ventilation – Requirement of good ventilation – Natural and Artificial ventilation – purpose of sunshades, louvers, and blinds.
e)   Air conditioning – Purpose – Air conditioning layout – Components –Types of cooling systems – Air coolers – Air conditioner – Centralized Air conditioner – Split type Air Conditioner.

6.0   Earth quake resistant structures
a)   Causes of seismic waves – Magnitude, intensity and energy release – basic terminology – Characteristics of earthquake – seismic zoning.
b)   Seismic construction of brick and stone masonry buildings – Provisions of I S : 4326.
c)   Seismic construction of R.C. Buildings – Detailing as per Provisions of I S : 13920.

7.0   Building Valuation
a)   Definition – Value, Cost and Price, Scrap value, Salvage value, Market value, Book value, Sinking fund and its meaning – purpose of valuation – factors governing valuation.
b)   Depreciation – Sinking fund – Annuity – Capitalized value.
c)   Methods of valuation – Land & building method, Development method, Depreciation method, Rental method, Capitalization method, Profit method, Simple problems on each of the above method.
d)   Rent fixation – Rent fixation of building – principles of rent fixation by CPWD – Fair rent method – simple problems.

REFERENCE BOOKS

1. Prestressed Concrete by   N Krishna Raju, Mc Graw Hill, New Delhi.
2. Concrete Technology   by   M S Shetty
3. Building Technology and valuation   TTTI, Chennai
4. Hand book on Design of Concrete mixes   S.P.23
5. Valuation of Real Properties by S.C.Rangwala

CONSTRUCTION FAILURES, REPAIRS AND MAINTENANCE

Subject Title : Construction failures, repairs and maintenance
Subject Code : CE-604
Periods/ week : 05
Periods/year : 75

TIME SCHEDULE

Sl.No.	Major Topics	Periods	Weightage of Marks	Short Answer Type	Essay Answer Type
1.	Introduction	02	03	1	--
2.	Subsurface construction failures and repairs	15	16	2	1
3.	Surface construction failures and repairs	08	13	1	1
4.	Masonry and concrete failures, repairs	15	26	2	2
5.	Manmade and Natural failures, rehabilitation	15	26	2	2
6.	Maintenance problems and their solutions	20	26	2	2
	Total	75	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Introduction
    1.1   Define
            1. Error,
            2. Defect and
            3. Failure
    1.2   State different types of errors causing failures.
    1.3   State the causes of failures.

2.0   Understand subsurface construction failures and repairs
    2.1   Describe construction failures in foundations – Under mining safe support – Load transfer failure – Lateral movement – Unequal support – settlement and differential settlement – Uplift in expansive soils – Design error – Construction error – flotation and water change – vibration effect – earthquake effect.
    2.2   Describe the repairs involved for rectifying the above failure.
    2.3   Describe Sub surface construction failures – Trenches, sheeting and bracing, piles and caissons – Sewer and tunnels, dams.
    2.4   Describes the repairs involved for rectifying the above failures.

3.0 **Understand Surface construction failures and repairs**
    3.1   Briefly describes the following types of failures in surface construction – Slopes and slides – Subsidence, retaining walls and abutments.
    3.2   Briefly describes the repairs involved for rectifying the above failures.

4.0 **Understand Masonry and concrete failures, repairs**
    4.1   Describe types of failures in masonry – Wall failure, construction error, aging, joints and cracks, weather tightness, masonry cladding, partitions, ornamental screens, plaster.
    4.2   Explain the repairs involved for rectifying the above failures.
    4.3   Explain the types of failures in concrete – Improper mix design, curing, placement of reinforcement, Rusting of embedded steel, handling of pre cast elements, shrinkage, expansion and plastic changes, surface disintegration due to fire, spalling of concrete, compression failure, erection difficulty, temperature change, Deformation and cracking – repairs.
    4.4   Explain the repairs involved for rectifying the above failure- use of expansion filler.

5.0 **Understand Manmade and natural failures and repairs**
    5.1   Describe the following types of failures in manmade and natural disasters.
    5.2   Demolition, deterioration, overload, alteration collapses, fire, explosion and vibration, collision, wind damages, towers and masts, storm at sea, storm on land, lightening damage, rain-ponding effect – Explain the repair's involved for rectifying the above failure.
    5.3   Describe the failures due to ignorance and negligence – Ignorance, or incompetence, negligence, control and supervision, responsibility.
    5.4   Explain the repairs involved for rectifying the above failures.

6.0 **Understand the Maintenance problems and their solutions**
    6.1   Describes the list of defects in buildings bringing out the investigation and remedial details.
    6.2   State the methods of solving dampness problems in buildings.
    6.3   Explain the causes, preventive and corrective methods of cracks in building.
    6.4   Explain the maintenance operations for the Water supply and sanitary components of building.
    6.5   Explain the methods of maintenance of roads / road berms / side drains.
    6.6   Explain methods of repairs to canal linings.
    6.7   Use of Leak proof chemicals for R.C.C roofs.

COURSE CONTENT

1. **Introduction**

    a)   Definition of error, defect, failure – Causes of failures.

