DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(FIRST YEAR)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-101	English - I	2	-	60	3	30	70	100
C-102	Engineering Mathematics – I	5	-	150	3	20	80	100
C-103	Engineering Physics	4	-	120	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	4	-	120	3	20	80	100
C-105	Surveying – 1	4	-	120	3	20	80	100
C-106	Engineering Mechanics	4	-	120	3	20	80	100
PRACTICAL SUBJECTS								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Physics Laboratory	-	3	90	3	20	30	50
C-109	Chemistry Laboratory	-			3	20	30	50
C-110	Information Technology Lab	-	4	120	3	40	60	100
C-111	Surveying Practical - I	-	4	120	3	40	60	100
-	Group Task / Seminar	-	2	60	-	-	-	-
	Total	**23**	**19**	**1260**	**-**	**290**	**710**	**1000**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(III SEMESTER)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-301	English -II	3	-	45	3	20	80	100
C-302	Engineering Mathematics –II	4	-	60	3	20	80	100
C-303	Strength of Materials & Theory of Structures	6	-	90	3	20	80	100
C-304	Hydraulics	5	-	75	3	20	80	100
C-305	Surveying-II	4	-	60	3	20	80	100
C-306	Construction Materials	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-307	Civil Engineering Drawing-I	-	4	60	3	40	60	100
C-308	Material Testing lab	-	3	45	3	40	60	100
C-309	Surveying Practical-II	-	6	90	3	40	60	100
C-310	Hydraulics Laboratory	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**280**	**720**	**1000**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(IV SEMESTER)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-401	English-III	3	-	45	3	20	80	100
C-402	R.C. Structures	6	-	90	3	20	80	100
C-403	Irrigation Engineering	5	-	75	3	20	80	100
C-404	Quantity Surveying	6	-	90	3	20	80	100
C-405	Environmental Engineering - I	4	-	60	3	20	80	100
C-406	Construction Practice	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-407	Civil Engg Drawing-II	-	6	90	3	40	60	100
C-408	CAD Lab-I	-	6	90	3	40	60	100
	Group Task / Seminar	-	2	30	-	-	-	-
	Total	**28**	**14**	**630**	**-**	**200**	**600**	**800**

C-501 INDUSTRIAL TRAINING
(Practical Training)

<u>V SEMESTER</u>

<u>Scheme of evaluation:</u>

S.No	Subject	Duration	Items	Max Marks	Remarks
1	Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3. Training Report		
			a) Log Book	30	
			b) Report	30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks is 50%.A candidate failing to secure the minimum marks should complete it at his own expances.No apprenticeship training stipend is payable in such case.

During Industrial training the candidate shall put in a minimum of 90%attendence.

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(VI Semester)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-601	English-IV	2	-	30	3	20	30	50
C-602	Steel Structures	5	-	75	3	20	80	100
C-603	Construction & Quality Management	5	-	75	3	20	80	100
C-604	Transportation Engineering	6	-	90	3	20	80	100
C-605	Environmental Engineering - II	4	-	60	3	20	80	100
C-606	**ELECTIVES** (A) Low Cost Housing, Rural Water Supply And Sanitation (B) Geo Technical Engineering (C) Maintenance of Buildings	5	-	75	3	20	80	100
PRACTICAL SUBJECTS								
C-607	Structural Engineering Drawing	-	4	60	3	40	60	100
C-608	CAD Lab - II	-	6	90	3	40	60	100
C-609	Advanced Surveying Practice	-	3	45	3	40	60	100
	Group Task / Seminar	-	2	30	-	-	-	-
	Total	**27**	**15**	**630**	**-**	**240**	**610**	**850**

1ST YEAR

ENGLISH - I

Subject Title : English - I

Subject code : C-101

Periods / Week : 2

Periods / Year : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of marks	No. of Short questions	No. of Essay questions
1.	Functional English	10	13	1	1
2.	Situational Grammar	19	31	7	1
3.	The Art of Reading	18	33	1	3
4.	The Craft of Writing	13	33	1	3
	TOTAL	**60**	**110**	**10**	**8**

INTRODUCTION:

Globalisation has made English language the need of the hour. Indian professionals are in great demand around the world. In this backdrop, English is felt as a bridge to make Polytechnic students employable soon after obtaining their Diploma Certificate.

In C-09 curriculum, the focus is on enhancing the students, communicative abilities as well as job-ready skills.

OBJECTIVES:

On completion of this course, the students should be able to

- Become communicatively competent
- Write and speak English confidently
- Read, listen and understand all kinds of communication
- Learn the modern methods of communication such as sending receiving emails
- Use English at social milieu or at work place

COURSE CONTENTS:

1. Functional English

- Need analysis
- Using a dictionary
- Introducing self / others
- Describing objects
- Vocabulary building
- Sounds and syllables
- Sentence structures

2. Situational Grammar

- Tense and Time
- Present, Past and Future Tenses
- Concord
- Yes/No, Wh-questions and Question Tags
- Voice
- Reported Speech
- Linkers
- Error Analysis

3. Art of Reading

- Note Taking
- Note Making and Summarising
- Preparing for Examination
- Enhancing Vocabulary through reading
- Reading for Pleasure
- Reading Strategies
- Drawing Inferences

4. Craft of Writing

- Mechanics of Writing
- Paragraph Writing
- Persuasive Writing
- Effective Correspondence
- E-mail
- Resume

ENGINEERING MATHEMATICS – I
(Common Subject)

Subject title   :   **Engineering Mathematics -I**
Subject code   :   **C - 102**
Periods per week :   **05**
Total periods per Year : **150**

TIME SCHEDULE

S.No.	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	**Unit- I -** Bridging of fundamentals In mathematics	12	06	2	-
2	**Unit -II-Algebra** Matrices	15	10	-	1
3	Partial Fractions	05	03	1	-
4	**Unit-III-Trigonometry** Compound Angles	05	03	1	-
5.	Multiple and Sub-multiple angles	05	03	1	-
6.	Transformations	06	05	-	$\frac{1}{2}$
7	Inverse Trigonometric Functions	05	05	-	$\frac{1}{2}$
8	Trigonometric Equations	05	05	-	$\frac{1}{2}$
9.	Properties of Triangles and Solution of Triangles	08	05	-	$\frac{1}{2}$
10	Complex Numbers	06	03	1	-
11	**Unit- IV Co- ordinate Geometry** Straight Lines	02	03	1	-
12	Circles	05	03	1	-
13	Elements of Conics	01	00	-	
14	Parabola	05	05	-	$\frac{1}{2}$
15	Ellipse	05	05	-	$\frac{1}{2}$
16	Hyperbola	05	05	-	$\frac{1}{2}$
17	Three Dimensional Geometry	08	05	-	$\frac{1}{2}$
18	*Unit-V: Differential Calculus* Limits	05	03	1	-
19	Methods of Differentiation	20	13	1	1
20	**Unit-VI Applications of the Derivative** Geometrical Applications	06	05	-	$\frac{1}{2}$
21	Physical Applications	06	05	-	$\frac{1}{2}$

22	Maxima and Minima	06	05	-	$\frac{1}{2}$
23	Errors and Approximations	04	05	-	$\frac{1}{2}$
	Total	**150**	**110**	**10**	**8**

Objectives:

Unit-1.Bridging of fundamentals in Mathematics:

1.1 Explain the bracket operations such as $a+\{b+(c-d)\}, \frac{-1}{2}m-\{-\frac{1}{2}m-\overline{m-n}\}$ etc.

1.2 Explain the ratios and properties such as componendo, dividendo, Componendo and dividendo rules such as

$\frac{a}{b}=\frac{c}{d} \Rightarrow \frac{a+b}{b}=\frac{c+d}{d}$ (componendo) $\frac{a}{b}=\frac{c}{d} \Rightarrow \frac{a-b}{b}=\frac{c-d}{d}$ (dividendo)

$\frac{a}{b}=\frac{c}{d} \Rightarrow \frac{a+b}{a-b}=\frac{c+d}{c-d}$ (componendo and dividendo)

Also explain the variation concept (direct and inverse) such as

x varies as y $\Leftrightarrow \frac{x}{y}=$ constant., x varies inversely as y $\Leftrightarrow$ xy=constant. Solve simple problems.

1.3. Explain Literal Values and Literal Coefficients. Solve simple problems such as $p = 2a-3b, q = 3b-4c, r = 5a-2b \ find \ 3p+2q-5r.$

multiply p with q and divide p by q when $p = 2x^2+3x+4 \ and \ q = 3x-1$

1.4. Explain the procedure of Handling Vulgar fractions such as

$\frac{\frac{x}{2x-1}+\frac{2x+4}{x-2}}{1-\frac{x+3}{2x-4}}$, $\frac{4}{1-\frac{1}{x}}+\frac{2}{2-\frac{3}{y}}$ *etc.*

1.4.1 Explain the formulae for basic algebraic identities in the form of forward and backward applications like

$(a+b)^2 = a^2+b^2+2ab$ and also $a^2+b^2-ab=(a+b)^2-3ab$ or $(a-b)^2+ab$.

And also express x^2+3x+5 *in the form of* $\left(x+\frac{3}{2}\right)^2+\left(\frac{\sqrt{11}}{2}\right)^2$ *etc.*

1.6 Explain the functional notation *y = f(x), z = f(x,y)* and *u = f(x,y,z)* with simple illustrative examples and their evaluation. Also explain the definition of a function classically as ***f : A→ B***, Domain ,Range , interval as subset of set of real numbers.

1.7 Explain the polynomials of Second, Third and fourth degree definitions, rational functions with arithmetic operations on them, Homogeneous functions, symmetric expressions and Σ notations with suitable examples in each case.

1.8 Explain surds and rationalizing factors with suitable simple examples.

1.9 Explain logarithms with basic properties.

1.10 Explain solving a quadratic equation by factorization and formula methods and

10

solving fourth and third degree equations using remainder theorem with simple constructed examples.

1.11 State the definitions of $\lfloor n, \ ^n\text{p}_r, \ ^nC_r$.

1.12 State Binomial expansions of the type $(x \pm a)^n, (1 \pm x)^{-1}, (1 \pm x)^{-2}, (1 \pm x)^{-3}$.

1.13 Explain the exponential constant e, exponential function, exponential series, Logarithmic Series, and also define Hyperbolic and inverse Hyperbolic functions with useful identities.

1.14 Define the basic Trigonometric ratios, their properties and allied angles formulae.

1.15 Explain two dimensional co-ordinate system, distance and ratio formulae centroid and the meaning of the graph of a function with suitable examples.

Unit-II. Algebra
Matrices

2.1 Definition of a matrix, various types of matrices with examples, define the order of a matrix- define square matrix and 3rd order square matrix with examples.

2.2 Define sum, scalar multiplication and product of matrices, algebra of matrices (associative, distributive, commutative properties) with examples and counter examples.

2.3 Define the transpose of a matrix, symmetry and non -symmetry of matrices, resolving a square matrix in to a sum of a symmetric and non- symmetric matrices-Examples in all cases.

2.4 Define minor, cofactor of an element of a 3x3 square matrix as determinant of 2x2 square matrix with examples. Define and determine the adjoint of a square matrix give examples.

2.5 Define determinant of a 3x3 matrix- Laplacian expansion with examples. Define singular and non singular matrices.

2.6 Define the multiplicative inverse of a 3x3 matrix, relation between the Adjoint and inverse leading to the formula A^{-1} = adj A/ det A.(proof not necessary) with examples.

2.7 System of 3 linear equations in 3 unknowns, matrix representation, solution by matrix inversion method and Cramer's rule-examples

2.8 Elementary row and column operations on a 3x3 matrix-examples, Gauss-Jordan method to solve a system of 3 linear equations in 3 unknowns with examples.

2.9 Row operations for evaluating the determinant of a 3x3 matrix with simple illustrative examples. Also state properties of determinants with illustrative examples.

3. Partial Fractions

3.1 Define rational, proper and improper fractions of functions.

3.2 Explain the Procedure of resolving rational fractions of the type mentioned below into partial fractions.

i) $\dfrac{f(x)}{(x+a)(x+b)(x+c)}$

$f(x)$

ii) $\dfrac{}{(x+a)^2(x+b)(x+c)}$

iii) $\dfrac{f(x)}{(x^2+a)(x+b)}$

iv) $\dfrac{f(x)}{(x+a)(x^2+b)^2}$

Unit-III Trigonometry

4.0 Compound Angles

4.1   Define compound angles, State the formulas of *Sin(A±B), Cos(A±B), tan(A±B) and cot(A±B),* simple examples, derive the values of *sin15⁰ cos15⁰, sin75⁰, cos75⁰, tan 15⁰, tan75⁰* etc.

4.2   Derive identities like *sin(A+B) sin(A-B) = sin² A –sin² B* etc.
Solve simple problems on compound angles.

5.0 Multiple and Sub multiple Angles

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

5.2   Derive useful allied formulas like sinA=√*(1-cos2A)/2* etc

5.3   Provide examples on the above formulae

6.0 Transformations

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

6.2   Apply these formulae to sum or difference or product of three or more terms and solve problems.

7.0 Inverse Trigonometric Functions

7.1   Understand the concept of the inverse of a trigonometric function by selecting an appropriate domain and range. Define inverses of six trigonometric functions along with their domains and ranges.

7.2   To derive relations between inverse trigonometric functions so that given *A= sin⁻¹x,* to Express angle *A* in terms of other inverse trigonometric functions- with examples.

7.3   State various properties of inverse trigonometric functions and identities like *sin⁻¹x+cos⁻¹ x = π/2* etc·Derive formulae like *tan⁻¹ x + tan⁻¹ y = tan⁻¹ ((x+y)/(1-xy))etc.,* and solve simple problems.

8.0 Trigonometric Equations

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

8.2   To 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.

9.0 Properties and Solutions of Triangles

9.1   To state sine rule, cosine rule, tangent rule and projection rule.

9.2   Give the formulas 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.

9.3   Give various formulae for the area of a triangle. Solve problems on the above formulae.

9.4   Explain what is meant by solving a triangle; solve a triangle given (i) three sides, (ii) two sides and an included angles, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles.

10. 0 Complex numbers:

10.1   Give the definition of a complex number, its modulus and Conjugate of a complex number and their properties.

10.2   Define the arithmetic operations on Complex numbers with examples.

10.3   Define amplitude of a complex number and give the modulus-amplitude (polar) form ,Exponential (Euler)form of a complex number - illustrative examples on all the above.

10.4   State DeMoivre's Theorem (proof not necessary) and its applications to complex numbers eg. Finding the roots, powers, simplifications of a complex number with illustrative examples.

Unit-IV Coordinate Geometry

11.0 Locus, Translation of axes and Straight lines

11.1   Explain the concepts of locus of a point, shifting of origin(translation of axes) with illustrative examples.

11.2   Provide equations of a straight line in various forms, explain the slope, angle between two lines, point of intersection of lines, perpendicular distance from a point to a line, distance between two parallel lines, provide examples.

12.0 Circles

12.1   Define a circle, provide circle equation given (i) center and radius, (ii) given two ends of a diameter with examples.

12.2   State the general equation of a circle and explain the procedure to find the centre, radius from it with examples.

12.3   Problems on finding the equation of circle passing through three given points.

12.4 Define the tangent and normal at a point on the circle and problems relating to finding their equations (Derivation of general Equations not necessary.). Define the pole and polar of a circle and find the pole of a line and polar of a point w.r.t. a circle.(Derivation of general Equations not necessary)-Simple examples only.

13.0 Elements of Conics

13.1. Define a conic, explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic.

13.2 Find the Equation of a Conic, given its focus, eccentricity and directrix.

14.0 Parabola
14.1 Derive the standard equation of a parabola with vertex at origin and one of the coordinate axes as its axis (four forms) and also the standard forms with translation of axes (shifting of origin, vertex at *(h,k)* and axis parallel to one of the coordinate axes).

14.2 Given the equation of parabola, explain how to reduce it to standard form and find its vertex, focus, directrix, axis, latus rectum etc.-illustrative examples.

14.3 To find the equation of a parabola given any two of focus, vertex and directrix-examples

14.4 To find the equation of a parabola passing through 3 given points.

14.5 Applications of parabola to practical problems.

15.0 Ellipse

15.1 Derive the standard equation of an ellipse , Types of ellipse with (i) center at origin, coordinate axes as axes and (ii) center at *(h,k)* and axes parallel to coordinate axes.

15.2. Find the foci,centere, vertices, axes, directrices, latera recta for an ellipse in standard form and Their length and prove that sum of focal distances from any point on the ellipse is equal to length of major axis-solve problems.

15.3 To find the equation of an ellipse (i) given focus, eccentricity and equation of directrix and (ii) in standard form and passing through two given points.

15.4 Applications of ellipse to practical problems-simple cases.

16.0 Hyperbola
16.1 Derive the standard equation of hyperbola, explain different forms, define rectangular and conjugate hyperbola.

16.2 Mention the properties of hyperbola with examples.

16.3 To find the equation of a hyperbola given its (i) focus, directrix and eccentricity, (ii) asymptotes.

16.4 To find the centre, foci, vertices, axes, directrices, latera recta and the length of latus rectum given equation of a hyperbola in standard form.

17.0 Three Dimensional Geometry

17.1 Explain the three dimensional coordinate system.

17.2 Explain the distance between two points with problems.

17.3 Explain the ratio formula with examples.

17.4 State the formulae to find the centroid of a triangle and the tetrahedron with simple examples.

17.5 Define the direction cosines and direction ratios of a line, angle between two lines with Illustrative examples.

17.6 State the general equation of a plane, its intercept form, plane passing through a given point and perpendicular to a line whose direction ratios are given-angle between two planes -simple illustrative examples and problems

Unit-V Differential Calculus

18.0 Limit and Continuity

18.1 Explain the concept of limit and meaning of $\lim\limits_{x \to a} f(x) = l$ and State the properties of limits .

18.2 Mention the Standard limits $\lim\limits_{x \to a} \dfrac{x^n - a^n}{x - a}$, $\dfrac{Sinx}{x}, \dfrac{Tanx}{x}, \dfrac{a^x - 1}{x}, \dfrac{e^x - 1}{x}, (1+x)^{\frac{1}{x}} \, as \, x \to o$ and

$also \; \lim\limits_{x \to \infty} \left(1 + \dfrac{1}{x}\right)^x$ (All without proofs) with illustrative examples applying the above and

also evaluate the limits of the type $\lim\limits_{x \to a} \dfrac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}, \lim\limits_{x \to \infty} \dfrac{f(x)}{g(x)}$.

18.3 Explain the concept of continuity of a function at a point and in an interval. Some examples whether a given function is continuous or not can be mentioned.

19.0 Methods of differentiation

19.1 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 use the appropriate standard notations to denote the derivative of a function. Mention the significance of derivative in scientific and engineering applications.

19.2 Find the derivatives of elementary functions like x^n, $a^x, e^x, Logx$,Cosx, Sinx, Tanx, Secx,Cosecx and Cotx using the first principles and also find the derivatives of simple functions from the first principle .

19.3 State the rules of differentiation of Sum, Difference Scalar multiplication, Product and Quotient of functions with illustrative and simple examples .

19.4 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as
        i) $2t^2 + 3/\sqrt{t}$
        ii) $x^2 \, sin^2 x$
        iii) $x/\sqrt{x^2 + 1}$
        iv)   log [sin (cos x)].

19.5 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric   transformations.

19.6 Explain the method of differentiation of a function with respect to another function and also Differentiation of Parametric functions with illustrative examples.

19.7   Explain the procedure of differentiating of hyperbolic and implicit functions with examples.

19.8.   Explain the need of taking logarithms for differentiating some functions with illustrative examples like $[f(x)]^{g(x)}$.

19.9.   Explain the concept of successive differentiation –derivatives of second   and higher order-examples.

19.10   Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple illustrative examples.

19.11   Explain the definition of Homogenous function of degree n and Statement of Euler's Theorem
        for Homogeneous functions with applications to simple problems.

Unit-VI Applications of the Derivative

20.0 Geometrical Applications of Derivatives

20.1   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.

20.2.   To find the tangent and normal to the curve $y=f(x)$ at any point on the curve using the slope found using the derivative.

20.3.   Define the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve
        $y=f(x)$ – Provide formulae and examples.

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

21.0 Physical Applications of Derivatives

21.1   Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

21.2   Explain the derivative as a rate measurer in the problems where the quantities like volumes areas vary with respect time- illustrative examples.

22.0 Derivatives to find extreme values

22.1   Define the concept of increasing and decreasing functions. Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

22.2   Explain the procedure to find the extreme values (maxima or minima) of a function of single variable-simple problems yielding maxima and minima.

22.3   Solve problems on maxima and minima in applications like finding areas, volumes etc.

23.0. Derivatives to find Errors and Approximations

23.1 Use the definition of derivative to find the approximate values of a function of single variable and to find the errors in dependent or independent variables as the case may be-appropriate applications.

23.2 Provide formulae for relative error and percentage error in evaluating the dependent variable given the corresponding errors in independent variable. Provide simple examples with functions of one variable.

COURSE CONTENT

UNIT – I

1. **Bridging of fundamentals in mathematics**:
    Bracket operations-examples-Ratio and Proportion, Variation-examples-Literal values-examples- Literal coefficients-examples-Identities-examples with forward and backward applications-Polynomials-examples-Rational functions-examples-Homogenous expressions-examples-Symmetrical expressions-examples-Functional notation-Exponential, logarithmic, hyperbolic functions and their series—Elementary combinatorial concepts -examples -Binomial expansion- examples -Vulgar fractions – examples- Elementary theory of equations-examples-Surds- examples-Logarithms-   examples-Trigonometric ratios-examples-Basic concepts of coordinate geometry- examples.

UNIT-II
2.Matrices:

Matrices of 3rd order: Definition of a matrix-types of matrices-examples-algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion-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 and column operations on matrices and determinants-Gauss-Jordan method to solve a system of equations. **.**

3. **Partial Fractions** : Procedure for resolving rational functions of the types mentioned below in to into partial fractions.

i) $$\frac{f(x)}{(x+a)(x+b)(x+c)}$$

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

$$f(x)$$

iii) $\dfrac{\quad\quad\quad}{(x^2+a)(x+b)}$

iv) $\dfrac{f(x)}{(x+a)(x^2+b)^2}$

UNIT –III

Trigonometry

4   Compound angles-Formulas of *Sin(A±B), cos(A±B), tan(A±B),cot(A±B),* and related identities with problems.

5   Multiple and sub multiple angles-trigonometric ratios of multiple angles *2A,3A* and submultiple angle *A/2* - problems.

6   Transformations of products into sums or differences and vice versa-simple problems

7   Inverse trigonometric functions-definition, domains and ranges-basic properties-problems.

8   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 multiple angles and usage of transformations- problems.

9   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.

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

UNIT-IV

Coordinate geometry

11   Concepts of locus, change of axes- various forms of straight lines – angle between lines, perpendicular distance from a point, distance between parallel lines-examples.

12   Circle-definition-Circle equation given center and radius- circle equation with given diameter-general equation-finding center, radius-tangent, normal, pole and polar of a circle.

13   Definition of a conic- focus, directrix and eccentricity-finding the equation of a conic given focus, directrix and eccentricity

14   Parabola- Standard forms- finding focus, vertex, directrix etc. of a parabola-simple applications-

15   Ellipse- Standard forms- finding foci, vertices, directrices etc. of an ellipse-properties of ellipse- simple application problems.

16   Hyperbola- Standard forms- finding foci, vertices, directrices etc. of a hyperbola-properties of hyperbola- simple problems

17   Three dimensional geometry: Coordinate system-distance between two points-ratio formula-direction cosines and ratios of a line- angle between two lines-centroid of a triangle and tetrahedron-simple equation of a plane-general form-angle between planes.

UNIT-V

Differential Calculus

18   Concept of Limit- Definition- Properties of Limits and Standard Limits - Simple Problems-Continuity of a function at a point- Simple Examples only.
19   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 equations, Derivative of hyperbolic, Implicit functions Functions, Logarthmic Differentiation –problems in each case.Successive differentiation- examples-.Partial differentiation, Euler's Theorem-simple problems.

UNIT-VI

Applications of the Derivative:

20   Geometrical meaning of the derivative,equations of Tangentand normal to acurve at any point. The lengths of Tangent, Normal, Subtangent and Subnormal to the curve at any point .Angle between the curves- problems.
21   Physical applications of the derivative –velocity, acceleration, derivative as a rate Measure –Problems.
22   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.
23   Applications of derivative in finding errors and approximations of functions and simple problems.

