

CURRICULUM  
for  
DIPLOMA PROGRAMME  
in  
**CIVIL ENGINEERING**  
3<sup>rd</sup> Year (5<sup>rd</sup> & 6<sup>th</sup> Semester)

FOR THE STATE OF HIMACHAL PRADESH



June, 2019

## Study & Evaluation Scheme

### 5<sup>th</sup> SEMESTER (CIVIL ENGINEERING)

SR. NO.	SUBJECTS	STUDY SCHEME Hrs/Week		EVALUATION SCHEME								Total Marks of Int.& Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
5.1	Basics of Management & Entrepreneurship Development *	4	-	50	-	50	100	3	-	-	100	150
5.2	RCC Design	4	-	50	-	50	100	3	-	-	100	150
5.3	RCC Drawing & Detailing	-	4	-	50	50	100	3	-	-	100	150
5.4	Highway Engineering	4	2	30	20	50	100	3	50	3	150	200
5.5	Quantity Surveying	5	-	50	-	50	100	3	-	-	100	150
5.6	Earthquake Resistant Building Design **	4	-	50	-	50	100	3	-	-	100	150
5.7	Computer Applications in Civil Engineering	-	6	-	50	50	-	-	100	3	100	150
5.8	Minor project	-	4	-	50	50	50	3	-	-	5	100
5.9	Survey Camp***	-	-	-	50	50	-	-	50	3	5	100
Industrial Training		-	-	-	50	50	-	-	50	-	5	100
Student Centered Activities		-	3	-	25	25	-	-	-	-	-	25
<b>Total</b>		<b>21</b>	<b>19</b>	<b>230</b>	<b>295</b>	<b>525</b>	<b>650</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>900</b>	<b>1425</b>

\* Common with other diploma programmes

\*\*Common with diploma in Architectural Assistantship

\*\*\*Survey Camp to be held during the course of 5th Semester for minimum of one week covering, Leveling, Contouring, and Plane Tabling for a minimum of 500 sq.m. area.

*Note: Apart from the above mentioned number of hours for each subject (Theory & Practical), at least **TWO** hours/week for each class should be allocated for Library to motivate the students to attend library compulsory. The attendance of library period should be added in master attendance.*

## Study & Evaluation Scheme

### 6<sup>th</sup> SEMESTER (CIVIL ENGINEERING)

SR. No.	SUBJECTS	STUDY SCHEME Hrs/Week		EVALUATION SCHEME								Total Marks of Int.& Ext.
				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		Th	Pr	Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
6.1	Prestressed Concrete	4	-	50	-	50	100	3	-	-	100	150
6.2	Steel Structures Design and Drawing	4	4	30	20	50	100+50**	4	-	-	150	200
6.3	Irrigation Engineering	4	-	50	20	50	100	4	-	-	100	150
6.4	Construction Management and Accounts	4	-	50	-	50	100	3	-	-	100	150
6.5	Elective 6.5.1 Repair and maintenance of buildings 6.5.2 Environmental Engineering 6.5.3 Bridges, Tunnels and Airport Engineering 6.5.4 Railways, Bridges and Tunnels 6.5.5 Green Buildings & Services	4	-	50	-	50	100	3	-	-	100	150
6.6	Major Project	-	10	-	100	100	-	-	100	3	100	200
6.7	*Practices in Communication Skills	-	2	-	50	50	-	-	50	3	50	100
Student Centered Activities		-	4	-	25	25	-	-	-	-	-	25
<b>Total</b>		<b>20</b>	<b>20</b>	<b>210</b>	<b>215</b>	<b>425</b>	<b>600</b>	<b>-</b>	<b>150</b>	<b>-</b>	<b>750</b>	<b>1175</b>

\*Common with other Diploma Programmes

\*\*100 Marks for Theory Examination and 50 Marks for Drawing

**Note:** Apart from the above mentioned number of hours for each subject (Theory & Practical), at least **TWO** hours/week for each class should be allocated for Library to motivate the students to attend library compulsory. The attendance of library period should be added in master attendance.

## 5.1 BASICS OF MANAGEMENT & ENTREPRENEURSHIP DEVELOPMENT

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### RATIONALE

*In present scenario, there is an urgent need to develop right kind of attitude, knowledge and skills amongst the Diploma engineers leading them to achieve gainful wage/ self-employment. There is a huge gap in perceptions of employers and employees regarding meeting the job requirements. Also the dual challenges of competing in global working environment and keeping pace with the rapid technological advancements call for re-design of curricula and thus enabling the importance of generic and managerial skills. Entrepreneurship development aim at developing conceptual understanding for setting up owns' business/enterprise to cope up with the problem of unemployment and also to promote the socio- economic development of our country. Both the subject areas, "Basics of Management and entrepreneurship development" are supplementary to each other. Knowledge and skills of these must be imparted to diploma engineering students for enhancing their employability and confidence in their personal and professional life.*

### DETAILED CONTENTS

- 1. Introduction to Management (7 hrs)**
  - 1.1 Definitions and concept of Management
  - 1.2 Functions of management- planning, organizing, staffing, coordinating and controlling.
  - 1.3 Various areas of management
  - 1.4 Structure of an Organization
  
- 2. Self-Management and Development (10 hrs)**
  - 2.1 Life Long Learning Skills, Concept of Personality Development, Ethics and Moral values
  - 2.2 Concept of Physical Development; Significance of health, hygiene, body gestures
  - 2.3 Time Management Concept and its importance
  - 2.4 Intellectual Development: Reading skills, speaking, listening skills, writing skills (Note taking, rough draft, revision, editing and final drafting), Concept of Critical Thinking and Problem Solving (approaches, steps and cases).
  - 2.5 Psychological Management: stress, emotions, anxiety and techniques to manage these.
  - 2.6 ICT & Presentation skills; use of IT tools for good and impressive presentations.
  
- 3. Team Management (10 hrs)**
  - 3.1 Concept of Team Dynamics. Team related skills, managing cultural, social and ethnic diversity in a team.
  - 3.2 Effective group communication and conversations.
  - 3.3 Team building and its various stages like forming, storming, norming, performing and adjourning
  - 3.4 Leadership, Qualities of a good leader
  - 3.5 Motivation, Need of Motivation, Maslow's theory of Motivation

- 4. Project Management (5 hrs)**  
4.1 Stages of Project Management; initiation, planning, execution, closing and review (through case studies), SWOT analysis concept.

- 5. Introduction to Entrepreneurship (10 hrs)**  
5.1 Entrepreneurship, Need of entrepreneurship, and its concept, Qualities of a good entrepreneur  
5.2 Business ownerships and its features; sole proprietorship, partnership, joint stock companies, cooperative, private limited, public limited, PPP mode  
5.3 Types of industries: micro, small, medium and large

- 6. Entrepreneurial Support System (Features and Roles in Brief) (7 hrs)**  
6.1 District Industry Centers (DICs), State Financial Corporations (SFCs), NABARD  
6.2 MSME (Micro, Small, Medium Enterprises) – its objectives & list of schemes

- 7. Market Study and Opportunity Identification (7 hrs)**  
Types of market study: primary and secondary, product or service identification, assessment of demand and supply, types of survey and their important features

- 8. Project Report Preparation (8 hrs)**  
8.1 Preliminary Report, Techno-Economic Feasibility Report, Detailed Project Report (DPR)

#### **LIST OF TUTORIAL EXERCISES**

1. Understanding Self-Management and Development (Related to Chapter 02); through examples, cases, exercises, panel discussions, seminars, meditation and yoga techniques.
2. SWOT Analysis
3. Team Management (Related to chapter 03); through examples, cases, role plays, group discussions and panel discussions.
4. Market Study and Opportunity Identification (Related to Chapter 07); through literature reviewing, making questionnaires, conducting mock interviews and analyzing data for product/service identification and demand assessment.
5. Project Management and Project Report Preparation through exercises on making project reports on micro and small enterprises. Case studies and SWOT analysis of projects can be taken.