2. **Sub-surface construction failures and repairs**

    a)   Failures in Foundations – Under mining – Load transfer failures – Lateral movement – Unequal support – Settlement and Differential Settlement –

Uplift in expansive soils compression failure, erection difficulty, temperature change, Deformation and cracking – Drag down and heave – Design error – Construction error – Flotation and water change – Vibration effect – Earthquake effect – repairing techniques to be adopted.

b)   Failures during excavation – Sheeting and bracing – piles and caissons – sewers and tunnels – measures to be taken.

3.   Surface construction failures and repairs

a)   Earthen bunds – failures – slope failures and sliding – subsidence – measures to be taken to prevent surface construction failures – measures to be taken – retaining walls and abutments – geo-membranes – Rivetment and pitching.

4.   Masonry and concrete failures, repairs

a)   Wall failures – Construction error – Aging – Joints and crakes – Water tightness – Masonry cladding – Partitions – Ornamental screens – Plastering failures - repairs.

b)   Concrete failures – Improper mix design, curing, placement of reinforcement and handling of pre cast elements – shrinkage failures – expansion and plastic changes – surface disintegration due to fire – spalling of concrete – repairs.

5.   Man-made and natural failures, rehabilitation

a)   Demolition – Deterioration – Overload – Alteration collapses – Fire – Explosion and Vibration – Collision – wind damages of towers and masts – Storm at sea – Storm on Land – Lighting damage – rain-ponding – effects – rehabilitation measures.

6.   Maintenance problems and their solutions

a)   Water proofing, leakage of basements and roofs – Treating dampness in walls – Omission of DPC – Window sills, down pipes and other areas of damp penetration – Cico water proofing.

b)   Cracks in walls – Horizontal, Vertical, diagonal – causes and prevention of cracks in buildings – Care of floors, removing stains from floors – Inks, rust, oil, paint and varnish.

c)   Maintenance problems of plumbing, heating, hot water supply, clogged drains, sewers, leaking pipe joints, electrical installations, other building services, septic tanks and soak pits.

d)   Maintenance of roads, road-berms and side drains.

e)   Strengthening of canals, embankments, silt clearance weed removal, repairs to canal lining.

f)   Leak proofing of water tanks and roofs use of chemicals for RCC roofs.

REFERENCE BOOKS

1. Construction Failure by Jacob Feld - John Wiley & Sons, New Yark, London.
2. Failures & Repairs of Concrete Structure by S. Champion - John Wiley & Sons, New Yark, London.
3. Engineering Structural Failures by Rolt Hammond – Odham Press, London
4. Learning from Failures by Raikar
5. Building Failures Diagnosis and Avoidance by Ran Son W.H. – Publishing E and F.N. Span.
6. Maintenance Engineering for Civl Engineers-- Nayak B.S. , Khanna Publisher's, Delhi
7. SP: 25 –1987 Causes and prevention of cracks in buildings by BIS

QUALITY CONTROL & SAFETY IN CONSTRUCTION

Subject Title : **Quality control & Safety in construction**
Subject Code : **CE-605**
Periods/ week : **04**
Periods/year : **60**

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weight age of Marks	Short Answer Type	Essay Type
1	Specifications and Standards	12	26	2	2
2	Quality control	06	13	1	1
3	Statistical Analysis and Tolerance	06	13	1	1
4	Introduction to safety in construction Activities	06	16	2	1
5	Causes of Accidents and Safety Measures	24	29	3	2
6	Prevention of accidents	06	13	1	1
	Total	60	110	10	08

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Know different specifications and standards
    1.1   State different specifications of buildings.
    1.2   Explain functional aspects of different structures.
    1.3   Describe detailed specification for various items of work.
    1.4   Prepare detailed specification from general description.
    1.5   List relevant IS codes.
    1.6   Identify sizes for building components.
    1.7   Identify standards.
    1.8   Understand standards for industrial buildings.
    1.9   Explain Management aspects of quality control.
    1.10   Describe Advisory Organization.
    1.11   Describe Management Functions and Regulations.
    1.12   State PWD & CPWD Guidelines for field officers.

2.0   Understand the production and Quality control of construction works and Tolerance levels
    2.1   Describe control aspects of batching and mixing.
    2.2   Explain the inspection of reinforcement grills.
    2.3   Explain the inspection and examination of formwork.
    2.4   Describe the quality of the filler materials.

2.5 Establish relationship between the strength of brickwork and strength of mortar.

3.0 Understand statistical basis for modern quality control
3.1 Describe Mathematical probability.
3.2 Describe sampling plan.
3.3 Explain sampling risks of acceptance and rejections.
3.4 State the tolerances levels in construction industry.
3.5 Understand visual appearance.
3.6 State the dimensional accuracies.

