

**Curriculum for
Diploma Programme in
CIVIL ENGINEERING
For the State of Uttar Pradesh**



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PREFACE

An important issue generally debated amongst the planners and educators world over is how technical education can contribute to sustainable development of the societies struggling hard to come in the same bracket as that of the developed nations. The rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In India, a shift has taken place from the forgettable years of closed economy to knowledge based and open economy in the last few decades. In order to cope with the challenges of handling new technologies, materials and methods, we have to develop human resources having appropriate professional knowledge, skills and attitude. Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Now it is time to consolidate and infuse quality aspect through developing human resources, in the delivery system. Polytechnics play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by the State Board of Technical Education, UP to revise the existing curricula of 6 diploma programmes as per the needs of the industry and making them NSQF compliant, are laudable.

In order to meet the requirements of future technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of diploma programmes. The curricula for diploma programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of diploma programme.

The real success of the diploma programme depends upon its effective implementation. However best the curriculum document is designed, if that is not implemented properly, the output will not be as expected. In addition to acquisition of appropriate physical resources, the availability of motivated, competent and qualified faculty is essential for effective implementation of the curricula.

It is expected of the polytechnics to carry out job market research on a continuous basis to identify the new skill requirements, reduce or remove outdated and redundant courses, develop innovative methods of course offering and thereby infuse the much needed dynamism in the system.

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Coordinator

1. SALIENT FEATURES OF DIPLOMA PROGRAMME IN CIVIL ENGINEERING

- 1) Name of the Programme : Diploma Programme in Civil Engineering
- 2) Duration of the Programme : Three years (Six Semesters)
- 3) Entry Qualification : Matriculation or equivalent NSQF Level as Prescribed by State Board of Technical Education, UP
- 4) Intake : 60 (or as prescribed by the Board)
- 5) Pattern of the Programme : Semester Pattern
- 6) NSQF Level : Level - 5
- 7) Ratio between theory and Practical : 45 : 55 (Approx.)
- 8) Industrial Training:
Four weeks of industrial training is included after IV semester during summer vacation. Total marks allotted to industrial training will be 50.
- 9) Ecology and Environment :

As per Govt. of India directives, a subject on Environmental Studies has been incorporated in the curriculum.
- 10) Energy Conservation:
A subject on Energy Conservation has been incorporated in the curriculum.
- 11) Entrepreneurship Development:
A full subject on Construction Management Accounts and Entrepreneurship Development has been incorporated in the curriculum.
- 12) Student Centred Activities:
A provision of 3-6 hrs per week has been made for organizing Student Centred Activities for overall personality development of students. Such activities will comprise of co-curricular activities such as expert lectures, self study, games, hobby classes like photography, painting, singing etc. seminars, declamation contests, educational field visits, NCC, NSS and other cultural activities, disaster management and safety etc.
- 13) Project work

A project work has been included in the curriculum to enable the student get familiarize with the practices and procedures being followed in the industries and provide an opportunity to work on some live projects in the industry.

2. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN CIVIL ENGINEERING

Keeping in view, the present scenario of activities in the field of Civil Engineering, following employment opportunities are visualized for diploma holders in Civil Engineering:

a) **Wage Employment in:**

- i) Government Departments/Public sector / /Boards/ Corporations/ private construction companies
- ii) Service sector i.e. Estate Offices of Business organizations/ Universities/Colleges, Hotels , Hospitals etc. specially for repair and maintenance of buildings and their upkeep.
- iii) Military Engineering Services/BRO/Defence/Railways/ Power Projects/Banks/ Municipal Corporations and Committees/Airport Authority and Harbours etc.
- iv) Installation of communication towers and framed structure.
- v) Testing laboratories
- vi) Technical institutions.

