

**THIRD SEMESTER (CIVIL ENGINEERING)**

Sr. No	Subject	STUDY SCHEME			Credit	EVALUATION SCHEME						Total Marks
						Internal Assessment		External Assessment (Examination)				
		Theory	Practical	Written Paper		Practical						
		Max. Marks	Max. Marks	Max. Marks		Hrs	Max. Marks	Hrs				
Hrs/week		L	T	P								
3.1	Fluid Mechanics				3	-	2	4	25	25	100	3
3.2	Structural Mechanics	4	-	2	5	25	25	100	3	50	3	200
3.3	Surveying – I	3	-	5	6	25	25	100	3	50	3	200
3.4	Construction Materials	3	-	2	4	25	25	100	3	50	3	200
3.5	Building Construction	4	-	2	5	25	25	100	3	50	3	200
3.6	Building Drawing	-	-	3	2	50	-	100	3	-	-	150
Soft Skills-I		-	-	2	-	-	25	-	-	-	-	25
<b>Total</b>		<b>17</b>	<b>-</b>	<b>18</b>	<b>26</b>	<b>175</b>	<b>150</b>	<b>600</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>1175</b>

#### FOURTH SEMESTER (CIVIL ENGINEERING)

Sr. No	Subject	STUDY SCHEME			Credit	EVALUATION SCHEME						Total Marks
		Hrs/week L T P				Internal Assessment		External Assessment (Examination)				
						Theory	Practical	Written Paper		Practical		
		Max. Marks	Max. Marks	Max. Marks		Hrs	Max. Marks	Hrs				
4.1	Concrete Technology	4	-	2	5	25	25	100	3	50	3	200
4.2	Water Supply & Waste Water Engineering	4	-	2	5	25	25	100	3	50	3	200
4.3	Irrigation Engineering	3	-	-	3	25	-	100	3	-	-	125
4.4	Surveying – II	3	-	6	6	25	25	100	3	50	3	200
4.5	Soil Mechanics & Foundation Engineering	4	-	2	5	25	25	100	3	50	3	200
4.6	Water Supply & Waste Water Engineering and Irrigation Engineering Drawing	-	-	3	2	50	-	100	3	-	-	150
Soft Skills-II		-	-	2	-	-	25	-	-	-	-	25
<b>Total</b>		<b>18</b>		<b>17</b>	<b>26</b>	<b>175</b>	<b>125</b>	<b>600</b>	<b>-</b>	<b>200</b>	<b>-</b>	<b>1100</b>

- Note: 1.** Survey camp will be held after 4<sup>th</sup> semester for minimum 10 days in a sub mountainous area away from polytechnic preferably in camp conditions. Details are given at Sr. No. 5.3 in 5<sup>th</sup> Semester.
- 2. Industrial Training:** After examination of 4<sup>th</sup> Semester, the students shall go for training in a relevant industry/field organization for a period of 8 weeks and will prepare a diary. It shall be evaluated during 5<sup>th</sup> semester by his/her teacher in charge for 100 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 100 marks. This evaluation will be done by assigned lecturer in charge in the presence of one subject expert from other Institution/representative from Industry or field/representative from Construction Sector Skill Council/Training and Placement Officer.

### FIFTH SEMESTER (CIVIL ENGINEERING)

Sr. No	Subject	STUDY SCHEME			Credit	EVALUATION SCHEME						Total Marks
		Hrs/week L T P				Internal Assessment		External Assessment (Examination)				
						Theory	Practical	Written Paper		Practical		
		Max. Marks	Max. Marks	Max. Marks		Hrs	Max. Marks	Hrs				
Industrial /Field Training		-	-	-	5	-	100	-	-	100	3	200
5.1	Highway Engineering	4	-	2	5	25	25	100	3	50	3	200
5.2	Reinforced Cement Concrete Design & Drawing	5	-	3	7	50*	-	150	6	-	-	200
5.3	Survey Camp <sup>1</sup>	-	-	-	3	-	50	-	-	100	3	150
5.4	Computer Applications in Civil Engineering	-	-	6	3	-	50	-	-	100	3	150
5.5	Railways, Bridges & Tunnels	5	-	-	5	25	-	100	3	-	-	125
5.6	Plumbing Services	3	-	2	4	25	25	100	3	50	3	200
5.7	Elective**	3	-	-	3	25	-	100	3	-	-	125
Soft Skills - III		-	-	2	-	-	25	-	-	-	-	25
<b>Total</b>		<b>20</b>	<b>-</b>	<b>15</b>	<b>35</b>	<b>150</b>	<b>275</b>	<b>550</b>	<b>-</b>	<b>400</b>	<b>-</b>	<b>1375</b>

\*Sessional test including Drawing also with 2 hours duration.

\*\*Elective: To choose any one from the following:

5.7.1 Pre-stressed Concrete      5.7.2 Repair and Maintenance of Buildings

Use of the IS: 456-2000 is permissible in the theory exam of Reinforced Cement Concrete Design & Drawing.

### SIXTH SEMESTER (CIVIL ENGINEERING)

Sr. No	Subject	STUDY SCHEME			Credit	EVALUATION SCHEME						Total Marks
		Hrs/week L T P				Internal Assessment		External Assessment (Examination)				
						Theory	Practical	Written Paper		Practical		
		Max. Marks	Max. Marks	Max. Marks		Hrs	Max. Marks	Hrs				
6.1	Steel Structures Design and Drawing	4	-	3	6	50*	-	150	3	-	-	200
6.2	Earthquake Resistant Building Construction	3	-	-	3	25	-	100	3	-	-	125
6.3	Quantity Surveying & Valuation	4	-	2	5	25	25	100	3	50	3	200
6.4	Construction Management & Accounts	5	-	-	5	25	-	100	3	-	-	125
6.5	Major Project Work	-	-	12	6	-	100	-	-	100	3	200
Soft Skills-IV		-	-	2	-	-	25	-	-	-	-	25
<b>Total</b>		<b>16</b>	<b>-</b>	<b>19</b>	<b>25</b>	<b>125</b>	<b>150</b>	<b>450</b>	<b>-</b>	<b>150</b>	<b>-</b>	<b>875</b>

\*Sessional test including Drawing also with 2 hours duration.

Use of the IS: 800-2007 is permissible in the theory exam of Steel Structures Design and Drawing.

# **THIRD SEMESTER**

## **FLUID MECHANICS**

**L T P**  
**3 - 2**

### **RATIONALE**

Subject of Fluid Mechanics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid - mechanics problems.

### **LEARNING OUTCOMES**

After undergoing the subject, the students will be able to:

- Interpret the different terms related to fluids.
- Calculate the pressure exerted by fluids on the walls of containers.
- Calculate discharge through pipes, irrigation channels, water supply pipe lines.
- Use different flow measurement devices like venturimeter, mouthpiece, notches, weir, orificemeter
- Calculate size of the pipe for carrying a particular discharge.
- Prepare the details like dimensions, slope of the irrigation, canals and water courses
- Differentiate between different type of water pumps used in the field.
- Measure the loss of head in pipes and channels

### **DETAILED CONTENTS**

#### **THEORY**

1. Introduction: (1 Hours)

Fluids: Real and ideal fluids

Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics

2. Properties of Fluids (definition only) (3 Hours)

Mass density, specific weight, specific gravity, viscosity, surface tension -cohesion, adhesion and, capillarity, vapour pressure and compressibility.

3. Hydrostatic Pressure: (8 Hours)

Pressure, intensity of pressure, pressure head, Pascal's law and its applications.

Total pressure, resultant pressure, and centre of pressure.

Total pressure and centre of pressure on horizontal, vertical and inclined planesurfaces of rectangular, triangular, trapezoidal shapes and circular.  
(No derivation - Simple Numerical Problems)

4. Measurement of Pressure: (5 Hours)

Atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure.

Piezometer, simple manometer and differential manometer, Bourden gauge and dead weight pressure gauge.

5. Fundamentals of Fluid Flow: (6 Hours)

Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow

Discharge and continuity equation (flow equation) {No derivation}, Simple numerical problems.

Types of hydraulic energy: Potential energy, kinetic energy, pressure energy

Bernoulli's theorem; statement and description (without proof of theorem), Simple numerical problems.

6. Flow Measurements (6 Hours)

Brief description with simple numerical problems of :  
Venturimeter and orificemeter

Pitot tube

Orifices and mouthpieces

Current meters

Notches and weirs

7. Flow through Pipes: (8 Hours)

Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment

Critical velocity and velocity distributions in a pipe for laminar flow

Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula), Simple numerical problems

Hydraulic gradient line and total energy line

Pipes in series and parallel

Water hammer phenomenon and its effects (only definition and description)

8. Flow through open channels: (9 Hours)

Definition of an open channel, uniform flow and non-uniform flow

Discharge through channels using

- i) Chezy's formula (no derivation)
- ii) Manning's formula (no derivation)

Most economical channel sections (no derivation, only simple numerical problems)

- i) Rectangular
- ii) Trapezoidal

Head loss in open channel due to friction

9. Hydraulic Pumps: (2 Hours)

Hydraulic pump, reciprocating pump, centrifugal pumps (No numericals and derivations) (may be demonstrated with the help of working models)

## **PRACTICAL EXERCISES**

1. To verify Bernoulli's Theorem
2. To find out venturimeter coefficient
3. To determine coefficient of velocity ( $C_v$ ), Coefficient of discharge ( $C_d$ ) Coefficient of contraction ( $C_c$ ) of an orifice and verify the relation between them



4. To perform Reynold's experiment
5. To verify loss of head in pipe flow due to
  - a. Sudden enlargement
  - b. Sudden contraction
  - c. Sudden bend
6. Demonstration of use of current meter and pitot tube
7. To determine coefficient of discharge of a rectangular notch and triangular notch.

## **INSTRUCTIONAL STRATEGY**

Fluid Mechanics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room and provide tutorial exercises so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory. Visit to hydraulic research stations must be carried out.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report Writing
- Viva-Voce

## **RECOMMENDED BOOKS**

1. Fluid Mechanics and Hydraulics by Jagdish Lal; Delhi Metropolitan Book Co. Pvt Ltd.
2. Hydraulics and Fluid Mechanics by Modi, PN, and Seth, SM; Delhi Standard Publishers Distributors.
3. Hydraulics and Hydraulics Machines by Khurmi RS ; S Chand and Co., Delhi
4. Laboratory Manual for Fluid Mechanics by Poonia MP and Jakhar OP; Standard Publishers Distributors, Delhi
5. Fluid Mechanics by Birinder Singh; Kaption Publishing, New Delhi.
6. Fluid Mechanics by Sarao A.S; Tech. India Publication, New Delhi
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	1	1
2	3	5
3	8	16
4	5	10
5	6	13
6	6	13
7	8	18
8	9	20
9	2	4
<b>Total</b>	<b>48</b>	<b>100</b>

## STRUCTURAL MECHANICS

**L T P**  
**4 - 2**

### RATIONALE

This is a basic engineering subject. The purpose of the subject is to impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to strength of materials. This subject will also enable the students to continue their further education.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Conduct different tests on mild steel
- Calculate modulus of elasticity
- Analyse and explain stress-strain diagram of mild and HYSD steel
- Calculate various forces used in design of structures
- Calculate shear force, bending moment for simply supported, cantilever and overhanging beams with concentrated and uniformly distributed loads
- Calculate moment of inertia, second moments of inertia, radius of gyration, section modulus for L, T, channel and I sections
- Calculate the bending stresses, moment of resistance of simply supported beams
- Explain shear stress, stress distribution diagram for rectangular, circular, I,T and L sections
- Calculate slope and deflection of determinate structures
- Verify forces in a framed structure

### DETAILED CONTENTS

#### THEORY:

1. Properties of Materials (04 Hours)

Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.

Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.

2. Simple Stresses and Strains: (14 Hours)

Concept of stress, normal and shear stresses,

Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain

Hooke's law, moduli of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.

Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars (two or tPeriodsee) due to axial load.

Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety.

Temperature stresses and strains

3. Shear Force and Bending Moment: (18 Hours)

Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, cantilever and continuous beams (only concept).

Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)

Concept of bending moment and shear force, sign conventions

Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed

Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

4. Moment of Inertia: (04 Hours)

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (*without derivations*). Second moment of area for L, T and I sections, section modulus.

5. Bending Stresses in Beams: (06 Hours)

Concept of pure/simple bending

Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only

Moment of resistance

Calculations of bending stresses in simply supported beam

6. Shear Stresses in Beams (04 Hours)

Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections for S.S. beams and Portland

7. Slope and Deflection: (04 Hours)

Determination of slope and deflection using Moment Area Theorem for simply supported beam for pointed load and U.D.L. (no derivation, numerical problems)

8. Columns: (04 Hours)

Theory of columns

Problem solving using Eulers and Rankine Formula

9. Analysis of Trusses: (06 Hours)

Concept of a perfect, redundant and deficient frames

Assumptions and analysis of trusses by:

- a) Method of joints
- b) Method of sections

### **PRACTICAL EXERCISES**

- i) Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel
- ii) Testing of HYSD Steel

- iii) Determination of Young's modulus of elasticity for steel wire with sear's apparatus
- iv) Determination of modulus of rupture of a concrete beam
- v) Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point
- vi) Verification of forces in a framed structure

## **INSTRUCTIONAL STRATEGY**

Teachers are expected to give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics and students should be encouraged/guided to solve tutorial sheets independently. In the practical works, individual students should be given opportunities to do practical work, make observations and draw conclusions. Teachers should also conduct viva examination in which stress should be given on the understanding of basic concepts and principles.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work,
- Report writing
- Viva-Voce

## **RECOMMENDED BOOKS**

1. "Strength of Materials" by Ramamrutham, S ; Dhanpat Rai and Sons., New Delhi
2. "Applied Mechanics and Strength of Materials" by Ram Chandra; Standard Publishers, Delhi:
3. "Strength of Materials" by Punmia, BC ; Standard Publishers, Delhi,
4. "Strengths of Materials" by Sadhu Singh; Standard Publishers, New Delhi
5. "Structural Mechanics" by Singh Birinder; Kaption Publishers, Ludhiana
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	04	06
2	14	21
3	18	30
4	04	06
5	06	10
6	04	06
7	04	07
8	04	07
9	06	07
<b>Total</b>	<b>64</b>	<b>100</b>

### 3.3 SURVEYING - I

L T P  
3 - 5

#### RATIONALE

The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works

While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying,

Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

#### LEARNING OUTCOMES

After undergoing the subject, the student will be able to:

- Measure a long line with chain or tape
- Prepare maps for closed traverse and open traverse with survey instruments
- Measure bearing of line
- Perform leveling with digital level
- Find difference of level between two points with dumpy level, auto level and digital level
- Perform temporary adjustments of leveling instruments

#### DETAILED CONTENTS

1. Introduction: (04 Hours)

Basic principles of surveying

Concept and purpose of surveying, measurements-linear and angular, units of measurements

Instruments used for taking these measurements, classification based on surveying instruments



2. Chain surveying: (07 Hours)

2.1. Purpose and principles of Chain Surveying

Introduction, advantages and disadvantages

Direct and indirect ranging, offsets and recording of field notes

Obstacles in Chain Surveying

Errors in Chain Surveying and their correction.