#### **RECOMMENDED BOOKS**

1. Generic Skill Development Manual, MSBTE, Mumbai
2. Lifelong Learning, Policy Brief([www.oecd.org](http://www.oecd.org))
3. Towards Knowledge Society, UNESCO Publication, Paris
4. Entrepreneurship Development by CB Gupta and P Srinivasan: Sultan Chand and sons: New Delhi
5. Essentials of Management by H Koontz, C O' Daniel , McGraw Hill
6. Principles and Practice of Management by Shyamal Bannerjee: Oxford and IBM Publishing Co, New Delhi

7. Management by James AF Stoner, R Edward Freeman and Daniel R Gilbert Jr., Prentice Hall of India Pvt. Ltd, New Delhi
8. Entrepreneurship Development by S. L. Gupta and Arun Mittal: IBH Publication
9. A Handbook of Entrepreneurship, Edited by B S Rathore and Dr. J S Saini
10. Entrepreneurship Development and Small Business Enterprises by Poornima M: Pearson Education India
11. Handbook of Small Scale Industry by P M Bhandari

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	07	10
2	10	15
3	10	15
4	05	10
5	10	15
6	07	10
7	07	10
8	08	15
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.2 RCC DESIGN

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### RATIONALE

*This subject is an applied engineering subject Diploma holders in Civil Engineering will be required to supervise RCC 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). He must be able to read and interpret structural drawings of different elements. This subject thus deals with elementary design principles as per BIS code of practice and their relevant drawings.*

### DETAILED CONTENTS

- 1. Introduction to R.C.C Designing using Limit State Method (6 hrs)**
  - 1.1 Design Philosophies: Working Stress Theory, Ultimate Design Theory, Limit State Theory
  - 1.2 Concept of Reinforced Cement Concrete (RCC)
  - 1.3 Reinforcement Materials:
    - Suitability of Steel as reinforcing material
    - Properties of mild steel and HYSD steel
  - 1.4 Loading on structure as per I.S 875.
  - 1.5 Study of BIS:456-2000-clause5,clause6,clause9,clause18,clause19,clause22, clause 23.0,23.2, 23.3,Clause25,clause26clause35,clause36,clause37,clause 38, clause 39, clause 40, clause 41, clause42, clause, 43, **Annexure–B, C, D, E, G**
  
- 2. Shear, Bond and Development Length (LSM) (6 hrs)**
  - 2.1 Nominal Shear stress in R.C.Section, Design shear strength of concrete, maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, Forms of shear reinforcement.
  - 2.2 Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value for hooks 90°bend and 45° bend Standard Lapping of bars, check for development length.
  - 2.3 Simple numerical problems on deciding whether shear reinforcement are required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams;
  - 2.4 Determination of development length required for tension reinforcement of cantilevers beam and s lab, check for development length.
  
- 3. Analysis and Design of Singly Reinforced Sections (LSM) (10hrs)**
  - 3.1 Limit State of collapse (Flexure), Assumptions stress. Strain relationship for concrete and steel neutral axis, Stress block diagram and Strain diagram for singly reinforced section.
  - 3.2 Concept of under- reinforced, over-reinforced and balanced section, neutral axis co- efficient, limiting value of moment of resistance and limiting percentage of steel required For balanced singly R.C. Section.
  - 3.3 Simple numerical problems on determining design constants, moment of resistance and area of steel.
  - 3.4 Design of Singly reinforced simply supported beam and cantilever beam.
  
- 4. Analysis and Design of Doubly Reinforced Sections (LSM) (8 hrs)**
  - 4.1 General features, necessity of providing doubly reinforced section reinforcement limitations.

- 4.2 Analysis of doubly reinforced section, strain diagram stress diagram, depth of neutral axis, moment of resistance of the section.
- 4.3 Numerical problems on finding moment of resistance
- 4.4 Design of beam sections.

**5. Design of One Way Slab (LSM) (8 hrs)**

- 5.1 Analysis & Design of simply supported one-way slab.

**6. Two Way Slab (LSM) (8 hrs)**

- 6.1 Design of two-way simply supported slab with corners free & no provision for torsion reinforcement.

**7. Design of Axially Loaded Column (LSM) (10 hrs)**

- 7.1 Assumptions in limit state of collapse–compression
- 7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
- 7.3 Analysis and Design of axially loaded: Uniaxial & Biaxial Bending along with axial loading: short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied.

**8. Design of Staircase (LSM) (8 hrs)**

- 8.1 Live load on stair as per IS875:1987
- 8.2 Effective span of stair
- 8.3 Design of Stair slab spanning longitudinally
- 8.4 Design of stair slab spanning horizontally

**SUGGESTED DISTRIBUTION OF MARKS**

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1	6	5
2	6	5
3	10	15
4	8	15
5	8	15
6	8	15
7	10	15
8	8	15
<b>Total</b>	<b>64</b>	<b>100</b>

**RECOMMENDED BOOKS**

1. Birinder Singh, RCC Design and Drawing, Kaption Publishing House, New Delhi
2. Neelam Sharma RCC Design and Drawing S K Katria & Sons
3. Ramamurtham S; "Design and Testing of Reinforced Structures", Delhi Dhanpat Rai and Sons
4. Punmia BC; "Reinforced Concrete Structure Vol I", Delhi Standard Publishers Distributors
5. Mallick SK; and Gupta AP; "Reinforced Concrete", New Delhi, Oxford and IBH Publishing Co
6. Gambhir M.L., "Reinforced Concrete Design", Macmillan India Limited
7. S.N. Sinha; Reinforced Concrete Design; Tata McGraw Hill Publishing co. Ltd.



## 5.3 RCC DRAWING & DETAILING

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### RATIONALE

*This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RCC Construction and fabrication. He must be able to read and interpret structural drawings of different elements. This subject thus deals with their relevant drawings & Detailing.*

### RCC DRAWING

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

1. Rectangular beams – Singly reinforced
2. Rectangular beams- Doubly reinforced
3. Cantilever beam – Rectangular and trapezoidal
4. One way slab
5. Two way slab
6. Square columns with isolated footing of uniform depth and varying depth (sloped footings)
7. Rectangular columns with isolated footing of uniform depth and varying depth (Sloped footings)
8. Circular column with isolated footing of uniform depth and varying depth (sloped footings)
9. Dog legged stair Case

**Note:** *Examiner will be required to set a question paper of 100 marks for drawing having a duration of 3 Hrs. Use of IS 456-2000 is permitted in the examination.*

### RECOMMENDED BOOKS

1. Birinder Singh, RCC Design and Drawing, Kaption Publishing House, New Delhi
2. Neelam Sharma RCC Design and Drawing S K Katria & Sons
3. J.S.layal RCC Design and Drawing Satya Prakashan New Delhi
4. V.B.Sikka Civil Engineering Drawing Kaption Publishing House, New Delhi

## 5.4 HIGHWAY ENGINEERING

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### RATIONALE

*Construction of roads is one of the area in which diploma holders in Civil Engineering may get employment. These diploma holders are responsible for construction and maintenance of highways. 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.*

### DETAILED CONTENTS

#### THEORY

##### 1. Introduction

(4 hrs)

- 1.1 Importance of Highway engineering
- 1.2 Functions of IRC, CRRI, MORT&H, NHAH
- 1.3 IRC classification of roads

##### 2. Highway Alignment & Surveys

(6 hrs)

- 2.1 Highway alignment- factors controlling alignment
- 2.2 Engineering surveys for highway location
  - 2.2.1 Map study
  - 2.2.2 Reconnaissance
  - 2.2.3 Preliminary survey
  - 2.2.4 Final location and detailed survey
- 2.3 Drawings and report

##### 3. Highway Geometrics

(8 hrs)

- 3.1 Importance of geometric design
- 3.2 highway cross section element
  - 3.2.1 Pavement surface characteristic
  - 3.2.2 Cross slope or camber
  - 3.2.3 Width of pavement or carriage way
  - 3.2.4 Kerbs
  - 3.2.5 Road margin
  - 3.2.6 Right of way
  - 3.2.7 Typical Cross Section of roads
- 3.3 Sight distance (No derivation and numerical)
  - 3.3.1 Introduction
  - 3.3.2 Stopping sight distance (SSD)
  - 3.3.3 Overtaking sight distance (OSD)
- 3.4 Super elevation (No derivation and numerical)
  - 3.4.1 Types of super elevation
  - 3.4.2 Maximum super elevation
  - 3.4.3 Minimum super elevation
  - 3.4.4 Attainment of super elevation
- 3.5 Widening of pavement on horizontal curve (No derivation and numerical)
  - 3.5.1 Mechanical widening
  - 3.5.2 Psychological widening
- 3.6 Horizontal Transition Curves
  - 3.6.1 Object