REFERENCE:

1) **Text book of Engineering Mathematics –I** by G.Srinagesh, and others – FALCON publishers
2) **Text book of Engineering Mathematics –I** by Dr.J.Sairam and others – UNI-TECH SERIES.
3) **A Text book of intermediate Mathematics –I & II** by Telugu Academy.
4) **Differential Calculus by ManicavachagomPillai**
5) **Elementary Algebra by Hall & Knight.**
6) **Text book of Engineering Mathematics –I** by Radiant publishers.
7) **Trigonometry** By S.L Loney

ENGINEERING PHYSICS

Subject Title : **Engineering Physics**
Subject Code : **C -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	10	13	1	1
3.	Kinematics	13	13	1	1
4.	Friction	08	03	1	-
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	11	13	1	1
7.	Heat & Thermodynamics	13	13	1	1
8.	Sound	11	13	1	1
9.	Properties of matter	14	13	1	1
10	Electricity & magnetism	14	13	1	1
11.	Modern Physics	08	03	1	
	Total:	**120**	**110**	**10**	**8**

OBJECTIVES

1.0   UNITS AND DIMENSIONS

1.1   Introduction to units
1.2   Define Physical quantity, fundamental physical quantities and 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   Rules of writing S.I. units
1.8   State advantages of SI units
1.9   Define Dimensions and Dimensional formulae
1.10   Derive dimensional formulae of physical quantities
1.11   List dimensional constants and dimensionless quantities
1.12   State the principle of Homogeneity of Dimensions

1.13 Explain the applications of Dimensional Analysis with examples
1.14 State the limitations of dimensional analysis
1.15 Solve problems

2.0 ELEMENTS OF VECTORS

2.1 Introduction to Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Types of Vectors (Proper Vector, Null Vector, Unit Vector, Equal Vectors, Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).
2.6 Explain addition and subtraction of vectors
2.7 Represent a vector in space using unit vectors (I, j, k)
2.8 Resolution of vectors
2.9 Resultant of the vectors by component method
2.10 State parallelogram law of vectors and illustrations
2.11 Derive formula for resultant (Magnitude and direction)
2.12 State and Explain triangle law of vectors
2.13 State and Explain polygon law of vectors
2.14 Define Dot product of two vectors with examples (Work done, Gravitational P.E)
2.15 Mention the properties of Dot product
2.16 Define Cross products of two vectors with example (Torque ,Linear velocity)
2.17 Mention the properties of Cross product.
2.18 Solve problems

3.0 KINEMATICS

3.1 Recapitulation of equations of motion in a straight line
3.2 Define acceleration due to gravity
3.3 Derive expressions for Maximum Height, time of ascent, time of descent, time of flight and velocity on reaching the point of projection
3.4 Derivation for height of a tower when a body projected vertically upwards from the top
3.5 Define projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derivation for the path of a horizontal projectile
3.8 Explain oblique projection
3.9 Derivation for the path of a oblique projectile
3.10 Derive formulae for maximum height, time of flight and Horizontal Range of a projectile, maximum range in oblique projection
3.11 Derive formula for magnitude and direction of resultant velocity in oblique projection
3.12 Solve problems

4.0   FRICTION

4.1   Introduction to friction
4.2   Examples of friction in daily life
4.3   Definition of friction
4.4   Types of friction
4.5   Concept of Normal reaction
4.6   State laws of static friction
4.7   State laws of kinetic friction
4.8   Define coefficients of friction
4.9   Angle of friction w.r.t. rough horizontal surface
4.10   Derivations for displacement and time taken to come to rest over a rough horizontal surface and work done by frictional force
4.11   Define Angle of repose
4.12   Explain Motion of a body on a rough inclined planes
4.13   Derive expressions for acceleration of a body on a rough inclined plane (UP &DOWN)
4.14   Derive expressions for acceleration of a body on a smooth inclined plane (UP &DOWN)
4.15   List the Advantages and Disadvantages of friction
4.16   Mention the methods of minimizing friction
4.17   Solve problems

5.0.   WORK, POWER AND ENERGY

5.1   Define work
5.2   State SI units, dimensional formula for work
5.3   Explain the concept of power
5.4   Define power
5.5   State SI units, dimensional formula for power
5.6   Define energy
5.7   State SI units, dimensional formula for energy
5.8   Define potential energy
5.9   Derive the expression for Potential energy, with examples
5.10   Define kinetic energy
5.11   Derive the expression for kinetic energy, with examples
5.12   Work Energy theorem
5.13   Relation between Kinetic energy and momentum
5.14   State the law of conservation of energy and verify in the case of freely falling body
5.15   Law of conservation of energy in the case of simple pendulum-theory only
5.16   Define conventional and non conventional energy sources with examples
5.17   Solve problems

6.0   SIMPLE HARMONIC MOTION

6.1   Define S. H. M

6.2   State the conditions of S. H. M
6.3   Give examples of S. H. M
6.4   Derive the equation for S H M as projection of particle executing uniform circular motion
6.5   Derive expression for displacement
6.6   Derive expression for velocity
6.7   Derive expression for acceleration
6.8   Derive expression for period and frequency of S H M
6.9   Define phase of S H M
6.10   Derive expression for period of simple pendulum
6.11   Experiment for determination of acceleration due to gravity using simple pendulum.
6.12   Seconds pendulum
6.13   Solve problems

7.0   HEAT AND THERMODYNAMICS

7.1   Introduction to expansion of gases
7.2   Explain Boyle' s law
7.3   Experimental verification of Boyle's law
7.4   Explain absolute scale of temperature
7.5   State Charles laws
7.6   Derive ideal gas equation
7.7   Define gas constant and Universal gas constant
7.8   Explain why universal gas constant is same for all gases
7.9   State SI unit and value of universal gas constant
7.10   State the gas equation in terms of density
7.11   Differences between r and R
7.12   Concept of internal energy
7.13   Definition of external work
7.14   Calculate external work done by a gas
7.15   Explain Isothermal process and Adiabatic process
7.16   State laws of thermodynamics
7.17   Define specific heats & molar specific heats of a gas
7.18   Derive relation C_p-C_v = R
7.19   Solve problems

8.0   SOUND

8.1   Introduction to sound
8.2   Distinguish between musical sound and noise
8.3   Explain noise pollution and state SI unit for noise
8.4   Explain causes of noise pollution
8.5   Explain effects of noise pollution
8.6   Explain methods of minimizing noise pollution
8.7   Explain the phenomenon of beats
8.8   Explain the applications of beats
8.9   Explain Doppler effect

8.10   Derive formula for apparent frequency – (i) Source in Motion and observer at rest (ii) Observer in motion and source at rest
8.11   Applications of Doppler effect
8.12   Explain reverberation and reverberation time
8.13   Write Sabine's formula
8.14   Explain echoes
8.15   Solve problems

9.0   PROPERTIES OF MATTER

9.1   Introduction to Elasticity
9.2   Definitions of Stress and strain, their units and dimensional formulae
9.3   Statement of Hooke's law
9.4   Types of Stress
9.5   Types of strain
9.6   Types of moduli of elasticity
9.7   Definition of Surface Tension and examples
9.8   Explanation to Surface Tension with reference to molecular theory
9.9   Definitions of angle of contact and capillarity
9.10 State formula for Surface Tension based on capillarity
9.11 Experimental determination of surface tension by capillarity method
9.12 Concept of Viscosity, definition and examples
9.13 Newton's formula for Viscous force and definition of coefficient of Viscosity.
9.14 Effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for coefficient of viscosity
9.16 Experimental determination of coefficient of viscosity
9.17 Solve problems

10.0   ELECTRICITY AND MAGNETISM

10.1   Introduction to Electricity
10.2   Ohm's law and explanation
10.3   Definitions of specific resistance, conductance and their units
10.4   Statements of Kichoff's laws and explanation
10.5   Wheatstone's bridge
10.6   Meter bridge
10.7   Experimental determination of specific resistance using Meter Bridge
10.8   Introduction to magnetism
10.9   Coulomb's inverse square law of magnetism
10.10 Defition of magnetic field and magnetic lines of force
10.11 Magnetic induction field strength-units and dimensions
10.12 Moment of couple on a bar magnet placed in a uniform magnetic field
10.13 Derivation for Magnetic induction field strength at a point on the axial line
10.14 Derivation for Magnetic induction field strength at a point on the equatorial line
10.15 Solve problems

11.0   MODERN PHYSICS

11.1   Explain Photo-electric effect
11.2   Einstein 's photoelectric equation
11.3   State laws of photoelectric effect
11.4   Working of photoelectric cell
11.5   Applications of photoelectric effect
11.6   Recapitulation of refraction of light and its laws
11.7   Critical angle
11.8   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 Definition of super conductor and superconductivity\
11.13 Examples of superconducting materials
11.14 Properties of Superconductors
11.15 Applications of superconductors

COURSE CONTENTS

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- Addition of vectors- Representation of vectors-
Resolution of vectors - Parallelogram, Triangle and Polygon laws 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 and resultant velocity- 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- Conservation law of energy- Conventional and Non conventional energy sources- Problems

6. SIMPLE HARMONIC MOTION:

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

7. HEAT AND THERMODYNAMICS:

Expansion of Gases- Boyle's law-Experiment of Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant-Differences between r and R- Internal energy-External work done by a gas- Isothermal and adiabatic processes- Laws of thermodynamics- Two specific heats of a gas- Relation between Cp and Cv- Problems

8. SOUND:

Sound- Nature of sound- Musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation- Reverberation time-Sabine 's formula- Problems

9. PROPERTIES OF MATTER:

Introduction to Elasticity- Stress and Strain- Hooke's law- Types of Stress and Strain- Types of moduli of elasticity- Introduction to Surface Tension- Definition and examples- Molecular theory- Angle of contact and capillarity- Experimental determination of surface tension by capillary method- Effects of temperature and impurities- Introduction to Viscosity- Definition and examples- Newton's formula for viscosity- Experimental determination of viscosity by Poiseuille's method- Effect of temperature- Problems

10. ELECTRICITY & MAGNETISM:

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

11. MODERN PHYSICS;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect - photoelectric cell –Applications of photo electric effect-critical angle – 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 1 and 2   Telugu academy.
2. Intermediate Physics Volume 1 and 2   Deepthi Publications
3. Unified Physics Volume 1,2,3 and 4   Dr. S.L. Gupta and Sanjeev Gupta.
4. Text book of Physics Volume 1 and 2   Resnick and Halliday
5. Text book of applied physics   Dhanpath Roy
6. Fiber optics   D.A. Hill
7. Engineering Physics   M. Raghavendra

ENGG. CHEMISTRY & ENVIRONMENTAL STUDIES
(Common Subject)

Subject Title	:	**Engg. Chemistry & Environmental studies**
Subject Code	:	**C -104**
Periods per week	:	**04**
Total periods per year	:	**120**

TIME SCHEDULE

S.No	Major Topic	No. of Periods	Weightage of Marks	No. of Short Questions	No. of Essay Questions
I.	**ENGINEERING CHEMISTRY**				
1.	Fundamentals of Chemistry	18	16	2	1
2.	Solutions	10	08	1	1/2
3.	Acids and Bases	10	08	1	1/2
4.	Principles of Metallurgy	10	10	-	1
5.	Electro Chemistry	12	13	1	1
6.	Corrosion	09	10	-	1
7.	Water Technology	13	13	1	1
8.	Polymers	12	13	1	1
9.	Fuels	08	03	1	-
II.	ENVIRONMENTAL STUDIES	18	16	2	1
	Total	**120**	**110**	**10**	**08**

OBJECTIVES: **After the completion of the study of these units the student should be able to comprehend the following**

I. ENGINEERINGCHEMISTRY

1.0 Fundamentals of Chemistry
Atomic Structure:
1.1   Fundamental particles of an atom
1.2   Understand the concept of atomic number and mass number
1.3   Postulates of BOHR'S atomic theory and its limitations
1.4   Briefly explain Quantum numbers
1.5   Define and explain Aufbau principle, Hund's rule and Pauli's exclusion principle.
1.6   Define Orbital
1.7   Draw the shapes of s, p and d Orbitals
1.8   Distinguish between Orbit and Orbital
1.9   Understand electronic configuration of elements (up to element atomic number 30)

Periodic Table
1.10   State modern periodic law
1.11   Salient features of modern periodic Table (Periods & Groups)

Chemical bonding

1.12 Introduction
1.13 Postulates of Electronic theory of valency
1.14 Types of Chemical bonds
1.15 Define ionic bond and explain ionic bond formation in NaCl and MgO
1.16 Properties of Ionic compounds
1.17 Define covalent bond and explain Covalent bond in H_2, O_2 and N_2 using Lewis
      dot method.
1.18 Properties of Covalent compounds
1.19 Explain Metallic bond

Oxidation-Reduction:

1.20 Definition of Oxidation and Reduction
1.21 Definition of Oxidation Number and its calculations
1.22 Difference between Oxidation Number and Valency

2.0 Solutions

2.1 Define Solution, solute and solvent
2.2 Types of solutions
2.3 Define mole and understand Mole concept
2.4 Define and explain Molarity
2.5 Define and explain Normality
2.6 Define and explain equivalent weight using acids, bases and salts
2.7 Numerical problems on Mole, Molarity and Normality

3.0 Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases and its limitations
3.1 Explain Bronsted – Lowry theory of acids bases and its limitations
3.2 Explain Lewis theory of acids and bases and its limitations
3.3 Explain Ionic product of water
3.4 Define pH and explain Sorenson scale
3.5 Numerical problems on pH (Strong Acids and Bases)
3.6 Define buffer solution with examples
3.7 Applications of buffer solutions

4. 0 Principles of Metallurgy

4.1 Characteristics of Metals
4.2 Distinction between Metals and Non Metals
4.3 Definitions of Metallurgy, Mineral, Ore, Gangue, Flux and Slag
4.4 Methods of concentration of ore –Hand picking, Levigation, Froth Floatation
4.5 Extraction of crude metal – Roasting, Calcination, Smelting
4.6 Purification of Metals – Electrolytic Refining
4.7 Define an Alloy
4.8 Composition and uses of following Alloys: Brass, German silver, Nichrome

5.0 Electrochemistry

5.1 Define conductor Insulator, Electrolyte and Non – electrolyte
5.2 Explain Arrhenius theory of electrolytic dissociation
5.3 Define and explain electrolysis by taking example fused NaCl
5.4 Explain Faraday's laws of electrolysis
5.5 Define chemical equivalent and electrochemical equivalent

5.6   Numerical problems based on Faraday's laws of electrolysis
5.7   Define Galvanic cell and explain its construction
5.8   Distinguish between electrolytic cell and galvanic cell
5.9   Understand the standard electrode potentials
5.10   Understand electrochemical series and its significance
5.11   Understand emf of a cell
5.12   Numerical problems on emf of cell

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

7. 0   Water Technology
7.1   Sources of water
7.2   Define soft and hard water
7.3   Understand temporary and permanent hardness and the compounds causing hardness (with Formulae)
7.4   State the disadvantages of using hard water in industries
7.5   Define Degree of hardness, units of hardness (ppm)
7.6   Explain the methods of softening of hard water: a) permutit process b) ion-Exchange process
7.7   Know the essential qualities of drinking water
7.8   Describe the method of municipal treatment of water for drinking purpose.
7.9   Explain Osmosis and Reverse Osmosis. Advantages of Reverse Osmosis

8.0   Polymers
8.1   Basic concepts 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   Classification of plastics with examples
8.5   Distinguish between thermo and thermosetting plastics
8.6   Characteristics of plastics
8.7   Advantages of plastics over traditional materials
8.8   Disadvantages of using plastics.
8.9   Methods of preparation and uses of the following plastics: 1. Polythene 2. PVC   3.Teflon 4. Polystyrene 5. Urea formaldehyde
8.10   Know 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   Characteristics of natural rubber
8.14   Explain the process of Vulcanization
8.15   Characteristics of Vulcanized rubber

8.16 State the term Elastomer
8.17 Describe the preparation and uses of the following synthetic rubbers
a) Buna-s b) Neoprene rubber

9.0 Fuels
9.1 Define the term fuel
9.2 Classification of fuels based on physical state – solid , liquid and gaseous fuels, and based on occurrence- primary and secondary fuels
9.3 Understand characteristics of good fuel
9.4 Extraction and Refining of Petroleum
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 f) acetylene

II. ENVIRONMENTAL STUDIES

1.1 Define terms environment and environmental studies. explain the scope and
   importance of environmental studies
1.2 Understand the terms – lithosphere, hydrosphere, atmosphere, biosphere, biotic component, energy component, pollutant, pollution, contaminant receptor - sink, particulates, dissolved oxygen, Threshold limit value, BOD, COD
1.3 Define air pollution
1.4 Classification of air pollutants- based on origin and state of matter
1.5 State and explain the causes of air pollution
1.6 Explain the use and over exploitation of forest resources and deforestation

1.7 Explain the effects of air pollution on human beings, plants and animals
1.8 Explain the green house effect- ozone layer depletion and acid rain
1.9 Understand the methods of control of air pollution
1.10 Define water pollution
1.11 Explain the causes of water pollution
1.12 Explain the effects of water pollution on living and non living things
1.13 Understand the methods of control of water pollution
1.14 knows growing energy needs renewable and non-renewable energy sources.
   Understand the use of alternate energy sources
1.15 Define an Ecosystem
1.16 Define producers, consumers and decomposers with examples.
1.17 Define biodiversity and threats to biodiversity

COURSE CONTENTS

I 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

   Periodic Table: Modern Periodic Law, salient features of Modern Periodic Table

   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 - P^H 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 – Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. Electrochemistry

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

6. Water technology

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

7. Corrosion

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

8. Polymers

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

9. Fuels

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

II. ENVIRONMENTAL STUDIES

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

Reference :

1.	Intermediate Chemistry Vol 1& 2	Telugu Academy
2.	Intermediate Chemistry Vol 1& 2	Vikram Publishers
3.	Intermediate Chemistry Vol 1 & 2 publishers	Vignan Publishers & Deepthi
4.	Engineering Chemistry	Jain and Jain
5.	Engineering Chemistry	O.P.Agarwal, Hi-Tech.
6.	Engineering Chemistry	M.S.N.Raju, etc, Hi-Tech.
7.	Applied Chemistry	V.Subrahmanyam
8.	Engineering Chemistry	Sharma
9.	Environmental chemistry	A.K. De
10	Engg. Chemistry & Env. Studies	Dr. G. Venkatanarayana

SURVEYING–I

Subject Title : **Surveying–I**
Subject Code : **C-105**
Periods/Week : **04**
Periods/Year : **120**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay type
1.	Classification of surveying	05	03	01	--
2.	Chain Surveying	30	29	03	02
3.	Compass Surveying	25	26	02	02
4.	Levelling	50	39	03	03
5.	Minor Instruments	10	13	01	01
	Total	120	110	10	08

OBJECTIVES:

1.0 Known basic facts about Surveying
    1.1 States the purpose of surveying.
    1.2 States the units of linear and angular measurements in Surveying.
    1.3 States the instruments used for taking linear and Angular measurements.
    1.4 States the classification of surveys.
    1.5 States the fundamental principles in surveying.

2.0 Understands the principles of Chain Surveying
    2.1 Explains the functions of different equipment used in Chain Surveying.
    2.2 Explains methods of ranging and chaining a line.
    2.3 Lists the operations involved in chaining on flat and sloping ground and when high ground intervenes.
    2.4 Describes the method of setting out right angles with or without cross staff.
    2.5 Explains the method of recording field observations.
    2.6 Determines the corrections for incorrect length of chain
    2.7 Explains the principles used in Chain triangulation.
    2.8 Explains the methods of overcoming the different obstacles in chain surveying.
    2.9 Explains the method of preparation of site plans by Chain Surveying.
    2.10 Calculates the areas using analytical method only.

3.0 Principles of Compass Surveying
    3.1. States the purpose and principle of Compass Surveying.
    3.2. Identifies the parts of prismatic Compass and states their

Functions.

3.3. Defines terms:- Whole Circle Bearing, Quadrantal Bearing, True Meridian, Magnetic Meridian, True Bearing, Magnetic Bearing, Declination, Dip, Local Attraction.

3.4. Converts Whole Circle Bearing into Quadrantal Bearing and vice versa.

3.5. Explains local attraction and its effect.

3.6. Determines corrected bearing for local attraction.

3.7. Computes the included angles and true bearings on lines in a Compass traverse from data.

3.8. Explains the operations involved in field in compass Surveying

3.9. Explains methods of recording field notes.

3.10. Explains the method of plotting Compass Survey and correcting for closing error by Bowditch method.

4.0   Understands the principles of levelling for different engineering purposes

4.1   Defines Important terms in levelling

4.2   Identifies component parts, operation of a Levelling Instrument and Steps involved in carrying out Temporary adjustments of a dumpy level

4.3   States various types of Levelling Staves

4.4   Tabulating the levelling field data and determination of reduced levels by Height of Instrument and Rise and Fall methods, Comparison between above two methods

4.5   Lists the errors in levelling.

4.6   Computes the correction due to Curvature and Refraction.

4.7   Explains the operations involved in performing Profile levelling, Reciprocal levelling, problems on Reciprocal levelling

4.8   States fundamental lines of a Dumpy Level and relationship between them.

4.9   States the uses of Contour maps.

4.10   Explains the method of performing Contour Survey.

4.11   Explains the method of aligning a road, railway and Canal using Contour Map.

5.0   Uses and working principles of Minor Instruments

COURSE CONTENT:

1.0 Classification and Principles of Surveying

1.1   Concept of Surveying-purpose of Surveying

1.2   Linear and angular measurements

1.3   Instruments used for taking Linear and angular measurements

1.4   Classification of Survey based on instruments and purpose of field work – Engineering Surveys

1.5   Fundamental principles of surveying.

2.0 Chain Surveying

2.1   Purpose and Principle of Chain Survey - equipment used and their functions, Chains and arrows. Metallic tapes and Steel tapes, ranging rods, offset rods, pegs, plumb bob, Optical square, Line ranger.

2.2   Errors in ordinary chaining -Correction due to incorrect length of Chain or tape- problems

2.3   Different operations in Chain Surveying- Direct ranging and Indirect ranging Chaining on sloping ground –Setting out right angles with open cross staff and tape – Guidelines for Chain triangulation.

2.4   Recording field notes – field book-Conventional signs.

2.5   Obstacles in chaining-methods to overcome obstacles.

2.6   Calculations of area – different methods –Average Ordinate, Trapezoidal and Simpson's rules.

3.0   Compass Surveying

3.1   Purpose and principle of compass Survey-description, working and uses of prismatic compass.

3.2   Concept of true meridian, magnetic meridian - designation of bearings: whole Circle bearing, Quadrantal bearing - conversion of whole circle bearing to Quadrantal bearing.

3.3   Compass Survey –field notes - Traversing using prismatic compass.

3.4   Local attraction- detection and correction – problems - declination- conversion of magnetic bearings to true bearings- problems -calculation of included angles.

3.5   Plotting of Closed traverse-closing error and adjustments by Bowditch method.

3.6   Errors in Compass Surveying-Personal, Instrumental and Natural.

4.0   Levelling

4.1   Definitions of important terms in levelling.

4.2   Component parts, operations involved in levelling-Temporary adjustments of a dumpy level.

4.3   Types of levelling staves

4.4   Determination of reduced levels by Height of Instrument and Rise and Fall methods – Comparison - Problems

4.5   Errors in levelling-Personal, instrumental and natural - Precautions

4.6   Errors due to curvature, refraction and combined correction – Problems

4.7   Classification of Levelling- Profile levelling, Reciprocal levelling-detailed description of each method – problems on Reciprocal levelling.

4.8   Fundamental lines in levelling and relationship between them.

4.9   Contouring – Characteristics

4.10 Methods of contouring : Block contouring, Radial contouring – interpolation of contours-tracing contour gradient- use of Contour maps

4.11 Alignment of roads, railway and canal on contour maps.

5.0   Uses and working principles of minor instruments

5.1   Abney level

5.2   Electronic Planimeter

5.3   Pentagraph

REFERENCE

1.   Surveying and levelling Vol–1   by   KULKARNI and KANETKAR
2.   Surveying and Levelling Vol–1   by   B.C. PUNMIA.
3.   Surveying – 1   by   NAGARAJ AND HUSSAIN
4.   Surveying – 1   by   A.KAMALA
5.   Surveying(McGrawhill)   by   N. N. BASAK.
6.   Text Book of Surveying   by   C.Venkatramaiah (Universities Press)

ENGINEERING MECHANICS

Subject Title : **Engineering Mechanics**
Subject Code : **C-106**
Periods/Week : **04**
Periods/Semester : **120**

TIME SCHEDULE

S.No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Forces & Moments	20	16	2	1
2.	Centroid	20	18	1	1½
3.	Moment of Inertia	20	18	1	1½
4.	Simple Stresses and Strains	30	29	3	2
5.	Shear force and Bending Moment	30	29	3	2
	Total	**120**	**110**	**10**	**8**

OBJECTIVES:

1.0 Understand Equilibrium of Co-Planner forces
    1.1   Defines: Force, Moment, Resultant, Equilibrium of forces; equilibrant and Moment of a couple.
    1.2   Distinguishes between Scalar and Vector quantities, Co-planar and non-co-planar forces, parallel and non-parallel forces, like and unlike parallel forces.
    1.3   Computes the resultant of two co-planar forces acting at a point by law of parallelogram and law of Triangle of forces, concept of Lamis theorem.
    1.4   Computes the resultant of a system of coplanar concurrent forces by law of polygon of forces and by resolution.
    1.5   Computes the resultant of a system of coplanar parallel forces.
    1.6   Explains the properties of a couple.
    1.7   State the condition of equilibrium of rigid body subjected to a number of co- planar forces.
    1.8   Determines resultant of co-planar concurrent forces by analytical methods.

2.0 Defines Centroid
    2.1   State positions of centroids for simple regular plane figures.
    2.2   Determines position of centroids of T,L,I,Channel section, Z section, unsymmetrical I section and built-up section.

3.0 Defines Moment of Inertia and radius of gyration
    3.1   Determines moment of Inertia and Radius of gyration for regular geometrical sections.

3.2 Determines MI of simple and built-up sections by applying parallel axes theorem.

3.3 Calculates radius of gyration of standard sections.

3.4 Determines the polar M.I for solid and hollow circular section applying perpendicular axes theorem.

4.0 Understand Behaviour of Materials under simple Stresses and Strains

4.1 Defines terms:
Stress, strain, Modulus of Elasticity, Longitudinal Strain, Lateral Strain, Poisson's ratio, Modulus of rigidity, Bulk Modulus, working stress, Factor of safety, Resilience, Strain Energy, proof Resilience, Modulus of Resilience.

4.2 Distinguishes between different kinds of stresses and strains.

4.3 Explains the salient points in stress-strain curve for ductile materials (Milled steel).

4.4 States HOOKE'S LAW and limits of proportionality.

4.5 Solves problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.

4.6 States the relationship between the elastic constants.

4.7 Solves problems on relationship between elastic constants.

4.8 Calculates stresses in simple and composite members under axial loading

4.9 Explains temperature stress, strain, hoop stress, temperature stresses in composite sections.

4.10 Calculates instantaneous stress and strain Energy due to dynamic loads and impact loading.

4.11 Explains the mechanical properties of materials.

5.0 Determines shear force and Bending Moment on simple Beams Analytically

5.1 Defines different types of beams and loading, Cantilevers, simply supported, overhanging, fixed and continuous beams – Types of loads – point load – uniformly distributed load.