b) **Self employment opportunities:**

- i) Small building contractors/Licensed contractors (Class B)
- ii) Approved building planner and valuer
- iii) Plumbing and water supply fitting contracts
- iv) White washing, distempering, repair and maintenance of buildings, renovations, POP work, texture work, false ceiling, specialized flooring etc.Anti - termite treatment Erection job
- v) Construction material suppliers/marketing
- vi) Preparation of computer aided design and drafting jobs
- vii) Estimating and costing jobs/bill maker
- viii) Surveyor/loss assessment/valuation of buildings etc
- ix) Water proofing of existing and new building

- x) A small enterprise like precast elements/hume pipes/water proofing chemicals, RCC pipes, hollow blocks, shuttering etc.
- xi) Rain water harvesting system installation
- xii) Sanitary Installation

3. LEARNING OUTCOMES OF DIPLOMA PROGRAMME IN CIVIL ENGINEERING

At the end of the programme, a diploma holder in Civil Engineering will be able to:

1.	Communicate effectively in English with others
2.	Apply basic principles of Mathematics and Science to solve engineering problems
3.	Prepare computerized reports, presentations using IT tools and computer application software
4.	Use cutting tools and tooling for fabrication of jobs by following safe practices during work
5.	Use appropriate procedures for preventing environmental pollution and energy conservation
6.	Use basic concepts and principles of fluid mechanics as applied to civil engineering practices.
7.	Apply concepts of mechanics to solve Engineering problems
8.	Carry out various types of surveying like levelling, plane tabling, theodolite surveying, and tachometry and contouring; and use modern surveying techniques like total station, remote sensing, GIS and GPS.
9.	Select, Use and carry out testing of construction materials including eco friendly and advanced materials as per their suitability and availability
10.	Supervise various building construction works from substructure to superstructure and their finishing operations.
11.	Prepare, read and interpret, component drawing, building drawings and layout
12.	Supervise production, placement and quality control of concrete operations.
13.	Supervise construction of pre cast elements.
14.	Carry out layout plan of water supply, sewerage and sanitary systems and monitor quality of water and waste water
15.	Supervise constructional aspects pertaining to irrigation structures
16.	Prepare, read and interpret public health and irrigation engineering drawings
17.	Analyse and design simple structural elements of R.C.C.

18.	Supervise constructional aspects pertaining to highway engineering
19.	Prepare, read and interpret R.C.C. drawings
20.	Prepare topographical plan of an area
21.	Use various computer softwares in the field of Civil Engineering
22.	Supervise constructional aspects pertaining to railways, bridges and tunnels
23.	Analyse, use and treat various types of soils for foundation purpose
24.	Plan and execute given task/projects as a team member/ leader
25.	Analyse and design simple structural elements of steel
26.	Prepare material estimates as per CSR, Specifications, costing, valuation and tender documents as per given drawings and prepare bill of quantity of construction.
27.	Apply basic principles of construction management techniques and accounts in Civil Engineering
28.	Carry out repair, maintenance and retrofitting of buildings as per requirement
29.	Use various advanced constructional techniques for construction of high rise and earthquake resistant structures keeping safety aspects in mind.
30.	Plan and execute activities related to disaster management.
31.	Apply the knowledge and skills gained through various courses in solving live problems/projects in the field
32.	Demonstrate appropriate values and attitude.

4. DERIVING CURRICULUM AREAS FROM LEARNING OUTCOMES OF THE PROGRAMME

The following curriculum area subjects have been derived from learning outcomes:

Sr. No.	Learning Outcomes	Curriculum Areas/Subjects
1.	Communicate effectively in English with others	– Communication Skills – Student Centred Activities (SCA)
2.	Apply basic principles of Mathematics and Science to solve engineering problems	– Applied Mathematics – Applied Physics – Applied Chemistry
3.	Prepare computerized reports, presentations using IT tools and computer application software	– Basics of Information Technology
4.	Use cutting tools and tooling for fabrication of jobs by following safe practices during work	– General Workshop Practice – Basics of Mechanical and Electrical Engg.
5.	Use appropriate procedures for preventing environmental pollution and energy conservation	– Environmental Studies – Energy Conservation
6.	Use basic concepts and principles of fluid mechanics as applied to civil engineering practices.	– Hydraulics and Hydraulic Machines
7.	Apply concepts of mechanics to solve Engineering problems	– Applied Mechanics – Structural Mechanics
8.	Carry out various types of surveying like levelling, plane tabling, theodolite surveying, and tachometry and contouring; and use modern surveying techniques like total station, remote sensing, GIS and GPS.	– Quantity Surveying and Valuation
9.	Select, Use and carry out testing of construction materials including eco friendly and advanced materials as per their suitability and availability	– Construction Materials
10.	Supervise various building construction works from substructure to superstructure and their finishing operations.	– Building Construction – Building Drawings
11.	Prepare, read and interpret, component drawing, building drawings and layout	– Engineering Drawing
12.	Supervise production, placement and quality control of concrete operations.	– Concrete Technology