3.6.2 Different type of transition curves

3.6.3 Paver Blocks

3.7 Gradient

3.7.1 Ruling gradient

3.7.2 Limiting gradient

3.7.3 Exceptional gradient

3.7.4 Minimum gradient

3.8 Vertical curves

3.8.1 Summit curves- types

3.8.2 Valley curves

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

#### **4. Highway Materials**

**(8 hrs)**

4.1 Subgrade soil-

4.1.1 Significance

4.1.2 Characteristics of soil

4.1.3 Desirable properties

4.1.4 Index properties of soil

4.1.5 Soil classification based upon size- IS soil classification

4.2 Sub-grade soil strength

4.2.1 CBR test- method and significance

4.3 Stone aggregate-Desirable properties of stone aggregate

4.4 Bituminous material

4.4.1 type- i) bitumen- requirements, grades of bituminous, cut back bitumen, bituminous emulsion, modified bituminous

ii) Tar

4.4.2 Comparison of bitumen and tar

#### **5. Highway Pavements**

**(8 hrs)**

5.1 Object and requirements of pavement

5.2 Type of pavement structure

5.2.1 Flexible pavement- their merits and demerits, typical cross-sections, functions of various Components

5.2.2 Rigid pavement- their merits and demerits, typical cross-sections, functions of various components

5.3 Factor to be considered in the design of pavements (Flexible and rigid)

#### **6. Highway Construction**

**(8hrs)**

6.1 Type of highway construction

6.2 Earthwork

6.3 Construction of earth road- general, specification of material used, procedure

6.4 Construction of water bound macadam road- general, specification of material used, Procedure, wet mix macadam

6.5 Construction of bituminous macadam

6.5.1.1 Interface treatment- primecoat, tackcoat

6.5.1.2 Bituminous surface dressing

6.5.1.3 Seal Coat

6.5.1.4 Penetration Macadam

6.5.1.5 Built-up spray grout

6.5.1.6 Premix method

6.5.1.7 Bituminous macadam

6.5.1.8 Bituminous premix carpet

6.5.1.9 Bituminous concrete or asphalt concrete

- 6.5.1.10 Sheet Asphalt
- 6.5.1.11 Mastic Asphalt
- 6.5.1.12 Mix seal surfacing
- 6.5.1.13 Dense bituminous macadam
- 6.5.2 Construction of surface dressing- specification of material used, construction procedure
- 6.5.3 Construction of bituminous Macadam-specification of material used, construction Procedure
- 6.6 Construction of cement concrete pavement slab-specification of material used, construction Procedure
- 6.7 Paver clock construction

**7. Road Drainage (6 hrs)**

- 7.1 Importance of highway drainage-significance, requirement of highway drainage system
- 7.2 Surface drainage- collection of surface water (No design)
- 7.3 Cross drainage
- 7.4 Subsurface drainage-Lowering of water table

**8. Hill Roads (8 hrs)**

- 8.1 Classification of hill road
- 8.2 Alignment of hill road-resisting length, trace cut, hairpin bend, geological consideration (brief description only)
- 8.3 Alignment survey-Reconnaissance, trace cut, detailed survey
- 8.4 Geometric of hill roads
  - 8.4.1 Width of pavement, formation and land
  - 8.4.2 Camber or cross fall
  - 8.4.3 Sight distance
  - 8.4.4 Super elevation
  - 8.4.5 Radius of horizontal curve
  - 8.4.6 Widening at curves
  - 8.4.7 Setback distance
  - 8.4.8 Gradient
  - 8.4.9 Hairpin band
- 8.5 Pavement type
- 8.6 Drainage in hill roads
  - 8.6.1 Roadside drains
  - 8.6.2 Cross drainage
  - 8.6.3 Subsurface drainage

**9. Highway Maintenance (8 hrs)**

- 9.1 Need for highway maintenance
- 9.2 General cause of pavement failure
- 9.3 Classification of maintenance work
- 9.4 Typical flexible pavement failure- alligator cracking, pit hole, rutting, loss of aggregate bleeding, deprenions, longitudinal cracking, frost heaving, lack of binding to the lower course, reflection cracking, formation of waves and corrugation,
- 9.5 Typical rigid pavement failure-scaling of cement concrete, shrinkage cracks, spalling of joints, warping cracks, mud pumping, structural cracks
- 9.6 Maintenance of earth roads
- 9.7 Maintenance of W.B.M roads
- 9.8 Maintenance of bituminous surfaces-patch repair, surface treatment, resurfacing
- 9.9 Maintenance of cement concrete roads- treatment of cracks, maintenance of joints

## **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. Visit to Hot mix plant
7. Visit to highway construction site for operation of:  
Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB etc. Mixing and spraying equipment
8. Determination of crushing value of aggregates

## **RECOMMENDED BOOKS**

1. Khanna SK and Justo CEG, "Highway Engineering "Roorkee, Nem Chand and Bros
2. Vaswani NK, "Highway Engineering", Roorkee Publishing House
3. Priyani VB, "Highway and Airport Engineering" Anand, Charotar Book Stall
4. Sehgal SB; and Bhanot KL; "A Text Book on Highway Engineering and Airport "Delhi, S Chand & Co.
5. Bindra SP; "A Course on Highway Engineering "New Delhi, Dhanpat Rai and Sons
6. Sharma RC; and Sharma SK; "Principles and Practice of Highway Engineering", New Delhi, Asia Publishing House
7. Duggal AK, Puri VP. "Laboratory Manual in Highway Engineering", Delhi, New Age Publishers (P) Ltd
8. NITTTR, Chandigarh "Laboratory Manual in Highway Engineering", 2004
9. RK Khitoliya, "Principles of Highway Engineering (2005)", Dhanpat Rai Publishing Co. New Delhi
10. Rao, GV' Transportation Engineering
11. Duggal AK, "Maintenance of Highway– a Reader", NITTTR, Chandigarh
12. Duggal AK Types of Highway constitution a Reader, NITTTR Chandigarh 2006 Rao, Airport Engineering

## **IRC Publications**

1. MORTH Specifications for Road and Bridge Works Fifth Revision
2. MORTH Pocketbook for Highway Engineers, 2001
3. MORTH Manual for Maintenance of Roads, 1983

### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	4	4
2	6	10
3	8	15
4	8	15
5	8	15
6	8	13
7	6	8
8	8	10
9	8	10
<b>Total</b>	64	100

## 5.5 QUANTITY SURVEYING

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### 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, and principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.*

### DETAILED CONTENTS

1. **Introduction** (6 hrs)  
Meaning of the terms estimating & costing. Purpose of estimating and costing
2. **Types of Estimates** (5 hrs)
  - 2.1 Approximate and Detailed
  - 2.2 Approximate estimate Types
    - 2.2.1 Plinth area rate method
    - 2.2.2 Cubic Content method
    - 2.2.3 Approximate Quantity method
  - 2.3 Types of detailed estimate
    - 2.3.1 Detailed estimate for new work
    - 2.3.2 Revised estimate
    - 2.3.3 Supplementary estimate
    - 2.3.4 Repair & Maintenance estimate
3. **Measurement** (5 hrs)
  - 3.1 Units of measurement for various items of work as per BIS: 1200
  - 3.2 Rules for measurements
  - 3.3 Different methods of taking out quantities—centre line method and long wall and short wall method
4. **Preparation of Detailed Estimates and Abstract of Cost for** (15 hrs)
  - 4.1 One & two room residential building with flat roof
  - 4.2 Septic tank for 10 users
5. **Preparation of Detailed Estimates and Abstract of Cost for** (10 hrs)
  - 5.1 Plain road with-mid section area method, mean sectional area method, prismatic formula
  - 5.2 Earth working hill road
6. **Calculation of Quantities of Materials & Analysis of Rates for** (10 hrs)
  - 6.1 Calculation of quantities
    - 6.1.1 Cement mortars of different proportion
    - 6.1.2 Cement concrete of different proportion
    - 6.1.3 Brick/stonemasonry in cement mortar
    - 6.1.4 Plastering and pointing
    - 6.1.5 Whitewashing, painting

## 6.2 Analysis of rate

- 6.2.1 Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads
- 6.2.2 Analysis of rates for finished items when data regarding labour, rates of material and labour is given:
  - Earth working 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

(8 hrs)

- 7.1 Meaning of contract
- 7.2 Qualities of a good contractor and their qualifications.
- 7.3 Essentials of a contract
- 7.4 Types of contracts, their advantages, dis-advantages and suitability, system of payment
- 7.5 Single and two cover-bids; tender, tender form and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period

## 8. Preparation of Tender Document based on Common Schedule Rates (CSR)

(15 hrs)

- 8.1 Introduction to CSR and calculation of cost based on premium on CSR (ales test HPSR)
- 8.2 Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
- 8.3 Exercises on preparing tender documents for the following
  - 8.3.1 Earth work
  - 8.3.2 Construction of a Single room building as per given drawing
  - 8.3.3 Publication of notice inviting tender
  - 8.3.4 RCC works
  - 8.3.5 Pointing, plastering and flooring
  - 8.3.6 White-washing, distempering and painting
  - 8.3.7 Wood work including polishing
  - 8.3.8 Tile flooring including base course

## 9. Exercises on preparation of comparative statements for item rate contract

(6 hrs)