5.2 Explains terms: Shear Force, Bending moment and point of contra flexure

5.3 Explains the reactions at rollers, hinged and fixed supports.

5.4 Determines shear Forces and Bending Moment for simple cases of loading analytically and sketching S.F.D and BMD for simply supported beams, cantilevers and overhanging beams.

5.5 Explains relationship between rate of loading, shear force and Bending Moment.

COURSE CONTENT :

1.0 Forces & Moments

1.1 Definition of force; vectors and scalars; vector representation of a force; systems of forces; co-planar forces.

1.2 Resultant of forces at a point – parallelogram Law and triangle Law of forces – Lamis theorem – polygon law of forces – Resolution of forces.

1.3 Parallel forces – like and unlike – moment of force-its units and sense-couple-moment of a couple – properties of a couple.

1.4 Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

2.0 Centroid

2.1 Definitions – centroid
2.2 Position of centroids of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium.
2.3 Determination of location of centroids of built-up sections: T, L, I, Channel section, Z section and section consisting of RSJ's and flange plates, Hollow sections.

3.0 Moment of Inertia

3.1 Definition of Moment of Inertia
3.2 Perpendicular and parallel axes theorems
3.3 Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections
3.4 Moment of Inertia T, L, I, Channel section, and Z sections using parallel axis theorem
3.5 Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's flange plates, channels & flange plates etc.
3.6 Polar Moment of Inertia of solid and hallow circular sections using perpendicular axis theorem

4.0 Simple Stresses and Strains

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

5 Shear force and bending Moment

5.1 Beams – Types of beams-cantilevers- simply supported – over hanging – fixed and continuous.
5.2 Types of supports – roller – hinged – fixed,
5.3 Significance of S.F and B.M. at a section
5.4 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.

5.5   Drawing S.F. and B.M diagrams by analytical methods location of points of contraflexure.

5.6   Relation between rate of loading SF and BM

REFERENCE:

1.   Engineering Mechanics   –   R.S.KURMI
2.   Engineering Mechanics   –   P.K. Abdul Latheef
3.   Engineering Mechanics Statics   –   Dayaratnam.
4.   Engineering Mechanics   –   N. Srinivasulu.
5.   Engineering Mechanics   –   A.Kamala & A.V.R.J.Sharma.

ENGINEERING DRAWING

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

TIME SCHEDULE

S. No	Major Topics	Periods	Weightage 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

On completion of the study of this subject the student should 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 necessity of I.S. Code of practice for Engineering Drawing.
    1.3 Appreciate the linkages between Engineering drawing and other subjects of study in Diploma course.

2.0 Use Engineering Drawing Instruments
    2.1 Select the correct instruments and draw lines of different orientation.
    2.2 Select the correct instruments and draw small and large Circles.
    2.3 Select the correct instruments for measuring distances on the drawing.
    2.4 Use correct grade of pencil for different types of lines, thickness and given function.
    2.5 Select and use appropriate scales for a given application.

2.6   Identify different drawing sheet sizes as per I.S. and Standard Lay-
outs.

2.7   Prepare Title block as per 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 of dimensioning the drawing according to accepted standard.

4.2   Define "Dimensioning".

4.3   Identify notations of Dimensioning used in dimensioned drawing.

4.4   Identify the system of placement of dimensions in the given dimensioned drawing.

4.5   Dimension a given drawing using standard notations and desired system of dimensioning.

4.6   Dimension standard features applying necessary rules.

4.7   Arrange dimensions in a desired method given in a drawing.

4.8   Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

5.0   Apply Principles Of Geometric Constructions

5.1   Divide a given line into desired number of equal parts internally.

5.2   Draw tangent lines and arcs.

5.3   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.

1.3   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 an Engineering Drawing of a given simple Engineering part in first angle projection.

7.3   Draw the orthographic view 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 given two other views of an object.

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 Engineering drawing.

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 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 Surface of Engineering components like trays, funnel, 90^0 elbow & rectangular duct.

COURSE CONTENTS

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.

Understand the importance of Engineering Drawing

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

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 " – and 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.

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.

Dimensioning practice

Purpose of engineering Drawing, need of I.S.I code in dimensioning –Shape
description of an Engineering object -Definition of Dimensioning size description -
Location of features, surface finish, fully dimensioned Drawing -Notations or tools of
dimensioning, dimension line extension line, leader line, arrows, symbols, number and
notes, rules to be observed in the use of above tools -Placing dimensions: Aligned
system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain,

parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

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.

Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in Engineering application.
Construction of tangent lines: to draw tangent lines touching circles internally and externally.
Construction of tangent arcs
i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
ii)Tangent arc of given radius touching a circle or an arc and a given line.
iii)Tangent arcs of radius R, touching two given circles internally and externally.
Hexagon: Inscribing a Hexagon in a circle of given dia and circumscribing 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 Engg. 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 given the position of a point on the curve.
General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their Engineering application, viz, Gear tooth profile, screw threads, springs etc. Their construction:

Drawing Plate: 4 (Consisting of about 12 to 15 exercises)
Exercises mentioned above at the rate of at least one problem on each "construction".

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 and parallel to other planes.
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

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 views, and sides view sketching these views for a number of Engg. Objects -Explanation of "First angle projection". – Positioning of three views in First angle projection -   Projection   of   points   as   a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines - Selection of minimum number of views to describe an object fully.

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 and a simple object – Draw the mission of third view.

Drawing Plate 6: (Consisting of about 6 to 8 exercises)

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

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 a 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 given number of objects and number of sectional views (Matching exercise.)

Auxiliary views

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

Drawing plate No.8: (Consisting of about 8 exercises)

Given a set of objects, 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)

Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective – Use of these - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric drawing (or view, and Isometric Projection) and orthographic drawing - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, 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.

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

PHYSICS LAB
(Common to All Courses)

Subject title   :   **Physics LAB**
Subject code   :   **C -108**
Periods / week   :   **03**
Total periods / Year   :   **45**

List of Experiments   **No. of Periods**

1. Vernier calipers	3
2. Screw gauge	3
3. Parallelogram law of forces and Triangle law of forces (verification)	3
4. Simple pendulum	3
5. Velocity of sound in air (Resonance method)	3
6. Focal length and focal power of convex lens (separate and combination)	3
7. Refractive index of solid using traveling microscope	3
8. Surface tension of liquid using traveling microscope	3
9. Coefficient of viscosity by capillary method	3
10. Boyle's law verification	3
11. Meter bridge	3
12. Mapping of magnetic lines of force	3
Revision	6
Test	3

Total	45

SUBJECT : PHYSICS LAB
SUBJECT CODE: C -108

SPECIFIC OBJECTIVES OF PHYSICS LABORATORY

1. **VERNIER CALIPERS** - To determine the volumes of a cylinder and a sphere

2. **SCREW GAUGE** – To determine the thickness of a glass plate and area of cross section of a wire

3. **PARALLELOGRAM LAW AND TRIANGLE LAW VERIFICATION –** To verify laws and determination of unknown weight of an object

4. **SIMPLE PENDULUM –** To determine the value of acceleration due to gravity using law of length and to draw l-T and l- T^2 curves.

5 **VELOCITY OF SOUND IN AIR** – To determine velocity of sound in air at room temperature and to calculate its value at 0^0 C using two tuning forks.

6. **FOCAL LENGTH AND FOCAL POWER OF CONVEX LENSES –** To find focal length and focal power of a single convex lens and combination of convex lenses respectively using U-V method and draw U-V and 1/U – 1/V curves for single convex lens experiment only.

7. **REFRACTIVE INDEX OF A SOLID** – To determine the refractive index of material of a glass slab using traveling microscope.

8 **SURFACE TENSION OF A LIQUID** – To determine the surface tension of   water using traveling microscope (Capillary method.)

9 **VISCOSITY OF A LIQUID** – To determine viscosity of water by using capillary method

10 **BOYLE'S LAW VERIFICATION** – To experimentally verify Boyle's law employing a Quill tube.

11 **METER BRIDGE** – To find specific resistance of the material of a wire

12 **MAPPING OF MAGNETIC LINES OF FORCE** – To locate the positions of neutral points using N-S and N-N method with the help of magnetic compass

CHEMISTRY LAB

Subject Title : **Chemistry LAB (COMMON TO ALL)**
Subject Code : **C - 109**
No of periods : **03**
Total periods : **45**

List of Experiments

1. Introduction to volumetric analysis

2. Preparation of Standard Na_2CO_3 solution
3. Estimation of HCl solution using Std. Na_2CO_3 solution

4. Estimation of NaOH using Std. HCl solution

5. Estimation of Mohr's Salt using Std. $KMnO_4$ solution

6. Determination of acidity of water sample

7. Determination of alkalinity of water sample

8. Determination of total hardness of water using Std. EDTA solution

9. Estimation of Chlorides present in water sample

10. Estimation of Dissolved Oxygen (D.O) in water sample

DEMONSTRATION EXPERIMENTS

11. Determination of pH using pH meter

12. Determination of conductivity of water

13. Determination of turbidity of water

14. High volume air sampler

15. Estimation of total solids present in water sample
    Revision

INFORMATION TECHNOLOGY LAB

Subject Title : **Information Technology Lab**
Subject Code : **C -110**
Periods/Week : **04**
Periods per Semester : **120**

SPECIFIC OBJECTIVES

On completion of this subject the student would be able to

- Identify the various components of a Computer system

- Differentiate between hardware and software

- State the functions of each component of a computer a system

- State the configuration of a computer system

- Identify the various peripherals

- Know how to open an application program

- Know how to create a folder in a specified location

- Open MS-word and Identify the components on the screen

- Create a document using MS-word and save it

- Create a table using MS-Word and save it

- Create mailing letters using mail merge tool of MS-word

- Open MS-Excel and identify the components on the screen

- Create a Worksheet in MS-Excel and save it

- Generate a Chart using the data in Excel-worksheet

- Automate calculations in a worksheet using formula

- Sort and filter data in a worksheet

- Create a simple Power point presentation for a small topic

- Backup required files and folders to a CD-ROM

- Introduction to the internet technology and imparting training to use searching of required sites and using e-Mails etc..

COURSE CONTENT:

1. Study of a computer system
2. Familiarise with basic MS-WINDOWS facilities like opening programs, searching, creating folders, copying and shifting data , etc.
3. Create a formatted word document using MS-Word
4. Familiarise with spell checker facility of MS-Word
5. Print the Word document using page setup and Print facilities
6. Create a soft copy of a given table using MS-Word
7. Create mailing letters for a given information using MS-Word
8. Create a soft copy of the given statistical data using MS-Excel
9. Generate Appropriate Chart for the statistical data using MS-Excel
10. Generate the soft copy of a worksheet using formula facility of MS-Excel
11. Create a soft copy of a simple database using Excel. Run sort and filter facilities for the database
12. Create a power point presentation for a simple technical topic using MS-PowerPoint
13. Create a backup CD for a data using NERO or similar CD writing software
14. Create an user account on the Internet and e-mail and sending a document to from a given e-mail address. To another e-Mail ID as attachment.
15. Using different search engines finding required sites to collect information on engineering related topics including down loading the contents.

SURVEYING PRACTICE – I

Subject Title : **Surveying Practice – I**
Subject Code : **C-111**
Periods/Week : **04**
Periods/Year : **120**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Chain surveying	32
2.	Compass Surveying	20
3.	Levelling	40
4.	Plotting	28
	Total	120

OBJECTIVES:

Upon the completion of the study of this subject the student should be able to

1.0 Applies standard practices to perform chain survey in the field and plots from field data
1.1 Folds and unfolds chain.
1.2 Performs chaining operations on level ground between two given stations.
1.3 Performs chaining operations along a line when a high ground intervenes to prevent inter-visibility of ends of line.
1.4 Sets out a right angle.
1.5 Takes offsets and measures the same.
1.6 Performs triangulation survey of a given area with Chain and cross staff.
1.7 Records the measurements in a field book.
1.8 Draws conventional signs used in survey work
1.9 Plots the Survey from field measurements.
1.10 Calculates the area enclosed.

2.0 Performs compass survey and plots from field data
2.1 Identifies the parts of a prismatic Compass.
2.2 Sets up the compass at a station.
2.3 Takes readings of bearings.
2.4 Performs a closed compass survey with Compass and Chain.
2.5 Records angular and linear measurements in field book.
2.6 Performs an open traverse with compass and chain.
2.7 Plots the traverse from field data after adjusting for closing error.

3.0 Performs different methods of levelling.
3.1 Performs temporary adjustments for taking observations
3.2 Takes levels for differential levelling.
3.3 Takes levels for check levelling and Reciprocal levelling
3.4 Reduces the levels from field data.
3.5 Takes L.S. and C.S for alignment of Road/Canal.

55

3.6   Conducting block levels of an area.
3.7   Locating contour Points by direct method in the field

**4.0   Applies principles of mapping from the fieldwork and plotting
the field work**
4.1   Understand the importance & relation between field work & plotting.

<u>**COURSE CONTENT:**</u>

1.0   Chain Surveying
1.1   Practicing unfolding and folding of a chain.
1.2   Ranging and chaining of lines on level ground and recording in field book.
1.3   Chaining a line involving indirect ranging.
1.4   Measurement of land areas – chain triangulation and cross staff methods.
1.5   Chain triangulation around the building covering a small area with other details, taking offsets and recording.

2.0   Compass Surveying
2.1   Setting up the compass – observation of bearings - calculation of included angles.
2.2   Traversing with prismatic compass and chain – closed traverse and recording.
2.3   Traversing with prismatic compass and chain - open traverse and recording.

3.0   Levelling
3.1   Study of dumpy level, levelling staff and Temporary adjustments of level.
3.2   Taking levels of various points and booking the same in a level field book.
3.3   Differential or Fly levelling, reducing levels by Height of Collimation and Rise & Fall method.
3.4   Differential levelling involving inverted levels.
3.5   Reciprocal levelling.
3.6   Taking levels of Longitudinal Section and Cross Sections of a Road/ Canal

4.0   Plotting

4.1 Conventional signs in Surveying	1 Exercise
4.2 plotting of perpendicular and oblique Offsets	1 Exercise
4.3 Plotting of land surveys – Chain and Cross Staff survey – Calculation of areas	3 Exercises
4.4 Plotting of chain triangulation, Surveying of small areas around Buildings.	2 Exercises
4.5 Plotting of closed traverse -Compass surveying location of details and adjusting error by Bow ditch's method.	2 Exercises
4.6 Plotting of open traverse by Compass Surveying and locating details	1 Exercise.
4.6 Plotting of L.S and C.S.	2 Exercises
4.8 Plotting of contours from radial methods & block levelling.	2 Exercises
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Total	14Exercises(each2 hrs)

3RD SEMESTER

ENGLISH-II

Subject Title   :   **English- II**

Subject Code   :   **C-301**

Periods/Week   :   **03**

Periods per semester   :   **45**

ENGINEERING MATHEMATICS – II
(Common to AEI/C/M/EE/EC/MIN/PKG)

Subject title   : **Engineering Mathematics -II**
Subject code   : **C - 302**
Periods per week   : **04**
Periods / Semester   : **60**

TIME SCHEDULE

S.No.	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	**Unit –I** Integration Methods of Integration	18	35	5	2
2	**Unit-II** Definite Integrals and Applications	14	26	2	2
3	Numerical Integration	03	05	-	½
4	**Unit-III** Differential Equations	25	44	3	$3\frac{1}{2}$
	Total	**60**	**110**	**10**	**8**

Objectives:
On completion of the study of the subject the student should be able to comprehend the following
Unit-I
Methods of Integration:
1.0 Understand the concept of Indefinite integral:

1.1 Explain that $\dfrac{d}{dx}(f(x)) = F(x) \Rightarrow \int F(x)dx = f(x) + c$,where c is arbitrary constant.

1.2.State the indefinite integral of standard functions and properties of Integrals with examples.

1.3. Integrate simple functions using the rule for $\int (u + v)\, dx$ and $\int ku\, dx$ where k is constant and *u, v* are functions of *x.*

1.4. Evaluate arbitrary constant and determine particular integrals in problems of the following type:
       a.   Find the equation of the curve passing through (1, 1) and whose slope at any point *(x , y)* is *2x^2 + 1/√x.*
       ii)   If the velocity at time *'t'* is given by
           V = √t + 3 find the displacement "S" at time *t = k* given that
           S = 0 when t = 0.

1.5. Explain various methods of integration with examples.

1.6. Integrate simple functions by decomposition of the integrand

1.7 Integrate simple functions of the following type by 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) $\int f\{g(x)\}\, g'(x)\, dx$

1.8. Explain finding the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

1.9*.* Evaluate the integrals of the form $\int Sin^m \theta\ Cos^n \theta.\, d\theta$ where m and n are

positive integers.

1.10. Evaluate Integrals of powers of *tan x* and *sec x*.

1.11. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

1.12 Evaluate the Standard Integrals of the functions of the type

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

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

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

1.13. Evaluate the Integrals of the

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

1.14. Evaluate integrals using integration by parts with examples State the
Bernoulli's rule for evaluating the integrals of the form $\int u.v dx$.

Unit-II
2.0 Definite Integrals and its applications

2.1 Understand the concept of definite integrals and define the definite
integral over an interval.

2.2 State various properties of definite integrals.

2.3 Evaluate some problems on definite integrals using the above properties.

2.4.Identify a definite integral as a limit of sum by considering an area.

2.5.State the fundamental theorem of integral calculus.

2.6. Find the areas under plane curves and area enclosed between two curves using
integration.

2.7 Obtain the volumes of solids of revolution.

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

3. 0 Numerical Integration
3.1 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of
Integrals and provide some examples.

Unit –III

4.0 Differential Equations
4.1. Definition of a Differential equation – order, degree and solution of a
differential equation – formation of differential equations - solutions of
ordinary differential equations of the first order and first degree of the type:
    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.
    v.   Bernoulli's Equation (Reducible to linear form.)

4.2   Solution of second order differential equation of the type f(D)y=0

4.3   Solution of nth order differential equation of the type
    f(D) y = X where *f(D)* is a polynomial of nth order and *X* is a function of the form
    k, e^{ax} , *Sinax, Cosax, x^n* .

COURSE CONTENTS

Unit-I
1. Methods of Integration.
1. Integration regarded as reverse of differentiation – Indefinite integral and constant of integration – standard forms. Integration by decomposition of the integrand into simple rational, algebric functions-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.
Integrals of:

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

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

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

Integration by parts including Bernoulli's rule.

Unit-II
2. Definite Integral and its applications:
Definite integral – 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 value and RMS value of a function in a given interval.

3. Numerical Integration:
Trapezoidal rule, Simpson's 1/3 rules for approximation of Integrals.

Unit -III
4. Differential Equations:
Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous, exact, linear differential equation of the form dy/dx + Py = Q, Bernoullis equation, nth order linear differential equation with constant coefficients both homogeneous and non homogeneous and finding the Particular Integrals for the functions $k, e^{ax} , Sinax, Cosax , x^n$.

Reference books:

1 Text book of Engineering Mathematics –II by G.Srinagesh, and others – FALCON publishers
2 Text book of Engineering Mathematics –II by Dr.J.Sairam and others – UNI-TECH SERIES.
3 A Text book of intermediate Mathematics –I & II by Telugu Academy.
4 Integral Calculus by Manicavachagom Pillai
5 Text book of Engineering Mathematics –II by Radiant publishers.

STRENGTH OF MATERIALS &THEORY OF STRUCTURES

Subject Title : STRENGTH OF MATERIALS & THEORY OF STRUCTURES
Subject Code : C-303
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theory of simple bending	20	26	02	02
2.	Deflection of beams	26	29	03	02
3	Columns	15	26	02	02
4	Dams and Retaining walls	13	13	01	01
5	Stresses in Frames	12	13	01	01
6	Torsion	04	03	01	
	Total	**90**	**110**	**10**	**08**

OBJECTIVES:

After completion of the subject the student

1.0   Understands the Effect of Loading on Beams

  1.1   Explains terms: Neutral axis, Modulus of section, Moment of resistance
  1.2   States the assumptions made in the theory of simple bending.
  1.3   Derives the formula for simple bending – Explain bending stress distribution.
  1.4   Solves problems on theory of simple bending.
  1.5   Explains shear distribution across rectangular, solid circular and I sections.

2.0   Understands Deflection of Beams under Loading

  2.1   Derives the equation of the elastic curve and Relation between curvature, slope and deflection.
  2.2   Distinguishes between strength and stiffness of a beam.
  2.3   Computes the slope &deflection by Double integration method, Mecaulay's method.
  2.4   Defines Mohr's theorem(Moment area method)
  2.5   Computes the slope &deflection by Mohr's theorem.
  2.6   Determines the section of a beam from consideration of strength and stiffness.

2.7 Differentiates statically indeterminate structures from statically determinates structures

2.8 Determines the prop reaction of propped cantilever beams for various types of loadings (point & u.d.l) and draw the S.F.D and B.M.D.

2.9 Draws the deflected shapes of Fixed & Continuous beams under loading and identifies the sagging & hogging moments.

3.0 Understands the behaviour of columns under vertical loads

3.1 States the effective lengths of columns for different end conditions.
3.2 Distinguishes between Long and short columns.
3.3 Calculates Slenderness ratio of a column.
3.4 Calculates the load carrying capacity of a column using Euler's and Rankine's formula.

4.0 Understands the Stability of Retaining walls and dams under the action of lateral pressures

4.1 Explains different forces acting on the Gravity Dam.
4.2 Computes the intensity of base pressures acting on the Gravity Dam.
4.3 Explains the stability conditions of Gravity Dams.
4.4 Calculates the base width of the dam based on Stability conditions.
4.5 Explains the Earth pressures acting on the retaining walls.
4.6 Explains different forces acting on the Retaining wall.
4.7 Computes the intensity of base pressures acting on the Retaining Wall with or without surcharge.
4.8 Explains the stability conditions of Retaining wall.
4.9 Calculates the base width of the Retaining wall based on Stability conditions.

5.0 Understands effect of Dead and Live loads on statically determinate frames

5.1 Differentiates between statically determinate and indeterminate structures.
5.2 Calculates forces in members of a simple truss under dead loads and live loads by method of joints and method of sections.

6.0 Understands the effects of pure Torsion on Solid and Hollow Circular Shafts.
6.1 Knows the formula for pure torsion of a circular shaft.
6.2 Solves the simple problems on torsion applying torsion formula.

COURSE CONTENT:

1.0 Stresses in Beams.

1.1 Theory of simple bending-Neutral axis-Modulus of section, Moment of resistance
1.2 Assumptions made in the theory of simple Bending.
1.3 Formula for Theory of simple bending – Bending stress distribution.
1.4 Theory of simple bending-problems
1.5 Shear stresses in Beams -Shear stress distribution across rectangular, solid circular and I sections. (Derivation of formula not required.)

2. 0 Deflection of Beams

2.1 Equation of the elastic curve - Relation between curvature, slope and deflection

2.2 Strength and stiffness of a beam.

2.3 Slope &deflection by Double integration method, Mecaulay's method for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads

2.4 Mohr's theorem-I & II for slope &deflection.

2.5 Slope & deflection by Mohr's theorem for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads

2.6 Section of a beam from consideration of strength and stiffness.

2.7 Difference between statically determinate and statically indeterminate structures.

2.8 Prop reaction of propped cantilever beams - various types of loadings (point & u.d.l) - S.F.D and B.M.D.

2.9 Fixed and Continuous beams – degree of static indeterminacy – deflected shapes under loading (no necessity to solve problems on the topic)

3.0 Columns

3.1 Columns - Effective lengths for different end conditions.

3.2 Columns - Long and short columns – Comparison.

3.3 Slenderness ratio of a column – Rectangular, I, circular, Hollow Circular, Built-up Sections.

3.4 Load carrying capacity by Euler's and Rankine's formula – problems - Limitations.

4.0 Dams and retaining walls

4.1 Forces acting on the Gravity Dam – Eccentricity, middle third rule.

4.2 Intensity of base pressures acting on the Gravity dam for different water storage levels.

4.3 Stability conditions of Gravity Dams.

4.4 Base width of the dam based on Stability conditions – problems.

4.5 Earth pressures – Active, passive and rest condition with or without surcharge.

4.6 Forces acting on the Retaining wall - Eccentricity, middle third rule.

4.7 Intensity of base pressures acting on the Retaining wall.

4.8 Stability conditions of Retaining wall.

4.9 Base width calculation - based on Stability conditions.

5.0 Stresses in frames

5.1 Forces in the members of statically determinate pin jointed frames- method of Joints and method of sections.

6.0 Torsion

6.1 Theory of pure torsion-Torsion formula - solid and hollow circular shafts subjected to pure torsion-

6.2 Simple problems-shear stress distribution in shafts.

REFERENCE

1. Strength of Materials   by   Ramamurtham.
2. S.M and T.S   by   B.C. punmia.
3. S.M and T.S   by   Srinivasulu.
4. Strength of Materials   by   R.S. Khurmi.
5. Introduction to strength of materials   by   D.S . Prakash rao.
6. Strength of Materials Vol-I   by   D.S . Prakash rao.
   (A practical approach)
7. Introduction to Strength of materials   by   D.S. Prakash rao
   (Universities Press)

HYDRAULICS

Subject Title : **Hydraulics**
Subject Code : **C-304**
Periods/Week : **05**
Periods/Year : **75**

TIME SCHEDULE

S.NO	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Properties of liquids	04	03	1	-
2	Liquid pressure and its measurement	10	13	1	1
3	Flow of liquids	08	13	1	1
4	Flow through orifices and mouth pieces	10	13	1	1
5	Flow over notches and weirs	10	16	2	1
6	Flow through pipes	10	18	1	1 ½
7	Flow though open channels	12	18	1	1 ½
8	Pumps & Water turbines	08	13	1	1
10	Hydro electric power plants	03	03	1	-
	TOTAL	**75**	**110**	**10**	**8**

OBJECTIVES:

1.0   Know the properties of liquids
   1.1   Define Mass density, Specific weight, Specific gravity, Adhesion, Cohesion, Surface tension, Capillarity, Compressibility, Dynamic viscosity, Kinematic viscosity   and vapour pressure.
   1.2   States the values of Specific weight, Massdensity, Specific gravity for pure water and mercury
   1.3   Formulae of Dynamic viscosity, Capillarity, Surface tension and Kinematic Viscosity.