13.	Supervise construction of pre cast elements.	– Reinforced Cement Concrete Structures (RCC Structures)
14.	Carry out layout plan of water supply, sewerage and sanitary systems and monitor quality of water and waste water	– Water and Waste water Engineering
15.	Supervise constructional aspects pertaining to irrigation structures	– Irrigation Engineering
16.	Prepare, read and interpret public health and irrigation engineering drawings	– Waste Water and Irrigation Engineering Drawing
17.	Analyse and design simple structural elements of R.C.C.	– Reinforced Cement Concrete Structures (RCC Structures)
18.	Supervise constructional aspects pertaining to highway engineering	– Highway Engineering
19.	Prepare, read and interpret R.C.C. drawings	– RCC Drawing
20.	Prepare topographical plan of an area	– Surveying
21.	Use various computer softwares in the field of Civil Engineering	– Computer Aided Drawing – Software Application in Civil Engineering
22.	Supervise constructional aspects pertaining to railways, bridges and tunnels	– Railways, Bridges and Tunnels
23.	Analyse, use and treat various types of soils for foundation purpose	– Soil Mechanics and Foundation Engineering
24.	Plan and execute given task/projects as a team member/ leader	– Project Work
25.	Analyse and design simple structural elements of steel	– Design of Steel Structure – Steel Structure Drawing
26.	Prepare material estimates as per CSR, Specifications, costing, valuation and tender documents as per given drawings and prepare bill of quantity of construction.	– Quantity Surveying and Valuation
27.	Apply basic principles of construction management techniques and accounts in Civil Engineering	– Construction Management, Accounts and Entrepreneurship Development
28.	Carry out repair, maintenance and retrofitting of buildings as per requirement	– Repair and Maintenance of Buildings
29.	Use various advanced constructional techniques for construction of high rise and earthquake resistant structures keeping safety aspects in mind.	– Earthquake Engineering

30.	Plan and execute activities related to disaster management.	– Analysis of Structures
31.	Apply the knowledge and skills gained through various courses in solving live problems/projects in the field	– Project Work
32.	Demonstrate appropriate values and attitude.	– Student Centred Activities

5. ABSTRACT OF CURRICULUM AREAS

a) General Studies

1. Communication Skills
2. Environmental Studies
3. Energy Conservation

b) Applied Sciences

4. Applied Mathematics
5. Applied Physics
6. Applied Chemistry

c) Basic Courses in Engineering/Technology

7. Engineering Drawing
8. General Workshop Practice
9. Basics of Mechanical and Electrical Engg.
10. Basics of Information Technology

d) Applied Courses in Engineering/Technology

11. Construction Materials
12. Computer Aided Drawing
13. Applied Mechanics
14. Hydraulics and Hydraulic Machines
15. Concrete Technology
16. Structural Mechanics
17. Building Construction
18. Building Drawings
19. Construction Materials
20. Computer Aided Drawing
21. Applied Mechanics
22. Hydraulics and Hydraulic Machines
23. Concrete Technology
24. RCC Drawing
25. Water and Waste water Engineering
26. Railways, Bridges and Tunnels
27. Earthquake Engineering