3. Compass surveying: (11 Hours)

Purpose of compass surveying. Use of prismatic compass: Setting and taking observations

Concept of following with simple numerical problems:

- a) Meridian - Magnetic and true, Arbitrary
- b) Bearing - Magnetic, True and Arbitrary
- c) Whole circle bearing and reduced bearing
- d) Fore and back bearing
- e) Magnetic dip and declination

Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse (Simple Numerical Problems)

4. Levelling: (14 Hours)

Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks

Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level.

Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis

Levelling staff: single piece, folding, invar precision staff, telescopic

Temporary adjustment and permanent adjustment of dumpy level by two peg method.

Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

Level book and reduction of levels by

Height of collimation method and  
Rise and fall method

Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems.

Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems

5. Plane Table Surveying (12 Hours)

Purpose of plane table surveying, equipment used in plane table survey:

Setting of a plane table:

- (a) Centering
- (b) Levelling
- (c) Orientation

Methods of plane table surveying

- (a) Radiation,
- (b) Intersection
- (c) Traversing
- (d) Resection

Concept of Two point and Three point problems (Concept only)

Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidade

## **PRACTICAL EXERCISES**

I. Chain surveying:

- i)
  - a) Ranging a line
  - b) Chaining a line and recording in the field book
  - c) Taking offsets - perpendicular and oblique (with a tape only)
  - d) Setting out right angle with a tape
- ii) Chaining of a line involving reciprocal ranging
- iii) Chaining a line involving obstacles to ranging

iv) Chain Survey of a small area.

II. Compass Surveying:

- i) a) Study of prismatic compass
- b) Setting the compass and taking observations
- c) Measuring angles between the lines meeting at a point

III. Levelling:

- i) a) Study of dumpy level and levelling staff
- b) Temporary adjustments of various levels
- c) Taking staff readings on different stations from the single setting and finding differences of level between them
- ii) a) To find out difference of level between two distant points by shifting the instrument
- iii) Longitudinal and cross sectioning of a road/railway/canal
- iv) Setting a gradient by dumpy and auto-level

IV. Plane Table Surveying:

- i) a) Study of the plane table survey equipment
- b) Setting the plane table
- c) Marking the North direction
- d) Plotting a few points by radiation method
- ii) a) Orientation by
  - Trough compass
  - Back sighting
- b) Plotting few points by intersection, radiation and resection method
- iii) Traversing an area with a plane table (at least five lines)

V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

## **INSTRUCTIONAL STRATEGY**

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trigonometrical Survey(GTS), Dehradun.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Laboratory and practical work
- Report Writing
- Drawing
- Viva-Voce

## **RECOMMENDED BOOKS**

1. A Text Book of Surveying by Kochar, CL; Katson Publishing House, Ludhiana,
2. "Surveying and Leveling" by Kanetkar,TP and Kulkarni, SV; AVG Parkashan, Poona
3. "Surveying –I by Mahajan, Sanjay; Tech. Publication, Delhi
4. "Surveying and Leveling" by Punmia, BC; Standard Publishers Distributors, Delhi.
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	04	08
2	07	12
3	11	20
4	14	32
5	12	28
<b>Total</b>	<b>48</b>	<b>100</b>

### 3.4 CONSTRUCTION MATERIALS

L T P  
3 - 2

#### RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

#### LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Classify rocks and identify particular type of stones
- Classify different types of bricks and tiles
- Perform laboratory tests of cement to determine properties of cement, bricks, tiles.
- Identify types of defects of timber
- Select paints/varnishes for various types of surfaces
- Identify and use different types of metals/alloys
- Select different materials used for wall paneling and false ceiling, such PVC, POP etc.
- Select other materials commonly used for contemporary buildings.

#### DETAILED CONTENTS

##### 1. Building Stones: (05 Hrs)

Classification of Rocks: (General Review)

Geological classification: Igneous, sedimentary and metamorphic rocks

Chemical classification; Calcareous, argillaceous and siliceous rocks

Physical classification: Unstratified, stratified and foliated rocks

General characteristics of stones – Marble, Kota stone, Granite, Sand, Trap, Basalt stone, Lime stone and Slate

Requirements of good building stones

\*\*1.4 Identification of common building stones

Various uses of stones in construction

Quarrying of stones by blasting and its effect on environment

2. Bricks and Tiles: (10 Hrs)

Introduction to bricks

Raw materials for brick manufacturing and properties of good brick making earth  
Manufacturing of bricks

Preparation of clay (manual/mechanically)

\*\*2.3.2 Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-flyash bricks, sun dried bricks, only line diagram of kilns

Classification and specifications of bricks as per BIS: 1077

Testing of common building bricks as per BIS: 3495

Compressive strength, water absorption – hot and cold water test, efflorescence, Dimensional tolerance, soundness

Tiles

Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles

Ceramic, terrazzo and PVC tiles, : their properties and uses,  
Vitrified tiles, Paver blocks, interlocking tiles

Stacking of bricks and tiles at site

3. Cement: (08 Hrs)

\*\*3.1 Introduction, raw materials, flow diagram of manufacturing of cement

Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement, low heat cement, white and coloured cement, portland pozzolana cement

Properties of cement

4. Timber and Wood Based Products: (08 Hrs)

Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ

\*\* 4.2 Market forms of converted timber as per BIS Code

Seasoning of timber: Purpose, methods of seasoning as per BIS Code

Properties of timber and specifications of structural timber

Defects in timber, decay in timber

Preservation of timber and methods of treatment as per BIS

Other wood based products, their brief description of manufacture and uses: laminated board, gypsum board, block board, fibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Doors.

5. Paints and Varnishes: (05 Hrs)

Introduction, purpose and use of paints

Types, ingredients, properties and uses of oil paints, water paints and cement paints\*\*

Covering capacity of various paints

Types, properties and uses of varnishes

Trade name of different products.



6. Metals: (03 Hrs)

Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.

Commercial forms of ferrous, metals.

Aluminium & Stainless Steel.

7. Miscellaneous Materials: (09 Hrs)

Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes

7.2 Fibre Sheets and their size and uses

7.3 Types and uses of insulating materials for sound and thermal insulation

7.4 Construction chemicals like water proofing compound, epoxies, polymers

7.5 Water proofing, termite proofing and fire resistance materials – types and uses

7.6 Materials used in interior decoration works like POP, methods of doing POP, PVC paneling

7.7. Eco friendly materials for construction of buildings.

NOTE: \*\*A field visit may be planned to explain and show the relevant things

**PRACTICAL EXERCISES:**

- i) To identify the stones used in building works by visual examination
- ii) To determine the crushing strength of bricks
- iii) To determine the water absorption of bricks and efflorescence of bricks
- iv) To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail & Hollock by visual examination only
- v) The students should submit a report work on the construction materials, covering water proofing material, cements, steel, paints and timber products available in the local

market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.

## **INSTRUCTIONAL STRATEGY**

Teachers are expected to physically show various materials while imparting instructions. Field-visits should also be organized to show manufacturing processes and use of various materials in Civil engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests,
- Laboratory and practical work,
- Report Writing
- Viva-voce

## **RECOMMENDED BOOKS**

- 1) "Engineering Materials" by D Sharma, SK and Mathur GC; S. Chand and Co. Jalandhar
- 2) "Engineering Materials" by Surendra Singh; Vikas Publishing House Pvt. Ltd. New Delhi
- 3) "Engineering Materials" by Bahl, SK; , Rainbow Book Co., Delhi
- 4) "Civil Engineering Materials" by TTTI, Chandigarh; Tata McGraw Hill Publication, New Delhi.
- 5) "Engineering Materials" by Shahane; Allied Book Stall, Poona,
- 6) "Engineering materials" by Gurcharan Singh; Standard Publishers Distributors, Delhi..
- 7) "Construction Materials" by SC Rangawala; Charoter Publishers
- 8) "Construction Materials" by Alam Singh
- 9) "Lab Manual in Testing of Engineering Materials" by Dr. Hemant Sood; New Age International (P) Ltd., New Delhi
- 10) Handbook of Civil Engineering by PN Khanna.
- 11) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	05	12
2	10	21
3	08	16
4	08	16
5	05	10
6	03	09
7	09	16
<b>Total</b>	<b>48</b>	<b>100</b>

### 3.5 BUILDING CONSTRUCTION

L T P  
4 - 2

#### RATIONALE

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

#### LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Define the different components and classification of building
- Select a foundation for particular type of building
- Explain different types of walls, scaffolding, shoring, underpinning and their constructional methodology
- Carry out the construction of brick wall.
- Supervise rubble and ashlar types of stone masonry construction
- Demonstrate the construction details of lintels and arches at appropriate level in building
- Select different types of doors, windows, floors and stairs cases in building
- Recognise different parts of roof trusses and drainage system of roofs
- Identify and select application procedure for different types of surfaces finishes in building i.e. plastering, pointing, painting, white washing and distempering
- Evaluate the possible reason of dampness at various level in building and remedial means
- Demonstrate how to carry out different types of possible anti termite treatments in building

#### DETAILED CONTENTS

1. Introduction: (03 Hours)

Definition of a building, classification of buildings based on occupancy  
Different parts of a building

2. Foundations: (05 Hours)

Concept of foundation and its purpose  
Types of foundation-shallow and deep

\*\*2.2.1 Shallow foundation - constructional details of: Spread foundations for walls, min. depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns

2.2.2 Introduction to deep foundation and their types

Earthwork

Layout/setting out for surface excavation, cutting and filling  
Excavation of foundation, trenches, shoring, timbering and de- watering

3. Walls: (05 Hours)

Purpose of walls

Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls

Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls

Partition walls: Constructional details, suitability and uses of brick and wooden partition walls

Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning

4. Masonry ( 08 Hours )

Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters

Bond – meaning and necessity; English, flemish bond and other types of bonds

Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints

Mortars: types, selection of mortar and its preparation

## Stone Masonry

Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course  
grouting, moulding, templates, corner stone, bondstone, throating, through stone, parapet,  
coping, pilasters and buttress

Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to  
be observed in construction of stone masonry walls

### 5. Arches and Lintels: (06 Hours)

Meaning and use of arches and lintels:

Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados,  
voussoirs, springer, springing line, crown, key stone, skew back, span, rise, depth of an  
arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span

Arches:

Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving

Stone arches and their construction

Brick arches and their construction

Lintels

Purpose of lintel

Materials used for lintels

Cast-in-situ and pre-cast lintels

Lintel along with sun-shade or chhajja

### \*\*6. Doors, Windows and Ventilators: ( 06 Hours)

Glossary of terms with neat sketches

Classification based on materials i.e. wood, metal and plastic and their suitability for different  
situations. Different type of doors- panel door, flush door, glazed door, rolling shutter,  
steel door, sliding door, plastic and aluminium doors

Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window,  
Louvers shutters, plastic and aluminium windows.

Door and window frames – materials and sections, fixtures and fasteners, hold fasts

### \*7. Damp Proofing and Water Proofing ( 06 Hours )

Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement,  
damage to aesthetic appearance, damage to heat insulating materials, damage to stored  
articles and health

Sources of dampness - moisture penetrating the building from outside e.g. rainwater,  
surface water, ground moisture. Moisture entrapped during

construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc.

Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals

7.4. Damp proofing of basement, Ground floors, plinth and walls, water storage tank, kitchen, W.C., roof.

\*\*8. Floors ( 05 Hours)

Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose

Types of floor finishes - concrete flooring, ceramic tile flooring, stone (marble and kota) flooring. Wooden flooring

Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase

9. Roofs ( 05 Hours )

Types of roofs, concept of flat, pitched and arched roofs

Glossary of terms for pitched roofs - batten, eaves, fascia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts

False ceilings using gypsum, plaster boards, cellotex, fibre boards

10. Stairs ( 06 Hours)

Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing

Classification of staircase on the basis of material – RCC, timber, steel, Aluminium

Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc

Various types of layout - straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

11. Surface Finishes ( 06 Hours )

Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing

Pointing - different types of pointing and their methods

Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces

Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints

Selection of appropriate paints/finishes for interior and exterior surfaces

Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

12 Anti Termite Measures as per IS 6.313-I-III (03 Hours)

Anti Termite Treatment to Foundation, Masonary, RCC, Floors, Junction of walls and Floors.