2.0   Understands Liquid pressure and its Measurement
   2.1   Distinguishes among atmospheric pressure, gauge pressure and absolute pressure.
   2.2   Describes pressure measuring instruments.
   2.3   Computes the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.
   2.4   Computes the total pressure and centre of pressure on a horizontal, vertical and inclined surfaces immersed in a liquid.(No derivation of formulae, problems only)
   2.5   Calculates reactions at hinges on Lock gates.

3.0   Understands the General Principles of flow of the Liquids
   3.1   Distinguishes the different types of flow of liquids.
   3.2   States the equation of continuity and energies of liquid in motion.
   3.3   Explains Bernoulli's theorem of total energy of a liquid in motion and its limitations (no proof). Solves problems on application of Bernoulli's theorem.
   3.4   Explains the working and use of pitot tube, orifice meter , Venturimeter and Solves problems on Venturimeter.(No derivation of formula)

4.0   Understands the function of Orifices and mouth pieces
   4.1   Defines orifice and vena-contracta and explains the types of orifices.
   4.2   Defines co-efficient of contraction, velocity and discharge.
   4.3   Deduces the relation between Hydraulic Coefficients - Cc, Cv, and Cd. and Solves problems on hydraulic co-efficients.
   4.4   Derives the formula for discharge through large rectangular orifice and states the equations for discharge through Submerged and partially submerged orifices.
   4.5   Solves problems on discharge through a large rectangular orifice, Submerged and partially submerged orifices.
   4.6   Computes the time of emptying of a prismatic tank by an orifice
   4.7   Defines Mouthpiece and Differentiates between orifices and mouth pieces.
   4.8   States the different types of mouth pieces with their equations for discharge and calculates the discharge through a mouth piece from the given details.

5.0   Comprehends the flow over different types of notches and weirs
   5.1   Defines a notch and Distinguishes between rectangular, triangular and trapezoidal notches
   5.2   States the formulae for the discharge over rectangular, triangular and trapezoidal notches.
   5.3   Calculates the discharge over the above notches from the given parameters.
   5.4   Defines a weir and Distinguishes sharp crested and broad crested weirs.
   5.5   States the formulae for discharge over sharp crested and broad crested weirs.
   5.6   Explains the above formulae with modifications for end contractions and velocity of approach.
   5.7   Determines the discharge over sharp crested and broad crested weirs under given conditions.

6.0   Understands the flow through pipes
   6.1   Explains the major and minor losses of head of water flowing through pipes stating relevant formulae.
   6.2   States Chezy's and Darcy's formulae for friction loss in pipe flow.
   6.3   Solves problems on a pipe flow under friction.
   6.4   Sketches the Hydraulic gradient and total energy line under different conditions.
   6.5   Computes the discharge through parallel pipes and compound pipes connected to a reservoir
   6.6   Differentiates between laminar and turbulent flows.
   6.7   Explains Reynolds's number and critical velocity in pipes.

7.0 Understands the principles of flow through open channels
   7.1   Defines open channel flow and differentiates with pipe flow.
   7.2   Defines terms Wetted perimeter and Hydraulic mean depth
   7.3   States Chezy's formula for uniform flow through open channels.
   7.4   Calculates value of Chezy's constant given Kutter's formula and Manning's formula.
   7.5   Computes the velocity and discharge in a channel.
   7.6   Derives the conditions for most economical section of rectangular and trapezoidal channels.
   7.7   Solves problems on flow through rectangular and trapezoidal channels for the given conditions.

8.0 Understands types and working of pumps
   8.1   Defines pump and States different types of pumps
   8.2   Describes the different parts of centrifugal pumps.
   8.2   State the use of foot valve and strainer in a centrifugal pump.
   8.3   Describes the different parts of Reciprocating pumps.
   8.4   Know the use of jet, air lift and deep well pumps.
   8.5   States the advantages and disadvantages of Centrifugal & Reciprocating pumps.
   8.6   Definition of turbine States different types of turbines.
   8.7   Explains impulse & reaction turbines and their types.
   8.8   Briefly explains with sketches the principle of working of Pelton wheel and Francis turbine.
   8.9   Differentiate between impulse and reaction turbines.

9.0 Knows the general lay-out of Hydro-Electric Power Plants
   9.1   Sketches a typical layout of hydro-electric power plants and shows the components.
   9.2   Explains the function of surge tank.

COURSE CONTENT:

1.0   Properties of Liquids
   1.1   Scope and importance of hydraulics in Civil Engineering.
   1.2   Definition and properties of liquids-as mentioned in specific objectives
   1.3   Formulae of Dynamic viscocity, Surface tension and Kinematic Viscosity

2.0   Liquid Pressure and its Measurement
   2.1   Atmospheric pressure, gauge pressure and absolute pressure.
   2.2   Types of Pressure measuring instruments – Piezometer, Manometers- U-tube, Inverted U-tube and differential Manometer.
   2.3   Determination of the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.
   2.4   Determination of Total and Centre of Pressure on Plane surface, on horizontal, vertical and inclinedly immersed Plane surfaces.(No derivation of formulae, problems only)
   2.5   Determination of Hinge reactions on lock gates.

3.0 Flow of Liquids

3.1 Types of flow-uniform flow, non-uniform flow, stream-line flow, turbulent flow, steady flow and unsteady flow.

3.2 Energies of liquid in motion-Datum head- pressure head and velocity head- principle of continuity.-problems

3.3 Total energy of liquid in motion-Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem.-problems.

3.4 Practical applications of Bernoulli's theorem-pitot tube, orificemeter and venturimeter.-problems on Veturimeter. (No derivation of formula.)

4.0 Flow through orifices and mouthpieces

4.1 Definition of orifice and vena-contracta –types of orifices. Determination of discharge through small orifice

4.2 Defines co-efficient of contraction, velocity and discharge.

4.3 Relation between Hydraulic Coefficients - Cc, Cv, and Cd. And solves problemson hydraulic co-efficients.

4.4 Large rectangular orifice-derivation of formula for discharge and states the equationsfor discharge through Submerged and partially submerged orifices.

4.5 Problems on discharge through a large rectangular orifice, Submerged and Partially submerged orifices.

4.6 Fully submerged and partially submerged orifices-explanation and formulae for discharge.

4.7 Problems on determination of time of emptying of a prismatic tank by an orifice.

4.8 Definition of Mouthpiece and Difference between orifices and mouthpieces

4.9 Different types of mouth pieces with their equations for discharge and determination of discharge through a mouth piece from the given details.

5.0 Flow over Notches & Weirs

5.1 Definition of notch, types of notches-rectangular, triangular and trapezoidal.

5. 2 Formulae for Determination of Discharge for the above notches

5. 3 Problems on Determination of Discharge for the Notches

5.4 Definition of Weir-types of weirs, sharp-crested and broad crested weirs.

5.5 Formulae for determination of Discharge over a sharp crested weir (Mathematical formula)

5.6 Equations for Discharges for above Wiers with velocity of approach and end contractions.

5.7 Determines the discharge over sharp crested and broad crested weirs under given conditions.

6.0 Flow thorough pipes

6.1 Major loss (loss of head due to friction) and minor losses (Loss of head at entrance, loss of head due to sudden enlargement, loss of head due to sudden contraction, loss of head at exit of the pipe) - simple problems.

6.2 Frictional loss in pipes - Chezy's formula and Darcy's formula (without Proof) – problems.

6.3 Solves problems on a pipe flow under friction.

6.4 Hydraulic gradient and total energy line.

6.5 Discharge through parallel and compound pipes connected to a reservoir.

6.6   Laminar and turbulent flow in pipes.
6.7   Reynolds's number and critical velocity .

7.0   Flow through open Channels
7.1   Definition of open channel flow and differences between open channel flow and pipe flow.
7.2   Wetted perimeter and hydraulic mean depth.
7.3   Chezy's formula for discharge for uniform flow(Derivation not necessary).
7.4   Value of 'C' for different surfaces.
    7.4.1 Kutter's formula.
    7.4.2 Manning's fourmula
    7.4.3 Bazin's formula
7.5   Determination of values of the velocity and discharge in a channel
7.6   Conditions for Most economical section of a channel-rectangular and trapezoidal.
7.7   Design of rectangular and trapezoidal channel cross sections – problems.

8.0   Pumps and Turbines
8.1   Definition of pump and different types of pumps
8.2   Different parts of centrifugal pumps.
8.3   Uses of foot valve and strainer in a centrifugal pump.
8.4   Different parts of reciprocating pumps.
8.5   Uses of jet, air lift and deep well pumps.
8.6   Advantages and disadvantages of centrifugal & Reciprocating pumps.
8.7   Definition of turbine and different types of turbine.
8.8   Impulse & reaction turbines and their types.
8.9   Brief explanation of principle of working of Pelton wheel and Francis turbine.
8.10   Differnces between impulse and reaction turbines.

9.0   Hydro-electric Power Plants
9.1   Sketch of a typical layout of hydro-electric power plants and its components.
9.2   The function of surge tank.

REFERENCE:

1.   Hydraulics   by   R.S. Khurmi.
2.   Hydraulics & Hydraulic Mechines   by   Modi & sethi.
3.   Hydraulics   by   Jagdishlal.
4.   Hydraulics   by   Reye & Rao
5.   Hydraulics   by   Bansal.
6.   Hydraulics   by   NITTTR,Chennai

SURVEYING – II

Subject Title	:	**Surveying – II**		
Subject Code	:	**C-305**		
Periods/Week	:	**04**		
Periods/Semester	:	**60**		

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theodolite Survey	15	29	03	02
2.	Trigonometric levelling	05	13	01	01
3.	Tacheometry	10	16	02	01
4.	Curves	15	26	02	02
5.	Advanced Surveying	15	26	02	02
	Total	60	110	10	08

OBJECTIVES:

1.0 Understands the principles of theodolite surveying for preparation of plans and alignment
   1.1 Identifies the parts and functions of a Theodolite
   1.2 Lists the fundamental lines of a Theodolite and their relationships.
   1.3 List the steps involved in carrying out temporary adjustments for taking observations.
   1.4 Explains measuring of horizontal and vertical Angles.
   1.5 Steps involved in setting out angles using theodolite.
   1.6 Explains the method of conducting traverse survey
   1.7 Computes the latitudes, departure of lines and error of closure.
   1.8 Understands the methods of determining omitted measurements like i)Length and bearing one side. ii)Length of one side and bearing of another side. iii)Length of two sides.iv) Bearing of two sides.
   1.9 Calculate the closing error and balancing the same by Bowdich and transit rule.
   1.10 Calculates the area of a closed traverse by co-ordinates.
   1.11 Types of Errors in theodolite surveying.

2.0 Understands the principles of Trigonometrical Levelling
   2.1 Calculates the height of an object when the base of the object is accessible.

2.2　Calculates the elevations of the object when the base of the object is inaccessible and instrument stations are
　　　　a) in the same vertical plane
　　　　b) not in the same vertical plane.

3.0　Understands the principles of Tacheometry to find the elevations and distances of stations
3.1　Explains the types and advantages of Tacheometry.
3.2　Explains the principle of Stadia Tacheometry.
3.3　Determination of Tacheometric constants.
3.4　Finds vertical and horizontal distance of stations by Stadia observations-Problems
3.5　Explains the principle of Tangential Tacheometry
3.6　Simple problems in Tangential Tacheometry

4.0　Understands the method of setting out simple curves
4.1　States the definition and notation of a simple curve.
4.2　Computes the elements of simple curve
4.3　Explains the procedure for setting out a simple curve by linear methods using Chain and Tape.
4.4　Explains the procedure for setting out a simple curve by Angular Methods-Single and Double Theodolite.
4.5　Solves problems on setting out a simple curve by linear and angular methods for the given data.

5.0　Understands the Electronic surveying instruments
5.1　States the principles and uses of the following modern surveying instruments.
　　　　a)　Electronic Distance Meter(EDM)
　　　　b)　Distomat
　　　　c)　Total Station.
5.2　Concept, applications and uses of GPS and GIS in Civil Engineering
5.3　Introduction to Photogrammetric surveying and Remote sensing.

COURSE CONTENT

1.　Theodolite
1.1　Principles of theodolite surveying
1.2　Component parts, technical Terms, detailed study of a transit.
1.3　Fundamental lines and conditions of adjustments.
1.4　Temporary adjustments.
1.5　Measurement of horizontal angles by repetition and reiteration method.
1.6　Measurement of vertical angles.
1.7　Determination of magnetic bearings- deflection angles- direct angles-Prolonging a straight line.
1.8　Errors in theodolite work.
1.9　Traversing with theodolite by included angle method, deflection angle method, bearing method.
1.10　Checks for closed and open traverse
1.11　Traverse computations, Latitude, departure, closing error, balancing a closed traverse by Bowditch rule and transit rule, problems on omitted measurements, area of closed traverse.

2. Trigonometric levelling

2.1 Principle and necessity of Trigonometric levelling

2.2 Elevations and Distance of objects whose base is accessible and base is inaccessible with instruments station in same vertical plane and different vertical plane.

3. Tacheometry

3.1 Principles of tacheometry-Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined -elevations and distances of staff stations-determination of Tacheometric constants

3.2 Tangential Tachometry- Finding elevations- Problems.

4. Curves

4.1 Simple circular curve- elements of simple curve

4.2 Preparation of curve table and setting out curves by chain and tape single and double Theodolite methods – problems.

5. Advanced Surveying

5.1 Principle and uses of EDM, Electronic theodolite and distomat, Total station Global positioning system(G.P.S)-Fundamentals,

5.2 Importance of G.P.S. receivers, G.P.S observation and data processing and application in Civil Engineering

5.3 Geographical-Information-System(GIS)-definition-components-Spatial and Attribute data - use and application of GIS in Civil Engineering.

5.4 Introduction to Photogrammetric surveying - types of Photogrammetry- basic principles

5.5 Remote Sensing-definition-Electro Magnetic Radiation-Platforms and Sensors.

REFERENCE

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	C.venkatRamaiah
6	Surveying(McGrawhill)	by	N.N. Basak
7	Higher Surveying	by	A.M.Chandra (New Age Int.)

CONSTRUCTION MATERIALS

Subject Title **:** **Construction Materials**
Subject Code **:** **C-306**
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.	Clay Products	12	23	01	02
3.	Sand	04	03	01	00
4.	Cement	08	13	01	01
5.	Mortars & Concrete	12	26	02	02
6.	Surface Protective Materials	09	16	02	01
7.	Miscellaneous Materials	08	16	02	01
	Total	**60**	**110**	**10**	**08**

OBJECTIVES:

1.0 Understands selection of stones and their acceptability for construction work
 1.1 State the classification of stones – Physical classification only
 1.2 State the characteristics of good building stone.
 1.3 State the common varieties of stone used in different items of construction – Granite, marble, Cuddapah slabs, shahabad stones.
 1.4 Explains the purpose of dressing stones.

2.0 Understands the Clay Products for construction work
 2.1 States the common variety of tiles used for different purposes-**roofing** tiles, (Mangalore tiles only), Floor and Wall Tiles.
 2.2 States the characteristics of good tiles.
 2.3 States the use of stone ware and earthen ware.
 2.4 State the uses of porcelain and glazed tiles
 2.5 Common sizes of bricks – IS specifications.
 2.6 States the characteristics of good bricks.
 2.7 States the standard tests for bricks and explain water absorption and compressive strength tests only.

2.8   States the uses of refractory bricks, fly ash bricks, precast Solid Concrete Blocks, Hollow concrete blocks, High quality building blocks.

3.0   Understands suitability of sand for construction work
3.1   States the types of Sand.
3.5   States the characteristics of sand
3.6   States the functions of good building sand.
3.7   States the percentage of bulkage allowance for construction work.
3.8   Knows the uses of substitute materials for sand – Robo sand.

4.0   Understand the use of cement for construction work
4.1   States the chemical composition of cement.
4.2   States the details of method of manufacture of cement by dry process only.
4.3   States the classification of cements and their uses.
4.4   State the standard tests for cement and explain tests for consistency and setting time of cement.
4.5   State grades of cement and their compressive strengths.
4.6   State the importance of Portland Puzzolona cement (Blended cement) and their application.

5.0   Understands the principles of preparation of mortars and Concrete
5.1   States the classification of mortars.
5.2   States the different proportion of mortars for various works.
5.3   Explain the method of preparation of cement mortar.
5.4   States the ingredients of plain and reinforced concrete.
5.5   States the usual proportions of plain and reinforced concrete for different item of work.
5.6   Explain the importance of Hydration of cement, water cement ratio, workability
5.7   states the types and uses of admixtures in concrete.
5.8   Explain the term fine aggregate, coarse aggregate.
5.9   Explain the method of preparing concrete- Hand mixing – Machine mixing
5.10   State the steps involved in the procedure of conveyance, placing, compaction and curing of concrete.
5.11   State the advantages of ready mix concrete
5.12   State the uses of Shotcrete and Ferro-cement.

6.0   Understands the selection and application of Surface Protective Materials.
6.1   Understands the compositions of Paints, enamels, varnishes

6.2   Understands the types and uses of surface protective materials like Paints, Enamels,Varnishes, Distemper, Emulsion, French Polish and Wax Polish.

7.0   Understands the selections and applications of miscellaneous materials like
Wood, Plastics, Glass, Asbestos, Gypsum and Geo-synthetics for construction work
6.1   State the characteristics of good timber.

6.2   States the importance of seasoning.

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

6.4 States the uses of wood products used in construction Work.

6.5 Uses of different types of plastics – fibre reinforced plastic in manufacture of doors and windows, water tanks.

6.6 Specifications and advantages of using asbestos in Manufacture of plastics.

6.7 Suitability of different types of glasses as a building Material & their uses.

6.8 Suitability of Powder coated Aluminium and Steel sheets as building material.

6.9 Understands the types and applications of Gypsum and Geo-synthetics.

COURSE CONTENT:

1.0 Stones
1.1 Classification of rocks, physical classification.
1.2 Characteristics of good building stone.
1.3 Common varieties of stones - granite, marble, Cuddapah slab, Shahabad stones.
1.4 Dressing of stones-purpose.

2.0 Clay Products
2.1 Introduction- Classification – Physical Properties of Clay.
2.2 Bricks - ISI specification for bricks IS-1077-1971
2.3 Characteristics of good bricks.
2.4 Testing of bricks as per IS-3495-1966 – water absorption, compressive strength.
2.5 Refractory bricks and Fly ash bricks - their uses.
2.6 Tiles –Types of tiles - roofing tiles (Mangalore tiles), floor (Ceramic and Vitrified) and wall Tiles.
2.7 Characteristics of good tiles
2.8 Stone ware, Earthen ware – definition – uses
2.9 Porcelain-glazed tiles (uses only)

3.0 Sand
3.1 Types of sand – River, Pit and Sea sand.
3.2 Characteristics of good sand, Function of sand
3.3 Bulking of sand-percentage of bulk age allowance to be permitted.
3.4 Substitute materials for sand – Robo sand – merits and demerits

4.0 Cement
4.1 Chemical composition of cement.
4.2 Methods of manufacture of cement- Dry process.
4.3 Hydration of cement – Water requirement for Hydration of cement
4.4 Classification of cement, ordinary Portland cement, quick setting cement, white cement, their uses
4.4 Tests for cement as per ISI-consistency, setting time, soundness test
4.5 Blended cement – Portland pozzolona cement (fly ash and slag based) - uses

5.0 Mortars & Concrete
5.1   Classification of mortars-Lime mortars, cement mortars. Surkhi mortars
5.2   Different proportions of mortars for various works.
5.3   Preparation of cement mortar.
5.4   Ingredients of plain concrete
5.5   Proportioning – Grades of concrete - usual proportions for different item of work- foundation, Footings, Columns, Beams and Slabs.
5.6   Reinforced concrete – definition - properties
5.7   Water cement ratio – factors effecting w/c ratio
5.8   Admixtures – definition – types: Plasticizers, super plasticizers, air entraining, aceelartors, retarders – uses.
5.9   Method of preparation of concrete-Hand and machine mix.
5.10   Procedure of Conveyance, Placing, Compaction and Curing of concrete
5.11   Ready mix concrete – definition – Advantages
5.12   Shotcrete, micro concrete and Ferrocement – definition - uses

6.0 Surface Protective Materials.
6.1   Composition of Paints, enamels, varnishes
6.2   Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distemper, Emulsion, French Polish and Wax Polish

7.0 Timber, Plastics, Glass and Asbestos
7.1   Characteristics of good timber.
7.2   Seasoning of timber-Importance.
7.3   Common varieties of timber used for different items of work-Doors and windows, frame work, centering with particular references of A.P
7.4   Wood products-veneer - Ply wood, particle board, laminated board, straw board, Eco board.
7.5   Types of plastics – fibre reinforced plastics, plastic doors and windows, water tanks.
7.6   Use of asbestos – manufacture of bricks.
7.7   Types of glasses and uses.
7.8   Gypsum – types –uses- plaster of paris or stucco, gypsum wall plasters, gypsum plaster boards, pyrocell and non load bearing gypsum partition blocks.
7.9   Geo synthetics- definition – types –uses – geotextiles, geogrids, geomembranes and geo composites.

REFERENCE

1.	Building materials and Components	by	C B R I
2	Building materials	by	Kulkarni
3	Construction materials	by	N.Sreenivasulu
4	Building Materials & Construction	by	Bindra & Arora
5	Building Materials	by	Duggal S.K

CIVIL ENGINEERING DRAWING-I

Subject Title	:	Civil Engineering Drawing - I
Subject Code	:	C-307
Periods/Week	:	04
Periods/Semester	:	60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Introduction	09	08	02	-
2.	Residential Buildings	27	24	01	01
3.	Public and Industrial Buildings	15	20	-	01
4.	Working drawings	09	08	02	-
	Total	**60**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 2x20=40marks

OBJECTIVES:

1.0   Applies standard practices in drawing different components of building
   1.1   Sketches the conventional signs of various Civil Engineering materials, Plumbing and Electrical fixtures.
   1.2   Draws the cross section of load bearing wall and Name all components below and above ground level.
   1.3   Draws the plan of one Brick wall meeting at corner showing alternative courses of headers and stretchers in English Bond.
   1.4   Draws the elevation and sectional plan of fully panelled door and labels the parts.
   1.5   Draws the elevation and sectional plan of fully panelled window, glazed window and labels the parts.
   1.6   Draws the elevation of king post and Queen post trusses and labels the parts with the given data(details of joints not required)

2.0   Understands the requirements of set backs and orientation principals for planning residential buildings as per local bye laws and NBC (National Building Code)

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

   2.2   Draws the plan, section and elevations of single storied load bearing residential buildings from the given line diagram and set of specifications. A) One room with veranda B) one bedroom house C) two bedroom house

2.3 Draws the plan, section and elevations of single storied framed structure residential buildings from the given line diagram and set of specifications.
A) One bedroom house B) two bedroom house

2.4 Draws plan and section of a dog legged stair with given specifications.

2.5 Draws the plan of first and second floors, section and elevation of two-storied residential building (framed structure) from the given line diagram and set of specifications.

2.6 Prepares the drawings in the standard format for obtaining sanction from a local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0 Draws the line diagram (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 Prepares a working drawing for the purpose of marking the width of foundation for the given plan of a building.

4.2 Prepares the working drawings for electrical &plumbing layout, , for a given residential building (2 bedroom buildings – ground floor only)

4.3 Calculates the Plinth area, Carpet area and Floor Area Ratio/Floor Space Index.

4.4 Draws the plan and cross section of a lift shaft for a multi storied building.

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 & Cross section of a Fully panelled door

1.5 Plan & Cross section of a Fully panelled window, glazed window,showing the component parts.

1.6 Elevation of King post and Queen post trusses with the given data,showing the component parts. (details of joints not required)

2.0 Residential Buildings:

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

2.2 Single storied two bedroom load bearing residential building

2.3 Single storied framed structure two bedroom residential building

2.4 Dog legged stair

2.5 Two-storied residential building (framed structure type)

2.6   The standard format for obtaining sanction from local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0   Public and industrial buildings

Draw line diagrams only showing the functional requirements of

3.1   Rural hospital for 10 beds capacity

3.2   Hostel for 50 students

3.3   Primary school for 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 the width of foundation for the given plan

4.1   The working drawings for electrical layout, plumbing, for a given residential building (two bedroom building – Ground floor only)

4.2   Lift shaft for multi storied building.

MATERIAL TESTING LAB

Subject Title   :   **MATERIAL TESTING LAB**
Subject Code   :   **C-308**
Periods/Week   :   **03**
Periods/Semester   :   **45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1	Tests on Bricks	3
2	Tests on Cement	6
3	Tests on Aggregates	9
4	Tests on Metals	6
5	Tests on Concrete	6
6	Tests on Road Aggregate	6
7	Tests on Soils	9
Total		45

OBJECTIVES:

Upon completion of the study of this subject the student is able to

1.0 Understand the standard tests on Engineering Materials to find their suitability in construction
    1.1 States the significance of tests on materials in the field.
    1.2 States the apparatus/equipment required for the tests on materials.
    1.3 Explains the procedure for conducting the test.
    1.4 Performs the test on materials to assess the characteristics of the materials/mechanical properties quantitatively.
    1.5 Draws inferences from the test results on the suitability of these materials in Civil Engineering works.

2.0 Determine suitability of sample of cement for given conditions of workability and strength
    2.1 States the significant of workability and Compression tests in field.
    2.2   States the method of preparing sample and the number of samples required for given work.
    2.3   States the apparatus required for the test.
    2.4 Explains the procedure for conducting the test.
    2.5 Performs test.

2.6   Record observations of test.
2.7   Draws inference from test results on workability/strength of concrete.

3.0   Understand the standard tests on soils
   3.1   State and application of liquid limit and plastic limit of soil.
   3.2   Finds the density of soil by Sand Replacement method.
   3.3   Conducts tests on OMC & MDD

COURSE CONTENTS:

1.0   Tests on Bricks
   a) Water absorption, b) Crushing strength c) Efflorescence.

2.0   Tests on Cement
   a) Fineness test   b) Normal consistency test   c) initial and final setting times of cement. d) Compressive strength of cement.