28. Soil Mechanics and Foundation Engineering
 29. Waste Water and Irrigation Engineering Drawing
 30. Quantity Surveying and Valuation
 31. Construction Management, Accounts and Entrepreneurship
Development
 32. Design of Steel Structure
 33. Steel Structure Drawing
 34. Software Applications in Civil Engineering
- e) Industrial Training**
35. Project Work
- f) Elective**
36. Repair and Maintenance of Buildings
 37. Plumbing Services
 38. Analysis of Structures

6. HORIZONTAL AND VERTICAL ORGANISATION OF THE SUBJECTS

Sr. No.	Subjects	Distribution in Periods per week in Various Semesters					
		I	II	III	IV	V	VI
1.	Communication Skills	6	-	-	6	-	-
2.	Applied Mathematics	5	5	-	-	-	-
3.	Applied Physics	7	-	-	-	-	-
4.	Applied Chemistry	7	-	-	-	-	-
5.	Engineering Drawing	8	-	-	-	-	-
6.	Construction Materials	5	-	-	-	-	-
7.	General Workshop Practice	8	8	-	-	-	-
8.	Computer Aided Drawing	-	8	-	-	-	-
9.	Applied Mechanics	-	7	-	-	-	-
10.	Basics of Mechanical and Electrical Engg.	-	8	-	-	-	-
11.	Basics of Information Technology	-	6	-	-	-	-
12.	Hydraulics and Hydraulic Machines	-	-	8	-	-	-
13.	Concrete Technology	-	-	8	-	-	-
14.	Environmental Studies	-	-	3	-	-	-
15.	Structural Mechanics	-	-	8	-	-	-
16.	Building Construction	-	-	9	-	-	-
17.	Building Drawings	-	-	8	-	-	-
18.	Highway Engineering	-	-	-	8	-	-
19.	Irrigation Engineering	-	-	-	5	-	-
20.	Surveying - I	-	-	-	12	12	-
21.	Reinforced Cement Concrete Structures (RCC Structures)	-	-	-	6	-	-
22.	Energy Conservation	-	-	-	5	-	-
23.	RCC Drawing	-	-	-	4	-	-
24.	Water and Waste water Engineering	-	-	-	-	8	-
25.	Railways, Bridges and Tunnels	-	-	-	-	6	-
26.	Earthquake Engineering	-	-	-	-	4	-
27.	Soil Mechanics and Foundation Engineering	-	-	-	-	8	-
28.	Waste Water and Irrigation Engineering Drawing	-	-	-	-	6	-
29.	Universal Human Values					3	
30.	Quantity Surveying and Valuation	-	-	-	-	-	6
31.	Construction Management, Accounts and Entrepreneurship Development	-	-	-	-	-	5
32.	Design of Steel Structure	-	-	-	-	-	6
33.	Steel Structure Drawing	-	-	-	-	-	4
34.	Software Applications in Civil Engineering	-	-	-	-	-	8
35.	ENVIRONMENTAL MANAGEMENT	-	-	-	-	-	5
36.	Project Work	-	-	-	-	-	10
37.	Student Centred Activities (SCA)	2	6	4	2	1	4

CORRECTED AND APPROVED BY BOARD OF TECHNICAL EDUCATION, U.P., LUCKNOW IN MEETING HELD ON 10.07.2019 @ RASHMI SONKAR

Total	48	48	48	48	48	48
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7. STUDY AND EVALUATION SCHEME FOR DIPLOMA PROGRAMME IN CIVIL ENGINEERING

FIRST SEMESTER

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1	*Communication Skills-I	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
1.2	*Applied Mathematics - I	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
1.3	*Applied Physics – I	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.4	*Applied Chemistry	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
1.5	*Engineering Drawing-I	-	-	8	2	40	-	40	60	3	-	-	60	100
1.6	Construction Materials	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
1.7	General Workshop Practice - I	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		22	-	26	26	140	110	250	310	-	140	-	450	700