### RECOMMENDED BOOKS

1. Pasrija HD; Arora CL and S. Inderjit Singh, "Estimating, Costing and Valuation (Civil)", Delhi, New Asian Publishers
2. Rangwala BS; Estimating and Costing". Anand Charotar Book Stall
3. Kohli D; and Kohli RC; "A Text Book on Estimating and Costing (Civil) with Drawings", Ambala Ramesh Publications
4. Chakraborti M; "Estimating, Costing and Specification in Civil Engineering", Calcutta
5. Dutta BN; "Estimating and Costing"
6. Estimating and Costing by Mahajan; Satya Parkashan



### SUGGESTED DISTRIBUTION OF MARKS

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	6	4
2	5	8
3	5	5
4	15	17
5	10	12
6	10	17
7	8	15
8	15	17
9	6	5
<b>Total</b>	<b>80</b>	<b>100</b>

## 5.6 EARTHQUAKE RESISTANT BUILDING DESIGN

L T P

4 - -

### RATIONALE

*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*

### DETAILED CONTENTS

- 1. Elements of Engineering Seismology (8 hrs)**
  - 1.1 General features of tectonic of seismic regions
  - 1.2 Causes of earthquakes
  - 1.3 Seismic waves
  - 1.4 Earth quake size (magnitude and intensity)
  - 1.5 Epicentre
  - 1.6 Seismograph
  - 1.7 Classification of earthquakes
  - 1.8 Seismic zoning map of India
  
- 2. Seismic Behaviour of Traditionally-Built Constructions of India (8 hrs)**
  - 2.1 Earth quake effects
  - 2.2 Traditionally built construction in India
  - 2.3 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. Introduction to IS1893 (Part-I)-2016 (6 hrs)**
  - 3.1 Introduction
  - 3.2 Assumptions
  - 3.3 Design lateral forces and their calculation methods
  
- 4. Ductile Detailing of Reinforced Concrete Buildings (IS 13920-2016) & IS 4326-2013 (12 hrs)**
  - 4.1 Common modes of failure in reinforced concrete buildings
  - 4.2 General Principal for earthquake resistant buildings & Special construction features
  - 4.3 Types of irregularities
    - 4.3.1 Vertical irregularities
    - 4.3.2 Plan irregularities
  - 4.4 Ductile detailing as per code
  - 4.5 Seismic strengthening arrangements
    - 3.5.1 Horizontal reinforcement
    - 3.5.2 Vertical reinforcement
  
- 5. Introduction to IS13828-1993 & IS13827-1993 (12 hrs)**
  - 5.1 Advantages and disadvantages of masonry construction
  - 5.2 Behaviour of masonry construction during earthquakes
  - 5.3 Earthquake resistance features for burnt clay brick in weak mortar
  - 5.4 Codal Provisions for earthquake resistant earthen construction
  - 5.5 Seismic strengthening features of earthen buildings
  
- 6. Retrofitting Measure for Traditionally Built Construction (10 hrs)**
  - 6.1 Introduction, need of retrofitting
  - 6.2 Retrofitting materials

6.3 Retrofitting measure of traditionally built construction

6.3.1 Retrofitting of masonry buildings

6.3.2 Retrofitting of concrete structure

6.3.3 Retrofitting of low-cost buildings

**7. Disaster Management**

**(8 hrs)**

7.1 Disaster rescue

7.2 Psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment

7.3 Safeties in rescue operations

7.4 Debris clearance

7.5 Causality management

**RECOMMENDED BOOKS**

1. Elements of Earthquake Engineering by Jai Krishana and AR Chander sekaran; 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, IS4326 (latest edition)
5. Earthquake Engineering by RL Weigel, Prentice Hall Inc., N.I., 1970
6. Dynamics of Structure by AK Chopra, Prentice Hall Inc. New Delhi
7. Earthquake resistant building construction by Neelam Sharma, Katson
8. Earthquake resistant building construction by Jagroop Singh, Rajiv Bhatia, Eagle Publication

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>TimeAllotted (hrs)</b>	<b>MarksAllotted (%)</b>
1	8	15
2	8	15
3	6	10
4	12	20
5	12	20
6	10	10
7	8	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.7 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 an engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer software in civil engineering.*

### DETAILED CONTENTS

#### PRACTICAL EXERCISES

##### 1. Introduction

Starting up of Auto CAD, Auto CAD Window, Toolbar, Drop down menu, Command window, saving the drawing. Introduction of Graphic screen.

##### 2. Drawing, Editing, Dimensioning Commands

Co-ordinates, drawing limits, grid, snap, ortho features. Drawing commands, line, circle, polyline, multiline, ellipse, polygon etc. Editing commands – Copy, move, offset, fillet, chamfer, trim, lengthen, mirror, rotate, array etc. Working with hatches, fills, dimensioning, text etc.

##### 3. Submission/ Working Drawing

- 1) Drawing T, L, I, E, H with absolute, consecutive and polar coordinate system
- 2) Preparation of line plan of a residential building
- 3) Preparation of detailed plan of a two room residential building, Elevation, Section, Site Plan (using different type of layers)
- 4) Introduction to STAAD Pro, (Expert may be invited to demonstrate)
- 5) Introduction to MS Project/Primavera

#### RECOMMENDED BOOKS

1. Reference Manual of AutoCAD by Auto Desk
2. AutoCAD 2013byIPH publication.
3. MS Project – Microsoft USA or Primavera or Bentley Company

#### Note:

- I) *The Polytechnic may use any other software available with them for performing these exercises.*
- II) *If the above software are not available in the institution, the demonstration of the above said software should be arranged outside the institute.*

## **5.8 MINOR PROJECT (CONSTRUCTION SITE ORIENTED)**

L T P  
- - 4

### **RATIONALE**

*Minor project work aims at exposing the students to field practices, size and scale of operations and work culture at works sites. For this purpose, students during middle of course, are required to be sent at different work sites where some construction activities are in progress or some operations are going on.*

### **LEARNING OUTCOMES**

After undergoing the subject, students will be able to:

- Apply concepts, principles and practices taught in the classroom in solving field problems.

### **GENERAL GUIDELINES**

Depending on the interests of the students, they may be sent to following (or any other field project related to Civil Engineering):

- i) Building construction sites
- ii) Water treatment plant, Sewage treatment plant
- iii) Crusher plant, Cement Manufacturing Plant, Brick kiln
- iv) Highway construction site
- v) Material and Soil testing laboratory, Soil investigation projects
- vi) Hydel Power Project
- vii) Land surveying projects
- viii) Community development works
- ix) Constructional site like building, bridge, tunnel, canal lining, highway, railway track, irrigation works etc
- x) Low costing Housing

As a minor project activity, each student is supposed to study the operations at site and prepare a detailed project report of the observations/processes seen by him/her and give seminar using computer aided presentation slides using photographs. These students should be guided by respective subject teachers. Each teacher may guide a group of 10 – 15 students.

The teachers along with field supervisors will conduct performance assessment of students. Some of the projects are suggested below:

1. Survey of a village approach road, drawings of L-section and x-sections
2. Estimation of white washing and distempering in hostel building
3. Preparation of detailed estimate with drawings of septic tank for 30-40 users
4. Plumbing work and installation of PVC over-head water tank on a toilet block and then prepare report

5. Construction of different components of a building
6. Identification of water-supply fittings and replacement of defective fittings and then prepare report.
7. Construction of a pipe/slab culvert
8. Ferro-cement construction techniques
  - a) Low cost housing
  - b) New construction materials
9. Study and preparation of models of hydraulic pumps.

This Industry oriented minor project work will carry 50 marks for internal assessment.

A group of students not exceeding 5 may work on any one project. Each student will prepare the project report of the activities observed by him. They will study the whole process of the plant, and explain the same in their project report. Further they are required to present the Project Report of work done by them through seminar in the class for internal assessment. External examiner will ask the questions on the construction, working, processes observed by the students during their project work: Shortcomings in the works (site) and their remedial measures may be suggested by the students.

**NOTE:**

This is only a suggestive list. The students may take any other problem as per their interest. The students of the class may be divided into five groups and work may be assigned to each group as per their interest.

## 6.1 PRESTRESSED CONCRETE

L T P  
4 - -

### RATIONALE

Now a day, diploma holders in Civil Engineering has to supervise prestressed concrete construction. So, it is necessary that they should have basic knowledge of prestressed concrete.