Treatment to wooden joinery

Treatment to existing building

**Note** \* An expert may be invited from field/industry for extension lecture  
\*\* A field visit may be planned to explain and show the relevant things

### **PRACTICAL EXERCISES**

1. Demonstration of tools and plants used in building construction
2. To prepare Layout of a building: two rooms building with front verandah
3. To construct brick bonds (English bond only) in one, one and half and two brick thick: (a) Walls for L, T and cross junction (b) Columns
4. Demonstration of following items of work at construction site by:
  - a) Timbering of excavated trenching
  - b) Laying damp proof courses
  - c) Construction of masonry walls
  - d) Laying of tile flooring on an already prepared lime concrete base
  - e) Plastering and pointing exercise
  - f) Constructing RCC work
  - g) Pre-construction and post construction termite treatment of building and woodwork
  - h) Interlocking tiles

Note: (A report of these activities will be submitted by the students)

### **INSTRUCTIONAL STRATEGY**

While imparting instructions in this subject, teachers are expected to take students to work site and explain constructional process and special details for various sub-components of a buildings. It is also important to make use of audio visual aids/video films (if available) to show specialised operations. The practical work should be given due importance and efforts should be made that each student should perform practical work independently. For carrying out practical works, polytechnics should have construction yard where enough raw materials is made available for students to perform practical work

### **MEANS OF ASSESSMENT**



- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce

### RECOMMENDED BOOKS

1. "Building Construction" by Rangwala, SC; Charotar Book Stall, Anand
2. "A Text Book of Building Construction" by Kulkarni, GJ; Ahmedabad Book Depot
3. "A Text Book of Building Construction" by Arora, SP and Bindra, SP; Dhanpat Rai and Sons, New Delhi.
4. "Building Construction" by Sushil Kumar; Standard Publishers Distributors, Delhi
5. SP – 62 Hand Book of BIS
6. B.I.S. – 6313 Part 1, 2, 3
7. National Building Code
8. Handbook of Civil Engineering by PN Khanna
9. Video films on Damp proofing, water proofing, surface finishes
10. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### Websites for Reference:

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

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4	08	12
5	06	9
6	06	9
7	06	10
8	05	08
9	05	08
10	06	9
11	06	9
12	03	05
<b>Total</b>	<b>64</b>	<b>100</b>

## 3.6 BUILDING DRAWING

L T P  
- - 3

### RATIONALE

Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

### LEARNING OUTCOME

After undergoing the subject, the students will be able to:

- Read and interpret building drawings
- Explain the drawing to craftsman
- Layout foundation plan of different types of foundations
- Prepare drawings of small buildings, developing different sections of building
- Guide and supervise carpenters in various carpentry works related to doors, windows etc.
- Prepare details of brick courses in joints
- Draw the sketches of various joints of carpentry
- Demonstrate circular arch and segmental arches

### DETAILED CONTENTS

#### Section-I

#### Drawing No. 1

(2 sheets)

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

#### Drawing No. 2

(one sheet)

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

#### Drawing No. 3

(one sheet)

Drawing plan, elevation of arches: circular arch, segmental arch

(one sheet)

**Drawing No. 4**

(2 sheets)

Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door with wire gauge shutter.

**Section-II****Drawing No. 5**

(2 sheet)

Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

**Drawing No. 6:**

(2 sheets)

Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet

**Drawing No. 7**

(one sheet)

Drawings of following floors

Cement concrete floors on ground and at first floor

- i) Wooden flooring
- ii) Bonded cement concrete flooring
- iii) Ceramic/vitrified tile flooring

**Drawing No. 8**

(one sheet)

Drawing of flat roof, showing the heat/thermal insulation provisions.

**Section-III****Drawing No. 9**

(one sheet)

Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

**Drawing No 10**

(one sheet)

Drawing Damp Proofing details in basement of buildings.

**Drawing No.11**

(one sheet)

Drawing Damp proofing details in water/soil retaining structures.

**NOTE:**

- a) All drawings should be as per BIS code and specifications in SI Units
- b) Intensive practice of reading and interpreting building drawings should be given
- c) Some practice should be done to prepare drawings on AutoCAD.

**MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Drawing
- Viva-Voce

**RECOMMENDED BOOKS**

1. Civil Engineering Drawing by RS Malik; Asia Publishing House
2. Civil Engineering Drawing by V.B.Sikka ; Katson Publishing, Ludhiana
3. Civil Engineering Drawing by NS Kumar ; IPH, New Delhi
4. Principles of Building Drawing by MG Shah and CM Kale; MacMillan, Delhi
5. Building Construction by Moorthy NRK
6. Civil Engg Drawing by Layal
7. Drawing and Design of Residential and Commercial Buildings by Zaidi, SKA and Siddiqui, Suhail; Standard Publishers and Distributors, Delhi.
8. SP : 20
9. National Building Code
10. Building Drawing by Mamta Kataria; North Publication, Jalandhar.
11. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

**Websites for Reference:**

<http://swayam.gov.in>

## **SOFT SKILLS – I**

L T P  
- - 2

### **RATIONALE**

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

### **LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Identify components of effective verbal communication
- Prepare a report
- Learn the techniques of enhancing memory
- Set goals for overall personality development
- Understand the concept of quality and its implementation in an organisation.

### **DETAILED CONTENTS**

- Soft Skills - Concept and Importance
- Communication Skills- Improving verbal communication
- Report Writing
- Method to enhance memory and concentration
- Component of overall personality- Dressing sense/etiquettes/body language etc.

In addition, the students must participate in the following activities to be organized in the institute.

- Sports
- NCC/NSS
- Camp – Blood donation
- Cultural Event

Note: Extension Lectures by experts may be organized. There will be no examination for this subject.

# **FOURTH SEMESTER**

## 4.1 CONCRETE TECHNOLOGY

L T P  
4 - 2

### RATIONALE

Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

### LEARNING OUTCOMES

After undergoing the subject, the students will be able to:

- Evaluate physical properties of cement concrete as per IS codes
- Conduct various tests on aggregate in laboratory to evaluate their characteristics
- Interpret the grading charts of different aggregates and evaluate fineness modulus of aggregates
- Evaluate workability and strength of concrete
- Recognise bleeding, segregation, harshness defects in fresh concrete
- Explain hydration process of cement, water to cement (w/s) ratio and analyze relationship between compressive strength and w/c ratio
- Conduct various destructive and non-destructive (NDT) test
- Design mix of concrete as per IS code
- Describe the use of different admixture to enhance the properties of concrete
- Explain the feature of special concretes
- Demonstrate how to carry out various concreting operation

### DETAILED CONTENTS

Introduction: Definition of concrete, properties of concrete, uses of concrete in comparison to other building materials. Advantages and disadvantages of concrete.

(03 Hours)

2. Ingredients of Concrete: (08 Hours)

Cement: physical properties of cement; different types of cement as per IS Codes

Aggregates:

Classification of aggregates according to size and shape

Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials soundness

Grading of aggregates: coarse aggregate, fine aggregate; All-in- aggregate; fineness modulus; interpretation of grading charts

Water: Water Quality requirements as per IS:456-2000

3. Water Cement Ratio: (03 Hours)

Hydration of cement principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete

4. Properties of Concrete: (11 Hours)

Properties in plastic state: Workability, Segregation, Bleeding and Harshness

Factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consistometer; Recommended slumps for placement in various conditions as per IS:456-2000/SP-23

Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;

5. Concrete Mix Design (10 Hours)

Objectives of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456-2000

Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability

Difference between nominal and controlled concrete

5.4. Introduction to IS-10262-2009-Code for controlled mix design.

6. Introduction to Admixtures (chemicals and minerals) for improving performance of concrete (03 Hours)

7. Special Concretes (only features) (07Hours)



Concreting under special conditions, difficulties and precautions before, during and after concreting

Cold weather concreting

Under water concreting

Hot weather concreting

Ready mix concrete

Fibre reinforced concrete

Polymer Concrete

Fly ash concrete

Silica fume concrete

8. Concreting Operations: (16 Hours)

\*\*8.1 Storing of Cement:

Storing of cement in a warehouse

Storing of cement at site

Effect of storage on strength of cement

Determination of warehouse capacity for storage of Cement

\*\*8.2 Storing of Aggregate: Storing of aggregate at site

Batching (to be shown during site visit )

Batching of Cement

Batching of aggregate by:

Volume, using gauge box (farma) selection of proper gauge box

Weight spring balances and batching machines

Measurement of water

\*\* 8.4 Mixing:

Hand mixing

Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers

Maintenance and care of mixers

\*\*8.5 Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.

## 8.6 Placement of concrete:

Checking of form work, shuttering and precautions to be taken during placement

## \*\* 8.7 Compaction:

Hand compaction

Machine compaction - types of vibrators, internal screed vibrators and form vibrators

Selection of suitable vibrators for different situations

Finishing concrete slabs - screeding, floating and trowelling

Curing:

Objective of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing

Duration for curing and removal of form work

Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location

Defects in concrete: Identification of defects and methods of removing defects

## 9. Importance and methods of non-destructive tests (introduction only) (3 Hours)

Rebound Hammer Test

Pulse Velocity method

NOTE: \*\* A field visit may be planned to explain and show the relevant things

### **PRACTICAL EXERCISES:**

1. To determine the physical properties of cement such as fineness, consistency, setting time, soundness and compressive strength of cement as per IS Codes
2. To determine flakiness at elongation Index of coarse aggregate
3. To determine silt content in fine aggregate
4. Determination of specific gravity and water absorption of aggregates
5. Determination of bulk density and voids of aggregates
6. Determination of particle size distribution of fine, coarse and all-in-aggregate by sieve analysis (grading of aggregate)

7. To determine bulking of fine aggregates
8. To determine workability by slump test and to verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
9. Compaction factor test for workability
10. Non destructive test on concrete by:
  - a) Rebound Hammer Test
  - b) Ultrasonic Pulse Velocity Test
11. To determine compressive strength of concrete cubes for different grades of concrete
12. To determine flexural strength of concrete beam

## **INSTRUCTIONAL STRATEGY**

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various stages of concreting operations. While working in the laboratory, efforts should be made to provide extensive practical training to students so as to make them confident in the preparation and testing of concrete. Teachers should also organize viva examination so as to develop understanding about concepts and principles involved. The experiments may also be demonstrated to students through video programmes developed in the field of 'concrete technology' by NITTTR, Chandigarh.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work,
- Report writing
- Viva-Voce

## **RECOMMENDED BOOKS**

1. "Concrete Technology by Krishnamurthy, KT Rao, A Kasundra and Khandekar, AA; Dhanpat Rai and Sons, Delhi
2. "Text Book of Concrete Technology" by Gupta BL and Gupta Amit; Standard Publishers Distributors, Delhi.
3. "Concrete Technology" by Handoo, BL, Puri, LD and Mahajan Sanjay; Satya Prakashan, New Delhi.
4. "Laboratory Manual on Concrete Technology" by Sood, Hemant, Mittal LN and Kulkarni PD; CBS Publishers, New Delhi
5. "Concrete Technology" by Birinder Singh; Kaption Publications, Ludhiana,
6. Module on "Special Concretes by Dr. Hemant Sood; NITTTR Chandigarh
7. Video programme on different experiments in 'Concrete Technology' developed by NITTTR, Chandigarh.

8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

**Websites for Reference:**

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
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3	03	04
4	11	17
5	10	16
6	03	04
7	07	12
8	16	26
9	03	04
<b>Total</b>	<b>64</b>	<b>100</b>

## 4.2 WATER SUPPLY AND WASTE WATER ENGINEERING

L T P  
4 - 2

### RATIONALE

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialized operations.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Calculate the water requirement for a particular population
- Check and improve the quality of water by giving required treatment to water
- Calculate the size of different pipes to carry water
- Lay the network of pipes for water supply as well as sewerage in a building
- Draw the location of different appurtenances
- Carry out the disposal of sewage
- Supervise the water supply and waste water schemes

### DETAILED CONTENTS

#### A. WATER SUPPLY

##### 1. Introduction ( 02 Hours)

Necessity and brief description of water supply system.  
Sources of water – surface/sub-surface sources

##### Quantity of Water ( 06 Hours)

Water requirement  
Rate of demand and variation in rate of demand  
Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)  
Population Forecasting

3. Quality of Water ( 03 Hours)

Meaning of pure water and methods of analysis of water  
Physical, Chemical and bacteriological tests and their significance  
Standard of potable water as per Indian Standard  
Maintenance of purity of water

4. Water Treatment (brief introduction) (09 Hours)

- \*\*4.1 Sedimentation - purpose, types of sedimentation tanks
- \*\*4.2 Coagulation/floculation - usual coagulation and their feeding
- \*\*4.3 Filtration - significance, types of filters, their suitability

Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.

Flow diagram of different treatment units, functions of (i) Aeration fountain (ii) mixer (iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

5. Conveyance of Water (07 Hours)

- \*\*5.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.
- 5.2 Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses

6. Laying of Pipes ( 04 Hours)

Setting out alignment of pipes  
Excavation for laying of pipes and precautions to be taken  
Handling, lowering and jointing of pipes  
Testing of pipe lines  
Back filling

7. Building Water Supply ( 02 Hours)

Connections to water main (practical aspect only)  
\*\*7.2 Water supply fittings (with sketches) and terminology related to plumbing

**B. WASTE WATER ENGINEERING**

8. Introduction (04 Hours)

Purpose of sanitation

Necessity of systematic collection and disposal of waste

Definition of terms in sanitary engineering

Collection and conveyance of sewage

Conservancy and water carriage systems, their advantages and Disadvantages

(a) Surface drains (only sketches) : various types, suitability

(b) Types of sewage: Domestic, industrial, storm water and its seasonal variation

9. Sewerage System ( 04 Hours)

Types of sewerage systems, materials for sewers, their sizes and joints

Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

10. Laying and Construction of Sewers: ( 05 Hours)

Setting out/alignment of sewers

Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.

Construction of surface drains and different sections required

11 Sewage Characteristics: ( 03 Hours)

Properties of sewage and IS standards for analysis of sewage

Physical, chemical and bacteriological parameters

12. Natural Methods of Sewerage Disposal ( 04 Hours)

General composition of sewage and disposal methods

Disposal by dilution

Self purification of stream

Disposal by land treatment

Nuisance due to disposal

13. Sewage Treatment ( 08 Hours)

Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams

Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant)

## 14. Building Drainage

( 03 Hours)

Aims of building drainage and its requirements

\*\*14.2 Different sanitary fittings and installations

14.3 Traps

\*\* A field visit may be planned to explain and show the relevant things.