3.0   Tests on Aggregates
   (a) Water absorption of Sand, (b) Bulking of Sand, (c) Percentage of voids in Coarse and fine aggregates, (d) Sieve analysis of course and fine aggregates (e) Field method to determine fine silt in aggregate

4.0   Tests on Metals
   (a) Tension test on mild steel rod
   (b)   Brinell/Rockwel-hardness test on steel and Brass
   (c)   Izod/Charpy tests on mild steel/brass.
   (d)   Deflection Test on beam (Steel beam or Wooden beam)

5.0   Tests on Concrete
   (a) Slump cone test.
   (b) Compaction factor test.
   (c) Compressive strength -cube test.

6.0   Tests on Road aggregates
   (a) Specific Gravity of fine and course aggregates.
   (b) Aggregates Impact Value
   (c) Flakiness index and elongation index of course aggregate

7.0   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's Compaction Test

SURVEYING PRACTICE - II

Subject Title : **Surveying Practice – II**
Subject Code : **C-309**
Periods/Week : **06**
Periods/Semester : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Theodolite Surveying	15
2.	Trigonometric levelling	09
3.	Tacheometry	15
4.	Curves	15
5.	Land Development & Site surveys	09
6.	Electronic Survey instruments - demonstration	06
7.	Plotting	06
8.	Survey camp	15
	Total	**90**

OBJECTIVES:

1.0 Performs Theodolite Surveying
    1.1 Performs temporary adjustment.
    1.2 Measures horizontal angles
    1.3 Records the observations in the field book.
    1.4 Performs Theodolite survey.
    1.5 Compute included angles, latitudes and departures from field notes

2.0 Performs Trigonometric levelling
    2.1 Determines horizontal and vertical distances of accessible and inaccessible objects by using a Theodolite.
    2.2 Determines horizontal and vertical distances of inaccessible objects by using two Theodolite stations.

3.0 Performs Tacheometric Surveying
    3.1 Determines constants of a given Tachometer in the field
    3.2 Takes Tacheometric observations.
    3.3 Computes heights and distances from field observations.

4.0   Sets out Simple Curves is the Field
  4.1   Computes the elements of curve.

  4.2   Sets out simple curve by chain and tape, one Theodolite and two Theodolite methods.

5.0   Applies Principles of Surveying for Land Development
  5.1   Divides the areas into plots using town planning rules.
  5.2   Prepares the Building plan in the given plot as per town planning rules.
  5.3   Sets out a building in the field as per town planning rules.

6.0   Knows the principle and operation of Electronic Survey instruments

7.0   Applies principles of mapping from the fieldwork and plotting the field work
  7.1   Understand the importance & relation between field work & plotting.

8.0   Applies knowledge of different methods of Surveying in overcoming different field problems in a survey camp.

COURSE CONTENT:

1.0   Theodolite surveying

  1.1   Study of transit Theodolite- Temporary adjustments of Theodolite.
  1.2   Measurement of horizontal angles by reiteration and repetition method.
  1.3   Measurement of vertical angles.
  1.4   Determination of inaccessible horizontal distance involving two Instrument stations.

2.0   Trigonometric levelling
  2.1   Determination of height and reduced level of the top and bottom of accessible object.
  2.2   Determination of distance and elevation of an inaccessible object involving two instrument stations.

3.0   Tacheometry
  3.1   Determination of constants of Tacheometry.
  3.2   Determination of horizontal distance and elevation by Stadia Tacheometry.

4.0   Curves
  4.1   Setting out a simple curve by chain and tape method.
  4.2   Setting out a simple curve by one Theodolite and two Theodolite method.

5.0   Land Development and site surveys
  5.1   Divide the areas into plots using Town Planning rules.
  5.2   Prepares the Building plan in the given plot as per town planning rules.
  5.3   Setting out centre lines and foundation widths fromthe given drawings for excavation.

6.0   Demonstration and Explanation of Electronic Survey instruments
  6.1   Electronic Theodolite.
  6.2   Electronic Distance measurement instrument.
  6.3   Total Station.
  6.4   Global positioning system.

7.0   Plotting
    7.1   Plotting the details of survey field work

8.0   Survey camp
    8.1   Conducting survey camp for 5 days using different methods of Surveying and Instruments and submit a report.

HYDRAULICS LABORATORY

Subject Title : **HYDRAULICS LABORATORY**
Subject Code : **C-310**
Periods/Week : **03**
Periods/Semester : **45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Verification of Hydraulic Principles/ Laws	36
2.	Study of Hydraulic machines	09
	Total	**45**

OBJECTIVES:

1.0 Verifies Hydraulic Principles
  1.1 States the principle / law
  1.2 States the apparatus / equipment required for testing the principle.
  1.3 Performs test and records observations.
  1.4 Draws inferences on the relationship between parameters.

2.0 Study of Hydraulic machines.
  2.0 Understands the principles of Hydraulic machines.
  2.1 Studies the functioning of Pumps and Turbines.

COURSE CONTENT:

LIST OF EXPERIMENTS:

1.0 Verifies Hydraulic Principles:

1 Determination of coefficient of discharge of a small orifice by constant head method and variable Head Method
2 Determination of Cc of an orifice by finding C_v and C_d.
3 Determination of coefficient of discharge of a mouthpiece by constant head method.
4 Determination of coefficient of discharge of a triangular, rectangular and trapezoidal notches.
5 Verification of Bernoulli's theorem.
6 Determination of coefficient of a discharge of a venturimeter.
7 Determination of the coefficients of friction of pipe flow.
8 Determination of Chezy's constant from flow through open channel.

2.0 Study of Hydraulic Machines
9 Study of reciprocating pump and centrifugal pump.
10 Study of turbines – Pelton wheel, Francis and Kaplan turbines.

4TH SEMESTER

ENGLISH-III

Subject Title   :   **English-III**

Subject Code   :   **C-401**

Periods/Week   :   **03**

Periods per semester   :   **45**

R.C.STRUCTURES

Subject Title : **R.C.STRUCTURES**
Subject Code : **C- 402**
Periods/Week : **06**
Periods/Semester : **90**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weight age of Marks	Short Type	Essay Type
1	Introduction to R.C.C and Principles of Working Stress Method	08	10	-	1
2	Philosophy of Limit State Design	07	6	2	-
3	Analysis and Design of Rectangular Beams	20	26	2	2
4	Design of Slabs	15	16	2	1
5	Design of T-beams	10	13	1	1
6	Design of continuous slabs and beams	12	16	2	1
7	Design of columns,	10	13	1	1
8	Design of footings	08	10	-	1
	Total	**90**	**110**	**10**	**8**

OBJECTIVES:

1.0 Understands the Loads to be considered and importance of IS Codes and principles of working stress design
    1.1 Introduction to R.C.C, Loads to be considered and Introduction to I.S Codes and explains the basic concepts of working stress design.
    1.2 Assumptions in the design, permissible stresses in the materials.
    1.3 Calculates the neutral axis, lever arm and moment of resistance of singly reinforced rectangular beam.
    1.4 Design of singly reinforced rectangular beam in flexure.

2.0 Introduction to Limit state Design
    2.1 Introduction to Limit state design, its philosophy and IS:456 – 2000 codal provisions.
    2.2 Defines *'characteristic strength'* of materials and *'characteristic loads'*
    2.3 Explains and differentiates 'Nominal Mix' and 'Design Mix'
    2.4 Explains the role of partial safety factors in limit state design.
    2.5 Defines 'Design strength of materials' and *'Design loads'*
    2.6 States the assumptions made in the limit, state design.
    2.7 Distinguish *'strength'* and *'service ability'* limit states.

3.0 Understands the principles of analysis and design of singly reinforced and doubly reinforced R.C.C rectangular beams, by limit state method.
    3.1 Calculates the maximum depth of neutral axis, lever arm and moment of resistances for singly reinforced beams. Moment of resistance of doubly

reinforced rectangular beams. Also calculate the allowable working load for the given span.

3.2 Calculates the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups. Design of shear reinforcement for beams.

3.3 Calculates the development length of bars in compression, tension, and the curtailment position for main tension bars. State the importance of anchorage values of reinforcement.

3.4 Designs 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.

3.5 Designs an independent lintel subjected to triangular loading.

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

4.1 Distinguishes one-way slabs and two way slabs.

4.2 Designs one-way slab for given grades of materials, loads and span for flexure and including shear design. Checks for deflection using stiffness criteria.

4.3 Understands Load distribution in two-way slabs. Designs two-way slabs with different end conditions for flexure including shear using B.M and S.F coefficients. Provision of torsional reinforcement in the restrained slabs. Checks the deflection using simplified approach of stiffness criteria.

4.4 Describes the detailing of reinforcement in stairs spanning longitudinally and horizontally.

5.0 Understands the principles involved in the design of T-beams

5.1 Describe the three cases of T-beams with sketches and notations.

5.2 Calculate the moment of resistance of the given Tee section using the expressions given in the code.

6.0 Understands the principles involved in the design of Continuous beams and slabs

6.1 Explains the behaviour of continuous beams and slabs subjected to loading.

6.2 Calculates 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.

6.3 Determines the area of steel at critical sections.

7.0 Understands Analysis and Design of columns

7.1 Defines column and understands its behaviour under loading.

7.2 Code provisions of columns

7.3 Differentiates between short and long columns and Understands their failure behaviour.

7.4 Determines load carrying capacity of a given axially loaded short column.

7.5 Designs a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).

8.0   Understands Design of Footings

   8.1   Defines Footing and States different types of Footings (Square/Rectangular Isolated footings of Uniform/Tapered sections).
   8.2   Explains the code provisions for the design of R.C.C footings.
   8.3   Design the square footing of uniform thickness for an axially loaded square column.

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 CONTENTS:

1.0   Introduction to R.C.C and Principles of working stress design

   1.1   Introduction to R.C.C, Loads to be considered and Introduction to I.S Codes and Assumptions in working stress method.
   1.2   Behaviour 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.

4.3 One way and two way slabs with various end conditions as per I.S:456 code.

4.4 Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading.

4.6 Check for deflection using simplified approach of stiffness criteria.

4.7 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.

4.8 Design of torsion reinforcement for the restrained slabs - Deflection check using stiffness criteria - Use of design aids (SP-16).

4.9 Detailing of reinforcement in stairs spanning longitudinally and horizontally.

5.0 Design of T-beam

5.1 Conditions needed for design of a beam as T-Section–advantagesCode provisions for effective flange width - three cases of tee beams.

5.1 Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations).

5.2 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 Behaviour 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).

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(subject to axial load only).

7.5   Design of short square, rectangular and circular columns (with lateral ties only).

8.0   Design of Footings

5.1   Footings - Need for footings

5.2   Fotings under isolated columns – loads on   footings

5.3   Code provisions for design of footings - size of footings for given bearing capacity

5.4   Design of an isolated square footing of uniform thickness under a column

8.5   Checking of the footing for one-way shear, two-way shear, bearing stress and for development length.

<u>REFERENCE:</u>

1.   *'Limit state design of R.C.C structures'*   by Ashok K.Jain, Nem chand

                                                                              brothers, Roorkee.

2.   '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.

3.   Structural Engineering(RCC)   by Ramamrutham.

4.   Structural Engineering (RCC)   by Vazirani and Ratwani.

5   R.C.C Structural Engineering   by Guru charan Singh.

6   Reinforced Concrete Structures   by I.C.Syal and A.K.Goyal

7   Limit state design of reinforced concrete by P.C. Verghese

8   Concrete technology and practice   by M.S Shetty

9   SP:34 - Handbook on concrete reinforcement and detailing.

10   Structural Design & Drawing   by   N. Krishna Raju

                                                                 (Universities press)

IRRIGATION ENGINEERING

Subject Title : **IRRIGATION ENGINEERING**
Subject Code : **C-403**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Basics of Irrigation and Hydrology	20	26	02	02
2.	Head works and weirs	10	16	02	01
3.	Gravity dams and Earth dams	20	39	03	03
4.	Distribution works	10	13	01	01
5.	Watershed Management	15	16	02	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

1.0 Understands basics of irrigation and Hydrology

1.1 Defines Irrigation
1.2 States the necessity for irrigation.
1.3 Lists advantages and disadvantages of irrigation.
1.4 Distinguishes between
    (a) Perennial and inundation irrigation.
    (b) Flow and Lift irrigation.
    (c) Storage and direct irrigation.
1.5 Briefly describes various methods of Irrigation
1.6 States Principal crops in India and their seasons.
1.7 States different methods of expressing duty.
1.8 States the relationship between duty and delta.
1.8 States the factors affecting duty.
1.10 Solves simple problems on duty.
1.11 Defines terms Catchment, intercepted catchment, free catchment, runoff, max flood discharge.
1.12 States the methods of measuring rainfall with Simon's rain gauge.
1.13 States the characteristics of good, average and bad catchments.
1.14 States the methods of estimating average rainfall over a catchment.
1.15 States the factors affecting run-off.
1.16 States the objectives for river gauging.
1.17 Lists the factors for selecting suitable site for a gauging station
1.18 States the methods of measuring velocity.

2.0 Understands head works for a diversion scheme and protective works for resisting percolation.

    2.1   States the classification of head works and their suitability under different conditions.

    2.2   Lists the factors suitable for selection of site of Diversion works.

    2.3   Describes with sketch the component parts of Diversion works.

    2.4   Distinguishes between barrages and Weirs

    2.5   Describes with sketch the component parts of a weir.

3.0 Understands basic ideas about reservoirs, gravity dams and Earth dams.

    3.1   States the classification of Dams.

    3.2   States factors influencing selection of site for reservoirs and dams.

    3.3   Defines the terms: Full reservoir level. Maximum water level, top bund level, dead storage, live storage, free board, gravity dam, spillway.

    3.4   Briefly explains the causes of failure of gravity dams and their remedies.

    3.5   Distinguishes between low and high dams.

    3.6   Draws the elementary profile of a gravity dam for a given height

    3.7   Draws the practical profile of a low dam.

    3.8   States need and types of foundation of drainage galleries, construction joints and draws their sketches.

    3.9   States the different types of spillways and their suitability and draw sketches

    3.10 States need and types of grouting of foundations.

    3.11 States the situations in which earth dams are suitable.

    3.12 Defines saturation gradient, phreatic line.

    3.13 States the three types of earth dams with sketches of typical cross sections.

    3.14 States the method of constructing rolled fill earth dams and their maintenance.

    3.15 Briefly explains drainage arrangements in earth dams with a neat sketch.

    3.16 Briefly explains the causes of failure of earth dams and states the preventive measures.

4.0 Understands basic ideas about canals & cross masonry works.

    4.1   States classifications of canals.

    4.2   States the different methods of canal alignment and the situations in which each is suitable.

    4.3   Sketches typical cross sections of canals in cutting, embankment and partial cutting.

    4.4   Defines terms: balanced depth of cutting, regime channel.

    4.5   States the three types of cross masonry works (cross regulator, drainage & communication) and their objectives.

    4.6   States need and draws the sketches of different cross regulatory and cross drainage structures.

    4.7   States the necessity and types of canal linings, advantages and dis - advantages of canal linings.

    4.8   States maintenance required for canals and their regulation

5.0 Understands the basic ideas about watershed management

    5.1   Defines terms: watershed, watershed management.

    5.2   States the necessity of watershed management.

5.3   Lists the objectives of watershed management
5.4   Briefly describes different approaches to watershed management.
5.5   Lists the characteristics of watershed
5.6   Briefly explains rain water harvesting.
5.7   Briefly explains soil moisture conservation methods.

COURSE CONTENT:

1.0   Nature and scope of Irrigation Engineering and Hydrology

1.1   Definitions-necessity of irrigation-advantages and disadvantages-perennial and inundation irrigation-flow and lift irrigation-direct and storage irrigation.- Methods of irrigation- Border, Strip, Furrow, Check basin, Sprinkler & Drip irrigation

1.2   Principal crops-kharif and Rabi crops-Dry and wet crops.

1.3   Definition of duty, delta, base period, 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.

1.4   Rainfall-types of rain gauges-Simon's rain gauge-float type automatic recording gauge-Precautions in setting and maintenance-rainfall records Hydrological cycle-average annual rainfall of an area – Theissen's polygon method.

1.5   Catchment basin an 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.

2.0   Head Works & Weirs
2.1   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.

2.2   Barrages and Weirs.

2.3   Head Regulator-scouring sluice-flood banks and other protective works.

3.0   Gravity dams and Earth dams
3.1   Dams-rigid and non-rigid dams - main gravity dams
3.2   Factors influencing selection of site for reservoirs and dams
3.3   Definition of various terms such as FRL, MWL, TBL, Dead Storage, Live Storage, Gravity Dam, Spillway
3.4   Failures of gravity dams and remedial measures
3.5   Elementary profile – limiting height of dam-low dam and high dam - free board and top width –practical profiles of low dam
3.6   Uplift pressure - drainage gallery
3.5   Contraction joints - grouting of foundations.
3.6   Earth dams – situations suitable for Earth Dams types of earth dams
3.7   Causes of failure of earth dams and precautions –saturation gradient and phreatic line-drainage arrangements
3.8   Construction details of earth dams-breaching sections-breach filling
3.9   Maintenance of earth dams.

4.0   Distribution works

4.1   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.

4.2   Cross drainage works-necessity –general description of aqueducts – super passage – under tunnel - siphon level crossing-inlet and outlet.

5.0   WATERSHED MANAGEMENT

5.1   Introduction, concept of watershed development, 0bjectives of watershed management, need for watershed development in India, Integrated and multidisciplinary   approach   for   watershed   management.

5.2   Characteristics of Watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics

6.3   Water Harvesting: Rainwater harvesting, catchment harvesting, soil moisture conservation, check dams, artificial recharge, and percolation tanks.

REFERENCE

1.   Irrigation Engineering   by B.R.Gupta.
2.   Irrigation Engineering   by Kamala
3.   Irrigation Engineering   by B.C Punmia
4.   Irrigation Engineering and water power engineering   by Birdie.
5.   Irrigation Engineering   by S.K.Garg
6   Watershed Management   by JVS Murthy, -
New Age International
7   Land and Water Management   by VVN Murthy, -
Kalyani Publications.

QUANTITY SURVEYING

Subject Title	:	Quantity Surveying
Subject Code	:	C-404
Periods/Week	:	06
Periods/Year	:	90

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to the subject	02	--	-	-
2	Measurement of Materials & Works	02	03	1	-
3	Types of Estimates	04	03	1	
4	Detailed Estimates of Buildings	30	26	2	2
5	Analysis of rates and Abstract Estimates	12	23	1	2
6	Estimation of quantity of Steel of R.C.C elements	08	03	1	-
7	Earth work calculations	08	13	1	1
8	Detailed estimates of roads, culverts, open well and Public health Engineering works	14	23	1	2
9	Valuation of buildings – principles and methods of Valuation	08	13	1	1
10	Rent fixation of buildings	02	03	1	-
	TOTAL	**90**	**110**	**10**	**08**

OBJECTIVES:

1.0 Understands basic concepts of Quantity Surveying, Units and Specifications
    1.1   Defines Quantity Surveying and Estimate
    1.2   States the need for quantity surveying, duties of Quantity Surveyor
2.0 Knows various items of Civil Engineering works and their units and method of measurement.
    2.1   Distinguishes different items of a work & materials of construction.
    2.2   States the units of measurements, data and payment for different items of work and materials using I S: 1200

2.3 States the process of taking measurements for different works and tolerances

2.4 Gives the general specifications for important items of work

3.0 Understands different types of estimates
3.1 States different types of estimates

3.2 Prepares 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.

4.0 Prepares detailed estimates for various Civil Engineering Structures
4.1 States the information required for preparation of detailed estimate of a building

4.2 Prepares the detailed estimate for various buildings from the given drawings specifications and site conditions.
    4.2.1 Two roomed building with verandah
    4.2.2 Two/Three bed room building
    4.3.3 Two Storied residential building
    4.3.4 Primary school building

4.3 Prepares the estimation of a Steel Roof Truss for an Industrial Building with sloped roof.

5.0 Understands the Analysis of Rates and Abstract estimations
5.1 Defines different terms involved in rate analysis

5.2 Explains the computation of rate of an item of work

5.3 Prepares Lead Statement and data for different items of work

5.4 Tabulates the material requirements of mortars and concrete of different proportions

5.5 Prepares abstract estimate for
    5.2.1 Two roomed building with verandah
    5.2.2 Two/Three bed room building

6.0 Prepares the estimates for steel reinforcement for different R.C.C elements
6.1 States the different methods of estimation of steel required for R C C work involved in a building

6.2 Computes the quantity of steel reinforcement for different elements of R.C.C Works in building by preparing a bar bending schedule

7.0 Computes the volumes of earth work and reservoir capacity
7.1 States the different methods of computations of areas and volumes

7.2 Defines the lead and lift and states the standard values

7.3 Prepares a detailed estimate for volume of earth work for roads ,canals and earthen bunds.

7.4 Computes gross and effective capacity of a reservoir from the areas of different elevations

8.0 Prepares the detailed estimates of irrigation and public health engineering structures
8.1 Prepares detailed estimates of different types of roads & culverts.

8.2 States the different items involved in the abstract estimates of Roads & culverts.

8.3 Prepares a detailed estimate for open well, R.C.C. overhead tank, Septic tank with soak pit / dispersion trench.

9.0   Understands valuation of buildings

9.1 Explains terms: Valuation, Scrap value, salvage value, market value, book value, sinking fund, depreciation.

9.1 States the purpose of valuation.

9.2 States the factors governing valuation.

9.3 Calculates depreciation of a building.

9.4 Determines value of a building

10.0   Understands rent fixation of building

10.1 Determines rent for a building on plinth area method.

COURSE CONTENT

1.   Introduction to the subject

1.1 Definition of quantity surveying/estimation –need for estimation –duties of Quantity Surveyor

2.   Measurement of Materials and works

2.1 Various items of Civil Engineering works as per I.S: 1200 and their units of measurement.

2.2 Rules for measurement.

2.3 General specifications for different items of work

3.   Types of estimates

3.1 Detailed Estimate – Abstract Estimate - Definitions – Formats for detailed and abstract estimates.

3.2 Preliminary or Approximate Estimate – Plinth area estimate – Cubic rate Estimate methods

3.3 Problems in Preliminary estimate for residential and non-residential buildings

4.   Detailed Estimates of Buildings

4.1 Detailed estimate for a Compound wall

4.2 Single roomed building (load bearing type structure)

4.3 Two roomed building (load bearing type structure)

4.4 Two storeyed residential building with number of rooms (load bearing type structure) Primary School building

5   Analysis of Rates and Abstract Estimates

1.1 Cost of materials at source and at site.

5.2 Cost of labour-Types of labour-Schedule of rates.

5.3 Lead and lift-Leads statement.

5.4 Abstract Estimate for

    5.4.1 Two roomed building with verandah

    5.4.2 Two/Three bed room building

6   Estimation of quantities of steel of R.C.C elements

6.1   Simply supported singly reinforced R.C.C beams.
6.2   Simply supported R.C.C lintels
6.3   Simply supported one way slab
6.4   Preparation of bar bending schedule for above

7   Earth work Calculations

7.1   Trapezoidal-Prismoidal-Mid-ordinate –mean sectional area rules for computing volumes in level sections for roads and canals.
7.2   Leads and Lifts and their standard values
7.3   Taking out quantities from L.S and C.S in cutting and embankment of level sections.
7.4   Capacity of reservoirs from contours maps

8.0   Detailed Estimates of Roads, Culverts, Open well and public health Engineering Works

8.1   Water bound macadam road
8.2   Road with Bitumen Surface dressing
8.3   Cement concrete road
8.3   Pipe culvert
8.4   R.C.C slab culvert with straight returns.
8.5   Open well with masonry steining
8.6   R.C.C Overhead Water tank.
8.6   Septic tank with dispersion trench/soak pit

10.0   Basic Principles of Valuation

9.1   Definition, meaning and purpose of valuation.
9.2   Factors governing valuation-Life of structure, type location maintenance, legal control
9.3   Scrap value, salvage value, market value and book value sinking fund
9.4   Calculation of depreciation by different methods.
9.5   Methods of valuation.

10.0   Rent fixation of Buildings

10.1   Rental value based on plinth area method.

REFERENCE

1.	Estimating and Costing	by	B N DATTA
2.	Estimating	by	Gurucharan Singh
3.	Estimating and Costing	by	S.C. Rangwala
4.	Quantity Surveying	by	A. Kamala
5.	Civil Engg Contracts & Estimates	by	B.S. Patil (Universities press)

ENVIRONMENTAL ENGINEERING - I

Subject Title : **Environmental Engineering - I**
Subject Code : **C-405**
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	08	16	02	01
3.	Sources and Conveyance of Water	10	16	02	01
4.	Quality and Purification of Water	18	36	02	03
5.	Distribution System	20	39	03	03
	Total	60	110	10	08

OBJECTIVES:

1.0   Knows about Environment and Ecology

    1.1   Defines Environment.
    1.2   Defines Ecology and Ecosystem.
    1.3   Lists the components of Ecosystem.
    1.4   Explains the flow of matter and energy in an ecosystem.
    1.5   Lists the factors affecting the stability of an ecosystem.
    1.6   Explains the concept of sustainable development.

2.0   Knows the scheme of water supply.

    2.1   Lists the objectives of a Protected water supply scheme.
    2.2   Draws the flow chart of a typical water supply scheme.
    2.3   Lists the factors affecting per capita demand.
    2.4   States the requirements of water for various purposes:
       (i) Domestic purposes (ii) industrial use (iii) fire fighting
       (iv) Commercial and institutional needs (v) Public use.
    2.5   Explains the variation in demand for water supply.
    2.6   Works out simple problems on forecasting population by different methods.
    2.7   States the method of determining total quantity of water required by a town.

3.0   Understands the different sources and conveyance of water.
    3.1   States the salient features of various surface sources.
    3.2   Defines terms: Aquifer, Aquiclude, Aquitard and Ground water-table.
    3.3   States the classification of wells according to construction.
    3.4   Defines terms: draw down, critical depression of head, circle of influence, cone of depression, confined and unconfined aquifer, specific yield.