4.0 Understand the safety aspects to be taken in construction works
4.1 Describe the safety requirements against fire hazards
4.2 Describe the safety while using construction machinery
4.3 Describe the safety during the demolition of buildings
4.4 Describe the preventive methods of accidents

5.0 Understand the causes of Accidents and Safety measures
5.1 Define accidents.
5.2 List the causes of accidents.
5.3 Role of loss control approach in the cost of the accidents.
5.4 Describe the cost aspects of accidents and measures.
5.5 Describe the General safety program.
5.6 Prepare accidents reports.
5.7 Describe the safety measures to be taken for storage and handling of building materials.
5.8 Describe the safety requirements in formwork and scaffolding.
5.9 Explain the safety in excavation & pile driving in foundation.
5.10 Describe the safety measures to be taken in construction of building elements.
5.11 Describe the safety measures to be taken in demolition of buildings.
5.12 Describe the safety measures to be taken for hot bituminous works.
5.13 Describe the safety measures to be taken in supporting structural work.

6.0 Understand the Planning for accident prevention
6.1 Define 1. Risk and 2. Risk management.
6.2 Explain the role of risk management.
6.3 Describe the planning for accident prevention.
6.4 Evaluate risks and losses and cost control works
6.5 Describe the management measures for controlling losses

COURSE CONTENT

Quality Control
1. (a) Specification for buildings – functional aspects of residential, commercial and industrial structures – Detailed Specifications for various items of work – preparation of detailed specification from general description – Modular Coordination – relevant IS codes – Preferred size for building components – Performance standards – Standards for industrial buildings.

(b) Management aspects of quality control – advisory organization management functions – Statutory regulations – State PWD & CPWD guide lines for field officers.

2. (a) Production & quality control of concrete – general – batching – mixing – inspection of reinforcement grill and form work.
    (b) Quality control in Masonry works – quality of filler materials – Brick – stone – quality of mortar – relation between strength of brick work Vs strength of bricks Vs strength of mortar.

3. (a) Statistical basis for modern quality control – Simple examples of mathematical probability – Sampling plan – Sampling risks of acceptance and rejection.
    (b) Tolerance levels in construction industry – Visual appearance – dimensional accuracies.

Safety

4. Introduction – safety against fire hazards – Fire & fire fighting – Fire rating of building materials – fire prevention standards – safety in use of construction machinery – lifting machinery, earth moving machinery and conveyors, demolition of buildings – Loading standards for buildings – The safety programme – Accident due to fall – preventive methods.

5. (a) Causes of accidents – Classification of construction accidents – Cost of accidents – loss control approach in the cost of accidents – measurement of accidents – Salient features of 'A safety programme' – General safety programmes for construction – Accident report.
    (b) Safety Measure for storage & handling of building materials – Safety Measure in construction of elements of building – Safety in excavation & pile driving – foundations – form work – scaffolding – roofing – safety on fragile roof – other items of work – Safety Measure in demolition of buildings – Safety Measure for hot bituminous works – Safety Measure for scaffolding, Ladders form work and other equipment – erection of prefabricated components and transportation – erection of steel structures – Safety measures for excavation.

6. Planning for accident prevention – evaluation of risk and loss potential in the work. vis-a-vis cost of control measures – loss control approach through accident prevention and other risk management measures for controlling losses due to personnel, legal, liability losses – property losses.

REFERENCE BOOKS

1. Design of Foundations & Detailing by Er.A.Veerappan & Er. A.Pragadeeswaran
2. A.J. and C.J.Willis. "Specification writing", Crossby Lockwood, London.
3. Norbert-L.Enrick "Quality control and reliability" Industrial press Inc., NY
4. R. Nagrajan, "Standards In Buildings", Pitman publishing, 1976.
5. Vincent G.Bush, "Safety in Construction industry-OSHA"
6. Estimation and Costing by Dutta

7. S.Purushotham & G. Vaidyanathan "Safety in Construction Industry", Central Labour Institute, Bombay
8. "Accident Prevention in Construction", Associated General Contractors of America
9. Standards on safety—BIS
10. Norbert-L.Enrick "Quality control and reliability" Industrial press Inc.,NY
11. R. Nagarajan, "Standards In Buildings", Pitman publishing, 1976
12. Shrivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd, # 5, Ansari road, Daryaganj, New delhi.
13. Design and Construction failures by DOV Kamimanetzky, Galgotia publications, New Delhi.

CIVIL ENGINEERING WORK SHOP

Subject title : **Civil Engineering Workshop**
Subject code : **CE-606**
Periods per week : **03**
Periods per semester : **45**

TIME SCHEDULE

Sl. No.	Major Topic	No. of periods
1	Carpentry	5
2	Bar Bending of steel reinforcement	10
3	Plumbing exercises	10
4	Electrical Exercises	20
Total		45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Understand the elements of carpentry in connection with the erection of scaffolding and form work with a particular reference to use of braces
1.1   State various components of scaffolding
1.2   State precautions to be taken while erecting scaffolding
1.3   Explain the method of fixing various elements of scaffolding
1.4   State precautions to be taken to fix the various elements of scaffolding at required position.
1.5   Connect various elements of scaffolding.
1.6   Explain various aspects of form work to be considered while fixing various elements
1.7   Explain the method of fixing of form work at required position for various elements of building construction
1.8   Connect various elements of formwork.