### DETAILED CONTENTS

- 1. Introduction (12 hrs)**  
Basic concept of prestressed concrete, advantages of prestressed concrete in comparison with RCC application of prestressed to various building elements, bridges, water tanks and precast elements.
- 2. Materials (12 hrs)**  
Materials requirement for prestressing concrete – High strength concrete, Prestressing steel wires, strands and high strength bars. Stresses in high strength steel and stress-strain relationship, tendon profile.
- 3. Prestressing Methods (14 hrs)**  
Introduction to prestressing methods—pre-tensioning and post-tensioning, forces due to pretensioning and post-tensioning; their suitability and comparison, circular prestressing and its application
- 4. Bending and Shear Capacity (14 hrs)**  
Concept of bending and shear capacity of prestressed members. Calculation of bending stresses in rectangular simply supported beams with straight and parabolic profile of tendons
- 5. Losses in Prestressing (12 hrs)**  
Types of losses in prestress—Elastic shortening, creep and shrinkage of concrete, frictionless and stress relaxation in prestress steel. Computation of losses for simple beam problems.

### RECOMMENDED BOOKS

1. Prestressed Concrete by N Krishna Raju, Tata McGraw Hill, Delhi
2. Prestressed Concrete by P Dayaratnam
3. Prestressed Concrete by S Ramamurtham

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	12	20
2	12	20
3	14	20
4	14	20
5	12	20
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.2 STEEL STRUCTURES DESIGN AND DRAWING

L T P  
4 - 4

### 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. He must be able to read and interpret structural drawings of different elements. This subject thus deals with elementary design principles as per IS code of practice IS:800 and their relevant drawings.*

### DETAILED CONTENTS

#### A) Steel Theory and Design

##### 1. Structural Steel and Sections

(6 hrs)

- 1.1 Terminology, Properties of structural steel as per IS Code, grades of steel
- 1.2 Designation of structural steel sections as per IS handbook and IS: 800
- 1.3 Classification of sections in Limit State Method
- 1.4 Hollow Sections; Hot rolled and Cold Formed, advantages and applications

##### 2. Bolted Connections

(10hrs)

- 2.1 Types of Bolts
- 2.2 Forces in Bolts
- 2.3 Types of Bolted joints with Sketches
- 2.4 Design of bolted connections (limit state)

##### 3. Welded Connections (LSM)

(10 hrs)

Introduction, types of welds, defects in welds, Permissible stress in weld, strength of weld, advantages and disadvantages of welded joint. Types of weld sand their symbols. Design of fillet weld and butt weld subjected to axial load.(Descriptive No numerical on plug and slot welds)

##### 4. Tension Members (LSM)

(10 hrs)

Types of section used, permissible stresses in axial tension. *Gross and net cross-sectional area of tension member*, Analysis and Design of tension member with welded and riveted connection. Introduction to Lug Angle and Tension splice. (Theory only)

##### 5. Compression Members (LSM)

(10 hrs)

Types of sections used, Effective length, Radius of gyration, slenderness ratio and its limit, Permissible compressive stresses. Analysis and Design of axially loaded angle struts with welded and riveted connection. Stanchion and Columns Types of sections-simple and builtup sections, Effective length, Introduction to lacing and battening (No numerical problem on Lacing and Battening)

##### 6. Beams (LSM)

(10 hrs)

Different steel sections used; Simple and built-up sections Permissible bending stresses. Design of simple I beam section, check for shear only. Introduction to Plate Girder: Various components and their functions. (No numerical Problem on Plate Girder)



## 7. Plate Girder (Conceptual knowledge)

(8 hrs)

Parts of plate girder

- a) Flange plate
- b) Flange angle
- c) Flange splice
- d) Web splice
- e) Vertical stiffener
- f) Intermediate stiffener
- g) Horizontal stiffener
- h) Bearing stiffener

## B) Steel Structures Drawing

1. Details of splicing for steel columns.
2. Column Beam Connection Drawings:
  - a) Beam to beam connections (Seated and framed)
  - b) Beam to column (Seated and framed)
  - c) Column bases (Slab base, and gusseted base)
3. Detailed drawing showing plan and elevation for a riveted plate girder with the given design data regarding the sizes of its parts, with details at the supports and connections of stiffeners, flange angles and cover plates with the web
4. Preparation of drawing of a steel roof truss with details of joints for the given span, shape of the truss and the design data regarding the size of the members and the connections.

## RECOMMENDED BOOKS

1. "Design of Steel Structures" by Duggal SK, Standard Publishers Distributors.
2. "Structures Design and Drawing" by Birinder Singh, Kaptian Publishing House, Ludhiana
3. "Design of Steel Structures" by Ram Chandra, Delhi, Standard Publishers Distributors
4. "Design of Steel Structure" by LS Negi, Tata McGraw Hill, New Delhi
5. "Design of Steel Structures", by S Ramamurthan

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1	06	10
2	10	16
3	10	15
4	10	16
5	10	16
6	10	16
7	08	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.3 IRRIGATION ENGINEERING

L T P  
4 - -

### 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 and prepare and interpret the irrigation engineering drawings. Some of diploma holders are also engaged for preventing water logging and irrigation by tube wells. 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. In drawing sectional: i) 60% drawing sheets ii) 40% test*

### DETAILED CONTENTS

#### A) THEORY

1. **Introduction** (3 hrs)
  - 1.1 Definition and Necessity of Irrigation
  - 1.2 Historical development of Irrigation systems
  
2. **Water Requirement of Crops** (5 hrs)
  - 2.1 Principal crops in India and their water requirements
  - 2.2 Crop/base period
  - 2.3 Crop seasons –Kharif and Rabi
  - 2.4 Duty, Factors affecting duty, Delta,
  - 2.5 Relationship between Base period, Duty and Delta
  
3. **Methods of Irrigation** (5 hrs)
  - 3.1 Type of irrigation- Surface irrigation and sub-surface irrigation
  - 3.2 methods of supplying water to the field (Brief description)
    - 3.2.1 Free Flooding
    - 3.2.2 Border Flooding
    - 3.2.3 Check Flooding
    - 3.2.4 Furrow irrigation method
    - 3.2.5 Basin flooding
    - 3.2.5 Sprinkler irrigation with its suitability
    - 3.2.6 Drip Irrigation with its suitability
  
4. **Hydrology and Run-off** (5 hrs)
  - 4.1 Definition, importance of hydrology
  - 4.2 Hydrological cycle
  - 4.3 Precipitation
    - 4.3.1 Definition
    - 4.3.2 Types of precipitation
    - 4.3.3 Raingauges, types with diagrams
  - 4.4 Runoff, Factors affecting runoff
  
5. **Dams & Canals** (12 hrs)
  - 5.1 Use of dams in irrigation
  - 5.2 Types of dams
  - 5.3 Construction of earthen, gravity and rock fill dams
  - 5.4 Alluvial and non-alluvial canals

- 5.5 Alignment of canal- ridge canal, contour canal, side slope canal
- 5.6 Distribution system for canal irrigation- Main canal, Branch canal, Distributaries, water course
- 5.7. Cross-section of canal showing- Side slope, Berm, Freeboard, Service road, Spoil bank, Dowel and Borrowpit (with their definition & functions)
- 5.8 Lining of canals and their types
- 5.9 Maintenance of irrigation canal
- 5.10 Closure of breaches

**6. Well and Tube Well Irrigation (8 hrs)**

- 6.1 Open well
  - 6.1.1 Shallow well
  - 6.1.2 Deep well
- 6.2 Construction of open well
- 6.3 Yield of open well (brief description, no derivation and numerical)
  - 6.3.1 Pumping test
  - 6.3.2 Recuperating test
- 6.4 Tube well
- 6.5 Types of tube well (Brief description with neat diagram)
  - 6.5.1 Cavitytype tube well
  - 6.5.2 Screen type tube well
  - 6.5.3 Slotted type tube well
- 6.6 Methods of boring tube wells
- 6.7 well development
- 6.7 Advantages and disadvantages of tube well irrigation over canal irrigation

**7. Diversion Head Works (6 hrs)**

- 7.1 Definition, object, general layout, functions of different parts of diversion head works.
- 7.2 Types of Weir
- 7.3 Difference between weir and barrage

**8. Cross Drainage Works (5 hrs)**

- 8.1 Functions and necessity of the following types: aqueduct, super Passage, level crossing, inlet and outlet
- 8.2 Sketches of the above cross drainage works

**9. Regulatory works (5 hrs)**

- 9.1 Introduction
- 9.2 Cross and head regulators
- 9.3 Outlets
- 9.4 Canal Escapes
- 9.5 Falls

**10. River Training Works (6 hrs)**

- 10.1 Control and river training
- 10.2 Objective of river training
- 10.3 Method of river training (Brief description)
  - 10.3.1 Marginal embankment
  - 10.3.2 Groynes
  - 10.3.3 Pitched island
  - 10.3.4 Guide banks

## 11. Water Logging

(4 hrs)

- 11.1 Definition
- 11.2 Causes
- 11.3 Preventive & remedial measures
- 11.4 Reclamation of water logged areas
- 11.5 Well point system