3.5   Explains procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests).

3.6   Explains with sketches:
       (i) Infiltration galleries.   (ii) Infiltration wells.

3.7   Describes with sketches intakes for collection of water.

3.8   Explains the different methods of conveyance of water.

3.9   Lists the merits and demerits of different types of pipes used for conveyance of water.

3.10   Explains with sketches the different joints used for connecting pipes.

3.11   Describes the standard method of pipe laying and testing as per I.S code.

3.12   States the causes and prevention of pipe corrosion.

4.0   Understands the Quality as per IS code and methods of purification of water

4.1   States the need for laboratory tests for testing water.

4.2   Explains the method of obtaining samples for testing.

4.3   Explains the different tests for analyzing quality of   water with their significance.

4.4   Defines: E-coli index, most probable number (MPN).

4.5   Sketches the overall layout of a water treatment plant indicating the different stages.

4.6   States the objects of aeration, plain sedimentation, sedimentation with coagulation, filtration and disinfection.

4.7   Explains the process of aeration, plain sedimentation, sedimentation with coagulation, filtration.

4.8   Describes the different types of sedimentation tanks.

4.9   Describes the construction and operation of slow sand, rapid and pressure filters and compares them.

4.10   Explains the methods of disinfection of water.

4.11   Explains the different methods of Chlorination.

4.12   Explains Hardness of water and methods of removal of Hardness.

5.0   Understands the systems of distribution and Water supply arrangements in Buildings.

5.1   Explains with sketches the different systems of distribution.

5.2   States the necessity for service reservoirs.

5.3   Draws sketches of rectangular overhead service reservoir showing all accessories.

5.4   Explains with sketches the different layouts in distribution system.

5.5   Lists the merits and demerits of layouts with their suitability for a given locality.

5.6   Explains methods of detecting leakages.

5.7   Explain methods of rectification and prevention of leakages.

5.8   Lists various appurtenances used in a distribution system.

5.9   Explains with sketches the location and functioning of various appurtenances used in a distribution system.

5.10   Defines terminology used while making water supply arrangements in buildings.

5.11   States the principles in laying pipelines within the premises of a building.

5.12 Explains 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.

5.13 States the general precautions to be taken in plumbing work for buildings.

5.14 Describes the constructional details and uses of different fittings: ferrule, goose neck, stopcock.

COURSE CONTENT:

1.0 Environment and Ecology.

1.1 Environment – Biosphere – Atmosphere – Acid rain, Green house effect – Ozone layer depletion.

1.2 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.

2.0 Introduction to Water Supply Scheme and Quantity of water

2.1 General importance and Historical Development of Water supply.

2.2 Need for protected Water supply.

2.3 Flow chart of a typical water supply scheme.

2.4 Total quantity of water required for a town, per capita demand and factors affecting demand.

2.5 Water requirements for different purposes: domestic, industrial, fire fighting, commercial and institutional, public.

2.6 Variation in demand: seasonal, daily and hourly variation - Peak demand

2.7 Forecasting population by arithmetical, geometrical and incremental increase methods - problems

3.0 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 Selection of Source of water for a water supply scheme.

3.4 Yield from wells by constant pumping and recuperation tests.

3.5 Comparison of surface and subsurface sources.

3.6 Types of intakes:
   (i) Reservoir intake;
   (ii) River intake;
   (iii) Canal intake.
   (iv) Lake intake.

3.7 Conveyance of water-open channels and pipes.

3.8 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.

3.9 Pipe joints - spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes.

3.10 Pipe Laying and testing-Leak detection-prevention-rectification.

3.11 Pipe corrosion - causes and prevention.

4.0 Quality and Purification of water.

4.1 Impurities of water - need for laboratory test – sampling: Grab Sampling – Composite sampling

4.2 Tests of water - physical, chemical and bacteriological tests.

4.3 Quality standards of water for domestic and industrial purposes as per Indian Standards.

4.4 Flow diagram of different treatment units in a treatment plant.

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 and Pressure filters.

4.8 Disinfection of water - necessity and methods.

4.9 Chlorination: methods of chlorination - Break point chlorination.

4.10 Hardness - Types of Hardness - Removal of hardness.

NOTE: No design of treatment units

5.0 Distribution system and water supply arrangements in a Building.

5.1 General requirements - systems of distribution: Gravity system, Direct pumping and Combined system.

5.2 Methods of supply - Intermittent and Continuous.

5.3 Storage – necessity – types: underground, surface and overhead service reservoirs.

5.4 Types of layout - dead end, grid, radial and ring system - merits and demerits - suitability.

5.5 Location and function 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 layout 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, reducer, coupling, elbow, Tee, bend, dummy etc.

REFERENCE

1. Environmental Engineering   by   G.S. Birdie
2. Elements of Public Health engineering   by   K.N. Duggal
3. Environmental Engineering   by   Baljeet Kapoor
4. Public Health Engineering   by   S.K. Hussain
5. Environmental Engineering   by   Ramachandraiah
6. Water supply and sanitary Engineering   by   V.N. Vazirani.

CONSTRUCTION PRACTICE

Subject Title : **Construction Practice**
Subject Code : **C-406**
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	11	23	01	02
2.	Masonry	06	13	01	01
3.	Doors, Windows and Lintels, Sunshades	08	16	02	01
4	Roofs and Floorings	12	16	02	01
5	Scaffolding, Form work, Stairs	07	13	01	01
6.	Protective,decorative finishes and Termite proofing	07	13	01	01
7.	Construction Failures and Maintenance	09	16	02	01
	Total	**60**	**110**	**10**	**08**

OBJECTIVES:

1.0 Knows the classification of Buildings and design of foundations as per NBC

1.1 States the components of a building and their functions.
1.2 States the classification of buildings with examples.
1.3 Explain the investigation required for foundation as per N.B.C
1.4 Describes with line diagrams - spread footings, raft foundation, pile foundation and well foundation.
1.5 Explain the term bearing capacity of soil, safe and ultimate bearing capacity of soil.
1.6 States the loads to be considered in design of foundation
1.7 State rules for minimum depth, width of foundation and thickness of concrete bed.
1.8 Explain the method of constructing spread foundation.
1.9 Causes and effect of dampness at basement level, Prevention of dampness at basement level.

2.0 Understand the construction of masonry work
    2.1   Explain the different types of stone masonry
    2.2   State the general principles to be observed in stone and brick masonry construction.
    2.3   Explain the term bond, course, headers, stretcher .
    2.4   Explain with sketches brick masonry, Precast concrete solid blocks and Hollow blocks, high quality building blocks masonry construction in English bond.

3.0 Understands the types and principles of doors , windows, ventilators and Lintels, 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 and their uses.
    3.3   Explain the functions of lintels, sunshades, canopy sun-breakers and porticos, thin lintel developed by CBRI with simple sketches.

4.0 Understands methods of construction and finishes of different types of roofs and floorings.
    4.1   State the classification of roofs.
    4.2   Explain with sketches king post truss, fan roof truss, north light roof trusses, Steel trusses – A type, B type using structural angles and tubular sections as per the provisions of IS code
    4.3   States the common and decorative ceilings used in construction work.
    4.4   State the functions of the components of a flooring.
    4.5   Explain method of construction of C.C flooring, stone slab flooring, tiled flooring and mosaic flooring, Ceramic flooring, Marble flooring and Marbonite flooring.

5.0 Understands scaffolding , Formwork and types of Stairs.
    5.1   Purpose of scaffolding.
    5.2   Advantages of tubular scaffolding.
    5.3   States the objectives of formwork
    5.4   States the requirement of formwork
    5.5   Draw the formwork arrangement for slab & Beam system, Column and Slip form work
    5.6   Advantages of Steel formwork over Timber formwork
    5.7   States the principles of locating stairs.
    5.8   Explain term: rise, tread, landing, flight, going
    5.9   Draw the line diagrams of different stairs – straight stair , dog legged, open well stairs, Slabless stairs, spiral stairs and Helical stairs

6.0 Protective, decorative finishes and Termite Proofing
    6.1   States the objects of plastering.
    6.2   State the steps in providing cement plastering on masonry walls.
    6.3   State the use of wall putty as a decorative finish on masonry walls
    6.3   State the objects of pointing
    6.4   States the types of pointing.

6.5   Explains the method of painting new and old walls.

6.6   State the paints suitable for painting wood work and steel work – Powder coating, spray painting

6.7   Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.

6.8   Definition, method of termite proofing.

7.0   Construction Failures and Maintenance

To understand the Construction failures, repairs, maintenance and Buildings services.

7.1   Understands the concepts of error and failures

7.2   State the different causes of failures

7.3   State the different types of structural failures in foundations, machinery and RCC frames and state the remedies

7.4   State the different types of non structural failures in plastering and floorings and cracks in buildings

7.5   State causes of leakages of roof and joints and state the remedial measures

7.6   List the various types of failures due to ignorance and negligence and State the remedies

7.7   State various annual and special maintenance works in buildings

COURSE CONTENT:

1.0   Classification of Buildings and foundations

1.1   Component parts of a building -Their function.

1.2   Classification of building according to National building code

1.3   Site investigation for foundation as per N.B.C, Trial pit, auger boring.

1.4   Bearing capacity of soils-Definitions of safe and ultimate bearing capacity

1.5   Spread footing of columns and walls.

1.6   Raft foundation.

1.7   Pile foundation RCC Piles-Bearing and friction piles under reamed pile

1.8   Well foundation-component parts-sinking of well foundation.

1.9   Different loads to be considered for the design of foundation as per IS 875-1987.

1.10   Spread foundation:-Depth of foundation-width of foundation- Thickness of concrete bed

1.11   Construction of foundation.(spread)

1.12   Causes, effects and prevention of dampness at basement level

2.0   Masonry

2.1   Classification of stone masonry-Ashlar, Random rubble masonry, Coursed Rubble Masonry- -general principles to be observed while constructing stone masonry

2.2   Brick Masonry-Bonds in brick masonry(English bond only) General principles to be observed in construction of brick masonry.

3.0 Doors, Windows and Lintels, Sunshades

3.1 Common types of doors-panelled, Glazed, Flush.
3.2 Special types of doors-Flush doors, revolving doors, collapsible doors, rolling shutters, sliding doors, referring to A.P.D.S.S for size of doors and windows.
3.3 Windows-Glazed.
3.4 Ventilators- fixed, swing, louvered.
3.5 Fittings and fasterings for doors and windows.
3.6 Lintels-Functions-Types of lintels-R.C.C .
3.7 Sunshade, canopy and sun breakers – lintel cum sunshade.

4.0 Roofs and Floorings

4.1 Roof functions.
4.2 Classification of roofs- flat roof- pitched roofs
4.3 Different types of trusses – king post truss, fan roof truss, north light roof truss.
4.4 Weather proof course on r.c.c. roof.
4.5 Decorative ceilings for auditoriums -method of fixing plaster of paris-Fibre glass.
4.6 Parts of flooring-Requirements of a good floor.
4.7 Methods of constructing flooring-cement concrete flooring, stone
      slab (cuddapah slab, shahabad stone) floorings, cement plaster flooring, Tiled flooring, mosaic flooring and morbonite flooring.

5.0 Scaffolding,Formwork and Stairs

5.1 Purpose, types – tubular scaffolding only.
5.2 Form Work - objectives of form work – form work arrangements for slab and beam, columns, walls, water tanks and cooling towers(slip forms)
5.3 Location of stairs
5.4 Types of different stairs-straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral stair case, free standing staircase and slab less stairs.

6.0 Protective, decorative finishes and Termite proofing

6.1 Plastering purpose-Types of plastering-procedure for plastering External finishing – sand faced, pebble dash, acoustic plastering, marble chips. Internal finishing – wall paper – wall putty finishing
6.2 Pointing purpose -Types of pointing
6.3 Painting objects-method of painting new and old wall surfaces-wood surface metal surfaces – powder coating and spray painting on metal surfaces.
6.4 White washing - colour washing – Distempering - internal and external walls.
6.5 Definition, method of termite proofing

7.0 Construction Failures and Maintenance

7.1 Introduction – error and failure – different types of failure – structural and non structural failures
7.2 Structural failures: Failures in foundations and in RCC building frames - Remedial measures

7.3 Non Structural failures: Failures in plastering and floorings, cracks in walls at different location – reasons and remedial measures Failures due to ignorance and negligence – Remedial measures

REFERENCE

1 . National Building code.   BIS publication
2. Building Construction   by S.P. Arora
3 Building Construction   by Sushil Kumar
4. Building Construction   by S.C.Rangawala
5. SP20 Explanatory handbook on Masonry code   BIS publication
6. Design of foundation structures principles and practice by N. P. Kurian

CIVIL ENGINEERING DRAWING – II

Subject Title : **Civil Engineering Drawing - II**
Subject Code : **C - 407**
Periods/Week : **06**
Periods/semester : **90**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Culverts	12	12	1	
2.	Bridges	12	12	1	01 (25marks)
3.	Public health engineering drawings	18	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=20marks & Part-B 25+15 =40marks

OBJECTIVES

1.0   Draws different views of culverts.

1.1   Draws the plan, cross sectional elevation and longitudinal sectional elevation of pipe culvert, R.C.C –slab culvert and identifies the component parts from the given set of specifications.

2.0.   Draws different views of T. Beam bridge
2.1   Labels the component parts of a given R.C.C. T-beam bridge.
2.2   Draws the sectional elevation, plan and cross section of Two span R.C.C T-beam bridges from the set of given specifications.

3.0   Draws the component parts of Public health Engineering works
3.1   Draws the sectional elevation, plan and cross section of public health Engineering works.

4.0   Draws the different views of irrigation Engineering structures
4.1   Draws the sectional elevation, plan and cross section of different Irrigation Engineering structures.

COURSE CONTENT

1.0   Simple Culvert.
Draw the plan, cross-sectional elevation and longitudinal sectional elevation of
1.1   Pipe culvert (Single Pipe)
1.2.   R.C.C slab culvert with square returns.
1.3.   R.C.C slab culvert with splayed wings

2.0   Bridges.
2.1   Two-Span R.C.C T-beam bridge with square return walls.
2.2   Two-Span R.C.C T-beam bridge with splayed wing walls and Returns walls.

3.0   Public health engineering drawings.
    3.1   Lavatory block of a large building showing internal water supply and sanitary fittings and plumbing fixtures.
    3.1   Prepare details of plumbing connections for toilet fixtures.
    3.2   Septic tank with details of connection to a dispersion trench/soak pit
    3.3   R.C.C overhead rectangular tank.(four columns with accessories).

4.0   Irrigation engineering drawings
    4.1   Earthen bunds – Three types.
            a) Homogeneous b) Zoned embankment type c) Diaphram type
    4.2   Tank surplus weir with splayed wing walls.
    4.3   Canal drop (notch type)
    4.4   Head sluice (Head wall type)
    4.5   Tank sluice with tower head.
    4.6   Canal regulator
    4.7   Super passage
    4.8   Aqueduct

REFERENCE:

1.   Civil Engineering Drawing   by   A. Kamala.
2.   Civil Engineering Drawing   by   Chakraborthy.

C.A.D LAB – I

Subject Title : **CAD LAB - I**
Subject Code : **C - 408**
Periods/Week : **06**
Periods/semester : **90**

TIME SCHEDULE

S.No	Major Topics	No. of Periods
1.	Introduction to Computer aided Drawing	06
2.	Practice on Auto CAD	24
3	Geometric Constructions	30
4	Preparation of Simple 2-D drawings using Auto CAD Software	27
5.	Study of software packages for civil engineering.	03
	Total	**90**

OBJECTIVES:

1.0. Computer aided drafting (CAD)
    1.1   State the applications and advantages of CAD
    1.2   State the features of Auto CAD as drafting package
    1.3   State the hardware requirements to run Auto CAD

2.0   Practices to start the Auto CAD, drawing editor and selects/enters Auto CAD Commands to perform any operations
    2.1   Studies the drawing editor screen.
    2.2   Practices the methods of selecting/entering commands to start new drawing accessing Auto CAD commands by selecting from menus, tool bars and entering Commands on command line.
    2.3   Sets the limits of the drawing to get the needed working area.
    2.4   Practices the 'setting commands' Grid, Snap, & Ortho Commands.
    2.5   Practices 'Draw commands'- point, line, pline, rectangle, circle, tangent, ellipse, arc, polygon.
    2.6   Dimensions the given figures.
    2.7   Practices 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
    2.8   Practices 'construct commands '– offset, array, Divide, measure.
    2.9   Practices 'edit commands' – Undo, Redo, Oops, CopyClip, PasteClip, Del.
    2.10   Practices 'view commands' – Redraw, Regen, Zoom, Pan.
    2.11   Practices 'Hatch commands' – Bhatch, Hatch.
    2.12   Practices 'insert commands' – Block, Wblock, Insert, Minsert.

3.0   Practices to draw Geometric Constructions for given object using Auto CAD commands.

4.0 Employ CAD software commands to prepare drawings related to Building components.

5.0 Knows about different packages available for Analysis, Design, Drafting, Estimation packages.

COURSE CONTENT:

1.0 Introduction to computer aided drafting (CAD)
  1.1 Computer graphics
  1.2 Definition of CAD
  1.3 Applications of CAD
  1.4 Advantages of CAD
  1.5 Introduction to Auto CAD as Drafting package

2.0 Practice on Auto CAD.
  2.1 Study of drawing editor screen
  2.2 List out methods to access Auto CAD commands.
  2.3 Practice of setting up of drawing area using utility commands, & using setting commands.
  2.4 Practice of entity draw commands.
  2.5 Draw the given geometrical figures using draw commands.
  2.6 Dimension the figures using dimensioning commands.
  2.7 Practice of Modify commands.
  2.8 Practice of construct commands.
  2.9 Practice of edit commands
  2.10 Practice of view commands.
  2.11 Practice of Hatch commands.
  2.12 Practice of insert commands.

3.0 Geometric Constructions
  3.1 Divide a given line into desired number of equal parts internally.
  3.2 Draw tangent lines and arcs
  3.3 Construct a hexagon from the given data.
  3.4 Construct ellipse, parabola, hyperbola, cycloid, and helix.

4.0 Using CAD software draw & print the following drawings.
  4.1 Draw conventional signs as per I.S. standards , symbols used in civil engineering drawing.
  4.3 Draw the important joinery components of the building like elevation of fully panelled double leaf door, elevation of partly glazed and partly panelled window.
  4.4 Draw the important building components like section of a load bearing wall foundation to parapet.
  4.5 Prepare the king post & Queen post truss and lable the various parts.

5.0 Packages available for Analysis, Design, Drafting and Estimation.
  Analysis - Staad pro, SCADS, Ansys, GT Studl, E-Tab, ASAP.
  Design – Staad pro, STRUDS etc.,
  Drafting – Auto CAD, Intelli CAD, Architectural CAD etc.,

5TH SEMESTER

C-501 INDUSTRIAL TRAINING
(Practical Training)

<u>**V SEMESTER**</u>

<u>Scheme of evaluation:</u>

S.No	Subject	Duration	Items	Max Marks	Remarks
1	Practical Training in the Industry	6 Months	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training report i) Log Book ii) Report	 30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 50%.A candidate failing to secure the minimum marks should complete it at his own expenses. No apprenticeship training stipend is payable in such case.

During Industrial training the candidate shall put in a minimum of 90%attendence.

DIPLOMA IN CIVIL ENGINEERING (CURRICULUM C-09)

V SEMESTER

(INDUSTRIAL TRAINING)

Duration : 6 months

OBJECTIVES

On completion of a spell of practical training in a industry, the student will be able to

1.0   Know the organizational set up from top executive to workmen level
2.0   Know the aspects to be considered during preliminary projects in respect of Irrigation/Road/Rural water supply/Housing colony etc.,
3.0   Know the duties of different officers in the organization
4.0   Know about administrative sanction and technical sanction
5.0   Know various stages of construction
6.0   Knows inspection of form work, reinforcement grills etc.,
7.0   Know the methods of procurement of labour, material and equipment
8.0   Know tenders, contract and contract systems
9.0   Know the need & principles supervision of works
10.0 Know measurement book and muster roll
11.0 Know the preparation, checking and payment of bills
12.0 Know the requirements of a licenced surveyor/contractor/manufacturer of building material(s)

RULES AND REGULATIONS:

1.   A candidate shall be assessed twice during the spell of industrial training and at the end of industrial training.
2.   The assessment shall be carried out by a committee comprising of
     (a)   A representative of the Industry where the candidate is undergoing training
     (b)   A staff member of the concerned section of the polytechnic.
3.   Each assessment should be as per the Assessment scheme listed

ASSESSMENT SCHEME

S. No.	Name of the Parameter	Max. Marks Allotted for each Parameter
1.	Attendance and punctuality	10
2.	General conduct during the period	10
3.	Ability to communicate & human relations	10
4.	Familiarity with materials, tools & machinery	10
5.	Attitude towards job	10
6.	Manual skills	10
7.	Comprehension & Observation	10
8.	Supervising ability	10
9.	Safety and Environmental consciousness	10
10.	Maintenance of dairy	10
	Total:	**100**

4.   The remaining <u>100 marks</u> are to be allotted as follows:

    For maintenance of log book   30 marks

     For the training report   30 marks,

    For seminar / viva-voce   40 marks.

      The assessment at the institute level (seminar / viva-voce) is to be done by the following three members individually and be averaged.

    (1)   Head of Dept. Concerned

    (2)   Staff members (two) who assessed the student in the industry

6TH SEMESTER

ENGLISH-IV

Subject Title   :   **English-IV**

Subject Code   :   **C-601**

Periods/Week   :   **02**

Periods per semester :   **30**

STEEL STRUCTURES

Subject Title	:	STEEL STRUCTURES
Subject Code	:	C- 602
Periods/Week	:	05
Periods/Semester	:	75

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	05	03	1	-
2.	Design of fillet welded joints	8	13	1	1
3.	Design of Tension members	10	16	2	1
4.	Design of Compression members, Columns & Column bases	22	36	2	3
5.	Design of Beams	20	26	2	2
6.	Design of Roof trusses	10	16	2	1
	Total	**75**	**110**	**10**	**08**

OBJECTIVES:

1.0 Understands the Properties of Sections and Loads on steel structures
    1.1   States the merits and demerits of Steel Structures.
    1.2   Lists the loads considered in the design of steel structures as per I.S:875-1987.

    1.3   Introduction to I.S. 800-2007 - Understands the mechanical properties of structural steel.
    1.4   States the standard structural sections – Classification of cross sections – class 1 to 4 – types of elements.
    1.5   Concept of Limit State Design.

2.0 Understands the principles of design of Fillet Welded Joints
    2.1   States the different types of joints.
    2.2   Differentiate the welded joints and Riveted joints
    2.3   Sketches the different forms of welded joints.
    2.4   Explains the features of a fillet welded joint.
    2.5   States stresses in welds as per I.S.800-2007.
    2.6   Calculates the strength of a fillet welded joint.
    2.7   Designs a fillet welded joint for a given load, thickness of a plate and permissible stresses as per code.
    2.8   Designs a fillet welded joint for single or double angles carrying axial loads.

3.0   Understands the principles of design of Tension Members
   3.1   Introduction to tension members and different forms of tension members.
   3.2   Understands the behaviour of tension members.
   3.3   Understands different modes of failures – gross section yielding, net Section rupture and block shear failure.
   3.4   Knows the maximum values of effective slenderness ratios as per code.
   3.5   Determines the design strength due to yielding of gross section, rupture of critical section and block shear.
   3.6   Understands design procedure of tension members
   3.7   Designs tension members.

4.0   Understands the principles of design of Compression Members, Columns and Column Bases
   4.1   Introduction to compression members and different forms of compression members.
   4.2   Understands the behaviour of compression members - classification of cross sections.
   4.3   States effective lengths to be used for different end conditions.
   4.4   Understands buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves.
   4.5   Knows the maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes.
   4.6   Determines the design strength of compression members - codal provisions for design compressive stress.
   4.7   Understands design procedure of compression members.

   4.8   Understands design details - effective sectional area – codal provisions for angle struts.
   4.9   Understands codal provisions of single / double lacing and battening for built-up columns.
   4.10   Designs a slab base along with a cement concrete pedestal.

5.0   Understands the principles of design for Steel Beams
   5.1   Understands the concept of limit state design of beams – shape factor and plastic properties of beams. .
   5.2   Understands the behaviour of steel beams – design strength in bending (flexure).
   5.3   Knows factors affecting lateral stability – influence of type of loading.
   5.4   Understands the beams failure by flexural yielding – types.
   5.5   Understands laterally supported beam – holes in tension zone – shear lag effects – design bending strength.
   5.6   Understands laterally unsupported beam – lateral torsional buckling of beams (theoretical concept only – no problems).
   5.7   Knows effective length of compression flanges.
   5.8   Understands concept of shear in beams – resistance to shear buckling.
   5.9   Knows the shear buckling design methods - simple post critical method – tension field method.
   5.10   Understands design of simple beams with solid webs.
   5.11   Understands component parts of plate girders with sketches – describes different types of stiffeners.
   5.12   Designs laterally supported simply supported and cantilever beam considering all codal requirements.

6.0   Understands the principles of design of Roof Trusses
   6.1   Knows types of trusses – plane trusses, space trusses.
   6.2   Sketches different roof trusses with their suitability for a given span.
   6.3   Knows configuration of trusses – pitched roof, parallel chord trapezoidal trusses.
   6.4   Knows cross sections of truss members.
   6.5   Understands loads on roof trusses as per I.S – 875.

6.6   Knows connections – details of members at typical joints.
6.7   Determines loads at nodal points of a given roof truss due to dead load, live load and wind load.

COURSE CONTENT:

1.0   Properties of Sections and Loads on 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 (fy), ultimate tensile stress (fu) and maximam 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 the design strength due to yielding of gross section, rupture of critical section and block shear – problems.
3.6   Design procedure of tension members
3.7   Problems on design of tension members.