* Common with other diploma programmes

Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

SECOND SEMESTER (CIVIL ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME								Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1	*Applied Mathematics - II	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
2.2	Computer Aided Drawing	-	-	8	3	-	40	40	-	-	60	3	60	100
2.3	+Applied Mechanics	5	-	2	5	20	10	30	50	2 ½	20	3	70	100
2.4	Basics of Mechanical and Electrical Engg.	6	-	2	5	20	10	30	50	2 ½	20	3	70	100
2.5	*Basics of Information Technology	-	-	6	2	-	40	40	-	-	60	3	60	100
2.6	General Workshop Practice -II	-	-	8	2	-	40	40	-	-	60	4	60	100
#Student Centred Activities (SCA)		-	-	6	1	-	30	30	-	-	-	-	-	30
Total		16	-	32	22	60	170	230	150	-	220	-	370	600

* Common with other diploma programmes

+ Common with diploma in Mechanical Engg. and Chemical Engg

Student Centred Activities will comprise of co-curricular activities like extension lectures, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

THIRD SEMESTER (CIVIL ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		L	T	P		INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
						Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
3.1	Hydraulics and Hydraulic Machines	6	-	2	5	20	10	30	50	2 ½	20	3	70	100	
3.2	Concrete Technology	6	-	2	5	20	10	30	50	2 ½	20	3	70	100	
3.3	*Environmental Studies	3	-	2	3	20	10	30	50	2 ½	20	3	70	100	
3.4	Structural Mechanics	6	-	2	5	20	10	30	50	2 ½	20	3	70	100	
3.5	Building Construction	6	-	3	6	20	10	30	50	2 ½	20	3	70	100	
3.6	Building Drawings	-	-	8	3	-	40	40	60	3	-	-	60	100	
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30	
Total		27	-	21	28	100	120	220	310	-	100	-	410	630	

* Common with other diploma programmes

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

FOURTH SEMESTER (CIVIL ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME							Total Marks of Internal & External	
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs		Tot
4.1	*Communication Skill-II	4	-	2	4	20	10	30	50	2 ½	20	3	70	100
4.2	Highway Engineering	6	-	2	5	20	10	30	50	2 ½	20	3	70	100
4.3	Irrigation Engineering	5	-	-	4	20	-	20	50	2 ½	-	-	50	70
4.4	Surveying - I	4	-	8	6	20	10	30	50	2 ½	20	3	70	100
4.5	Reinforced Cement Concrete Structures (RCC Structures)	6	-	-	5	20	-	20	50	2 ½	-	-	50	70
4.6	*Energy Conservation	3	-	2	3	20	10	30	50	2 ½	20	3	70	100
4.7	RCC Drawing	-	-	4	2	-	20	20	50	3	-	-	50	70
#Student Centred Activities (SCA)		-	-	2	1	-	30	30	-	-	-	-	-	30
Total		28	-	20	30	120	90	210	350	-	80	-	430	640

* Common with other diploma programmes

- **4 weeks industrial training will be organised after 4th Semester exam. The evaluation of industrial training will be done in 5th semester.**

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

FIFTH SEMESTER (CIVIL ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME Periods/Week			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		L	T	P		INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
						Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
-	Industrial Training	-	-	-	2	-	-	-	-	-	50	3	50	50	
5.1	Water and Waste water Engineering	6	-	2	5	20	10	30	50	2 ½	20	3	70	100	
5.2	Railways, Bridges and Tunnels	6	-	-	5	20	-	20	50	2 ½	-	-	50	70	
5.3	Earthquake Engineering	4	-	-	3	20	-	20	50	2 ½	-	-	50	70	
5.4	Soil Mechanics and Foundation Engineering	6	-	2	5	20	10	30	50	2 ½	20	3	70	100	
5.5	Surveying-II	4	-	8	6	20	10	30	50	2 ½	20	3	70	100	
5.6	Waste Water and Irrigation Engineering Drawing	-	-	6	2	-	20	20	50	3	-	-	50	70	
5.7	Universal Human Values	2	-	1	1	-	20	20	-	-	30	3	30	50	
#Student Centred Activities (SCA)		-	-	1	1	-	30	30	-	-	-	-	-	30	
Total		28	-	20	30	100	100	200	300	-	140	-	440	640	

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

Survey Camp of 2 weeks duration to be organized after 5th semester exam.