### LIST OF PRACTICALS

- 1) To determine turbidity of water sample
- 2) To determine dissolved oxygen of given sample
- 3) To determine pH value of water
- 4) To perform jar test for coagulation
- 5) To determine BOD of given sample
- 6) To determine residual chlorine in water
- 7) To determine conductivity of water and total dissolved solids
- 8) To study the installation of following:
  - a) Water meter
  - b) Connection of water supply of building with main
  - c) Pipe valves and bends
  - d) Water supply and sanitary fittings
- 9) To study and demonstrate the joining/Periodseading of GI Pipes, CI Pipes, SWG pipes, PVC pipes and copper pipes.
- 10) To demonstrate the laying of SWG pipes for sewers
- 11) Study of water purifying process by visiting a field lab.
- 12) Demonstration of plumbing tools.

### INSTRUCTIONAL STRATEGY

Before imparting the instructions in the class room, visits to water works and sewage treatment plants can go a long way for increased motivation of students for learning in the class room. As the subject is of practical nature, lecture work be supplemented by field visits from time to time. Home assignments related to collection of information, pamphlets and catalogues from hardware shop dealing water supply and sanitary fittings will be very helpful for the students.

### MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work,
- Report writing of field visit
- Viva-Voce

### RECOMMENDED BOOKS



1. “Elements of Public Health Engineering” by Duggal, KN; S. Chand and Co. New Delhi
2. “Water Supply and Sanitary Engineering” by Rangwala, SC; Charotar Book Stall, Anand
3. “Water Supply Engineering” by Kshirsagar, SR; Roorkee Publishing House, Roorkee
4. “Sewage and Sewage Treatment” by Kshirsagar, SR; Roorkee Publishing House, Roorkee
5. “Water Supply and Sanitary Engineering” by Birdie, GS; Dhanpat Rai and Sons, Delhi
6. “Water Supply Engineering” by Garg, Santosh Kumar; Khanna Publishers, Delhi
7. “Sewage and Waste Water Disposal Engineering” by Garg, Santosh Kumar; Khanna Publishers, Delhi
8. “A Laboratory Manual in Public Health Engineering” by Duggal, Ajay K and Sharma, Sanjay; Galgotia Publications, 2006, New Delhi
9. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

**Websites for Reference:**

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	02	03
2	06	10
3	03	04
4	09	14
5	07	12
6	04	06
7	02	03
8	04	06
9	04	06
10	05	08
11	03	05
12	04	06
13	08	12
14	03	05
<b>Total</b>	<b>64</b>	<b>100</b>

### 4.3 IRRIGATION ENGINEERING

**L T P**  
**3 - -**

#### **RATIONALE**

Diploma holders in Civil Engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works . Some of diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

#### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Explain concept of necessity of irrigation in India
- Recognise different crops and their water requirements
- Define rainfall and runoff
- Measure rainfall and read rain gauges and hydrographs
- Monitor construction and maintenance work of canal and canal linings
- Monitor installation of tubewells and water harvesting techniques
- Supervise maintenance and construction work of canal head works and cross regulators
- Supervise construction of various river training works
- Carry out desilting operation of canals

#### **DETAILED CONTENTS**

##### **THEORY**

1. Introduction: ( 02 Hours)

Definition of irrigation

Necessity of irrigation

History of development of irrigation in India

Major, medium and minor irrigation projects

2. Water Requirement of Crops ( 04 Hours)

Principal crops in India and their water requirements

Crop seasons – Kharif and Rabi

Soil water, soil crop and crop water relationships, Duty, Delta and Base Period, their relationship

Gross commanded area (GCA), culturable commanded area (CCA), Intensity of Irrigation, Irrigable area

3. Hydrological Cycle Catchment Area and Run-off ( 04 Hours)

Rainfall , definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall (Arithmetic system); catchment area runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.

4. Methods of Irrigation ( 05 Hours)

Flow irrigation - its advantages and limitations

Lift Irrigation – Tubewell, submersible and well irrigation advantages and disadvantages

Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts

Drip irrigation, suitability of drip irrigation, layout, component parts, advantages

5. Canals ( 05 Hours)

Classification, appurtenances of a canal and their functions, sketches of different canal cross-sections

Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal x-sections

Breaches and their control

Maintenance of lined and unlined canals

6. Tube Well Irrigation ( 07 Hours)

Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation

Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well

Types of tube wells and their choice-cavity, strainer and slotted type;

Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance

Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.

7. Dams ( 05 Hours)

Classification of dams; earth dams - types, causes of failure; cross-section of zoned earth dam, method of construction, gravity dams – types, cross-sections of a dam, method of construction

Concept of small and micro dams

Concept of spillways and energy dissipators

8. Canal Head Works and Regulatory Works (04 Hours)

Definition, object, general layout, functions of different parts of head works. Difference between weir and barrage

9. Cross Drainage Works (04 Hours)

Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet

Sketches of the above cross drainage works

10. Definitions of following Hydraulic Structures with Sketches ( 02 Hours)

Falls

Cross and head regulators

Outlets

Canal Escapes

11. River Training Works (03 Hours)

Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

12. Water Logging and Drainage and Ground Water Re-charge (03 Hours)

Definition of water logging – its causes and effects, detection, prevention and remedies

Surface and sub-surface drains and their layout

Concept and various techniques used for ground water re-charge

### **INSTRUCTIONAL STRATEGY**

The teaching of the subject should be supplemented by field visits at regular intervals of time to expose the students to irrigation works. Students should be asked to prepare and interpret drawings of various irrigation works.

### **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-Voce

### **RECOMMENDED BOOKS**

1. Irrigation Engineering and Hydraulics Structures by Garg, Santosh Kumar; Khanna Publishers, Delhi,
2. Irrigation and Water Power Engineering' by Punmia, BC and Pande Brij Bansi Lal; Standard Publishers Distributors, Delhi
3. "Irrigation Engineering and Hydraulic Structures" by Saharsabudhe SR
4. BIS Codes

5. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

**Websites for Reference:**

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	02	05
2	04	08
3	04	08
4	05	10
5	05	10
6	07	15
7	05	10
8	04	08
9	04	08
10	02	04
11	03	08
12	03	06
<b>Total</b>	<b>48</b>	<b>100</b>

## SURVEYING – II

**L T P**  
**3 - 6**

### RATIONALE

The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works. While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surveying, curves and use of minor and modern instruments have been included in this subject.

Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Interpolate contours on a given sheet of paper
- Align a proposed road
- Draw a contour plan of an area
- Calculate earth work for a road from a contour map
- Prolong a line with theodolite
- Conduct closed traversing
- Measure horizontal and vertical angles
- Set out simple circular curve
- Read Total Station, EDM and Auto level

### DETAILED CONTENTS

#### 1. Contouring: (08 Hours)

Concept of contours, purpose of contouring, contour interval and horizontalequivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map

2. Theodolite Surveying: (12 Hours)

concept of transiting, swinging, face left, face right and changing face;  
axes of a theodolite and their relation; temporary adjustments of a transit theodolite;  
Working of a transit vernier theodolite,  
measurement of horizontal and vertical angles.  
Prolonging a line (forward and backward)  
measurement of bearing of a line;  
traversing by included angles and deflection angle method; traversing by stadia measurement,  
theodolite triangulation, plotting a traverse;  
concept of coordinate and solution of omitted measurements (one side affected),  
errors in theodolite survey and precautions taken to minimize them; limits of precision in  
theodolite traversing.  
Height of objects – accessible and non-accessible bases

3. Tacho-metric surveying (08 Hours)

Tachometry, Instruments to be used in tachometry,  
methods of tachometry, stadia system of tachometry,  
general principles of stadia tachometry, examples of stadia tachometry and Numerical  
problems.

4. Curves: (15 Hours)

Simple Circular Curve:

- \* Need and definition of a simple circular curve; Elements of simple circular curve  
- Degree of the curve, radius of the curve, tangent length, point of intersection  
(Apex point), tangent point, length of curve, long chord deflection angle, Apex  
distance and Mid-ordinate. Setting out of simple circular curve:
  - a) By linear measurements only:
    - Offsets from the tangent
    - Successive bisection of arcs
    - Offsets from the chord produced
  - b) By tangential angles using a theodolite

Transition Curve:

Need (centrifugal force and super elevation) and definition of transition curve;  
requirements of transition curve; length of transition curve for roads; by cubic  
parabola; calculation of offsets for a transition curve; setting out of a transition  
curve by tangential offsets only

Vertical curve

Setting out of a vertical curve



5. Introduction to the use of Modern Surveying equipment and techniques such as:  
( 05 Hours)
- a) EDM or Distomat
  - b) Planimeter (Digital)
  - c) Total station
  - d) Introduction to remote sensing and GPS
  - e) Auto level
  - f) Digital theodolite

**NOTE:** No sketch of the instruments may be asked in the examination  
**PRACTICAL EXERCISES**

I. Contouring:

- i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer
- ii) Preparing a contour plan by method of squares
- iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

II. Theodolite:

- i) Taking out the Theodolite, mounting on the tripod and placing it back in the box
- ii) Study of a transit vernier theodolite; temporary adjustments of theodolite
- iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods
- iv) Measurement of vertical angles and use of tachometric tables
- v) Measurement of magnetic bearing of a line
- vi) Running a closed traverse with a theodolite (at least five sides) and its plotting
- vii) Height of objects with and without accessible bases

III. Curves

- i) Setting out of a simple circular curve with given data by the following methods
  - a) Offsets from the chords produced
  - b) One theodolite method

IV. Minor instruments:

- i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc.
- ii) Use of planimeter for computing areas
- V. Demonstration of digital instruments Periodic field visits to Survey of India and other government agencies.
- VI. To plot an area with the help of Total Station

## **INSTRUCTIONAL STRATEGY**

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work,
- Report writing
- Drawing
- Viva-Voce

## **RECOMMENDED BOOKS**

1. "A Text Book of Surveying" by Kocher, CL; Katson Publishing House Ludhiana,
2. "Surveying and Leveling" by Kanetkar, TP and Kulkarni, SV; AVG Parkashan, Pune
3. "Surveying and Leveling-Vol.2" by Kanetkar, TP and Kulkarni, SV; AVG Prakashan, Pune
4. "Surveying and Leveling " by Punima, BC; Standard Publishers Distributors, Delhi
5. "Surveying-II" by Mahajan, Sanjay; Satya Prakashan, Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	08	17
2	12	27
3	08	15
4	15	31
5	05	10
<b>Total</b>	<b>48</b>	<b>100</b>

## **SOIL MECHANICS AND FOUNDATION ENGINEERING**

**L   T   P**  
**4   -   2**

### **RATIONALE**

Civil Engineering diploma engineers are required to supervise the construction of roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil and Foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering.

The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures.

The emphasis will be more on teaching practical aspect rather than theory.

### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Identify and classify various types of soils
- Select particular type of foundation according to loading of structure
- Determine shear strength of soil
- Carry out compaction of soils as per density
- Calculate bearing capacity of soil
- Calculate liquid limit and plastic limit of soil
- Calculate maximum dry density of soil and optimum moisture content of soil
- Perform various tests of the soil

### **DETAILED CONTENTS**

1. Introduction: (03 Hours)

Importance of Soil Studies in Civil Engineering

Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in Punjab, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.

Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils: (04 Hours)

Constituents of soil and representation by a phase diagram

Definitions of void ratio, porosity, degree of saturation, water content, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them

Simple numerical problems with the help of phase diagrams

3. Classification and Identification of Soils (04 Hours)

- 3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils

Gradation and its influence on engineering properties

Relative density and its use in describing cohesionless soils

Behaviour of cohesive soils with change in water content, Atterberg's limit -definitions, use and practical significance

Field identification tests for soils

Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil

4. Flow of Water Through Soils: (04 Hours)

Concept of permeability and its importance

Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability

Comparison of permeability of different soils as per BIS

Measurement of permeability in the laboratory

5. Effective Stress: (Concept only) (04 Hours)

Stresses in subsoil

Definition and meaning of total stress, effective stress and neutral stress

Principle of effective stress

Importance of effective stress in engineering problems

6. Deformation of Soils (04 Hours)

Meaning, conditions/situations of occurrence with emphasis on practical significance of:

- a) Consolidation and settlement
- b) Creep
- c) Plastic flow
- d) Heaving
- e) Lateral movement
- f) Freeze and thaw of soil

Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.

Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects

Settlement due to construction operations and lowering of water table

Tolerable settlement for different structures as per BIS

7. Shear Strength of Soil: (09 Hours)

7.1. Concept and Significance of shear strength

Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law

Determination of shearing strength by direct shear test, unconfined compression test and vane shear test. Drainage conditions of test and their significance

Stress and strain curve, peak strength and ultimate strength, their significance

Examples of shear failure in soils

Numerical problems



Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity

Plate load test (no procedure details) and its limitations

Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

11. Foundation Engineering: (10 Hours)

Concept of shallow and deep foundation; types of shallow foundations: combined, isolated, strip, mat, and their suitability. Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap.

### **PRACTICAL EXERCISES**

1. To determine the moisture content of a given sample of soil
2. Auger Boring and Standard Penetration Test
  - a) Identifying the equipment and accessories
  - b) Conducting boring and SPT at a given location
  - c) Collecting soil samples and their identification
  - d) Preparation of boring log and SPT graphs
  - e) Interpretation of test results
3. Extraction of Disturbed and Undisturbed Samples
  - a) Extracting a block sample
  - b) Extracting a tube sample
  - c) Extracting a disturbed sample for mechanical analysis.
  - d) Field identification of samples
4. Field Density Measurement (Sand Replacement and Core Cutter Method)
  - a) Calibration of sand
  - b) Conducting field density test at a given location
  - c) Determination of water content
  - d) Computation and interpretation of results
5. Liquid Limit and Plastic Limit Determination:



- a) Identifying various grooving tools
  - b) Preparation of sample
  - c) Conducting the test
  - d) Observing soil behaviour during tests
  - e) Computation, plotting and interpretation of results
6. Mechanical Analysis
- a) Preparation of sample
  - b) Conducting sieve analysis
  - c) Computation of results
  - d) Plotting the grain size distribution curve
  - e) Interpretation of the curve
- 7 Laboratory Compaction Tests (Standard Proctor test)
- a) Preparation of sample
  - b) Conducting the test
  - c) Observing soil behaviour during test
  - d) Computation of results and plotting
  - e) Determination of optimum moisture and maximum dry density
8. Direct Shear Test
9. Permeability Test
10. Demonstration of Unconfined Compression Test
- a) Specimen preparation
  - b) Conducting the test
  - c) Plotting the graph
  - d) Interpretation of results and finding/bearing capacity
11. Demonstration of Vane shear Test

## **INSTRUCTIONAL STRATEGY**

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy loads. This can be shown by making use of photographs on working models of such failures. Efforts should be made in the practical classes that students perform practical exercises

individually. Conduct of viva examination at the end of each practical work will develop clear understanding about the concepts and principles related to this subject.

### MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and Practical work
- Report Writing
- Viva-voce

### RECOMMENDED BOOKS

1. "Soil Mechanics and Foundations" by Punmia, BC; Standard Publishers, Delhi
2. "Soil Mechanics and Foundations Engineering" by Bharat Singh and Shamsheer Prakash; Nem Chand and Bros, Roorkee,
3. "Soil Sampling and Testing - A Laboratory Manual by Duggal, AK., Ramana, TR., Krishnamurthy, S; Galgotia Publications, Delhi
4. BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
5. "Shallow Foundations" by NITTTR, Chandigarh
6. Video films on Geo-technical Laboratory Practices by Vinod Kumar; NITTTR, Chandigarh
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### Websites for Reference:

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hours)	Marks Allotted (%)
1	03	05
2	04	06
3	04	06
4	04	06
5	04	06
6	04	06
7	09	14
8	04	06
9	08	16
10	10	12
11	10	17
<b>Total</b>	<b>64</b>	<b>100</b>

## **4.6 WATER SUPPLY & WASTE WATER ENGINEERING AND IRRIGATION ENGINEERING DRAWING**

**L T P**  
**- - 3**

### **RATIONALE**

Diploma holders in Civil Engineering are expected to supervise construction of water supply and wastewater treatment works and irrigation structures. This subject aims at imparting skills for preparing water supply and waste water and irrigation engineering drawings to develop competencies for reading the drawings, and their execution in their field.

### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Draw the drawings of traps, manholes and inspection chambers
- Draw the drawing of water supply plan of building
- Draw the sewerage plan of buildings
- Draw the drawing of channel (L-section and cross-section)
- Draw and demonstrate cross-section of an earthen dams
- Draw layout plan of a canal head works
- Read and interpret the Public Health and Irrigation Engineering Drawings

### **DETAILED CONTENTS**

#### **Drawings Exercises**

#### **PART A :**

#### **WATER SUPPLY AND WASTE WATER ENGINEERING DRAWING**

(10 WEEKS)

##### **1. Drains and Sewers**

Cross section of standard types of open drains (circular, V-shaped and shaped) with their foundations

U-

Cross section of earthen ware and RCC sewer pipes

Cross sections of masonry sewers (circular and egg shaped)

##### **2. Traps, manholes and inspection chamber**

Detailed section of floor trap and gully trap

Detailed plan and section of an inspection chamber  
Detailed plan and section of a manhole

3. Septic Tank and Soak Pit

Detailed plan and cross sections of a domestic septic tank with soak pit for 5-10 users

4. Bath room and W.C connections:

Cross-section through the external wall of lavatories at ground and first floor showing the one and two pipe system and the connections of the lavatory to inspection chamber

4.2. Plan of a bathroom showing positions of lavatory, bath tub, wash-basin, taps and showers

5. Draw sectional elevation of a two storeyed building showing details of one pipe and two pipes systems with sanitation system.

6. Practice of reading water supply and sanitary engineering working drawings (PWD/urban Development agencies) including hot water and cold water supply system of a two room set.

## PART B

**B) IRRIGATION ENGINEERING DRAWING: (06 WEEKS)**

1. Typical cross-section of a channel

- L-section of a channel for given data
- Typical cross section of an unlined and lined channel in cutting, partly cutting and partly filling and fully in filling with given design data.

Layout plan of a canal head works

Draw the typical L-section of a weir

4. Draw the X-section of an Earthen Dam

- i) Homogeneous
- ii) Zoned type
- iii) Diaphragm type

Cross section of a tube well

6      Layout and cross section of rain water harvesting system.

**Important Note:**      **i) Use of BIS: 456-2000 is permitted in the examination**  
**ii) Paper should be set from Part A of 60 marks and Part B of 40 marks**

## **INSTRUCTIONAL STRATEGY**

Teachers are expected to develop skills in preparation and interpretation of water supply and waste water engineering drawings as per BIS codes of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy for industrial unit at different intervals of time. Reading and interpreting actual field drawings should also be practiced so as to develop necessary competency in the students.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Drawing
- Viva-Voce

## **RECOMMENDED BOOKS**

1.      “Civil Engineering Drawing” by Loyal JS ; Satya Parkashan, New Delhi
2.      “ Civil Engineering Drawings” by Chandel RP
3.      “ Civil Engineering Drawing by Kumar NS; IPH, New Delhi
4.      “Civil Engineering Drawing” by Malik RS and Meo GA ; Asian Publishing House, New Delhi
5.      “Civil Engineering Drawing” by S.K. Garg; Khanna Publishers.
6.      e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

## **SOFT SKILLS – II**

L T P  
- - 2

### **RATIONALE**

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

### **LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Develop Communication Skills
- Work in a team
- Learn to resolve conflict by appropriate method
- Identify leadership traits and learn self motivation
- Follow ethics

### **DETAILED CONTENTS**

- Concept of team building, behavior in a team
- Developing Interpersonal Relations- empathy, sympathy
- Communication skills-improving non-verbal communication
- Conflict Management
- Motivation
- Leadership
- Professional Ethics and Values
- Health, Hygiene, Cleanliness and Safety

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Environment awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

## INDUSTRIAL TRAINING

Industrial training provides an opportunity to students to experience the environment and culture of industrial production units and commercial activities undertaken in field organizations. It prepares student for their future role as diploma engineers in the world of work and enables them to integrate theory with practice.

For this purpose, students at the end of fourth semester need to be sent for industrial training for a minimum of 6 weeks upto 8 weeks duration to be organized during the semester break starting after IV Semester examinations. The concerned HODs along with other teachers will guide and help students in arranging appropriate training places relevant to their specific branch. It is suggested that a training schedule may be drawn for each student before starting of the training in consultation with the training providers. Students should also be briefed in advance about the organizational setup, product range, manufacturing process, important machines and materials used in the training organization.

Equally important with the guidance is supervision of students training in the industry/organization by the teachers. A teacher may guide a group of 4-5 students. A minimum of one visit per week by the teacher is recommended. Students should be encouraged to write daily report in their diary to enable them to write final report and its presentation later on.

An internal assessment of 100 and external assessment of 100 marks have been provided in the study and evaluation scheme of V Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations. The formative and summative evaluation may comprise of weightage to performance in testing, general behavior, quality of report and presentation during viva-voce examination. It is recommended that such evaluations may be carried out by a team comprising of concerned HOD, teachers and representative from industry. The components of evaluation will include the following.

- |                                      |     |
|--------------------------------------|-----|
| a) Punctuality and regularity        | 15% |
| b) Initiative in learning new things | 15% |
| c) Relationship with workers         | 15% |
| d) Industrial training report        | 55% |

# **FIFTH SEMESTER**



## 5.1 HIGHWAY ENGINEERING

L T P  
4 - 2

### RATIONALE

Construction of roads is one of the major areas in which diploma holders in Civil Engineering may get very good opportunities for employment. The diploma holders are responsible for construction and maintenance of highways and airports. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- classify the roads as per IRC types and geometrics
- explain various components of a flexible/rigid pavement
- select various highway materials and test them for different quality parameters
- supervise construction of a highway in plain areas and hilly areas
- supervise repair and maintenance of roads
- supervise preparation of bituminous mix in the hot mix plants
- describe the use various road construction equipment
- Describe basic terminology of various components of an airport.

### DETAILED CONTENTS

#### 1. Introduction ( 02 Hours)

Importance of Highway engineering

Functions of IRC, CRRI, MoRT&H, NHAI

Classification of roads

#### 2. Road Geometrics ( 06 Hours)

Glossary of terms used in road geo-metrics and their importance: Right- of- way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient

Average running speed, stopping and overtaking sight distance

Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation

Sketch of typical cross-sections in cutting and filling on straight alignment and at a curve

**(Note: No design/numerical problem to be taken)**

3. Highway Alignment (04 Hours)

Basic considerations governing alignment for a road in plain and hilly area

Highway location, marking of alignment on ground, setting out alignment of road, setting out bench marks, control pegs for embankment and cutting

4. Road Materials (08 Hours)

Different types of road materials in use; soil, aggregate and binders

Introduction to California Bearing Ratio, method of finding CBR value and its significance.  
Aggregate : Source and types, important properties, strength, durability

Binders: Common binders; bitumen, properties as per BIS specifications, penetration, softening point, ductility and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers (CRMB, PMB)

5. Road Pavements (14 Hours)

Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components

Sub-grade preparation:

Borrow pits, making profiles of embankment, construction of embankment, compaction, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation.

Stabilization of subgrade. Types of stabilization mechanical stabilization, limestabilization, cement stabilization, fly ash stabilization etc.(introduction only)

Base Course:

Granular base course:

- (a) Water Bound Macadam (WBM)
- (b) Wet Mix Macadam (WMM)

Bitumen Courses:

- (a) Bituminous Macadam
- (b) Dense Bituminous Macadam (DBM)

\*Methods of construction as per MoRT&H

Surfacing:

\* Types of surfacing

- a) Prime coat and tack coat
- b) Surface dressing with seal coat
- c) Open graded premix carpet
- d) Mix seal surfacing
- e) Semi dense bituminous concrete
- f) Bituminous Concrete

\* Methods of constructions as per MORT&H specifications and quality control; equipments used for above.

Rigid Pavements:

Construction of concrete roads as per IRC specifications: Form work laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used. Roller compacted concrete.

6. Hill Roads: (06 Hours)

Introduction: Typical cross-sections showing all details of a typical hill road, partly in cutting and partly in filling

Special problems of hill areas

Landslides: Causes, prevention and control measures, use of geogrids, geoflexbiles, geo synthetics

Drainage

Soil erosion

Snow: Snow clearance, snow avalanches, frost

Land Subsidence

7. Road Drainage: ( 04 Hours)

Necessity of road drainage work, cross drainage works

Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections

8. Road Maintenance: ( 06 Hours)

Common types of road failures of flexible pavements: Pot hole, cracks, rutting, alligator, cracking, upheaval - their causes and remedies (brief description)

Maintenance of bituminous road such as crack sealing, patch-work and resurfacing.

Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms)

9. Road Construction Equipment: ( 08 Hours)

Output and use of the following plant and equipment

Hot mix plant

Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline

Asphalt mixer and tar boilers

Road pavers

Paver finisher

10 Airport Engineering :- ( 06 Hours)

Necessity of study of airport engineering, aviation transport scenario in India.

Factors to be considered while selecting a site for an airport with respect to zoning laws.

Introduction to Runways, Taxiways, Apron and Hanger

\* An expert may be invited from field/industry for extension lecture on this topic.

**PRACTICAL EXERCISES**

1. Determination of penetration value of bitumen
2. Determination of softening point of bitumen

3. Determination of ductility of bitumen
4. Determination of impact value of the road aggregate
5. Determination of abrasion value (Los Angeles') of road aggregate
6. Determination of crushing strength of aggregate
7. Determination of flakiness and elongation index of aggregate
8. Determination of the California bearing ratio (CBR) for the sub-grade soil
9. Demonstration of working of hot mix plant through a field visit
10. Visit to highway construction site for demonstration of operation of:  
Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB
11. Demonstration of working of mixing and spraying equipment through a field visit

## **INSTRUCTIONAL STRATEGY**

While imparting instructions, it is recommended that emphasis should be laid on constructional details and quality control aspects. Students should be asked to prepare sketches and drawings, clearly indicating specifications and constructional details for various sub components of a highway. It will be also advantageous to organize field visits to show the actual construction of roads at site.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report Writing
- Viva-voce

## **RECOMMENDED BOOKS**

1. "Highway Engineering" by Khanna, SK and Justo, CEG; Nem Chand and Bros., Roorkee
2. "A Text Book on Highway Engineering and Airport" by Sehgal, SB; and Bhanot, KL; S Chand and Co, Delhi
3. "A Course on Highway Engineering" by Bindra, SP; Dhanpat Rai and Sons, New Delhi
4. "Laboratory Manual in Highway Engineering" by Duggal AK, Puri VP; New Age Publishers (P) Ltd, Delhi,
5. "Laboratory Manual in Highway Engineering", by NITTTR, Chandigarh
6. "Maintenance of Highway – a Reader by Duggal AK; NITTTR, Chandigarh
7. "Types of Highway Construction" by Duggal AK; NITTTR Chandigarh
8. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

## IRC Publications

- i) MoRTH Specifications for Road and Bridge Works (Fifth Revision)
- ii) MoRTH Pocket book for Highway Engineers, 2001
- iii) MoRTH Manual for Maintenance of Roads, 1983

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	02	03
2	06	10
3	04	06
4	08	12
5	14	22
6	06	10
7	04	06
8	06	10
9	08	12
10	06	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.2 REINFORCED CEMENT CONCRETE DESIGN AND DRAWINGS

L T P  
5 - 3

### RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per IS:456-2000 and Thus one should be able to read and interpret drawings of RC structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

### LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Explain methods of RCC design i.e.
  - Working stress methods
  - Limit state methods
- Design singly, doubly reinforced rectangular and T&L beams as per IS Code
- Design one way and two way slab
- Design axially loaded column and their isolated footing
- Draw the reinforcement details for various structural elements from the given data
- Calculate reinforcement details from the given drawings
- Draw bar bending schedule from drawing
- Read and interpret R.C.C. drawings

### DETAILED CONTENTS

1. Introduction ( 02 Hours)

Concept of Reinforced Cement Concrete (RCC)

Reinforcement Materials:

- Suitability of steel as reinforcing material
- Properties of mild steel and HYSD steel

- 1.3. Loading on structures as per IS: 875

2. Introduction to following methods of RCC design ( 02 Hours)

Working stress method: Definition and basic assumptions

Limit state method: Definition and basic assumptions

3. Shear and Development Length ( 05 Hours)

Shear as per IS:456-2000 by working stress method

- i) Shear strength of concrete without shear reinforcement
- ii) Maximum shear stress
- iii) Shear reinforcement

4. Concept of Limit State Method ( 07 Hours)

Definitions and assumptions made in limit state of collapse (flexure)

Partial factor of safety for materials

Partial factor of safety for loads

Design loads

Stress block, parameters

5. Singly Reinforced beam ( 11Hours)

Theory and design of singly reinforced beam by Limit State Method

6. Doubly Reinforced Beams ( 11 Hours)

Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method

7. Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals) ( 05 Hours)

8. One Way Slab ( 12 Hours)

Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..