### RECOMMENDED BOOKS

1. Bharat Singh, Fundamentals of Irrigation Engineering', Roorkee, Nem Chandand Bros
2. Garg, Santosh Kumar, 'Irrigation Engineering and Hydraulics Structures', Delhi, Khanna Publishers
3. Punmia, BC; and Pande Brij Bansi Lal, 'Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors
4. Sharma, RK; 'Text Book of Irrigation Engineering and Hydraulics Structures', New Delhi, Oxford and IBH Publishing Company
5. Sharma, SK; 'Principles and Practice of Irrigation Engineering', New Delhi, Prentice Hall of India Pvt. Ltd.
6. Varshney RS, Gupta SC, Gupta R L etc. "Theory and Design of Irrigation Structures", Vol. I and II
7. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"
8. Priyani BB, 'The Fundamental Principles of Irrigation and Water Power
9. BIS Codes
10. Wan. E. Houk, "Irrigation Engineering" Vol. I and II

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1	3	5
2	5	8
3	5	8
4	5	12
5	12	9
6	8	14
7	6	9
8	5	9
9	5	8
10	6	8
11	4	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.4 CONSTRUCTION MANAGEMENT AND ACCOUNTS

L T P  
4 - -

### 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 and safety, accounts and stores.*

### DETAILED CONTENTS

#### THEORY

#### SECTION-A

#### CONSTRUCTION MANAGEMENT

##### 1. Introduction (4 hrs)

- 1.1 Significance of construction management
- 1.2 Main objectives of construction management and overview of the subject
- 1.3 Functions of construction management, planning, organising, staffing, directing, controlling and coordinating, meaning of each of these with respect to construction job.
- 1.4 Classification of construction into light, heavy and industrial construction
- 1.5 Stages in construction from conception to completion

##### 2. Construction Planning (6 hrs)

- 2.1 Importance of construction planning
- 2.2 Stages of construction planning
  - Pre-tender stage
  - Contract stage, construction contracts and specifications
- 2.4 Scheduling construction works by bar charts
  - Definition of activity, identification of activities though
  - Limitations of bar charts
- 2.5 Scheduling by network techniques
  - Introduction to net work techniques; PERT and CPM, differences between PERT and CPM terminology
- 2.6 CPM Network including critical activities, slack, floats & critical path.

##### 3. Organization (5 hrs)

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

##### 4. Site Organization (5 hrs)

- 4.1 Principle of storing and stacking materials at site
- 4.2 Location of equipment
- 4.3 Organizing labour at site
- 4.4 Site layout of construction project

##### 5. Construction Labour (5 hrs)

- 5.1 Conditions of construction workers in India, wages paid to workers
- 5.2 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)

- 6. Control of Progress** (6 hrs)
- 6.1 Methods of recording progress
  - 6.2 Analysis of progress
  - 6.3 Taking corrective actions keeping head office informed
  - 6.4 Arbitration and settlement.
- 7. Inspection and Quality Control** (5 hrs)
- 7.1 Need for inspection and quality control
  - 7.2 Principles of inspection
  - 7.3 Stages of inspection and quality control for
    - Earthwork
    - Masonry
    - RCC
- 8. Accidents and Safety in Construction** (4 hrs)
- 8.1 Accidents—causes and remedies
  - 8.2 Safety measures for
    - Excavation work
    - Hot bituminous works
    - Scaffolding, form work
  - 8.3 Safety campaign and safety devices

## **SECTION-B**

### **ACCOUNTS**

#### **9. Public Work Accounts:**

**(24 hrs)**

- 9.1 Introduction
- 9.2 Necessities of accounts
- 9.3 Public works department system of account
- 9.4 Classification of transaction and head of account
- 9.5 Classification of works
- 9.6 Condition to be fulfilled before a work can taken in hand
- 9.7 work order
- 9.8 bill-first and final bill, running account bill, account of secured advances, running account bill "c", running account bill "D", final bill, Hand receipt, refund of security money, cash, debit and credit
- 9.9 cashbook-procedure for maintain the cash book, cash found surplus or deficient, subsidiary cash Book
- 9.10 contract ledger
- 9.11 completion report and completion certificate
- 9.12 Imprest
- 9.13 temporary advance or temporary Imprest
- 9.14 Cheques
- 9.15 Remittance transfer receipts
- 9.16 Advise of transfer debit/credit
- 9.17 Receipt of money
- 9.18 Treasury challan
- 9.19 Treasury remittance book
- 9.20 Work abstract
- 9.21 Register of works
- 9.22 Transfer entries
- 9.23 Appropriation and re-appropriation
- 9.24 Deposit works
- 9.25 Stores
  - 9.25.1 Necessity of stores
  - 9.25.2 Unstamped receipt
  - 9.25.3 Accounting procedure for store
  - 9.25.4 Suspense head
  - 9.25.5 Suspense sub-head
  - 9.25.6 Reserve limit of stock
  - 9.25.7 Indent
  - 9.25.8 Stock taking and shortage and surplus
  - 9.25.9 Classification of store
- 9.26 Road metal
- 9.27 materials charged to work
- 9.28 issue of material to contractor
- 9.29 Issue of machinery and equipment
- 9.30 bincard
- 9.31 stock register
- 9.32 write off

- 9.33 Handing over taking over charge on transfer
- 9.34 voucher
- 9.35 Establishments in P.W.D.
- 9.36 Cash payment to labourers
- 9.37 Tools and plant

(Students will prepare the various form used in P.W.D. for different terms mentioned above in class)

**RECOMMENDED BOOKS**

1. Shrinath, LS, "PERT and CPM-Principles and Applications", New Delhi, East West Press
2. Harpal Singh, "Construction Management and Accounts", New Delhi, Tata McGraw Hill Publishing Company.
3. Peurifoy, RL, "Construction Planning, Equipment and Methods "Tokyo, McGraw Hill
4. Wakhlo, ON; "Civil Engineering Management", New Delhi Light and Life Publishers
5. Verma, Mahesh; "Construction Equipment and its Planning and Application”
6. Dharwadker, PP; "Management in Construction Industry", New Delhi, Oxford and IBH Publishing Company.
7. Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern Limited, New Delhi

**SUGGESTED DISTRIBUTION OF MARKS**

<b>TopicNo.</b>	<b>Marks Allotted (%)</b>
1	6
2	10
3	10
4	10
5	12
6	9
7	9
8	9
9	25
<b>Total</b>	<b>100</b>



## 6.5.1 REPAIR AND MAINTENANCE OF BUILDINGS

LT P

4 - -

### 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 has habby 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.*

### DETAILED CONTENTS

- 1. Need for Maintenance** (8 hrs)
  - 1.1 Importance and significance of repair and maintenance of buildings
  - 1.2 Meaning of maintenance
  - 1.3 Objectives of maintenance
  - 1.4 Factors influencing the repair and maintenance
  
- 2. Agencies Causing Deterioration (Sources, Causes, Effects)** (10 hrs)
  - 2.1 Definition of deterioration/decay
  - 2.2 Factors causing deterioration, their classification
    - 2.2.1 Human factors causing deterioration
    - 2.2.2 Chemical factors causing deterioration
    - 2.2.3 Environmental conditions causing deterioration
    - 2.2.4 Miscellaneous factors
  
- 3. Investigation and Diagnosis of Defects** (10 hrs)
  - 3.1 Systematic approach/procedure of investigation
  - 3.2 Sequence of detailed steps for diagnosis of building defects/problems
  - 3.3 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** (12 hrs)
  - 4.1 Defined effects in buildings
  - 4.2 Classification of defects
  - 4.3 Main causes of building defects in various building elements
    - 4.3.1 Foundations, basements and DPC
    - 4.3.2 Walls
    - 4.3.3 Decorative and protective finishes
    - 4.3.4 Defects caused by dampness
  
- 5. Materials for Repair, Maintenance and Protection** (8 hrs)
  - 5.1 Compatibility aspects of repair materials
  - 5.2 State application of following materials in repairs:
    - 5.2.1 Anti corrosion coatings
    - 5.2.2 Adhesives/bonding aids
    - 5.2.3 Repair mortars

- 5.2.4 Curing compounds
- 5.2.5 Joints sealants
- 5.2.6 Water proofing systems for roofs
- 5.2.7 Protective coatings