SIXTH SEMESTER (CIVIL ENGINEERING)

Sr. No.	SUBJECTS	STUDY SCHEME			Credits	MARKS IN EVALUATION SCHEME									Total Marks of Internal & External
		Periods/Week				INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT						
		L	T	P		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot		
-	Survey Camp	-	-	-	2	-	40	40	-	-	60	-	60	100	
6.1	Quantity Surveying and Valuation	6	-	-	5	20	-	20	50	2 ½	-	-	50	70	
6.2	Construction Management, Accounts and Entrepreneurship Development	5	-	-	4	20	-	20	50	2 ½	-	-	50	70	
6.3	Design of Steel Structure	6	-	-	5	20	-	20	50	2 ½	-	-	50	70	
6.4	Steel Structure Drawing	-	-	4	2	-	20	20	50	3	-	-	50	70	
6.5	Software Applications in Civil Engineering	-	-	8	3	-	40	40	-	-	60	3	60	100	
6.6	**Elective:	5	-	-	4	20	-	20	50	2 ½	-	-	50	70	
6.7	Project Work	-	-	10	4	-	40	40	-	-	60	-	60	100	
#Student Centred Activities (SCA)		-	-	4	1	-	30	30	-	-	-	-	-	30	
Total		22	-	26	30	80	170	250	250	-	180	-	430	680	

**Elective :- Any one of the following:

- 6.6.1 Repair and Maintenance of Buildings
- 6.6.2 Plumbing Services
- 6.6.3 Analysis of Structures

Student Centred Activities will comprise of co-curricular activities like extension lectures, self study, games, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities, disaster management and safety etc.

8. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 30 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 10 Marks for general behavior and discipline
(by HODs in consultation with all the teachers of the department)
- ii. 5 Marks for attendance as per following:
(by HODs in consultation with all the teachers of the department)
 - a) 75 - 80% 2 Marks
 - b) 80 - 85% 4 Marks
 - c) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - State/National Level participation
 - b) 10 - Participation in two of above activities
 - c) 5 - Inter-Polytechnic level participation

Note: There should be no marks for attendance in the internal sessional of different subjects.

5.1 WATER AND WASTE WATER ENGINEERING

L T P
6 - 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 | (04 Periods) |
| | 1.1 Necessity and brief description of water supply system. | |
| | 1.2 Sources of water – surface/sub-surface sources | |
| 2. | Quantity of Water | (08 Periods) |
| | 2.1 Water requirement | |
| | 2.2 Rate of demand and variation in rate of demand | |
| | 2.3 Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems) | |
| | 2.4 Population Forecasting | |

3. Quality of Water (05 Periods)
- 3.1 Meaning of pure water and methods of analysis of water
 - 3.2 Physical, Chemical and bacteriological tests and their significance
 - 3.3 Standard of potable water as per Indian Standard
 - 3.4 Maintenance of purity of water
4. Water Treatment (brief introduction) (10 Periods)
- **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
 - 4.4 Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.
 - 4.5 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 (08 Periods)
- **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 (05Periods)
- 6.1 Setting out alignment of pipes
 - 6.2 Excavation for laying of pipes and precautions to be taken
 - 6.3 Handling, lowering and jointing of pipes
 - 6.4 Testing of pipe lines
 - 6.5 Back filling
7. Building Water Supply (02 Periods)
- 7.1 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 (05 Periods)
- 8.1 Purpose of sanitation
 - 8.2 Necessity of systematic collection and disposal of waste