9. Two Way Slab ( 12 Hours)

Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)

10. Axially Loaded Column ( 10 Hours)

Definition and classification of columns



Effective length of column,

Specifications for longitudinal and lateral reinforcement

Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)

11 Pre-stressed Concrete

(03 Hours)

Concept of pre-stressed concrete

Methods of pre-stressing : pre-tensioning and post-tensioning

Advantages and disadvantages of pre-stressing

Losses in pre-stress

### DETAILED CONTENTS

1. RCC Drawing:

Reinforcement details from the given data for the following structural elements with bar bending schedules

- (i) Drawing No. 1: RC Slabs - One way slab, Two way slab and Cantilever Slab.
- (ii) Drawing No.2 : Beams - Singly and doubly reinforced rectangular beams and Cantilever beam (All beams with vertical stirrups)
- (iii) Drawing No.3 : Columns and Footings – Square, Rectangular and Circular Columns with lateral ties and their isolated sloped column footings.
- (iv) Drawing No. 4 : Portal Frame – Three bay two storey RC portal frame with blow up of column beam junctions.
- (v) Drawing No. 5 : Draw atleast one sheet using AutoCAD software

**Important Note:** Use of BIS:456-2000 is permitted in the examination.

### INSTRUCTIONAL STRATEGY

Teachers are expected to give simple problems for designing various RCC structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show form work for RCC as well as placement of reinforcement in various structural members. Commentary on BIS:456 may be referred along with code for relevant clauses.

### MEANS OF ASSESSMENT

- Assignments and quiz/class tests

- Mid-term and end-term written tests
- Laboratory and practical work
- Software installation and operation
- Drawing
- Viva-Voce

### RECOMMENDED BOOKS

1. "Reinforced Concrete Structure Vol I" by Punmia, BC; Standard Publishers, Delhi
2. "Design and Testing of Reinforced Structures" by Ramamurtham, S; Dhanpat Rai and Sons, Delhi
3. "RCC Design and Drawing" by Singh, Birinder ; Kaption Publishing House, New Delhi
4. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### RCC DRAWING:

7. "Civil Engineering Drawing" by Loyal JS; Satya Parkashan, New Delhi
8. "Civil Engineering Drawing by Kumar NS; IPH, New Delhi
9. "RCC Design and Drawing" by Singh, Birinder; Kaption Publishing House, New Delhi.
4. "Steel Structures Design and Drawing by Singh, Birinder; Kaption Publishing House, New Delhi
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### Websites for Reference:

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	02	03
2	02	04
3	05	06
4	07	09
5	11	14

6	11	14
7	05	06
8	12	15
9	12	15
10	10	09
11	03	04
	RCC Drawing*	50
<b>Total</b>	<b>80</b>	<b>150</b>

\* Examiner have to set 03 questions from RCC Drawing of 25 marks each and out of which the examinee can attempt any 02 questions.

## **SURVEY CAMP**

**10 Days Duration**

### **Purpose**

- a. To impart intensive training in the use of surveying instruments
- b. To train the students to appreciate practical difficulties in surveying on the field
- c. Making the students conversant with the camp life
- d. Training the students to communicate with the local population
- e. Providing an opportunity to the students to develop team spirit
- f. To train the students for self management

### **LEARNING OUTCOME**

After undergoing the survey camp, students will be able to:

- Interpret the contours
- Work in a teamwork
- Mark a road alignment of a given gradient connecting any two stations on the map
- Calculate the earth work
- Prepare a topographical plan of a given area

### **Task:**

Preparation of topographical plan of a given area. The survey camp will be organized for a duration of 10 days time span.

The students may be assigned an undulated area of about 1.5 to 2.00 sq.km. with level difference of 15m consisting of good number of physical features such as buildings, roads, bridges, culverts, railway tracks, electric lines etc. They are required to prepare the topographic map of above areas showing various features along with contours using a suitable contour intervals. They will mark a road alignment of given gradient connecting any two stations on the map consisting some horizontal and vertical curves and will prepare estimate of earthwork and submit the detailed technical report indicating therein practical difficulties faced during surveying for the features like ridge, line, valley lines, saddle cliffs etc.

The students should be divided in the groups consisting of 10-15 in numbers. They are required to submit the Report of work done, during survey camp, which will be dully examined, while awarding the internal assessment.

### **MEANS OF ASSESSMENT**

- Practical work
- Report Writing
- Presentation
- Drawing
- Viva-voce

# COMPUTER APPLICATIONS IN CIVIL ENGINEERING

L T P  
- - 6

## RATIONALE

Computer applications play a very vital role in present day life, more so, in the professional life of engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer software's in Civil Engineering.

## LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Draw 2D drawings on AutoCAD viz. plan, section and elevation of a residential building
- Use various Civil Engineering software

## DETAILED CONTENTS

### PRACTICAL EXERCISES

1. Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of a residential building
2. Demonstration of various Civil Engineering softwares like STAAD-Pro, Revit or Primavera Project Planner, Auto CIVIL & Mx Road, Build Superfast, BIM, ArcGIS or any other equivalent software

#### Note:

- i) Polytechnics may use any other software available with them for performing these exercises
- ii) If the above softwares are not available in the institution, demonstration of the above said software should be arranged outside the institute.

### MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Software installation and operation
- Report Writing
- Drawing
- Viva-voce

## **RAILWAYS, BRIDGES AND TUNNELS**

<b>L</b>	<b>T</b>	<b>P</b>
<b>5</b>	<b>-</b>	<b>-</b>

### **RATIONALE**

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Describe different component parts of permanent way such as rails, sleepers and ballast
- Distinguish different types of rail gauges used in India
- Use of different types of rail fastenings and fixtures
- Classify bridges and select suitable type of bridge for a particular purpose
- Describe essential components of a ROB and RUB
- Supervise construction of a tunnel
- Carry out ventilation, drainage and lightening of tunnels

### **DETAILED CONTENTS**

#### **PART – I: RAILWAYS**

(35 Hours)

1. Introduction to Indian Railways
2. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey
3. Classification of permanent way describing its component parts
4. Rail Gauge: Definition, types, practice in India
5. Rails – types of rails
6. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates
7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.

- 8 Ballast: Function of ballast, requirements of an ideal material for ballast
- 9 Crossings and signalling: Brief description regarding different types of crossings/ signalling
- 10 Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools
- 11 Earth work and drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system
- 12 Station and yards: purpose and types of stations and yards

## **PART-II: BRIDGES**

( 35 Hours)

### 13. Introduction

Bridge – its function and component parts, difference between a bridge and a culvert

### 14. Classification of Bridges

Their structural elements and suitability:

According to life-permanent and temporary

According to deck level – Deck, through and semi-through

According to material –timber, masonry, steel, RCC, pre-stressed

According to structural form;

- Grade Separators-Railway Road Over Bridges (ROB), Road Under Bridge (RUB)
- Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges.
- Arch type – open spandrel and filled spandrel barrel and rib type
- Suspension type – unstiffened and stiffened and table (its description with sketches)
- According to the position of highest flood level submersible and non submersible  
IRC classification

Concept of Railway ROB and RUB – Precast components of ROB, drainage problems and solutions of RUB

15. Bridge Foundations: Introduction to open foundation, pile foundation, well foundation

16. Piers, Abutments and Wingwalls

Piers-definition, parts; types –solid (masonry and RCC), open

Abutments and wing walls – definition, types of abutments (straight and tee),abutment with wing walls (straight, splayed, return and curved)

17. Bridge bearings

Purpose of bearings; types of bearings – fixed plate, rocker and roller, Elastomeric bearings.

18. Maintenance of Bridges

Inspection of bridges

Routine maintenance

### **PART - III: TUNNELS**

( 10 Hours)

19. Definition and necessity of tunnels

20. Typical section of tunnels for a national highway and single and double broad gauge railway track

21. Ventilation –necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust

22. Drainage method of draining water in tunnels

23. Lighting of tunnels

- Notes:** i) Field visits may be organized to Bridge construction site or a Bridge/Tunnel construction site/Railways tracks to explain the various components and a field visit report shall be prepared by the students, as teamwork  
ii) Examiners should set questions from all the parts



## INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various components and construction of railway track, bridges and tunnel.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

## RECOMMENDED BOOKS

1. “Railway Engineering” by Vaswani, NK; Publishing House, Roorkee
2. “Railway Engineering” by Rangwala, SC; Anand, Charotar Book Stall
3. “A Text Book of Railway Engineering” by Deshpande, R; Poonam United Book Corporation
4. “Bridge Engineering” by Algia, JS; Charotar Book Stall, Anand
5. “Essentials of Bridge Engineering” by Victor Johnson; Oxford and IBH, Delhi
6. “Bridge Engineering” by Rangwala S.C; Charotar Book Stall, Anand
7. IRC Bridge Codes
8. MoRTH drawings for various types of bridges
9. MoRTH pocket books for bridge Engineers, 2000 (First Revision)
10. “Tunnel Engineering” by Subhash C Saxena; Dhanpat Rai and Sons, Delhi
- 11 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## Websites for Reference:

<http://swayam.gov.in>

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	35	44
2	35	44
3	10	12
<b>Total</b>	<b>80</b>	<b>100</b>

## PLUMBING SERVICES

L T P

3 - 2

### RATIONALE

Plumbing is said to be the system of pipes, tanks, fittings, and other apparatus required for water supply, heating, and sanitation in a building. Plumbers install, repair, and maintain piping systems in residential, commercial and industrial buildings. These systems traditionally included water distribution and wastewater disposal, but because of new technology that combines water and gas pipes, plumbers can work with vent, residential fire, irrigation, and chemical systems as well. The duties of a plumber include: installing, repairing and maintaining pipes, fixtures, and other plumbing equipment; opening walls and floors to accommodate pipes and pipe fittings; welding, connecting, and testing pipes for leaks; preparing cost estimates; interpreting blueprints and designs. Plumbers must also be aware of safety procedures and follow them at all times.

Diploma holders in Civil Engineering who normally work in supervisory positions, must not only be well versed with plumbing procedures, processes, equipment, safety requirements etc. but also be able to demonstrate all practical aspects of plumbing to as to effectively lead team of plumbers and ensure execution of quality work and excellent end results.

This subject is therefore, aimed at instilling theoretical and practical knowledge among students studying civil engineering at diploma level.

### LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Identify and select proper tools and use them for the given plumbing work
- Select appropriate pipes and carry out pipe fitting after carrying out operations like cutting, bending, threading, joining, aligning and other necessary operations
- Erect simple water supply system. Trace leakage and repair water supply system
- Plan, prepare and inspect domestic drainage system
- Select and install sanitary appliances
- Install heating appliances like geysers, etc.

### DETAILED CONTENTS

#### 1. Plumber's Tools

( 05 Hours)

Selection, use and care of tools required for plumbing work, such as threading die, bit brace, ratchet brace, pipe wrench, spanner set, pipe cutter, pipe vice, hacksaw, chisel, files and other common hand tools, bench drilling machine, soldering iron

2. **Pipes and Pipe Fitting** ( 10 Hours)  
Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions
3. **Water Supply System** (09 Hours)  
Sources of water; Rainwater harvesting; Water supply systems in a town; Water distribution systems; Distribution reservoirs; Pumps; Valves; Fire hydrants; Storage of water in buildings; Types of tanks; Laying water supply pipe lines
4. **Domestic Drainage** (10 Hours)  
Drainage system (two pipe, one pipe, single stack and other systems), Trap, Cesspool, Sceptic tank, Cleaning blocked pipes and drains, Laying sanitary and sewer pipes, Manholes, Inspection and testing (pressure & leakage test, testing straightness of pipes, ball test etc.); Fixing accessories, Problems in drainage and their solution
5. **Sanitary Appliances** ( 08 Hours)  
Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Pop up waste
6. **Heating System** ( 06 Hours)  
Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

## LIST OF PRACTICALS

1. Carry out simple job requiring cutting mild steel plate, filing, drilling and tapping holes etc.
2. Practice cutting, threading and bending of metal pipes; cutting and shaping of PVC pipes
3. Carry out simple pipe connections requiring use of bends, tees, elbows etc.
4. Erect simple water supply system
5. Test drainage lines by using different testing methods
6. Practice fixing of different valves
7. Install sanitary fittings like washbasin, Sink, Floor traps, Urinal, Bathtub and heating appliance like geyser

## INSTRUCTIONAL STRATEGY

During instructions, teacher should explain the use of various plumbing tools and demonstrate how to handle them properly. Liberal use of audio-visual aids may be made. Students may be asked to prepare models of different piping systems. Visit may be arranged for students to see how town water supply is arranged and managed. Detailed explanation with the help of actual sanitary appliances may be given about their use and method of installing them.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and Practical work
- Drawing
- Report Writing
- Viva-voce

## RECOMMENDED BOOKS

- Plumber by G. S. Sethi; Computech Publications Ltd, New Delhi (Available in English and Hindi)
- e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## Websites for Reference:

<http://swayam.gov.in>

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hours)	Marks Allotted (%)
1	05	10
2	10	21
3	09	19
4	10	21
5	08	17
6	06	12
<b>Total</b>	<b>48</b>	<b>100</b>

## ELECTIVE

### PRE- STRESSED CONCRETE

L T P  
3 - -

#### RATIONALE

This is an applied technology subject. In this subject, knowledge regarding precast and prestressed concreting operations and piles has been given.