4.0   Analysis and design of Compression Members
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 – problems.

5.0   Analysis and design for Steel Beams

5.1   Concept of limit state design of beams – shape factor and plastic properties of beams.

5.2   Behaviour of steel beams – design strength of in bending (flexure).

5.3   Factors affecting lateral stability – influence of type of loading.

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 torsional 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 and cantilever 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   Configuration of trusses – pitched roof, parallel chord trapezoidal trusses.

6.4   Cross sections of truss members.

6.5   Loads on roof trusses as per I.S – 875.

6.6   Connections – details of members at typical joints (sketches of Heel joint, Ridge joint, Lower chord joint and upper chord joint – no problems).

6.7   Determination of loads at nodal points of a given roof truss due to dead load, live load and wind load – problems.

REFERENCE:

1. Design of Steel Structures   by   N.Subramanian
2. Design of Steel Structures   by   S.S.Bhavikatti
3. Structural Engineering   by   A.P.ArulManickam
4. Teaching Resource Material   :   http://www.steel-insdag.org
5. Teaching Resource Material   :   http://www.nptel.iitm.ac.in

CONSTRUCTION & QUALITY MANAGEMENT

Subject Title	:	**Construction & Quality Management**	
Subject Code	:	**C-603**	
Periods/Week	:	**05**	
Periods/Semester	:	**75**	

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Preliminary planning & Organisational aspects	10	16	02	01
2.	Constructional planning, Contracts & Tenders	18	26	02	02
3.	Execution of works, Payment & Stores	18	26	02	02
4..	Basic concepts & Apporturities of Entrepreneurship	10	16	02	01
5.	T.Q.M. & Quality Control	10	13	01	01
6.	Quality control in constructions & Tolerance levels	9	13	01	01
	Total	75	110	10	08

OBJECTIVES:

1.0 Know the objectives of Preliminary planning and organisational aspects
    1.1   Defines the term construction management.
    1.2   States the need for construction management.
    1.3   Lists the factors involved in construction management.
    1.4   Explains the importance of preliminary planning.
    1.5   Explains the difference between feasibility report and project report.
    1.6   Explains the data to be collected and aspects to be considered in project report.
    1.7   Lists the aspects to be considered during preliminary planning in respect of:
        1.7.1 Minor & irrigation project.
        1.7.2 Road project.
        1.7.3 Rural water supply project
        1.7.4 Housing colony
        1.7.5 Rural hospital.
    1.8   Lists the different engineering departments of the government.
    1.9   Gives the organisational structure of Irrigation and Power, Roads and Buildings, Panchayat Raj and Public Health departments.
    1.10   Lists the duties of different officers.
    1.11   Defines the terms administrative approval and technical sanction.

2.0 Understands Constructional Planning, Contracts and tender systems
    2.1   Distinguishes between construction stages and construction Operations
    2.2   Explains the concept and use of construction schedules.

2.3   States the need for material schedule and labour schedule.
2.4   Explains the methods of procurement of labour, material and equipment.
2.5   Explains the use of bar chart and its limitations
2.6   Lists the effects and causes of accidents and safety measures to be adopted in construction industry.
2.7   Prepares network diagram based on C.P.M for construction works.
2.8   Defines terms; Contract and contractor
2.9   Explains the various contract systems available for construction works.
2.10   Lists the merits and limitations of each of the contract systems.
2.11   Explains the need for calling of tenders.
2.12   Lists the steps involved in fixing up the agency through tender system.
2.13   Drafts a tender notice for a work.
2.14   Prepares tender documents.
2.15   Explains the need of earnest money and security deposit.
2.16   Draws up a comparative statement.
2.17   Explains the methods of selecting a contractor from the tenders.
2.18   Lists out the conditions of contract agreement.

3.0   Understands Methods of execution of works, payments & stores
3.1   Explains the difference between the regular establishment and work charged establishment .
3.2   Explains the need for inspection of works.
3.3   Lists the duties of various inspecting officers of the engineering department.
3.4   Explains the need and methods of quality control
3.5   Explains the need and principles of supervision.
3.6   State the necessity for sampling and testing of materials.
3.7   States the need for departmental execution.
3.8   Explains the preparation and closing of muster rolls,
3.9   Explains the need for imprest amount.
3.10   Lists the common irregularities in a muster roll.
3.11   States the importance of measurement book.
3.12   Lists the rules to be followed in recording measurements.
3.13   States the need of obtaining contractors acceptance for the measurements in the M-Book.
3.14   States the need for pre-measurement and check measurement.
3.15   Lists the methods of payment to contractors.
3.16   Identifies the types of bills to be used.
3.17   States the steps involved in checking the bills.
3.18   Lists the recoveries to be made from the bills.
3.19   Identifies the different types of stores materials.
3.20   States the classification of the items held in general stock.
3.21   States the need for materials at site account.
3.22   List the use of indent, invoice in store accounts.
3.23   Explains the necessity of periodical inspection of stores.

4.0   Understands the Basic concepts & opportunities of entrepreneurship
4.1   Understands the requirements of a licenced surveyor, contractor and manufacturing of building materials.
4.2   Lists various assisting institutions set up for development of Small Business.

4.3 Explain the assistance provided by different institutions such as NISIET, SISI, NSIC,APIDC.

4.4 State the role of financial organisation in the development of Small Scale Industries and Small Business, such as APSFC, Nationalised Bank etc.

4.5 Gives the concepts contracting.

4.6 Lists the formalities to become a contractor.

4.7 States the various concessions given to civil Engineer to start on enterprise and execute contracts.

5.0 Understands the Total Quality Management & quality control

5.1 Discuss ISO 9000 series of quality systems

5.2 Know the quality systems and elements of quality systems.

5.3 Know the Principles of Quality Assurance.

5.4 Know the Indian standards on quality systems.

5.5 Know the evolution of ISO standards.

5.6 Understand statistical basis for modern quality control

5.7 Describe Mathematical probability

5.8 Describe sampling plan. Explain sampling risks of acceptance and rejections.

6.0 Identify the production and Quality control of constructions & Tolerance level

6.1 Describe control aspects of batching and mixing.

6.2 Explain the inspection of reinforcement grills.

6.3 Explain the inspection and examination of formwork.

6.4 Describe the quality of the filler materials.

6.5 Establish relationship between the strength of brickwork and strength of mortar.

6.6 State the tolerances levels in construction industry

6.7 Understand visual appearance

6.8 State the dimensional accuracies.

COURSE CONTENT:

1. Preliminary Planning & Organisational aspect

1.1 Construction Management –definition-need for construction Management factors involving construction management.

1.2 Importance of planning-site investigation-feasibility report and project report - collection of data and preparation of project report.

1.3 Different organisations of engineering department –Organisational structure of P.W.D., duties of various officers- administrative approval and technical sanction.

2. Construction Planning, Contracts & Tenders

2.1 Construction stage-construction operation schedule-procurement of labour, material and equipment -Bar chart - safety measures in construction - critical path method -preparation of net work diagram – critical path.

2.2 Legality of contracts – types of contracts – piece work – contracts – lumpsum contract – item rate contract – percentage contract – Negotiated rates –merits and limitations of each contract system

2.3 Necessity of tenders – sealed tenders – tender notice – tender documents – Earnest Money and Security Deposit – Opening of tenders – scrutiny of tenders – Comparative Statement – Acceptance of tenders, work order – contract agreement.

3. Execution of Works, payment of bills & stores

3.1 Regular and work charged establishment – inspection of works Duties of Assistant Engineer, Assistant Executive Engineer, deputy Executive Engineer and Executive Engineer.

3.2 Departmental execution of works- Muster roll -Imprest .

3.3 Measurement book-rules to be followed in recording measurement-pre-measurements and check measurement – contractors acceptance of measurements-preparation of bill-Types of hand receipts – modes of payment-checking of bills–-recoveries to be made from bills

3.4 Classification of stores-general stock items- consumables and non consumables-issue of stores-material-receipts-issues –transfer entry order-materials at site account-Indent-invoice–stock register-issue rate-verification of stores-accounting of shortages and surplus – write off.

4 Concept & opportunities of Entrepreneurship in civil engineering

4.1 Licenced surveyor, consultancy and contract services in building construction, interior decoration and landscape gardening manufacturing and supply of building materials

4.2 Significance and Concept of Small business enterprise-Assistance Programme for Small Business enterprises –Role of Banks in the development of Small Business Enterprise.

5. Total Quality Management and Modern Quality control

5.1 Introduction to ISO 9000

5.2 Elements of quality systems: Management responsibility, Quality system contract review, design control, document control, purchasing, purchaser,-Supplied product identification and traceability process control, Inspection and Testing

5.3 Principle of quality assurance-Definition of quality assurance.
Indian standards on quality systems-Main features of IS13999:1990, IS14000:1990, IS14004:1990, IS14001 & 1990, IS14002: 1990, IS 14003:1990.

5.4 Know the necessity of International standards –Evolution of ISO 9000 series of standards –ISO 9000 Phenomenon ISO 9000 series of quality systems –Constituents of ISO 9000 series of standards for quality systems Drawbacks of ISO – 9000 series of standards, list the beneficiaries of ISO 9000 (Whom does ISO 9000 help).

5.5 Simple example of mathematical probability – Sampling plan – Sampling risks of acceptance and rejection.

6. Production & quality control in construction and Tolerance levels

6.1 General – batching – mixing of concrete – inspection of reinforcement grill and form work.

6.2 Quality of filler materials – Brick – stone – quality of mortar – relation between strength of brick work Vs strength of bricks Vs strength of mortar.

6.3 Tolerance levels in construction industry – Visual appearance – dimensional accuracies.

REFEERENCE:

1. Enterprenenuership and construction Management   by P.Venkataiah
2. Entreprenuership and construction Management   by N. Sreenivasulu
3. Construction Management and Accounts   by V.N Vazirani
4. Construction Management and Accounts   by Sharma
5. Management in Construction industry   by P.P Dharwadekar

TRANSPORTATION ENGINEERING

Subject Title   :   **Transportation Engineering**

Subject Code   :   **C-604**

Periods/Week   :   **06**

Periods/Semester   :   **90**

TIME SCHEDULE

S.No	Major Topics	No of periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Highways and Soil Mechanics	26	16	02	01
2	Highway Surveys and Traffic Engineering	12	23	01	02
3	Highway Constructions and Maintenances	14	23	01	02
4	Introduction and Permanent way of Railways	12	13	01	01
5	Station yards and Maintenance of Railways	08	16	02	01
6	Bridges, Culverts and Cause ways	18	19	03	01
	Total	90	110	10	08

OBJECTIVES:

1.0   Introduction to Highways and Soil Mechanics
    1.1   States the importance of transportation engineering.
    1.2   States the importance and functions of I.R.C
    1.3   States the classification of roads as per I.R.C
    1.4   Explains the components of a road C/S with a sketch.
    1.5   Defines the terms: width of pavement, shoulder, formation width, right of way, camber, gradient, ruling gradient, super elevation, sight distance.
    1.6   States the necessity of providing super elevation and gives formula.
    1.7   States the necessity of curves in highways.
    1.8   States the different horizontal and vertical curves adopted in roads.
    1.9   To understand the definitions of physical properties of soils like plasticity, cohesion and consolidation
    1.10   Defines Porosity, Voids Ratio, Water Content, Specific Gravity and Density.
    1.11   State the different systems of classification of soils
    1.12   Explain the textural classification soils with sketches I S Classification of soils
    1.13   Understand the basic principles of bearing capacity of soil
    1.14   States the presumptive bearing capacity values and the codes equation for   the calculation of bearing capacity.

2.0 Understands Highway Survey and Traffic Engineering

2.1 Defines the term alignment.
2.2 States the factors influencing selection of alignment for a road in plain and hilly areas.
2.3 Lists the surveys required for fixing alignment.
2.4 States the different data required for the preparation of highway project.
2.5 States the importance of traffic census.
2.6 Explains with neat sketches traffic islands and Interchanges.
2.7 States the functions and types of pavement markings with sketches.
2.8 States the purposes and types of traffic signs with sketches.

3.0 Understands Highway construction and Maintenance

3.1 States the necessity of road drainage.
3.2 Explains the methods of providing surface and sub-surface drainage.
3.3 Explains the methods of construction of different types of roads.
3.4 Explains the maintenance of different types of roads.
3.5 States the materials used in construction of different types of roads and tests on Bitumen
3.6 States the equipment/machinery used in construction of different roads.
3.7 States the different types of joints used in C.C roads with sketches.
3.8 States the need for joints in C.C roads.

4.0 Understands Introduction and Permanent way of Railways

4.1 States the advantages of Railways.
4.2 Defines gauge and states the classification of Rails based on gauges.
4.3 States the component parts of a permanent way and their functions.
4.4 States the requirements of good rail, rail joint, sleeper and ballast.
4.5 States the different types of rails, joints, rail fittings, sleepers, ballast, used in Indian Railways with sketches.

5.0 Understands Station yard and Maintenance of Railways

5.1 States the different types of turnouts and crossings with sketches.
5.2 States the classification of stations.
5.3 States different maintenance measures of a railway track.
5.4 States the duties of a permanent way inspector.

6.0 Understands Bridges, Culverts and Cause ways

6.1 States the classification of bridges.
6.2 States the factors influencing selection of site for a bridge.
6.3 States the data required for preparation of bridge project.
6.4 Defines terms: Waterway, linear waterway, afflux, vertical clearance, scour depth, free board.
6.5 States the formula for economical span and afflux.
6.6 States with sketches the different components of a bridge sub-structure and their functions.
6.7 Distinguishes between deck and through bridge.
6.8 Under stand the different types of bridge super structures.
6.9 Understand the different types of a causeways and culverts.

COURSE CONTENT:

1.0 Introduction of Highway and Soil Mechanics
1.1 Importance of transportation engineering-I.R.C.-Classification of roads as per I.R.C.
1.2 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.
1.3 Gradients-Ruling gradient, limiting, exceptional gradient –Recommended I.R.C values of gradients.
1.4 Super elevation-Necessity -Curves-necessity of curves in roads-transition curves-Horizontal alignment and vertical alignment details.
1.5 Physical properties of soil like plasticity, cohesion, consolidation, compaction, Permeability and compressibility.
1.6 Porosity, Voids Ratio, Water Content, Specific gravity and density.
1.7 Types of soils – residual soil – transported soil – sand – silt – clay – peat – Till – Tull – loess – mure – Caliche, clay, Bentonite – Soils in India
1.8 Different systems of classification of soils – Textural classification – I S classification of soils
1.9 Bearing Capacity – Definition – Importance in foundation design
1.10 Presumptive bearing capacity (values only)
1.11 Code equation for computing bearing capacity (no derivation)

2.0 Highway Surveys and Traffic Engineering
2.1 Alignment-Factors influencing alignment of road in plain and hilly areas –Surveys-Reconnaissance, preliminary and final location surveys.
2.2 Traffic census and its importance.
2.3 Road intersections-At grade intersections-Types-Traffic islands – Channelising islands-Round about –Interchange-Fly over—Diamond intersections-Clover Leaf junction.
2.4 Pavement marking and Kerb markings.
2.5 Traffic signs-informatory signs-Mandatory signs-Cautionary signs.

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

4.0 Introduction and permanent way of Railways
4.1 Importance of Railways-Gauges-Classification of rails based on gauges.
4.2 Structure of permanent way-Different types of rails- requirements of a good rail.
4.3 Rail joints-Types of joints-Requirements of a good rail joint-Fixtures

and fastenings of rails-coning of wheels.

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

    4.5   Ballast-Definition-Function –Characteristics of good ballast.

5.0 Station yards and Maintenance of Railways

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

    5.2   General idea with sketches of station yards.
            Marshalling yard, goods yard, passenger yard and loco yard.

    5.3   Maintenance of track-Duties of P.W.I (permanent way inspector).

6.0 Bridges, Culverts and Causeways

    6.1   Bridges-Classification -Selection of site for a bridge.

    6.2   Defines waterway, Afflux, vertical clearance, linear waterway, freeboard for bridges and culverts-Economical span-Scour depth.

    6.3   Definition and Functions of pier, abutment, wing wall and approaches.

    6.4   Deck and Through bridges-Sketches and suitability of different types of bridges – Masonry bridges – R.C.C beam and slab bridges, Plate girder bridges, prestressed concrete bridges, steel trussed bridges and suspension Bridges.

    6.5   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:

1.	Highway Engineering	by	S.C.Rangawala
2.	Railway Engineering	by	S.C.Rangawala
3.	Bridge Engineering	by	S.C.Rangawala
4.	High way Engineering	by	Khanna and Justo
5.	Transportation Engineering	by	H.Krishna sharma
6.	Railway Engineering	by	Saxena
7.	Transportation Engineering	by	P.Venkataiah
8.	A Text book of Road Engineering	by	Basu and Bhattacharjee

ENVIRONMENTAL ENGINEERING - II

Subject Title : **Environmental Engineering - II**
Subject Code : **C-605**
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	10	23	01	02
2.	Sewerage systems & appurtenances	7	13	01	01
3.	Characteristics of Sewage, treatment & disposal	18	29	03	02
4.	Solid waste disposal and Sanitation in buildings	15	26	02	02
5.	Rural Sanitation	05	08	01	1/2
6.	Air Pollution	05	11	02	1/2
	Total	60	110	10	08

OBJECTIVES:

1.0 Knows basic facts of sanitary engineering and Quantity of sewage.

1.1 States the objects of sewage disposal works.

1.2 Defines basic terms used.

1.3 Explains and compares systems of sewage disposal.
1.4 Explains and compares the different sewerage systems.
1.5 States the main constituents of sewage for calculating quantity.
1.6 States the factors affecting dry weather flow.
1.7 Explains the variation in rate of sewage.
1.8 Estimates the quantity of storm water flow using rational method and empirical formulae.
1.9 Lists the requirements of good surface drains.
1.10 Describes the different types of surface drains with their merits and demerits.
1.11 States the limiting velocities of flow in sewers.
1.12 Works out simple problems on design of sewers running half full only.
1.13 Uses nomograms as per I.S. 1742 to find the unknown values of gradient, diameter, discharge and velocity

2.0 Understands the Types of sewers and appurtenances
2.1 States the shapes and materials used for sewers.
2.2 States merits and demerits for each type.
2.3 Explains the method of laying the sewers as per given alignment.
2.4 Explains the construction, function and location of the different sewer appurtenances.
2.5 States the necessity for pumping sewage.
2.6 Describes the component parts of a pumping station.

3.0 Understands the characteristics of sewage
    3.1   Defines strength of sewage.
    3.2   States the methods of sampling sewage.
    3.3   States the physical, chemical and biological characteristics of sewage.
    3.4   States the significance of the following tests to analyse sewage.
        i) Solids   (ii) C.O.D.   (iii) B.O.D.   (iv) PH-Value   (v) Chlorides.
    3.5   States the characteristics of industrial waste water.
    3.6   Explains the principles of treatment of industrial wastewater.
    3.7   States the objects of sewage treatment.
    3.8   States the function of screens, skimming tanks and grit chambers.
    3.9   Describes with sketch the following treatment works.
        3.9.1 Sedimentation tank.
        3.9.2 Trickling filters.
        3.9.3 Activated sludge process
        3.9.4 Sludge digester
    3.10 States the methods of sludge disposal.
    3.11 Explains with sketch the disposal of sewage by septic tank and soak pit.
    3.12 Designs a septic tank for given data.
    3.13 States the methods of disposal of sewage.

4.0 Knows the methods of disposal of solid wastes and Sanitation in Building
    4.1   States the classification and methods of collection of solid wastes.
    4.2   Explains the methods of disposal of solid wastes.
    4.3   States the merits and demerits of solid waste disposal methods.
    4.4   Explains the methods of composting.
    4.5   Lists the equipment required for preparation of compost by mechanical Composting.
    4.6   States the aims of building drainage and its requirements.
    4.7   Describes the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storied).
    4.8   Describes different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.
    4.9   Explain the procedure involved in inspection, testing & maintenance of sanitary fittings.

5.0 Knows the methods of rural sanitation
    5.1   Explains the methods of rural sanitation.
    5.2   Describes with sketches the construction of sanitary latrines in rural areas.
    5.3   Describes the operation of a bio-gas plant using cow dung, night Soil and agricultural waste.

6.0 Knows the effects of air pollution and its control
    6.1   States the causes and effects of air pollution.
    6.2   States the methods of control of air pollution.
    6.3   Explains briefly with sketches the methods of controlling air pollution.

COURSE CONTENT:

1.0 Introduction and Quantity of Sewage

1.1 Objects of sewerage works.
1.2 Definition of terms : sullage, sewer, sewage and sewerage – classification of sewage.
1.3 Systems of sewage disposal - conservancy and water carriage systems - comparison.
1.4 Types of sewerage systems and their suitability – separate, combined and partially separate systems-comparison.
1.5 Quantity of discharge in sewers, dry weather flow, variation in flow.
1.6 Determination of storm water flow – run off co-efficient, time of concentration, rational method and empirical formulae for run-off - problems.
1.7 Surface drainage: requirements- types - construction.
1.8 Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae .
1.9 Use of nomograms as per I.S.1742 to determine the unknown values of gradient, diameter, discharge and velocity.

2.0 Sewerage Systems and Appurtenances

2.1 Different shapes of cross section for sewers – circular and non-circular – merits and demerits of each.
2.2 Brief description and choice of types of sewers - stone ware, PVC, cast iron, cement concrete and asbestos cement.
2.3 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.
2.4 Brief description, location, function of
    2.4.1 Manholes.
    2.4.2 Drop manholes.
    2.4.3 Street inlets.
    2.4.4 Catch basins.
    2.4.5 Flushing tanks.
    2.4.6 Inverted siphon.
2.5 Necessity of pumping sewage - component parts of a pumping station

3.0 Sewage Characteristics

3.1 Strength of sewage, sampling of sewage, characteristics of sewage: Physical - chemical - biological.
3.2 Analysis of sewage - significance of the following tests for determination of strength of sewage (No details of tests)
    (i) Solids, (ii) C.O.D, (iii) B.O.D., (iv) PH - Value, (v) Chlorides.
3.3 Characteristics of Industrial waste water–principles of treatment, Reduction of volume and strength of wastewater, Equalization, Neutralization and Proportioning.
3.4 Preliminary treatment - functions of following units.
    (i) Screens, (ii) Skimming tanks and (iii) Grit chambers.
3.5 Primary treatment - Brief description and functions of sedimentation tank.
3.6 Secondary treatment - Brief description of
    i) Trickling filters (ii) Activated sludge process
3.7 Sluge digestion – Process of slude digestion - methods of sludge disposal.

3.8   Miscellaneous treatments-septic tank- design- problems

3.9   Methods of sewage disposal.

4.0   Solid Waste Disposal and Sanitation in Buildings

4.1   Classification of solid waste based on origin, properties – collection of solid waste – methods.

4.2   Methods of disposal - uncontrolled dumping, sanitary land fill – Incineration – composting – merits and demerits

4.3   Preparation of compost - equipment required in mechanical composting: Storage hoppers, Grinders - Conveyors etc.,.

4.5   Aims of building drainage and its requirements – General layout of sanitary fittings to a house - drainage arrangements for single and multi storeyed. Buildings as per IS code of practice.

4.6   Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti-syphonage.

4.6   Inspection, testing and maintenance of building drainage.

5.0   Rural Sanitation

5.1   Rural sanitation and sanitary latrines,

5.2   Brief description and operational details of bio-gas plants using cow dung, night soil and agricultural wastes (KVIC and JANATA models).

6.0   Air Pollution

6.1   Definition - sources of air pollution – effects of air pollution.

6.2   Control of air pollution – methods – control at source - zoning

6.3   Air pollution controlling devices and equipment - brief description of

        6.3.1 Internal separators

        6.3.2 Gravity settling chambers,

        6.3.3 Cyclones

        6.3.4 Fabric filters

        6.3.5 Wet collection devices

                6.3.5.1   cyclonic scrubbers

                6.3.5.2   ventury scrubbers

                6.3.5.3   electrostatic precipitators

6.4   Air pollution control by stacks

REFERENCE:

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.

LOW COST HOUSING, RURAL WATER SUPPLY AND SANITATION

Subject Title : **Low Cost Housing, Rural Water Supply and Sanitation**
Subject Code : **C-606 A**
Periods/Week : **05**
Periods/Year : **75**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Housing Problems	04	8	1	½
2.	Emerging housing needs	06	8	1	½
3.	Improvement in Rural Housing and Up gradation of slums	08	13	1	1
4.	Significance of low cost building materials	08	13	1	1
5.	Innovative Techniques for cost reduction	10	13	1	1
6.	Shelter and Housing in areas prone to natural disasters	10	13	1	1
7	Low-cost infrastructure services	06	8	1	½
8	Transfer of Technology	06	8	1	½
9	Rural water supply	08	13	1	1
10	Rural sanitation	09	13	1	1
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

On completion of the subject the student should knows

1.0 Urban and Rural housing situation
    1.1   Environmental pollution related to Housing
    1.2   Financial assistance by Personal, Government organisations.

2.0 Planning and design of houses
    2.1   Influence of economic and Social dislikes
    2.2   National housing policy.

3.0 Need for rural housing and development
    3.1   Provision and Financing rural housing
    3.2   Need to promote use of indigenous building materials.
    3.3   Improvements in housing of poor families.
            a)   Shelter for pavement dwellers
            b)   Homes for slum inhabitants
            c)   Improvement of squatter settlements.
            d)   Shelter Up gradation technologies.

4.0   Significance of building materials and labour
    4.1   Choice of materials for low cost housing, in relation to prevention of environmental degradation, Energy conservation and Ecological balance.
    4.2   Informal use of materials for achieving economy.
        4.2.1   Inorganic materials
        4.2.2   Organic materials.
    4.3   Alternative building materials.
    4.4   Use of industrial and Agricultural wastes.
    4.5   Prospects of developing new and alternative building materials.
        4.5.1   Fly Ash bricks
        4.5.2   Sand lime bricks
        4.5.3   Cellular concrete
        4.5.4   Late rite blocks
        4.5.5   Dry hydrated lime
        4.5.6   Rice husk Ash pozzolone.
        4.5.7   Hollow concrete blocks
        4.5.8   Secondary species of timber
        4.5.9   Asphaltic Roofing sheets
        4.5.10 Stones
        4.5.11 Gypsum fiber board
        4.5.12 Ferrocement products.