2.0   Understand the skills of bending of reinforcing bars as per the bar bending schedule.
2.1   Identify various tools used for bending of reinforcing bars.
2.2   Read the data required from bar bending schedule for bending of bars.
2.3   Mark the salient points of location of bending on the bars as per the bar bending schedule.
2.4   Bend the bars using the specified tools to the exact shape as per bar bending schedule as specified in IS-2502(Code of practice for bending and fixing of bars for concrete reinforcement)
2.5   Prepare the grills as per the drawings of the structural elements using binders, stirrups, links etc. appropriate to the element.
3.0   Understand the elements of plumbing practice and procedure of fixing of various plumbing fixtures

3.1   Identify the different pipe specials and state their functions
3.2   Practice thread cutting on PVC/GI pipes
3.3   Assemble the pipe line for toilet block with taps, showers and wash basins using specific pipe specials.
3.4   Fix the floor trap, gully trap and water closet of a house to the drainage pipes.

4.0   Understand the various aspects of electrical installations used in buildings and their fixing at appropriate locations
4.1   Identity various electrical accessories, Wires and cables
        a. Mains switch
        b. MCB
        c. Fuse
        d. Switches (SPST SPDT)
        e. Rotary switch
        f .Push Button Switches
        g. 2 pin Sockets
        h. 3pin /Power sockets
        i. Ceiling Rose
        g. Lamp Holders.
            (a) Identify line, neutral and earth terminals in power sockets and power plugs by physical observation and using Tester
        h. Use of test lamp
4.2   Identify different wires and cables
        a. Know the wire gauge
        b. Specifications of electrical wires
        c. VIR, PVC, TRS wires
        d. Flexible wires and cables
        e. Power cords.
4.3   Study of earthling and earth pit
4.4   Study of different wiring systems
                        (a) Open conduit system
                        (b) Concealed conduit system
4.5   Use of Digital Multimeter to
        a. Identify the Range selector
        b. Selection of appropriate range to measure
                i.   AC Voltage
                ii.   DC Voltage (Battery)
                iii.   AC Current (Through a lamp/heater)
                iv.   Check continuity
                v.   Resistance
4.6   Connect a fuse in the main circuit
        a. Know the metals suitable for fuse wire
        b. Selecting a correct fuse wire rating for a given electrical load
4.7   Connect a low current (3A) MCB in the circuit and testing
4.8   Control the lamp using a switch
4.9   Control the fan with a switch and regulator
4.10   Connect a i) 2-pin socket ii) 2-pin socket with switch control
4.11   Control one lamp with 2 switches (Staircase wiring)
4.12   Know Power consumption of various Appliances like
        1. Tungsten Lamp
        2. CFL Lamp

3. Fan.
4. Fluorescent lamps (Tube Lights).
5. Air cooler
6. Water heater,
7. Geiser
8. Electric Iron

4.13   Estimate the total connected load
4.14   Study of inverter/UPS wiring
4.15   Electrical estimation and costing
4.16   Study of 3-phase system

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competencies	Key Competency
1	Fixing of scaffolding	• Measuring lengths of props accurately • Fixing braces at required locations correctly to support various other scaffolding members • Choosing suitable size of members to support load coming over the scaffolding	• Measuring lengths of props accurately • Choosing suitable size of members to support load coming over the scaffolding
2	Positioning of form work	• Adjusting the lengths of props correctly to support the weight of RCC elements • Fixing up of various elements of form work firmly to support the weight of RCC elements	• Fixing up of various elements of form work firmly to support the weight of RCC elements
3	Bar Bending of steel reinforcement	• Cutting of rods to the suitable lengths correctly • Maintaining the angle of cranking correctly • Maintaining required spacing of rods as per the design and drawings provided	• Cutting of rods to the suitable lengths correctly • Maintaining the angle of cranking correctly
4	Plumbing Exercises	• Using appropriate tools • Selection of suitable pipe specials • Making connections to various sanitary installations	• Making connections to various sanitary installations
5	Electrical Exercises	• Adopting suitable type of electrical fixtures for intended usage • Using suitable material in required quantities for making earthling for an electrical installation	• Using suitable material in required quantities for making earthling for an electrical installation

COURSE CONTENT

1. **Carpentry**
   a. Erection of Scaffolding Material
   b. Position of Shuttering
   c. Fixing of form work.

2. **Bar Bending of steel reinforcement**
   Preparation of bar bending schedule
   (a) Bar bending with bar bending schedule
   (b) Method of bar bending for Earthquake resistant structures
   (c) Filed visit to automated bar bending

3. **Plumbing exercises**
   a. Thread cutting on GI/PVC pipes
   b. Assembling of pipe lines for toilet with two taps, shower and wash basin
   c. Fixing of floor traps, gully traps, water closet, drain pipes
   d. Laying stoneware/PVC pipes and construction of inspection chambers