#### LEARNING OUTCOME

After undergoing the subject, student will be able to:

- Supervise prestressed concrete construction
- Use various methods of pile driving

#### DETAILED CONTENTS

#### 1. Precast and Prestressed Concrete Construction (32 Hours)

Introduction of prestressed concrete, general theory. Linear post tensioning – general, post tensioning advantages to the design engineer and the contractor

Linear post tensioning system, high strength post tensioned strands, parallel lay wire, high strength alloy steel bars

Techniques of post tensioning – general, special requirements for forming and false work, ducts or tendons, concreting, stressing procedure, grouting, protecting anchorage from corrosion

Pretensioning - general, pretensioning yards set up, forms for pretensioned structural elements, special techniques of pretensioning

Materials of prestressing – cement, aggregates concrete, admixtures, vibration, curing, light weight aggregates, high strength steel bars, high strength strand, stress relaxation, galvanization. Codes specifications and inspection, manufacturers of prestressing equipment, specifications, sizes and costs

#### 2. Piles (16 hours)

Piles; basic piling methods for various types of piles, methods of pile driving, non – displacement piles, problems in pile construction, pile testing

## INSTRUCTIONAL STRATEGY

The subject shall consist of visits by the students to various construction sites. They shall also contact the representatives of the manufacturers of various construction equipment and collect information from practical demonstration, discussions and technical information received from the firms.

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

## RECOMMENDED BOOKS

1. "A Text Book of Building Construction" by Gupta, Sushil Kumar, Singla, DR. and Juneja BM; Katson Publishing House, Ludhiana
2. "A Text Book of Building Construction" by Deshpande, RS and Vartak, GV; United Book Corporation, Poona.
3. "A Text Book of Building Construction" by Kulkarni, GJ; Ahmedabad Book Depot.
4. "A Text Book of Building Construction" by Arora, SP and Bindra, SP; Dhanpat Rai and Son, Delhi.
5. "A Text Book of Building Construction" by Sharma, SK and Kaul, BK; S. Chand and Corporation, Delhi
6. "Building Construction" by Sushil Kumar; Standard Publishers Distributors. Delhi.
- 7 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## Websites for Reference:

<http://swayam.gov.in>

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	32	65
2	16	35
<b>Total</b>	<b>48</b>	<b>100</b>

**ELECTIVE  
REPAIR AND MAINTENANCE OF BUILDINGS**

**L T P  
3 - -**

**RATIONALE**

One of the major concerns of a civil engineer is to take care of the building works, already constructed, in order to keep these buildings in utmost workable conditions. Usually it is being felt that the buildings deteriorate faster for want of care and proper maintenance. The buildings usually have a shabby appearance due to cracks, leakage from the roofs and sanitary/water supply fittings. Thus the need for teaching the subject in proper perspective has arisen making students aware of importance of maintenance of buildings.

**LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- State various factors causing deterioration to buildings
- Investigate/diagnose various defects in buildings
- Explain main causes of defects in buildings
- Select the materials for repair and maintenance of buildings
- Carry out repairs for various types of building defects

**DETAILED CONTENTS**

1. Need for Maintenance (06 Hours)

Importance and significance of repair and maintenance of buildings

Meaning of maintenance

Objectives of maintenance

Factors influencing the repair and maintenance

2. Agencies Causing Deterioration (Sources, Causes, Effects) (06 Hours)

Definition of deterioration/decay

Factors causing deterioration, their classification

Human factors causing deterioration

Chemical factors causing deterioration

Environmental conditions causing deterioration

Miscellaneous factors

Effects of various agencies of deterioration on various building materials i.e. bricks, timber, concrete, paints, metals, plastics, stones

3. Investigation and Diagnosis of Defects (06 Hours)

Systematic approach/procedure of investigation

Sequence of detailed steps for diagnosis of building defects/problems

List non-destructive and others tests on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests

4. Defects and their root causes (06 Hours)

Define defects in buildings

Classification of defects

Main causes of building defects in various building elements

Foundations, basements and DPC

Walls

Column and Beams

Roof and Terraces

Joinery

Decorative and protective finishes

Services

Defects caused by dampness

5. Materials for Repair, maintenance and protection (06 Hours)

Compatibility aspects of repair materials

State application of following materials in repairs:

Anti corrosion coatings

Adhesives/bonding aids

Repair mortars

Curing compounds

Joints sealants

Waterproofing systems for roofs

Protective coatings



## 6. Remedial Measures for Building Defects

(18 Hours)

Preventive maintenance considerations

Surface preparation techniques for repair

Crack repair methods

Epoxy injection

Grooving and sealing

Stitching

Adding reinforcement and grouting

Flexible sealing by sealant

Repair of surface defects of concrete

Bug holes

Form tie holes

Honey comb and larger voids

Repair of corrosion in RCC elements

Steps in repairing

Prevention of corrosion in reinforcement

Material placement techniques with sketches

Pneumatically applied (The guniting techniques)

Open top placement

Pouring from the top to repair bottom face

Birds mouth

Dry packing

Form and pump

Preplaced – aggregate concrete

Trowel applied method

Repair of DPC against Rising Dampness

Physical methods

Electrical methods

Chemical methods

Repair of walls

Repair of mortar joints against leakage

Efflorescence removal

Waterproofing of wet areas and roofs

Water proofing of wet areas

Water proofing of flat RCC roofs

Various water proofing systems and their characteristics

Repair of joints in buildings  
Types of sealing joints with different types of sealants  
Techniques for repair of joints  
Repair of overhead and underground water tanks

## **INSTRUCTIONAL STRATEGY**

This is very important course and efforts should be made to find damaged/defective work spots and students should be asked to think about rectifying/finding solution to the problem. Visits to work site, where repair and maintenance activities are in progress can be very useful to students. The students will also prepare a project report based upon the available water proofing materials, sealant, special concrete for repair and adhesives and other repair material available in the market.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Report Writing
- Viva-voce

## **RECOMMENDED BOOKS**

1. "Building Defects and Maintenance Management" by Gahlot P.S. and Sanjay Sharma; CBS Publishers, New Delhi
2. "Maintenance Engineering for Civil Engineers" by Nayak, BS; Khanna Publishers, Delhi
3. "Building Failures - Diagnosis and Avoidance" by Ransom; WH Publishing
4. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	06	13
2	06	13
3	06	13
4	06	13
5	06	13
6	18	35
<b>Total</b>	<b>48</b>	<b>100</b>

## **SOFT SKILLS – III**

L   T   P  
-   -   2

### **RATIONALE**

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

### **LEARNING OUTCOMES**

After undergoing this course, the students will be able to:

- Develop communication skills.
- Learn how to speak without fear and get rid of hesitation
- Use effective presentation techniques
- Understand entrepreneurial traits
- Exhibit attitudinal changes

### **DETAILED CONTENTS**

- Communication Skills – Handling fear and phobia
- Resume Writing
- Applying for job through email/job portal
- Interview preparation : Mock Interview, Group Discussions and Extempore
- Presentation Techniques
- Developing attitude towards safety. Disaster management.

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Camp – Entrepreneurial awareness
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.

**SIXTH SEMESTER**

# STEEL STRUCTURES DESIGN AND DRAWING

L T P  
4 - 3

## RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800. Thus one should be able to read and interpret structural drawings of steel structures. The competence to read and interpret structural drawings is best learnt by being able to draw these drawings. Hence there is a need to have a subject devoted to preparation of structural drawings.

## LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Explain structural properties of steel and its designation as per Indian Standards
- Select different types of bolted and welded joints
- Analyze and design single and double angle section struts and I section compression members
- Explain different types of trusses, their different components and usability
- Analyze and design of simply supported steel beams
- Select various types of plate girders
- Supervise fabrication and erection of steel structure like trusses, columns and girders
- Read and interpret steel structural drawing
- Prepare the detailed drawings of toe joint, ridge joint, details of purlins and roof sheets
- Prepare and draw slab base connection, gusseted base connection grillage base connection for single section steel columns
- Draw column beam connections
- Prepare drawings of plate girder from given design data
- Prepare the drawing and demonstrate steel roof truss
- Draw the structural drawing sheets using CAD Software

## DETAILED CONTENTS

1. Structural Steel and Sections: ( 02 Hours)

Properties of structural steel as per IS Code

Designation of structural steel sections as per IS handbook and IS:800

2. Riveted Connections (04 Hours)  
Types of Rivet, Permissible stresses in rivets, types of riveted joints, specifications as per IS800, Failure of riveted joint, strength and efficiency of riveted joint, Design of Riveted Connection only axially loaded number (No staggered rivetting)
3. Bolt Connections: (04 Hours)  
Types of bolt, permissible stresses in bolt, types of bolted joints, specifications for bolted joints as per IS 800. Failure of a bolted joint. Assumptions in the theory of bolted joints. Strength and efficiency of a bolted joint. Design of bolted joints for axially loaded members ( No Staggered bolts).
4. Welded connections: ( 04 Hours)  
Types of welds and welded joints, advantages and disadvantages of welded joints design of fillet and butt weld for axially loaded members
5. Tension Members ( 14 Hours)  
Analysis and design of single and double section tension members and their rivetted and welded connections with gusset plate as per IS:800-2007
6. Compression Members ( 14 Hours)  
Analysis and design of single and double angle sections compression members subjected to axial load
7. Roof Trusses (05 Hours)  
Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)
8. Column Bases: ( 07 Hours)  
Types of column bases i.e. slab base, gusseted base. Concept of buckling, effective length, slenderness ratio, Analysis and Design of axially loaded single section column.
9. Beams (08 Hours)  
Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder

10. Fabrication and erection of steel structures like trusses, columns and girders (02 Hours)

### **Steel Structures Drawings:**

Structural drawing from given data for following steel structural elements.

- (i) Drawing No. 1: Roof Truss – Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.
- (ii) Drawing No.2 : Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.
- (iii) Drawing No.3 : Column Beam Connections
  - (a) Sealed and Framed Beam to Beam Connections
  - (b) Sealed and Framed Beam o Column Connections
- (iv) Drawing No. 4 : Plate Girder (Bolted)  
  
Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.
- (v) Drawing No. 5 : Draw atleast one sheet using CAD software

### **Important Note:**

Use of IS: 800 and Steel Tables are permitted in examination.

### **INSTRUCTIONAL STRATEGY**

Teachers are expected to give simple problems for designing various steel structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show fabrication and erection of steel structures. IS:800 may be referred along with code for relevant clauses



## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and Practical work
- Drawing
- Software installation and operation
- Viva-voce
- 

## **RECOMMENDED BOOKS**

1. "Design of Steel Structures" by Duggal SK; Standard Publishers, Delhi
2. "Steel Structures Design and Drawing" by Birinder Singh; Kaption Publishing House, Ludhiana
3. "Design of Steel Structures" by Ram Chandra; Standard Publishers, Delhi
4. "Design of Steel Structures" by S Ramamurthan
- 5 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### **Steel Structures Drawings:**

10. "Civil Engineering Drawing" by Loyal JS; Satya Parkashan, New Delhi
11. "Civil Engineering Drawings" by Chandel RP
12. "Civil Engineering Drawing" by Kumar; NS; IPH, New Delhi
13. "Civil Engineering Drawing" by Malik RS and Meo GA; Asian Publishing House, New Delhi
5. "Steel Structures Design and Drawing" by Singh, Birinder; Kaption Publishing House, New Delhi
- 6 e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### **Websites for Reference:**

<http://swayam.gov.in>

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	02	03
2	04	06
3	04	06
4	04	06
5	14	22
6	14	22
7	05	08
8	07	10
9	08	14
10	02	03
	SS Drawing*	50
<b>Total</b>	<b>64</b>	<b>150</b>

\* Examiner have to set 03 questions from SS Drawing of 25 marks each and out of which the examinee can attempt any 02 questions.

## **EARTHQUAKE RESISTANT BUILDING CONSTRUCTION**

**L T P**  
**3 - -**

### **RATIONAL**

Diploma holders in civil engineering have to supervise construction of various earthquake resistant buildings. Therefore, the students should have requisite knowledge regarding terminology of earthquake and the precautions to be taken while constructing earthquake resistant buildings

### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Classify the earthquakes
- Explain seismic behavior of traditionally built constructions
- Supervise construction of earthquake resistant buildings
- Monitor reinforcement detailing in earthquake resistant structures
- Manage all rescue operation caused due to earthquake

### **DETAILED CONTENTS**

1. Elements of Engineering Seismology (08 Hours)

General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Seismic zoning map of India, Static and Dynamic Loading, Fundamental period.

2. Seismic Behaviour of Traditionally-Built Constructions of India (07 Hours)

Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)

3. Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building. (08 Hours)

4. Introduction to seismic zone of India and factors related to IS:1893 and IS: 13920 (latest edition) (05 Hours)
5. Seismic provision of strengthening and retrofitting measures for traditionally-built constructions (08 Hours)
6. Provision of reinforcement detailing in masonry and RCC constructions (06 Hours)
7. Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casualty management. (06 Hours)

### **INSTRUCTIONAL STRATEGY**

The student may be taken for visit to various building construction sites where precautions related to earthquake resistant construction are being taken so that the students may appreciate the importance of the subject.

### **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

### **RECOMMENDED BOOKS**

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandrasekaran; Sarita Parkashan, Meerut.
2. Building Construction by BL Gupta and NL Arora; Satya Prakashan, New Delhi
3. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur
4. IS 13920, IS: 13827, IS: 13828, IS 1893-2002, IS 4326 (latest edition)
5. Dynamics of Structure by AK Chopra; Prentice Hall Inc. New Delhi
6. Earthquake Resistant Building Construction by Neelam Sharma
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

Websites for Reference:

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hours)</b>	<b>Marks Allotted (%)</b>
1	08	19
2	07	15
3	08	17
4	05	10
5	08	19
6	06	08
7	06	12
<b>Total</b>	<b>48</b>	<b>100</b>

# QUANTITY SURVEYING & VALUATION

**L T P**  
**4 - 2**

## RATIONALE

Diploma holders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates, contracting, principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.