5.0   Guidelines for the selection of appropriate housing technology
    5.1   Listing of improved indigenous materials and construction Technologies.
    5.2   Cost reduction in housing – Innovative housing technologies.
        5.2.1   Brick Masonry:
            5.2.1.1   One brick thick (23cm) load bearing walls 4 to 5 stories residential building
            5.2.1.2   Load bearing walls 19 cm trick
            5.2.1.3   Half brick trick (11.5 cm) load bearing walls.
        5.2.2 Precast reinforced concrete roofing and flooring systems – precast walling units - Improved mud- thatch houses
        5.2.3 Following action for successful adoption of innovative techniques

6.0   Natural disasters – types – effect on housing
    6.1   Housing disaster mitigation
        6.1.1   Improvement of non-durable houses
        6.1.2   Repair and reconstruction of old houses.
        6.1.3   Disaster – resistant new houses
        6.1.4   Protection of infrastructure services.
    6.2   Basic principles of appropriate housing technologies in respect of natural disasters.
        6.2.1   Flood resistant houses
        6.2.2   Cyclone resistant – houses
        6.2.3   Earth quake resistant – houses
        6.2.4   Fire resistant houses.
    6.3   Provision of shelters and shelter for the homeless.

7.0   Inadequacy and shortage of essential housing services
    7.1   Innovative techniques – Equipment
        7.1.1   Low cost sanitary latrines

        7.1.2   Drainage system
        7.1.3   Potable water
        7.1.4   Smokeless wood burning heater
        7.1.5   Solar cooker
        7.1.6   Garbage disposal
        7.1.7   Paved sheets
        7.1.8   Protection of trees and Greenery.

8.0   Factors to be taken into account in adoption of innovative Technologies, Technological, Economic and social Factors
    8.1   List of innovations in house buildings
    8.2   Training and skill up gradation
    8.4   Action need to maximise the input of science and technology :-
         Production of low cost housing materials – Energy conservation – Ecological Balance – Recycling of waste –
    8.5   Objectives of housing development Entrepreneurship program (HDEP)

9.0   Need for protected water supply
    9.1   Bacteriology of water and waterborne diseases.
    9.2   Disinfection – Definition – Types of Disinfection –chlorination Action of chlorine – sterilization.
    9.3   Removal of Flourides.
    9.4   Sanitation of water wells.

10.0 Description of pit privy, Aqua privy, Bore Hole Latrine, Bucket Latrine, Trench Latrine , Sulaba Sauchalaya, West Bengal Type – CBRI type
    10.1 Biogas – composition of Biogas – Gobar Gas plant – Biogas production process – Factors affecting rate of Gas production.

<u>**COURSE CONTENT**</u>

1.0   Housing Problems
    1.1   Urban and Rural housing situation
    1.2   Environmental pollution
    1.3   Housing finance.

2.0   Emerging Housing Needs
2.1   Impact of Science and Technology
2.2   Economic and Social aspects
    2.3   National housing policy

3.0   Improvement in rural storing and upgradation of slums
    3.1   Rural House types
    3.2   Improves use of Indigenes materials
    3.3   Improvements of squatter settlements.
    3.4   Shelter up gradation Technologies.

4.0   Significance of low cost building materials
    4.1   Choice of materials
    4.2   Inorganic and organic materials
    4.3   Developing new and alternative Building materials

5.0 Innovative techniques for cost reduction
5.1 Thin load – bearing brick masonry walls
5.2 Pre cast reinforced concrete flooring/roofing systems
5.3 Improved mud – thatch houses.

6.0 Shelter and housing in areas prone to natural disasters
6.1 Natural disasters and effect on housing
6.2 Disasters housing technology.
    6.1.1 Flood resistant Houses
    6.1.2 Cyclone resistant Houses
    6.1.3 Earth quake resistant houses
    6.1.4 Fire resistant houses
6.3 Shelter for the houseless

7.0 Low cost infrastructure services
7.1 Inadequencies
7.2 Technical Innovations

8.0 Transfer of technology
8.1 Adoption of innovations
8.2 Examples of innovations in house building
8.3 Strategy for promoting adoption for innovative and appropriate technologies.

9.0 Rural water supply
9.1 Need for protected water supply
9.2 Bacteriology of water
9.3 Water borne diseases
9.4 Disinfection
9.5 Desflouridation on Nalgonda technique
9.6 Sanitation of drinking water wells and trick surroundings

10.0 Rural sanitation
10.1 Introduction – need for rural sanitation
10.2 Types of rural household latrines
10.3 Bio-gas plants , functions and working principles – KVIC Model Bio-gas Plant
10.4 Composting – Rural wastes.

REFERENCE

1. Low cost Housing in Developing Countries by G.C. Mathur
(Oxford and IBH Publishing Co.Pvt.,Ltd).,
2. Appropriate Technologies for Rural sanitation (Summer school by ISTE)
3. Course material on " Low cost housing & Appropriate Technology"
Workshop on Low cost Housing, S.V. Govt. Polytechnic, Tirupathi – TTTI (SR), Hyderabad.

GEO–TECHNICAL ENGINEERING

(Elective Subject)

Subject Title	:	**Geo–Technical Engineering**
Subject Code	:	**C-606B**
Periods/Week	:	**05**
Periods/Year	:	**75**

TIME SCHEDULE

S.NO	Major Topics	No.of Periods	Weightage of Marks	Short Type	Essay Type
1	General characteristics of Soils	10	13	1	1
2	Soil exploration	05	8	1	½
3	Essential properties of soils	15	23	1	2
4	Classification of soils	05	10		1
5	Hydraulic and mechanical properties of soils	05	8	1	½
6	Bearing capacity of soils	12	16	2	1
7	Settlement of foundation	06	8	1	½
8	Consolidation of compressive soils	05	8	1	½
9	Compaction of soils	12	16	2	1
	TOTAL	**75**	**110**	**10**	**8**

OBJECTIVES:

1.0   General Characteristics of Soils
    1.1   Explains the importance of soil mechanics.
    1.2   Lists the types of soils
    1.3   Describes the hydrometer analysis and sieve analysis of soil particles
    1.4   Knows the semi-logarithmic grain size curve.
    1.5   Defines the physical properties of soils, like, plasticity, cohesion and consolidation.

2.0   Understands the basic concepts of soil exploration
    2.1   Explains the need for soil exploration
    2.2   Lists the methods of soil exploration.
    2.3   Describe briefly the subsoil and ground water exploration

3.0   Understands the essential properties of soils
    3.1   Explains the method of disturbed soil sampling for testing.
    3.2   Defines the terms *"soil moisture content", "plasticity". "Atterberg's Limits – Liquid limit, Plastic limit and Shrinkage Limit", "plasticity index",* specific gravity of soil particles, *"dry density", "saturated density", "submerged density", "void ratio",* and *"porosity".*
    3.3   Expresses the relationships between volume of voids, moisture content, density of soil mass, dry density, saturated density, submerged density,

specific gravity, void ratio, porosity. Degree of saturation, percentage of air voids, air content and density index.

3.4   Works out simple problems using the relationships between various soil parameters.

4.0   Understand the various classifications of soils

4.1   States the different systems classification of soils.

4.2   Explains the textural classification of soils with a neat sketch.

4.3   I.S. classification of soils.

5.0   Understands the hydraulic and mechanical properties of soils

5.1   Explains the permeability of soils and compressibility of confined layers of soil.

5.2   Explains the shear resistance concept of soils

5.3   Describes the direct shear test experiment.

5.4   Briefly explain the tri-axial compression test.

6.0   Understand the basic principles of bearing capacity of soils

6.1   Defines the bearing capacity and its importance in the design of foundations

6.2   Justifies the importance of 'factor of safety' and 'safe bearing capacity' values in foundation design

6.3   States the presumptive bearing capacity values and the code's equation for the calculation of bearing capacity.

6.4   Explains the 'field plate load test' for determining the ultimate bearing capacity of soils.

7.0   Understand the basic principles of 'Settlement of Foundation'

7.1   Defines the concept of 'settlement'.

7.2   Briefly explains the vertical pressure in soil beneath loaded areas.

7.3   Describes briefly the importance of bearing capacity and also settlement in the design of foundations.

8.0   Understand the basic concepts of consolidation of compressive soils

8.1   Defines the principle of 'consolidation'.

8.2   Explain in detail, the Terzaghi's model analogy of compression springs, showing the process of consolidation.

9.0   Understand the basic principles of compaction of soils

9.1   Explains the basic principles of compaction and its objectives.

9.2   Describes the factors affecting Compaction.

9.3   Describes the proctor's compaction test and modified proctor's compaction test.

9.4   Explains the field measurement of compaction by core cutter method and sand replacement method.

9.5   Explain the term C.B.R. and its importance in the design of pavements.

9.6   Describes the flexible pavement design based on traffic in terms of number of vehicles.

COURSE CONTENT:

1.0 General characteristics of Soils
  1.1   Soil mechanics – its importance
  1.2   Types of soils – Residual soil, Transported soil, sand, silt, clay, peat, loess, murram, caliche, clay, bentonite – soils in India
  1.3   Mechanical analysis of soils – Hydrometer and sieve analysis of soil particles – semi logarithmic grain size curve.
  1.4   Physical properties of soils – plasticity, cohesion, consolidation.

2.0 Soil Exploration
  2.1   Soil exploration – need for soil exploration – methods of soil exploration – Sub soil and ground water exploration - a brief overview

3.0 Essential properties of soils
  3.1   Preparation of disturbed soil samples for testing – soil moisture content – oven drying method - soil plasticity
  3.2   Atterberg's Limits - liquid limit, Plastic Limit, Shrinkage Limit – tests for determination of Atterberg's Limits – plasticity index
  3.3   Specific gravity of soil particles – pycnometer method
  3.4   Definitions and relationships of volume of voids, moisture content, density of soil mass, dry density , saturated density, submerged density, specific gravity, void ratio, porosity, degree of saturation, percentage of air voids, air content, density index, - simple problems using the above relationships.

4.0 Classifications of Soils
  4.1   Classification of soils –different systems of classification of soils – textural classifications of soils – I.S. classification of soils.

5.0 Hydraulic and Mechanical Properties of Soils
  5.1   Permeability of soils
  5.2   Compressibility of soils
  5.3   Shearing resistance of soils – shear strength experiment with Direct shear apparatus and Tri-axial compression test.(Explanation of testing procedure with the help of figures only).

6.0 Bearing Capacity of Soils
  6.1   Bearing capacity – definition – importance of bearing capacity in foundation design – bearing capacity of shallow footings
  6.2   presumptive bearing capacity values – code equation for computing bearing capacity (No derivation) - field plate load test

7.0 Settlement of Foundation
  7.1   Settlement – definition – vertical pressure in soil beneath loaded areas – foundation settlement
  7.2   Importance of bearing capacity and settlement in building foundations (qualitative treatment only)

8.0 Consolidation of Compressive Soils
  8.1   Consolidation – definition- Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications.

9.0 Compaction of Soils

9.1 Theory of compaction – compaction and its objectives – factors affecting compaction

9.2 Laboratory compaction tests – Proctor's compaction test – Modified proctor compaction test

9.3 Field measurement of compaction by core cutter method and sand replacement method – compaction control – California bearing ratio – definition and its importance in the design of pavements.

REFERENCE:

1. Soil mechanics and foundation engineering   by Dr.B.C. Punmia
2. Modern Geo technical Engineering   by Alam Singh
3. Soil Mechanics' (SI Version)   by T. Willim Lambe and Robert V.Whitman
4. Geo technical Engineering'   by Dr. C. Venkatramaiah.

MAINTENANCE OF BUILDINGS
(Elective Subject)

Subject Title : **Maintenance of Buildings**
Subject Code : **C-606C**
Periods / week : **05**
Periods / Semester : **75**

TIME SCHEDULE

S. No.	Major Topics	Period	Weight age of Marks	Short Answer Type	Essay Type
1	Elements of maintenance	06	29	03	01
2	Defects in Buildings	12			01
3	Maintenance and Rehabilitation of buildings	14	26	02	02
4	Maintenance Problems in buildings and their solutions	25	26	02	02
5	Maintenance Problems in buildings services	10	16	02	01
6	Maintenance Organization	08	13	01	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES:

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

1.0   Appreciate the principles of maintenance
   1.1   Define maintenance of buildings
   1.2   List objectives of maintenance
   1.3   Explain broad categories of maintenance (annual and special)
   1.4   List causes for deterioration of buildings
   1.5   Describe the durability of building materials

2.0   Understand defects in buildings
   2.1   list common defects in buildings and explain methods of investigation
   2.2   list basic equipment for investigating defects and
   2.3   explain diagnosis of defects , remedial measures and execution
   2.4   State classification of cracks
   2.5   list causes of cracks

3.0   Understand maintenance and rehabilitation of buildings
   3.1   Explain rehabilitation of buildings with examples
   3.2   List the foundation failures and remedial measures

3.3   Know demolition of buildings and safety aspects

3.4   State the use of heavy earth movers and precaution

3.5   Explain about demolition of trusses, girders, beams, walls and flooring

3.6   Define under pinning and explain the methods of under pinning

4.0   Understand the maintenance problems in buildings and their solution

4.1   Describe dampness in buildings at various locations

4.2   List cause for dampness and explain treatment methods using integral liquid water proofing compounds for arresting dampness and leakage

4.3   List cracks in walls and explain about causes and prevention

4.4   Explain remedial measures for cracks as per IS SP-25 – use of expansion fillers in non-structural shrinkage cracks

4.5   Explain settlement of floors and repairs

4.6   Explain about removal of work due to termite and expansive cranks and state the treatment methods in wood work

5.0   Understand maintenance problems in buildings services

5.1   list and explain plumbing problems for water supply and sanitary lines

5.2   explain about the maintenance of electrical installations

5.3   State the building services for septic tanks and soak pits

6.0   Know maintenance organization

6.1   Explain about inventory of buildings for annual, periodical and emergency maintenance

6.2   Estimate the maintenance works knowing inspection Performa

6.3   Explain about tendering and award of work – general conditions of contract and special conditions guidelines

6.4   Explain the procedure for maintaining departmental labour for petty work using records; measurement books check measurement books and standard measurement books

<u>**COURSE CONTENT:**</u>

1.0   Introduction:

1.1   Definition of Maintenance of Buildings – objectives of maintenance.

1.2   Broad categories at maintenance – Annual and special

1.3   Deterioration of buildings – causes – durability of buildings materials

2.0   Defects in buildings

2.1   Broad list of common defects in buildings - methods of investigation – list of basic equipments for investigating defects

2.2   Diagnosis of defects – remedial measures and execution – cracks – types –structural and non-structural causes of cracks

3.0   Maintenance and rehabilitation of buildings :

3.1   Need for rehabilitation of buildings –examples – Foundation failures – remedial measures

3.2   Demolition of buildings – safety aspects – use of heavy earth movers – precautions – Demolition process of trusses, girders, beams, walls and flooring. Under pinning – definition - Methods of under pinning

4.0   Maintenance problems in Building & their Solutions:

4.1 Maintenance problems in buildings and their solutions

4.2 Dampness in buildings at various locations – causes – treatment with standard water proofing chemicals – methodology.

4.3 Cracks in walls –causes and prevention – provisions of IS SP –25 for remedial measures.

4.4 Maintenance of floors – settlement of floors – repairs –

4.5 Removal of stains – application of stain removers – repolishing of worn out floors.

4.6 Roofs-leakages of roofs – causes – spalling of concrete – exposure and corrosion of reinforcement – repairs by grouting with micro concrete and by application of anti corrosive paints

4.7 Wood work – defects in wood work due to termite and expansive cracks – treatments

5.0 Maintenance problems in building services:

5.1 Plumbing problems in water supply and sanitary lines

5.2 Clogged drains – sewers – leakage in pipe joints

5.3 Electrical installation

5.4 Other building services – septic tanks and soak pits

6.0 Maintenance organization:

6.1 Inventories of buildings required to be maintained – inspections – Annual, periodical and emergency – inspection proforma

6.2 Preparation of estimates for maintenance works

6.3 Maintaining departmental labour teams for petty works – maintaining records – measurement books – check measurement books and standard measurement books.

<u>**REFERENCE:**</u>

1. Maintenance engineering for civil engineers.   By   Nayak, B.S.
   (Khanna publishers)

2. Building failures- diagnosis and Avoidance   By   Ransom W.H , E and
                                                          FN Span

3. Services in building complex   By   V.K. Jain
   (Khanna Publishers)

4. Building technology and valuation   By   TTTI Chennai
   (Tata MC Graw-hill publishers)

5. Maitenance of Buildings   By   A.C.Panchdhari
   (New Age Int.)

6. Foundation failures – remedial measures edited By   Er. A.Veerappan
   (Association of Engineers & AE's Association, Tamilnadu PWD)

7. Causes and prevention of cracks in buildings SP:25-1987

8. Masonry structures by BIS SP:20-1987

9. A to Z of building repairs by Ambuja technical literature series – No. 54

STRUCTURAL ENGINEERING DRAWING

Subject Title : **Structural Engineering Drawing**
Subject Code : **C- 607**
Periods per Week : **04**
Periods per Semester : **60**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Structural Planning & Marking of Frame Components	9	08	02	-
2.	R.C.C Working Drawing	42	44	01	02
3	Reading and Interpretation of Structural Drawings	9	08	02	-
	Total	**60**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 2x20=40marks

<u>**NOTE:**</u> **Use HYSD bars for main reinforcement.**
<u>**OBJECTIVES:**</u>

1.0 Understands the structural planning of a building and marking of Frame components
    1.1   Positioning & Orientation of columns
    1.2   Positioning of beams
    1.3   Spanning of slabs
    1.4   Layout of stairs
    1.5   Types of footings
    1.6   Column reference scheme and
    1.7   Grid reference scheme (Scheme as per IS:5525 - recommended for detailing of reinforced concrete works and SP:34)

2.0 Draws the detailed working Drawings of R.C.C.
    2.1   Draws the longitudinal section and cross sections of singly reinforced simply supported beam. Prepare schedule of reinforcement and quantity of steel.
    2.2   Draws the longitudinal and cross section of lintel cum sunshade and prepare schedule of reinforcement and quantity of steel.
    2.3   Draws the plan and longitudinal section of one-way slab showing reinforcement details. Also prepare schedule of reinforcement and quantity of steel.

2.4 Draws the details of reinforcement of two-way simply supported slab with corners not held down condition. Top and bottom plan and section along short and long spans have to be Drawn. Also prepare schedule of reinforcement.

2.5 Draws the details of reinforcement of two-way simply supported slab with corners held down conditions. Top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary).

2.6 Draws 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)

2.7 Draws the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required.

2.8 Draws the reinforcement details of dog legged stair case (section only) also prepare schedule of reinforcement for one flight including landing.

2.9 Draws the details of reinforcement of a frame designed as earth quake resistant structure.

3.0 Read and interpret the Drawings
3.1 Understands the details of reinforcement from the given Drawings
3.2 Prepares the Schedule of reinforcement for a given structural Drawing.

CONTENTS:
1.0 Structural planning of a building and marking of Frame components
1.1 Draws the position of columns, beams, slabs, stairs and footing in a given line diagram of building
1.2 Prepare member reference scheme of given building following Column reference scheme & Grid reference scheme as per IS: 5525 – (recommendations for detailing of reinforced concrete works). & SP:34

2.0 Detailed working Drawings of
2.1 Singly reinforced simply supported rectangular beam.
2.2 Lintel cum sunshade.
2.3 Simply supported one-way slab.
2.4 Two-way slab simply supported corners not held down.
2.5 Two-way slab simply supported corners held down.
2.6 One-way continuous slab and T-beam (with details of slab and T-beam)
2.7 Column with square footing of uniform thickness.
2.8 Stair case – stairs spanning longitudinally (Dog legged stair case)
2.9 Frame showing the details of reinforcement for earth quake resistant structures.

3.0 Read and interpret the Drawings
3.1 Take the details of reinforcement from the given Drawings
3.2 Preparation of Schedule of reinforcement for a given structural Drawing.

REFERENCE:

1. Designing and detailing hand book (IS CODE)

C.A.D LAB – II

Subject Title : **C.A.D LAB - II**
Subject Code : **C-608**
Periods/Week : **06**
Periods/semester : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Preparation of building drawing using CAD software	30
2	Preparation of Structural Engg. drawings using CAD software	15
3.	Preparation of Layouts of electrical, water supply & Sanitary lines in buildings.	9
4.	Preparation of approval drawings	18
5	Exercises on Ms word, Ms Excel	18
	Total	90

OBJECTIVES:

1) Draw plan, section & elevation of residential buildings using Auto CAD commands.
2) Draw the structural detailing drawings of the Residential building.
3) Employ layer command to organise drawings on more than one layer and create electrical lines, and plumbing lines, layout of residential building on different layers.
4) Prepares standard drawings for municipal approval.
5) Practices exercises on Ms-word and Ms-excel

CONTENTS:

1.0   Residential buildings.
   1.1   Plan, Elevation, Section of single roomed building
   1.2   Single storied load bearing type residential building.
        1.2.1   One bed Room House
        2.2.2   Two bed room House
    1.3   Single storied framed structure type residential building.
        1.3.1   One bed Room House
        1.3.2   Two bed room House

2.0   Structural detailing drawings

     2.1   Singly reinforced simply supported rectangular beam.
     2.2   Lintel cum sunshade
     2.3   Continuous Beam.
     2.4   Simply supported two way slab.
     2.5   Isolated Column with square footing

3.0   Layouts of electrical, water supply & Sanitary lines in buildings.

     3.1   One bed Room House
     3.2   Two bed room House

4.0   Drawings to be submitted for approval to corporation or municipality showing required details in one sheet such as

     4.1   Plan – Showing Dimensions of all rooms.
     4.2   Section – showing Specifications and Typical Foundation Details.
     4.3   Elevation.
     4.4   Site Plan – Showing Boundaries of Site and Plinth Area, Car Parking, Passages and location of Septic Tank.
     4.5   Key plan – Showing the location of Building.
     4.6   Title Block – Showing signature of Owner & Licensed surveyor's.

5.0   Computer application by using MS Word & MS Excel

     5.1   Test report of the building materials by MS-Word.
     5.2   Complete estimation of a residential building using MS-Excel involving linkage of cells in different sheets viz., Lead statement, Data sheet, detailed estimation and Abstract estimation.

ADVANCED SURVEYING PRACTICE

Subject Title : **Advanced Surveying Practice**
Subject Code : **C-609**
Periods/Week : **03**
Periods/Year : **45**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1	Electronic Theodolite & Electronic Distance Meter	06
2	Total Station	21
3	Global Positioning System	06
4	Digitization using Auto CAD Map.	12
Total		**45**

OBJECTIVES:

Upon the completion of the study of this subject the student should be able to

1.0 Performs various exercises in the field using Electronic Theodolite & Electronic Distance Meter.

1.1 Studies the parts and functions of Electronic Theodolite.
1.2 Studies the parts and functions of Electronic Distance Meter.
1.3 Determines the Horizontal Distance of a point from the Instrument station using Electronic Distance Meter.
1.4 Determines the Horizontal Angle between two stations using Electronic Theodolite.
1.5 Determines the Vertical Angle between two points using Electronic Theodolite.

2.0 Performs various exercises in the field using total Station

2.1 Identifies the parts and the functions of Total Station
2.2 Performs initial adjustments of total station for taking observations.
2.3 Measures Horizontal Distance, Slope distance, Difference in height between two points.
2.4 Determines the Elevation of a point.
2.5 Measures the Horizontal angle between two stations and distance between them.
2.6 Setting out right angles at different points on a base line.
2.7 Sets the plan of a building on the ground for excavation.
2.8 Prolonging a straight line using total station.
2.9 Determines the area of a given closed traverse.
2.10 Determines the quantity of earth work for filling or cutting from the ground profile.

3.0   Performs various exercises in the field using G.P.S.

    3.1   Identifies the parts and the functions of G.P.S.
    3.2   Determines the Co-ordinates of given point on the earth.
    3.3   Exercise on linking the G.P.S with total station.

4.0   Performs Digitization using Auto CAD Map.

    4.1   Study the features of AutoCAD Map software and concept of Digitization.
    4.2   Digitization of any given contour map.
    4.3   Exercises on Digitization of any town map and create different layers for roads, railways, water supply line, drainage line etc.,

<u>COURSE CONTENT:</u>

1.0   Electronic Theodolite & Electronic Distance Meter.

    1.1   Electronic Theodolite - Parts and functions.
    1.2   Electronic Distance Meter - Parts and functions.
    1.3   Horizontal Distance of a point from the Instrument station by Electronic Distance Meter.
    1.4   Horizontal Angle between two stations by Electronic Theodolite.
    1.5   Vertical Angle between two points by Electronic Theodolite.

2.0   Total Station

    5.3   Total Station - Parts and the functions - Adjustments of total station for taking observations.
    2.2   Measurement of Horizontal Distance, Slope distance, Difference in Height between two points
    2.3   Elevation of a point.
    2.4   Horizontal angle and distance between two stations.
    2.5   Setting out right angles at different points on a base line.
    2.6   Setting out plan of a building on the ground.
    2.7   Prolonging a straight line.
    2.8   Area of a closed traverse.
    2.9   Earthwork calculation.

3.0   Global Positioning System

    3.1   Parts and the functions of G.P.S - Coordinates of given point on the earth.
    3.2   Linking the G.P.S data with total station.

4.0   Digitization using Auto CAD Map

    4.1   AutoCAD Map - Raster to vector conversion - scanning - Digitization.
    4.2   Digitization of contour map from scanned picture.
    4.3   Digitization of town map – Showing the different layers like roads, railways, water supply line, drainage line etc.,

REFERENCE:

1. Course material on G.I.S, G.P.S   by NITTTR, Chennai.
2. Computer applications in Civil Engineering   by NITTTR, Chennai.
3. Course material on Modern surveying instruments by NITTTR, Chennai.