4. **Electrical Exercises**
   i. Identity various electrical accessories
   ii. Identify line, neutral and earth terminals in power sockets and power plugs
   iii. Measure the AC voltage between line and neutral using DMM
   iv. Study of earthing and earth pit
   v. Study of different wiring systems
      1. Open conduit system
      2. Concealed conduit system
   vi. Measurement of the following using DMM
      1. AC Voltage
      2. DC Voltage (Battery)
      3. AC Current (Through a lamp/heater)
      4. Check continuity
      5. Resistance
   vii. Connecting a fuse in the main circuit
   viii. Controlling the lamp using a switch
   ix. Controlling the fan with a switch and regulator
   x. Connect a i) 2-pin socket ii) 2-pin socket with switch control
   xi. Control one lamp with 2 switches (Staircase wiring)
   xii. Study of inverter/UPS wiring
   xiii. Electrical estimation and costing
   xiv. Study of 3-phase system

STRUCTURAL ENGINEERING DRAWING

Subject Title   :   **Structural Engineering Drawing**
Subject Code   :   **C-607**
Periods per Week   :   **06**
Periods per Semester :   **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Structural Planning and marking of Frame components	09	04	01	-
2.	R.C.C. Drawings	42	28	02	01
3.	Reading and interpretation of Structural Drawings	09	04	01	-
4.	Steel Drawings	30	24	01	01
	Total	90	60	05	02

NOTE: All questions are to be answered. Part-A: 5X4=20 marks & Part-B: 2X20=40 marks

NOTE: Use HYSD bars for main reinforcement.

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0   Understand structural planning of a building and marking of Frame components
   1.1   Understand Positioning   and Orientation of columns
   1.2   Understand Positioning of beams
   1.3   Understand Spanning of slabs
   1.4   Explain layout of stairs
   1.5   List types of footings
   1.6   Prepare member reference scheme of given building following
       1. Column reference scheme and
       2. Grid reference scheme (Scheme recommended by IS:5525 – recommended for detailing of reinforced concrete works and SP-34)
       .
2.0   Draw the detailed working drawings of R.C.C.
   2.1   Draw the longitudinal section and cross sections of singly reinforced simply supported beam.

2.2 Prepare schedule of reinforcement and quantity of steel for singly reinforced simply supported beam

2.3 Draw the longitudinal and cross section of lintel cum sunshade

2.4 Prepare schedule of reinforcement and quantity of steel for lintel cum sunshade

2.5 Draw the plan and longitudinal section of one-way slab showing reinforcement details.

2.6 Prepare schedule of reinforcement and quantity of steel for one-way slab showing reinforcement details

2.7 Draw the details of reinforcement of two-way simply supported slab with corners not held down condition.

2.8 Draw top and bottom plan and section along short and long spans of two-way simply supported slab with corners not held down condition

2.9 Prepare schedule of reinforcement of two-way simply supported slab with corners not held down condition

2.10 Draw the details of reinforcement of two-way simply supported slab with corners held down conditions.

2.11 Draw top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary).

2.12 Draw the details of reinforcement of one-way continuous slab along with T-beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary)

2.13 Draw the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required.

2.14 Draw the reinforcement details of dog legged stair case (section only) repare schedule of reinforcement for one flight including landing.

3.0   Read and interpret the drawings

3.1 Understand the details of reinforcement from the given drawings

3.2 Fill in the details of reinforcement in a drawing.

4.0   Draw the detailed working drawings of steel structures

4.1 Draw the sectional plan, elevation and cross section of built up beam showing the details of curtailment of plates and connection details.

4.2 Draw the details of built up column with lacing and batten system showing the details of connections by welding (plan, elevation with three systems of lacing/batten systems)

4.3 Draw the details of steel column base with details of gusset plate. Plan, section parallel to web, section parallel to flange showing the connections with welded joints.

4.4 Draw the details of Fan roof truss with angular and tubular sections along with details of connections at ridge, heel, bottom chord and roof coverings (welded connections).

4.5 Draw the details of reinforcement of frame designed as earth quake resistant structure.

COURSE CONTENT

1.   a) Draw the position of columns, beams, slabs, stairs and footing in a given line diagram of building
     b) Prepare member reference scheme of given building following
        i)   Column reference scheme as per IS:696 code of practice for general engineering drawing.
        ii) Grid reference scheme as per IS:5525 – recommendations for detailing of reinforced concrete works.
2.   Singly reinforced simply supported rectangular beam.
3.   Lintel cum sunshade.
4.   Simply supported one-way slab.
5.   Two-way slab simply supported corners not held down.
6.   Two-way slab simply supported corners held down.
7.   One-way continuous slab and T-beam (with details of slab and T-beam)
8.   Column with square footing of uniform thickness.
9.   Stair case – stairs spanning longitudinally (Dog legged stair case)
10. Built up beam with two cover plates with details of curtailment of plates.
11. Built up column with lacing and battening systems.
12. Gusseted column base (with welded connections),
13. Fan roof truss – 8 m span with angular and tubular sections connected by welding.
14. Frame showing the details of reinforcement for earth quake resistant structures.