## **6. Remedial Measures for Building Defects**

**(16 hrs)**

- 6.1 Preventive maintenance considerations
- 6.2 Surface preparation techniques for repair
- 6.3 Crack repair methods
  - 6.3.1 Epoxy injection
  - 6.3.2 Grooving and sealing
  - 6.3.3 Stitching
  - 6.3.4 Adding reinforcement and grouting
  - 6.3.5 Flexible sealing by sealant
- 6.4 Repair of surfaced effects of concrete
  - 6.4.1 Bug holes
  - 6.4.2 Form tie holes
  - 6.4.3 Honey comb and larger voids
- 6.5 Repair of corrosion in RCC elements
  - 6.5.1 Steps in repairing
  - 6.5.2 Prevention of corrosion in reinforcement
- 6.6 Material placement techniques with sketches
  - 6.6.1 Pneumatically applied (The gunite techniques)
  - 6.6.2 Open top placement
  - 6.6.3 Pouring from the top to repair bottom face
  - 6.6.4 Birds mouth
  - 6.6.5 Dry packing
  - 6.6.6 Forman dpump
  - 6.6.7 Preplaced – aggregate concrete
  - 6.6.8 Trowel applied method
- 6.7 Repair of DPC against Rising Dampness
  - 6.7.1 Physical methods
  - 6.7.2 Electrical methods
  - 6.7.3 Chemical methods
- 6.8 Repair of walls
  - 6.8.1 Repair of mortar joints against leakage
  - 6.8.2 Efflorescence removal
- 6.9 Water proofing of wet areas and roofs
  - 6.9.1 Water proofing of wet areas
  - 6.9.2 Water proofing of flat RCC roofs
  - 6.9.3 Various water proofing system sand their characteristics
- 6.10 Repair of joints in buildings
  - 6.10.1 Types of sealing joints with different types of sealants
  - 6.10.2 Techniques for repair of joints
  - 6.10.3 Repair of overhead and underground water tanks

### **RECOMMENDED BOOKS**

1. Gahlot P.S., Sanjay Sharma, Building Defects and Maintenance Management by CBS Publishers New Delhi
2. Nayak, BS; "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi
3. Ransom, WH; "Building Failures-Diagnosis and Avoidance", Publishing E and F.N. Span
4. Hutchinson, BD; etc, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	8	14
2	10	16
3	10	16
4	12	16
5	8	14
6	16	24
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.5.2 ENVIRONMENTAL ENGINEERING

L T P

4 - -

### RATIONALE

*Civil Engineering diploma holders must have the knowledge of different types of environmental aspects related to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of their latest environmental laws for effectively combating environmental pollution. The classroom instructions should be supplemented by field visits to show the pollution caused by urbanization and the combatment measures being adopted at site. Extension lectures by experts may be encouraged.*

### DETAILED CONTENTS

1. **Study of Importance of Environmental Engineering** (5 hrs)  
Importance of clean environment, control of environmental pollution with respect to air, land and water. Conservation of natural resources, environmental education and awareness, sustainable development.
2. **Environments and Ecology** (6 hrs)  
Definition and understanding of environment and ecology concept, ecosystem and types of ecosystems, energy flow in an ecosystem, food chain, ecological pyramids, consortium and ecological balance
3. **Water Pollution** (8 hrs)  
Causes of pollution in surface and underground water eutrophication of lakes and its preventing measure; BIS standards for water quality.
4. **Air Pollution** (8 hrs)  
Definition, principal air pollutants, atmospheric parameters influencing air pollution, types of air contaminants and their sources, effects of air pollution on human beings, plants, animals, automobile pollution, BIS ambient air quality standards and measures to combat air pollution
5. **Noise Pollution** (6 hrs)  
Definition, unit of measurement of noise, sources and effects of noise pollution and control of noise pollution
6. **Effects of Mining, Blasting and Deforestation** (5 hrs)  
Effects of mining, blasting and deforestation on the environment human life and wild life.
7. **Land Use** (5 hrs)  
Effect of land use on environmental quality, land use and natural disasters, (landslides etc.) soil degradation problems - erosion, water logging, soil pollution etc.

8. **Environmental Impact Assessment** (5 hrs)  
 Definition and requirements, environmental impact assessment. Flow chart of environmental impact assessment methodology. Describe the need and importance of EIA.
9. **Legislation to Control Environmental Pollution (idea)** (8 hrs)  
 Indian legislative acts for water, land and air pollution control–provisions scope and implementation
10. **Global Issues of Environmental Engineering** (4 hrs)  
 Global warming, ozone depletion, acid rain, oil pollution; radiation hazards and their control
11. **Renewable Source of Energy** (4 hrs)  
 Role of non-conventional sources of energy (biogas, solar, wind etc) in environmental protection. Conservation of energy resources like coal, oil etc., alternative fuels, bio- diesel etc.

### RECOMMENDED BOOKS

1. Environmental Engineering by Deswal and SS Deswal; Dhanpat Rai and Company (P) Ltd., Delhi
2. Odum EP, “Fundamentals of Ecology”, Amarind publication Co., Delhi
3. Environmental Engineering and Management by SK Dhamija; SK kataria and Sons, Delhi
4. De AK, “Engineers Chemistry”, New Age Publication, Delhi
5. Kendeigh SC, “Ecology”, Prentice Hall of India, Delhi
6. RK Khitoliya, Environmental Pollution, (2007), S Chand & Co. Ltd., New Delhi
7. Bhatia HS A text book of environmental pollution and control Galogotia.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs)	Marks Allotted (%)
1	5	8
2	6	8
3	8	8
4	8	12
5	6	4
6	5	12
7	5	12
8	5	9
9	8	9
10	4	9
11	4	9
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.5.3 BRIDGES, TUNNELS AND AIRPORT ENGINEERING

L T P  
4 - -

### RATIONALE

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

### DETAILED CONTENTS

#### PART-I: BRIDGES

(24 hrs)

#### Bridge Engineering

##### 1. Sites Election and Investigation

- 1.1 Factors affecting selection of site of a bridge.
- 1.2 Bridge alignment
- 1.3 Collection of design data
- 1.4 Classification of bridges according to function, material, span, size, alignment, position of HFL.

##### 2. Component Parts of Bridge

- 2.1 Plan & sectional elevation of bridges how component parts of substructure & super structure.
- 2.2 Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc.
- 2.3 Foundation–function, types
- 2.4 Piers-function, requirements, types.
- 2.5 Abutment –function, types
- 2.5 Wingwalls–functions and types.
- 2.6 Bearing –functions, types of bearing for RCC & steel bridges.
- 2.7 Approaches –incuttingandembankment.
- 2.8 Bridge flooring- open and solid floors

##### 3. Permanent and Temporary Bridges

- 3.1 PermanentBridges- Sketches & description in brief of culverts, cause ways, masonry, arch, steel, movable steel bridges, RCC Girder Bridge, prestressed girder bridge, cantilever, suspension bridge.
- 3.2 Temporary Bridges- timber, flying, floating bridges
- 3.4 Inspection & Maintenance of Bridge.

##### 4. Inspection of bridges

- 4.1 Maintenance of bridges & types–routine & special maintenance.

#### PART - II: TUNNELS

(16 hrs)

- 1 Definition, necessity, advantages, disadvantages
- 2 Classification of tunnels
- 3 Shape and Size of tunnels

- 4 Tunnel cross sections for highway and railways
- 5 Tunnel investigations and surveying–Tunnel surveying locating center line on ground, transferring center line inside the tunnel
- 6 Shaft - its purpose
- 7 Methods of tunneling in Soft rock-needle beam method, fore-poling method. Line plate method, shield method
- 8 Methods of tunneling in Hard rock-Full-face heading method, Heading and bench method, drift method
- 9 Precautions in construction of tunnels
- 10 Tunnel lining and ventilation

**PART - III: AIRPORTS**

**(24 hrs)**

**1. Introduction**

- 1.1 History of transport
- 1.2 Air transport in India
- 1.3 Civil aviation department

**2. Airport Survey**

- 2.1 Type of Survey
- 2.2 Drawing to be prepared

**3. Airport Planning**

- 3.1 Airport site selection-factor affecting site selection
- 3.2 Airport obstruction-imaginary surfaces, objects with actual height
- 3.3 Clear zone
- 3.4 Turning zone

**4. Runway**

- 4.1 Runway orientation
- 4.2 Basic runway length

**5. Taxiway**

- 5.1 General
- 5.2 Layout of taxiway
- 5.3 Exit taxiway

**6. Terminal Area**

- 6.1 General
- 6.2 Terminal Building
- 6.3 Apron
- 6.4 Hangers
- 6.5 Typical airport layouts

**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*

## **RECOMMENDED BOOKS**

1. Vaswani, NK; "Railway Engineering", Roorkee Publishing House
2. Rangwala, SC; 'Railway Engineering', Anand, Charotar Book Stall
3. Deshpande, R;"A Text Book of Railway Engineering", Poonam United Book Corporation
4. Algia, JS "Bridge Engineering", Anand Charotar Book Stall
5. Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH
6. Rangwala, "Bridge Engineering", Aand, Charotar Book Stall
7. IRC Bridge Codes
8. MORTH drawings for various types of bridges
9. MORTH pocket books for bridge Engineers, 2000 (First Revision)
10. Subhash CSaxena "Tunnal Engineering Dhanpat Rai and Sons

## **SUGGESTED DISTRIBUTION OF MARKS**

<b>TopicNo.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	24	43
2	16	43
3	24	14
<b>Total</b>	<b>64</b>	<b>100</b>



## 6.5.4 RAILWAYS, BRIDGES AND TUNNELS

L T P  
4 - -

### 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 board based knowledge regarding various components and construction of railway track, bridges and tunnels.*

### DETAILED CONTENTS

#### **PART-I: RAILWAYS**

**(25 hrs)**

1. Introduction to Indian Railways
2. Railways surveys: Factors influencing the railways route, brief description of various types of railway survey
3. Classification of permanent way describing its component part
4. Rail Gauge; Definition, types, practice in India
5. Rail – types of rails
6. Rail Fastening: Rail joints, types of rail joints, fastening for rails, fish plates, bearing plates
7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material of Sleepers.
8. Ballast: Function of ballast, requirements of an ideal material of ballast
9. Crossing and signaling: Brief description regarding different types of crossing/signalling
10. Maintenance of track: Necessity, track fixtures; maintenance and boxing of ballast, maintenance gauges, tools.
11. Drains, methods of construction.