## LEARNING OUTCOMES

After undergoing the subject, students will be able to:

- Explain different units of measurement for different items
- Calculating quantities of materials and prepare the material chart
- Prepare detailed and abstract of estimates from drawings
- Prepare tender document of different civil engineering items by using C.S.R. rates with premium
- Use principles of valuation for valuation of a building

## DETAILED CONTENTS

1. Introduction to quantity surveying and its importance. Duties of quantity surveyor  
( 02 Hours)

2. Types of estimates ( 02 Hours)

Preliminary estimates

- Plinth area estimate
- Cubic content estimate

Detailed estimates

- Definition
- Stages of preparation – details of measurement and calculation of quantities and abstract

3. Measurement ( 07 Hours)

Units of measurement for various items of work as per BIS:1200

Rules for measurements

Different methods of taking out quantities – centre line method and long wall and short wall method

4. Preparation of Detailed and Abstract Estimates from Drawings by following CSR rates for: (20 Hours)

A small residential building with a flat roof comprising of

- Two rooms with W.C., bath, kitchen and verandah

Earthwork for unlined channel

WBM road and pre-mix carpeting

Single span RCC slab culvert

Earthwork for plain and hill roads

RCC work in beams, slab, column and lintel, foundations

10 users septic tank

5. Calculation of quantities of materials for (05 Hours)

Cement mortars of different proportion

Cement concrete of different proportion

Brick/stone masonry in cement mortar of different proportion

Plastering, pointing and painting

D.P.C. and flooring

6. Analysis of Rates (08 Hours)

Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads

Analysis of rates for finished items when data regarding labour, rates of material and labour is given:

- Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift
- RCC in roof slab/beam/lintels/columns
- Brick masonry in cement mortar
- Cement Plaster
- White washing, painting

7. Contractorship (05 Hours)

- Meaning of contract

- Essentials of a contract

- Types of contracts, their advantages, dis-advantages and suitability, system of payment

- Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period
- Classification and types of contracting firms/construction companies

8 Preparation of Tender Document based on Common Schedule Rates (CSR) ( 10 Hours)

- Introduction to CSR and calculation of cost based on premium on CSR
- Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
- Exercises on preparing tender documents for the following
  - a) Earth work
  - b) Construction of a small house as per given drawing
  - c) RCC works
  - d) Pointing, plastering and flooring
  - e) White-washing, distempering and painting
  - f) Wood work including polishing
  - g) Sanitary and water supply installations
  - h) False ceiling, aluminum (glazed) partitioning
  - i) Tile flooring including base course
  - j) Preparation of comparative statement for item rate contract.

9. Valuation ( 05 Hours)

- a) Purpose of valuation, principles of valuation
- b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.
- c) Methods of valuation (i) replacement cost method (ii) rental return method

**LIST OF PRACTICAL'S**

- Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
- Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
- Study of items with specification given in the HSR (for any ten items)
- Recording in Measurement Book (MB) for any four items
- Prepare bill of quantities of given item from actual measurements (any four items).



- Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab)
- Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase).
- Use the relevant software to prepare detailed estimate of a residential building.

## **INSTRUCTIONAL STRATEGY**

This is an applied engineering subject. Teachers are expected to provide working drawings for various Civil Engineering works and students be asked to calculate the quantities of materials required for execution of such works and use of relevant software for preparing estimates. Teachers should conceptualize making analysis of rates for different items of works. It will be advantageous if students are given valuation reports for reading.

## **MEANS OF ASSESSMENT**

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Report Writing
- Viva-voce

## **RECOMMENDED BOOKS**

1. “Estimating, Costing and Valuation (Civil)” by Pasrija, HD, Arora, CL and S. Inderjit Singh; New Asian Publishers, Delhi,
2. “Estimating and Costing” by Rangwala, S.C ; Charotar Book Stall, Anand
3. “Estimating and Costing by Dutta, BN
4. “Estimating and Costing” by Mahajan Sanjay; Satya Parkashan, Delhi
5. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## **Websites for Reference:**

<http://swayam.gov.in>

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Periods)</b>	<b>Marks Allotted (%)</b>
1	02	03
2	02	04
3	07	10
4	20	30
5	05	08
6	08	13
7	05	08
8	10	16
9	05	08
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.4 CONSTRUCTION MANAGEMENT AND ACCOUNTS

**L T P**  
**5 - -**

### **RATIONALE**

This is an applied civil engineering subject. The subject aims at imparting basic knowledge about construction planning and management, site organisation, construction labour, control of work progress, inspection and quality control, accidents & safety and accounts.

### **LEARNING OUTCOME**

After undergoing the subject, students will be able to:

- State functions of various aspects of controlling construction job/project
- Explain pre-tender stage and contract stage
- Prepare bar charts for simple construction work
- Prepare scheduling techniques i.e. PERT and CPM
- Prepare job layout of building
- Comply with various labour laws
- Analyze and support in effective functioning of organization
- Inspect quality at various stages of the construction
- Control accidents and safety concerns
- Prepare measurement books and bill of quantities

### **DETAILED CONTENTS**

#### **THEORY**

#### **CONSTRUCTION MANAGEMENT:**

1. Introduction: ( 06 Hours)

Significance of construction management

Main objectives of construction management and overview of the subject

Functions of construction management, planning, organising, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.

Classification of construction into light, heavy and industrial construction

Stages in construction from conception to completion

The construction team: owner, engineer, architect and contractors, their functions and inter-relationship

2. Construction Planning: ( 12 Hours)

Importance of construction planning  
Stages of construction planning

- Pre-tender stage
- Contract stage

Scheduling construction works by bar charts

- Definition of activity, identification of activities though
- Preparation of bar charts for simple construction work
- Preparation of schedules for labour, materials, machinery and finances for small works
- Limitations of bar charts

Scheduling by network techniques

- Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology

3. Organization: ( 06 Hours)

Types of organizations: Line, line and staff, functional and their characteristics

4. Site Organization: ( 06 Hours)

Principle of storing and stacking materials at site  
Location of equipment  
Preparation of actual job layout for a building  
Organizing labour at site

5. Construction Labour: (06 Hours)

Conditions of construction workers in India, wages paid to workers  
Important provisions of the following Acts:

- Labour Welfare Fund Act 1936 (as amended)
- Payment of Wages Act 1936 (as amended)
- Minimum Wages Act 1948 (as amended)
- Acts relating to Labour Safety

6. Control of Progress: ( 05 Hours)

Methods of recording progress

Analysis of progress

Taking corrective actions keeping head office informed

Cost time optimization for simple jobs - Direct and indirect cost, variation withtime, cost optimization

7. Inspection and Quality Control: ( 09 Hours)

Need for inspection and quality control

Principles of inspection

Stages of inspection and quality control for

- Earth work
- Masonry
- RCC
- Sanitary and water supply services

8. Accidents and Safety in Construction: (08 Hours)

Accidents – causes and remedies

Safety measures for

- Excavation work
- Drilling and blasting
- Hot bituminous works
- Scaffolding, ladders, form work
- Demolitions

Safety campaign and safety devices, safety training

### ACCOUNTS

9. Public Work Accounts: ( 22 Hours)

Introduction, technical sanction, allotment of funds, re-appropriation of funds bill, contractor ledger, measurement book running and final account bills complete, preparation of bill of quantities (BOQ), completion certificate & report, hand receipt, acquittance roll. Muster Roll labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, account of stock, misc.

P.W. advances T & P – verification, survey report, road metal material charged direct to works, account - expenditure & revenue head, remittance and deposit head, definition of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register.

Filling of PWD accounts forms

## INSTRUCTIONAL STRATEGY

This is highly practice-based course and efforts should be made to relate process of teaching with direct experiences at work sites. Participation of students should be encouraged in imparting knowledge about this subject. To achieve this objective the students should be taken to different work sites for clear conception of particular topics, such as site organization, inspection of works at various stages of construction and working of earth moving equipment

## MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Report Writing
- Viva-voce

## RECOMMENDED BOOKS

1. "Civil Engineering Management" by Wakhlo, ON ; Light and Life Publishers, New Delhi
2. "Construction Equipment and its Planning and Application by Verma, Mahesh
3. "Management in Construction Industry" by Dharwadker, PP; Oxford and IBH Publishing Company, New Delhi
4. "Construction Planning and Management" by Gahlot PS; Dhir, BM; Wiley Eastern Limited, New Delhi
5. MS Project – Microsoft USA
6. Primavera Manual by Sh. Vinod Kumar; NITTTR, Chandigarh.
7. e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## Websites for Reference:

<http://swayam.gov.in>

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hours)	Marks Allotted (%)
1	06	8
2	12	15
3	06	8
4	06	8
5	06	8
6	05	6
7	09	12
8	08	10
9	22	25
<b>Total</b>	<b>80</b>	<b>100</b>

## 6.5 PROJECT WORK

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- - 12

### RATIONALE

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place students for project oriented practical training in actual work situation for the stipulated period.

### LEARNING OUTCOMES

After undergoing the project work, students will be able to:

Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. In addition, the project work is intended to place the learner for project oriented practical training in actual work situation for the stipulated period with a view to:

- Develop understanding regarding the size and scale of operations and nature of field-work in which students are going to play their role after completing the courses of study
- Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work.
- Develop abilities like interpersonal skills, communication skills, positive attitudes and values etc.

### General Guidelines

The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. The activity of problem identification should begin well in advance (say at the end of second year). Students should be allotted a problem of interest to him/her as a major project work. It is also essential that the faculty of the respective department may have a brainstorming session to identify suitable project assignments for their students. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The project work identified in collaboration with industry should be preferred.

This practical training cum project work **should not be considered** as merely conventional industrial training in which students are sent at work places with either minimal or no supervision. This experience is required to be planned in advance and supervised on regular basis by the polytechnic faculty. For the fulfillment of above objectives, polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience to students. It is necessary that each organization is visited well in advance and activities to be performed by students are well defined. The chosen activities should be such that it matches with the curricular interest to students and of professional value to industrial/ field organizations. Each teacher is expected to supervise and guide 5-6 students.

**Some of the projects are listed below for the benefit of the students:**

1. Study and detailed estimate of different component of modern residential and commercial building
2. Preparation of detailed estimate for low cost two room set residential building
3. Analysis of green building
4. Design of rain water harvesting for a given building
5. Analysis of accidents prone area in your city and remedial measure for them
6. Case study of safety practices in a multi-storied buildings under constructions
7. Concrete Mix Design
8. Case study of repair and maintenance of a given building
9. Preparation of DNIT of a given building for Civil Engineering works
10. Detailed estimate for installing plumbing fixtures
11. Preparing a standard measurement book of a given building
12. Construction of concrete road by using latest techniques
13. Water supply scheme for a govt approved colony
14. Construction estimates of shopping complex
15. Analysis and design of Effluent Treatment Plant (ETP) for an industry
16. Design of soak pit with septic tank for 100 users
17. Design and estimate of two room set building
18. Design of concrete mix by using flyash
19. Setting up of an interlocking pavers fabrication plant



20. Preparation of different Civil Engineering models e.g. beam, one way, two way slab, column etc.
21. Reinforcement detailing as per IS:4326
22. Design of car parking in your polytechnic
23. Design of acoustics for an auditorium
24. To prepare analysis of rates for non -schedule items e.g. aluminium door, windows, work stations etc.
25. Study of retrofitting of a given Civil Engineering works.
26. Survey of your polytechnic by using total station.
27. Traffic volume study and analysis on different roads in a city
28. Case study of a flyover with regard to its various construction components
29. Study and preparation of detailed project report of ready mix concrete (RMC) unit
30. Study and preparation of detailed project report of prefabricated/prestressed concrete components unit
31. Construction of a small concrete road consisting of following activities
  - Survey and preparation of site plan
  - Preparation of drawings i.e. L-Section and X-Section
  - Estimating earth work
  - Preparation of sub grade with stone ballast
  - Laying of concrete
  - Testing of slump, casting of cubes and testing
  - Material estimating and costing with specifications
  - Technical report writing
32. Water Supply system for a locality
  - Surveying
  - Design of water requirements and water distribution system
  - Preparation of drawing of overhead tank
  - Material estimating and costing
  - Specifications

- Technical report writing
- 33. Construction of shopping complex by detailing of RCC drawings, estimating and costing of material
- 34. Design and construction of septic tank with soak pit for 100 users
- 35. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

There is no binding to take up the above projects as it is only a suggestive list of projects.

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance Criteria	Max.** Marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10%	10	8	6	4	2
2.	Planning and execution of considerations	10%	10	8	6	4	2
3.	Quality of performance	20%	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20%	20	16	12	8	4
5.	Sense of responsibility	10%	10	8	6	4	2
6.	Self expression/ communication skills	5%	5	4	3	2	1
7.	Interpersonal skills/human relations	5%	5	4	3	2	1
8.	Report writing skills	10%	10	8	6	4	2
9	Viva voce	10%	10	8	6	4	2
<b>Total marks</b>		<b>100</b>	<b>100</b>	<b>80</b>	<b>60</b>	<b>40</b>	<b>20</b>

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared “not eligible to receive diploma ”. It is also important to note that the students must get more than six “goods” or above “good” grade in different performance criteria items in order to get “Overall Good” grade.

	<b>Range of maximum marks</b>	<b>Overall grade</b>
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

### **Important Notes**

- 1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**
- 2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**
- 3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.**
- 4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work

## SOFT SKILLS – IV

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### RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. The diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject is to prepare students for employability in job market.

### LEARNING OUTCOMES

After undergoing this course, the students will be able to:

- Communicate effectively.
- Apply techniques of effective time management
- Develop habits to overcome stress
- Face problems with confidence
- Exhibit attributes required to appear for an interview
- Learn about current and future career opportunities
- Exhibit entrepreneurial skills
- Use QC/QT tools

### DETAILED CONTENTS

- Communication Skills - Presentation
- Time management
- Stress Management
- Problem solving
- Career opportunities-Current and future
- Entrepreneurial Skills
- Quality and Quality tools used in industry

In addition, the students must participate in the following activities to be organized in the institute

- Sports
- NCC/NSS
- Cultural Event

Note : Extension Lectures by experts may be organized. There will be no examination for this subject.