REFERENCE BOOKS
1. Designing and detailing hand book SP-34

CONSTRUCTION TECHNOLOGY PRACTICE

Subject Title   :   **Construction Technology Practice**
Subject Code   :   **CE-608**
Periods/ Week   :   **03**
Periods/Semester   :   **45**

TIME SCHEDULE

SI.No	List of Experiments	No. of periods
	Tests on Road Aggregate	
1	Specific Gravity of fine and coarse aggregate	
2	Impact value of coarse aggregate	
3	Crushing value of coarse aggregate	15
4	Abrasion value of coarse aggregate	
5	Flakiness Index of coarse aggregate	
6	Elongation Index of coarse aggregate	
	Tests on Concrete	
7	Slump test on concrete	
	(a) Study the changes in workability by adding cement paste to poorly workable concrete	
	(b) Study the changes in workability by adding dry cement to poorly workable concrete	
8	Compaction factor test on concrete	
	(a) Study the changes in compactor of a poorly workable concrete by admixtures	20
	(b) Study the methods of enhancing workability of concrete without using any admixtures	
9	Casting of Cement concrete cubes	
10	Testing of cement concrete cubes for compression	
	(a) Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water	

	(b) Compare the compressive strengths of concrete cubes of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate	
11	Split Tensile Strength of concrete	
12	Design mix of concrete proportion	
	Non-destructive tests on concrete	5
13	(a) Surface hardness test(Rebound hammer)	
14	(b) Ultrasonic test	
	Tests on Soil	10
15	Sieve Analysis – Classification of soil	
16	Field Density of soil(Sand Replacement Method)	
17	Proctor Compaction Test	
	Total:	45

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 **Determine suitability of given sample of aggregate for road construction Specific Gravity of fine and coarse aggregate**

1.1 Study the importance of specific gravity of fine and coarse aggregate
1.2 State the range of specific gravity values for various naturally available fine and coarse aggregate
1.3 Use the apparatus required for conducting specific gravity test on both fine and coarse aggregate
1.4 Perform the specific gravity tests for both fine and coarse aggregate

Impact value of coarse aggregate

1.5 Study the significance of impact value of aggregate used for road construction
1.6 State the standards on impact value of aggregate used for various civil engineering works as per IS-383
1.7 Use the apparatus required for conducting impact test on aggregate
1.8 State the procedure for preparing the sample and no.of samples required for the given work
1.9 Explain the procedure for conducting impact test on aggregate
1.10 Perform impact test on given sample of coarse aggregate
1.11 Draw inferences by conducting impact test on different types of natural aggregate

Crushing value of coarse aggregate

1.12   Study the significance of crushing value of aggregate used for various civil engineering works

1.13   State the standards on crushing value of aggregate used for various civil engineering works as per IS-383

1.14   Use the apparatus required for conducting crushing test on aggregate

1.15   State the procedure for preparing the sample and no.of samples required for the given work

1.16   Explain the procedure for conducting crushing test on aggregate

1.17   Perform crushing test on given sample of coarse aggregate

1.18   Draw inferences by conducting crushing test on different types of natural aggregate

Abrasion value of coarse aggregate

1.19   Study the significance of abrasion value of aggregate used for various civil engineering works

1.20   State the standards on abrasion value of aggregate used for various civil engineering works as per IS-383

1.21   Use the apparatus required for conducting abrasion test on aggregate

1.22   State the procedure for preparing the sample and no.of samples required for the given work

1.23   Explain the procedure for conducting abrasion test on aggregate

1.24   Perform abrasion test on given sample of coarse aggregate

1.25   Draw inferences by conducting abrasion test on different types of natural aggregate

Flakiness Index of coarse aggregate

1.26   Study the significance of flakiness index of aggregate on strength and workability properties of concrete

1.27   State the standards on flakiness index of aggregate

1.28   Use the apparatus required for conducting flakiness index of coarse aggregate

1.29   Explain the procedure for conducting the flakiness index test on coarse aggregate

Elongation Index of coarse aggregate

1.30   Study the significance of elongation Index of aggregate on strength and workability properties of concrete

1.31   State the standards on elongation Index of aggregate

1.32   Use the apparatus required for conducting elongation Index of coarse aggregate

1.33   Explain the procedure for conducting the elongation Index test on coarse aggregate

2.1   Determine suitability of fresh and hardened concrete for the given conditions of workability and strength

2.2   Study the importance of workability on strength properties of concrete

2.3   State various types of tests used for measuring the workability of fresh concrete

2.4   State standards on workability of concrete used for different places of construction work

Slump cone test

2.5   Use apparatus required for conducting slump test

2.6   Explain the procedure for conducting slump test of workability

2.7   Perform slump test on the concrete made of given sample of ingredients

2.8   Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different elongation index

2.9   Draw inference from test results on slump test of workability of concrete made with coarse aggregate having different flakiness index

2.10 Compare the slumps of concrete made with gap graded coarse aggregate and well graded coarse aggregate
2.11 Study the changes in workability by adding cement paste to poorly workable concrete
2.12 Study the changes in workability by adding dry cement to poorly workable concrete

Compaction factor test

2.13 State the purpose of compaction of concrete
2.14 Use apparatus required for conducting compaction factor test
2.15 Explain the procedure for conducting compaction factor test of workability
2.16 Perform compaction factor test on the concrete made of given sample of ingredients
2.17 Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different elongation index values
2.18 Draw inference from test results on compaction factor test of workability of concrete made with coarse aggregate having different flakiness index values
2.19 Compare the compaction factors of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate
2.20 Study the changes in compactor of a poorly workable concrete by admixtures
2.21 Study the methods of enhancing workability of concrete without using any admixtures