#### **PART-II: BRIDGES**

**(21 hrs)**

12. Introduction  
Bridge—its function and component parts, difference between a bridge and a culvert
13. Classification of Bridges  
Their structural elements and suitability:
  - 13.1 According to life—permanent and temporary
  - 13.2 According to deck level—Deck, through and semi-through
  - 13.3 According to material—timber, masonry, steel, RCC, pre-stressed
  - 13.4 IRC classification
14. Bridge Foundations: Introduction to open foundation pile foundation, well foundation
15. Piers, Abutments and Wing walls
  - 15.1 Piers—definition, parts; types—solid (masonry and RCC), open
  - 15.2 Abutment and wing walls—definition, types of abutment (straight and tee), abutment with wing walls (straight, splayed, return and curved)
16. Bridge bearings  
Purpose of bearing; types of bearing—fixed plate, rocker and roller,
17. Maintenance of Bridges
  - 17.1 Inspection of bridges
  - 17.2 Routine maintenance

**PART-III: TUNNELS**

**(18 hrs)**

18. Definition and necessity of tunnels
19. Typical section of tunnels for a national highway and single and double broad gauge railway track.
20. Ventilation-necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust
21. Drainage method of draining water in tunnels
22. Lighting in tunnels & lining 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 team work*  
ii) *Examiners should set question from all the parts*

**RECOMMENDED BOOKS**

1. Vaswani, NK; “ Railway Engineering”, Roorkee Publishing House
2. Rangwala,SC; “ Railway Engineering”, Anand Charotar Book Stall
3. Deshpande, R: “ A Text Book of Railway Engineering”, Poonam United Book Corporation
4. Algaia, JS “Bridge Engineering”, Anand Charotar Book Stall
5. Victor Johnson, “Essentials of Bridge Engineering” Oxford and IBH
6. Rangwala, “Bridge Engineering”, Anand Charotar Book Stall
7. IRC Bridge Codes
8. MORTH drawings for various types of bridges
9. MORTH pocket books for bridge Engineering, 2000 (First Revision)
10. Subhash C Saxena “ Tunnel Engineering Dhanpat Rai and Sons

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (hrs)</b>	<b>Marks Allotted (%)</b>
1	25	43
2	21	43
3	18	14
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.5.5 GREEN BUILDINGS & SERVICES

L T P  
4 - -

### RATIONALE

*The subject will cater to the needs of those technicians who would like to find employment in the building construction. The subject aims at providing board based knowledge regarding various components of green buildings and sustainable infrastructure development*

### DETAILED CONTENTS

- 1. Introduction (8 hrs)**  
Concept of green buildings, Sustainable design to achieve environmental, economic and social benefits.  
Components of green building
- 2. Site Selection (8 hrs)**  
Building envelope and orientation, Fenestrations, shading, Landscaping, day lighting, site preservation
- 3. Resource efficiency (12 hrs)**  
Reduction in waste, Concept of L.C.A (life cycle assessment), recycled materials, Features of eco friendly materials and types, solid waste management
- 4. Energy Efficiency (10 hrs)**  
Active and passive techniques. Importance of passive techniques. Role of orientation, shading and vegetation. Solar gain for winters. Optimization of daylight. Renewal energy, energy efficient appliances
- 5. Water Efficiency (10 hrs)**  
Water Efficient appliances, rain water harvesting, water and waste water treatment
- 6. Indoor air quality (8 hrs)**  
Natural & mechanical ventilation system, Low VOC (Volatile organic compounds) paints
- 7. Rating systems of green building (8 hrs)**  
LEED, GRIHA, IGBC: Points & Certifications

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	8	10
2	8	18
3	12	18
4	10	18
5	10	18
6	8	8
7	8	10
<b>Total</b>	<b>64</b>	<b>100</b>

## 6.6 MAJOR PROJECT (INDUSTRY/FIELD ORIENTED- PRACTICE BASED)

L T P  
- - 10

As far as possible students should be given live project problems with a view to:

- i) 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.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) Provide first hand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge and skills to solve practical problems of the world of work.
- iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, Polytechnics may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional

Value to industrial/field organisations. Each teacher is expected to supervise and guide 5-6 students. Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students. Students may be assessed both by industry and polytechnic faculty.

**Some of suggested projects are given below:** These are only guide lines; teacher may take any project related to Civil Engineering depending upon the availability of projects. Preference should be given to practical oriented projects. According to the need of the polytechnic, the following major projects are suggested:

### 1. Construction of a Small Concrete Road consisting of following activities

- a. Survey and preparation of site plan
- b. Preparation of drawings i.e.L-Section and X-Section
- c. Estimating and earthwork
- d. Preparation of subgrade with stone ballast
- e. Laying of concrete
- f. Testing of slump, casting of cubes and testing
- g. Material estimating and costing with specifications
- h. Technical report writing

## **2. Water Supply System for one or two Villages**

- a. Surveying
- b. Design of water requirements and water distribution system
- c. Preparation of drawing of overhead tank
- d. Material estimating and costing
- e. Specifications
- f. Technical report writing

3. Construction of shopping complex detailing of RCC drawings, estimating and costing of material

## **4. Rainwater Harvesting**

- a. Assessment of catchment's area
- b. Intensity of rainfall
- c. Collection of water
- d. Soak pit design
- e. Supply of water
- f. Monitoring during rainy season

## **5. Construction of Concrete Cubes including concrete mix design by mixing with appropriate quantity of flyash with fibres**

- a. The fibres like polypropylene, carbon, steel etc. can be used
- b. Students will show the comparison between concrete mixed with fibres verses the controlled quality concrete.

## **6. Estimation and Designing of a State Highway Road**

- a. Reconnaissance survey of proposed road
- b. To take L and cross-sections
- c. Fixing of grades
- d. Estimation of cutting and filling of earth mass
- e. Plan tabling of proposed road
- f. Estimation of proposed road

## **7. Designing a Small Height Gravity Dam**

- a. Constructing of catchment tree
- b. Calculating the reservoir capacity
- c. Designing of gravity dam by taking the account various forces

***Note: The projects undertaken should be field oriented.***

## 6.7 PRACTICES IN COMMUNICATION SKILLS

L T P

- - 2

### RATIONALE

*For successful completion of diploma programme, the students should possess adequate command on language and communication skills so that they are able to express themselves with ease and felicity. The language used by the students should be appropriate to objectives and occasion. The contents of this subject shall provide them practical training through language laboratory.*

### LIST OF PRACTICALS

1. **Exercises on phonetics** (8 hrs)
  - 1.1 Identifications of English phonemes
  - 1.2 Stress and Intonation
  - 1.3 Speaking exercises with emphasis on voice modulation (reading and extempore)
2. **Group Discussion** (4 hrs)
3. **Exercises on** (4 hrs)
  - Self-assessment using tools like SWOT analysis
  - Listening skills
4. **Internet communication and Correspondence** (4 hrs)
  - 4.1 Resume writing
  - 4.2 Covering letter
  - 4.3 Agenda and Minutes of meeting
  - 4.4 Business Correspondence
5. **Exercises on** (4 hrs)
  - 5.1 Body language and Dress sense
  - 5.2 Etiquettes and mannerism in difficult situations like business meetings, table manners, Telephone etiquette
  - 5.3 Manners related to opposite gender
  - 5.4 Cross-cultural Communication
6. **Mock interviews** (telephonic/personal) (4 hrs)
7. **Role plays for effective Communication** (4 hrs)