Casting of Cement concrete cubes

2.22 Study the purpose of casting of concrete cubes
2.23 Use equipment required for casting of cement concrete cubes
2.24 Explain the procedure for casting concrete cubes
2.25 Cast the concrete cubes with given ingredients

Testing of cement concrete cubes for compression

2.26 Study the importance of testing concrete cubes
2.27 Use equipment required for conducting compression test concrete cubes
2.28 State the precautions to be taken for testing of concrete cubes
2.29 Explain the procedure for conducting compression test on concrete cubes
2.30 Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different elongation index values
2.31 Draw inference from test results on compressive strength of concrete cubes made with coarse aggregate having different flakiness index values
2.32 Compare the compressive strengths of concrete cubes of concrete made with gap graded coarse aggregate and that made with well graded coarse aggregate
2.33 Compare the compressive strengths of concrete cubes made and cured with potable water and concrete cubes made and cured with non-potable water

Split Tensile Strength of concrete

2.34 Study the importance of split tensile strength of concrete
2.35 Cast the concrete cylinders with given ingredients
2.36 Explain the procedure for conducting split tensile strength test on concrete cylinders
2.37 Perform split tensile strength test on concrete cylinder

Design mix of concrete proportion as per IS: 10262 - 2009

2.38 Study the various elements of design mix of concrete as per IS:10262-2009
2.39 Conduct tests to find specific gravity, bulk density and sieve analysis of aggregate for the preparation of design mix of concrete
2.40 Write the procedure for design mixing of concrete
2.41 Calculate the proportions of ingredients of concrete as per IS:10262-2009

2.42   Cast cubes of trail mixes to decide the proportion of concrete
2.43   Perform the compression tests on concrete cubes casted as per design mix
3.0   Understand the significance of various non-destructive tests on concrete
3.1   State the importance of non-destructive tests
3.2   State the apparatus/equipment required for the non-destructive tests
3.3   Explain the procedure for conducting non-destructive tests
3.4   Perform the non-destructive tests like Rebound hammer tests, ultrasonic tests on the given hardened concrete
3.5   Record the observations of tests
3.6   Draw the inferences from the test results
4.0   Determine various engineering properties of soils used for various Civil Engineering Activities

Sieve Analysis – Classification of soil

4.1   Study the classifications of various types of soils
4.2   Use apparatus required for conducting sieve analysis of soils
4.3   Explain the procedure for conducting sieve analysis of soils
4.4   Perform sieve analysis over a given soil sample

Atterberg Limits of Soil

4.5   Study the significance of Atterberg limits of soil in civil engineering activities
4.6   Study Atterberg limits of soils
4.7   Use apparatus required for conducting tests to determine Atterberg limits of soil
4.8   Explain the procedure for conducting Atterberg limits of soil
4.9   Perform tests to determine liquid limit, plastic limit, shrinkage limit and plasticity index of a given soil sample
4.10   Calculate the values of Atterberg limits of given soil sample from the observations of tests
4.11   Classify given soil sample based on sieve analysis and Atterberg limits

Field Density of soil (Sand Replacement Method)

4.12   Study the significance of field density of soil
4.13   Use the apparatus required for conducting field density of soil
4.14   Explain the procedure for conducting field density test on soil by sand replacement method
4.15   Perform field density test of soil by sand replacement method

Proctor Compaction Test

4.16   Study the significance of proctor compaction test
4.17   Use the apparatus required for conducting proctors compaction test
4.18   Explain the procedure for conducting proctor compaction test
4.19   Perform proctor compaction test over given sample of soil
4.20   Compare the observations of tests conducted on different types of soils
4.21   Draw the graph for proctor's compaction test
4.22   Calculate the values OMC and MDD of given soil sample from the observations of test

KEY Competencies to be achieved by the student

S. No	Experiment Title	Competencies	Key Competency
1	Specific Gravity of fine and coarse aggregate	• Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately • Record the observations accurately • Calculate the values correctly	• Take weights of empty pycnometer, pycnometer with water and pycnometer with aggregate accurately
2	Impact value of coarse aggregate	• Prepare of sample correctly • Weigh the cup and aggregate accurately • Count number of strokes accurately • Weigh residue retained on 2.36 mm sieve correctly	
3	Crushing value of coarse aggregate	• Prepare of sample correctly • Weigh the mould and aggregate accurately • Apply the load at required rate and to the required period accurately • Weigh residue retained on 2.36 mm sieve correctly	• Apply the load at required rate and to the required period accurately
4	Abrasion value of coarse aggregate	• Weigh the aggregate accurately • Count the required number of rotations correctly • Weigh residue retained on 1.70 mm sieve accurately	
5	Flakiness Index of coarse aggregate	• Arrangement of sieves in correct order • Weighing the aggregate passing through thickness gauge correctly •	
6	Elongation Index of coarse aggregate	• Arrange the sieves in correct order • Weigh the aggregate retaining over length gauge correctly	
7	Slump cone test on concrete	• Weigh the material accurately • Apply required no.of tampings for each layer of concrete • Measure the subsidence accurately	• Measure the subsidence accurately

8	Compaction factor test on concrete	• Weigh the material accurately • Weigh the mould and concrete accurately • Calculate the compactor factor correcly	•
9	Casting of Cement concrete cubes	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly • Cure the demoulded cubes to the required period	• Weigh the material accurately • Vibrate the concrete filled in moulds to the required time correctly
10	Testing of cement concrete cubes for compression	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the compressive strength accurately	• Apply the load at required rate correctly
11	Split Tensile Strength of concrete	• Apply the load at required rate correctly • Record the load at FAILURE accurately • Calculate the split tensile strength accurately	• Apply the load at required rate correctly • Calculate the split tensile strength accurately
12	Design mix of concrete proportion	• Calculate the proportions of material correctly • Weigh the ingredients of concrete accurately as per design mix calculations	• Calculate the proportions of material correctly
13	Non-destructive tests on concrete	• Applying the load at required rate as per procedure correctly • Calculating the strength of hardened concrete from graphs accurately	• Applying the load at required rate as per procedure correctly
14	Sieve Analysis – Classification of soil	• Weigh of residue in each sieve accurately	•
15	Field Density of soil(Sand Replacement Method)	• Calibrate the apparatus correctly • Weigh the samples accurately • Calculate the density accurately	• Calibrate the apparatus correctly • Weigh the samples accurately

16	Proctor Compaction Test	• Weigh the soil correctly • Measure the water accurately • Apply required no.of blows of compaction accurately • Record the observations correctly • Draw graph correctly	• Weigh the soil correctly • Measure the water accurately • Draw graph correctly

COURSE CONTENT

1. Tests on Road aggregate

    d. Specific Gravity of fine and coarse aggregate
    e. Impact value of coarse aggregate
    f. Crushing value of coarse aggregate
    g. Abrasion value of coarse aggregate
    h. Flakiness index of coarse aggregate
    i. Elongation index of coarse aggregate

2. Tests on concrete

    a. Workability test by Slump Cone Test
    b. Workability test by Compaction factor test
    c. Casting of Cement concrete cubes
    d. Testing of Cement concrete cubes for compression
    e. Split tensile strength of concrete
    f. Design mix of concrete proportion

3. Non-destructive tests on concrete

    a. Surface hardness test(Rebound hammer test)
    b. Ultrasonic Test

4. Tests on Soil

    a. Sieve analysis-classification of soil.
    b. Liquid limit and plastic limit
    c. Field density of soil (sand replacement method)
    d. Proctor Compaction Test

REFERENCE BOOKS

1. Concrete Technology – M.S. Shetty,
                 S. Chand & Company Ltd., New Delhi.
2. Concrete Technology(5/E) – M.L. Gambhir-TMH
3. Soils Mechanics – B.C. Punmia
4. Engineering Properties of soils and their measurement –
       Joseph E. Bowles – TMH

PROJECT WORK

Subject Title	:	**Project Work**
Subject Code	:	**CE-609**
Periods/Week	:	**07**
Periods/Semester	:	**105**

OBJECTIVES

1.1 Identifies different works to be carried out in the Project.
1.2 Collects data relevant to the project.
1.3 Carries out Site Surveys.
1.4 Selects the most efficient method from the available choices based on preliminary investigation.
1.5 Designs the required elements of the project as per standard practices.
1.6 Prepares working drawings for the project.
1.7 Estimates the cost of project, men, materials and equipment required.
1.8 Prepares schedule of time and sequence of operations.
1.9 Prepares project report.
1.10 Prepares C.P.M. Chart.
1.11 Collects the requirements to start a Small Enterprise/Industry under Self Employment Scheme.
1.12. Collects the necessary information to procure necessary finance, site and equipment.
1.13 Prepares the chart or model for each project.

COURSE CONTENT

Project work is intended to provide training in the solution of field engineering problems involving Surveying, Planning, drawing plans, designing, estimating and marking out of a building/highway/irrigation/public health project. Project work will also include the preparation of the feasibility report for any one type of enterprise under self – employment schemes.

Students shall be divided into groups of five each and shall be assigned a problem that calls for application of the knowledge he/she acquired in the course and also which involves some extra study of reference materials.
Problems

a) Planning of a Campus.
b) Building project.
c) Industrial complex
d) Irrigation project.
e) Rural Water Supply Scheme.
f) Sanitary Engineering Scheme.
g) Bridge project.
h) Low Cost Housing Scheme.
i) Design of framed structure type building by using a software package.
j) Set up of a small enterprise under self employment scheme.

Every student should prepare a project report and submit the same for assessment. Every student puts his share to the work in all the operations of the project. The end examination in Project work shall consist of power point presentation and Viva-voce test to be assessed by a panel of examiners comprising of an External examiner, the Head of Section, and member of staff who guided the project as Internal examiner.

Scheme of assessment

1)	Seminar	-	20 Marks
2)	Internal assessment	-	20 Marks
3)	Power point presentation & Viva – Voce	-	60 Marks (3x20)

Total		**100**