- 8.3 Definition of terms in sanitary engineering
 - 8.4 Collection and conveyance of sewage
 - 8.5 Conservancy and water carriage systems, their advantages and Disadvantages
 - 8.6 (a) Surface drains (only sketches) : various types, suitability
(b) Types of sewage: Domestic, industrial, storm water and its seasonal variation
9. Sewerage System (05 Periods)
- 9.1 Types of sewerage systems, materials for sewers, their sizes and joints
 - 9.2 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 (07 Periods)
- 10.1 Setting out/alignment of sewers
 - 10.2 Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.
 - 10.3 Construction of surface drains and different sections required
- 11 Sewage Characteristics (05 Periods)
- 11.1 Properties of sewage and IS standards for analysis of sewage
 - 11.2 Physical, chemical and bacteriological parameters
12. Natural Methods of Sewerage Disposal (05 Periods)
- 12.1 General composition of sewage and disposal methods
 - 12.2 Disposal by dilution
 - 12.3 Self purification of stream
 - 12.4 Disposal by land treatment
 - 12.5 Nuisance due to disposal
13. Sewage Treatment (10 Periods)
- 13.1 Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams
 - 13.2 Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plainsedimentation 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) Oxidation ditch, duckweed pond, Vermin culture

14. Building Drainage (03 Periods)
- 14.1 Aims of building drainage and its requirements
- **14.2 Different sanitary fittings and installations
- 14.3 Traps
15. Introduction to smart water supply and waste water management (02 Periods)
- ** A field visit may be planned to explain and show the relevant things.

LIST OF PRACTICALS

- 1) To determine turbidity of water sample by (i) JTU (ii) NTU
- 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/teaming 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.
- 13) Testing of pipes (GI, CI, PVC, SWG) as per BJI standards.

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
- Actual Practical Performance
- 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/ NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	05
2	08	10
3	05	06
4	10	12
5	08	10
6	05	06
7	02	20
8	05	06
9	05	06
10	07	07
11	05	06
12	05	06
13	10	12
14	03	06
15	02	02

Total	84	100
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5.2 RAILWAYS, BRIDGES AND TUNNELS

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6 - -

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

(30 Periods)

1. Introduction to Indian Railways
2. Mass Transit System: Metro, Mono-rail, Tube
3. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey
4. Classification of permanent way describing its component parts
5. Rail Gauge: Definition, types, practice in India (gauges in different countries knowledge salce)
6. Rails – types of rails
7. Rail Welding and its types
8. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates
9. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.
10. Ballast: Function of ballast, requirements of an ideal material for ballast
11. Points of Crossings and signalling: Brief description regarding different types of crossings/ signalling
12. Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools

13. Earth work and drainage: Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system
14. Station and yards: purpose and types of stations and yards

PART-II: BRIDGES

(30 Periods)

13. Introduction

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

14. Classification of Bridges

Their structural elements and suitability:

- 14.1 According to life-permanent and temporary
- 14.2 According to deck level – Deck, through and semi-through
- 14.3 According to material –timber, masonry, steel, RCC, pre-stressed
- 14.4 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
- 14.5 IRS, IRC introduction of IRS and IRC
- 14.6 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, Retaining walls, Wing walls and Toe walls

- 16.1 Piers-definition, parts; types –solid (masonry and RCC), open
- 16.2 Abutments and wing walls – definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)
- 16.3 Toe walls: Importance and Functions
- 16.4 Retaining Walls: Types, functions, parts, MSE(Mechanically stabilized earth) walls

17. Bridge bearings

Purpose of bearings; types of bearings – fixed plate, rocker and roller and pin bearing, Elastomeric bearings, PTFE bearing, Sliding bearing.

18. Super structure: Components, features, cross-section and services, footpath, median crash banner, light pole.

19. Maintenance of Bridges

19.1 Inspection of bridges

19.2 Routine maintenance

PART - III: TUNNELS

(24 Periods)

20. Definition and necessity of tunnels, method of tunneling, machinery used in tunneling

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

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

23. Drainage method of draining water in tunnels

24. 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
- Presentations
- Model Making

- Report writing
- 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 Engineerin” 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/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	30	36
2	30	36
3	24	28
Total	84	100

5.3 EARTHQUAKE ENGINEERING

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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
- Understand the concept of predicting the earthquakes
- Understand the provisions of IS 1893, IS 13920 & IS 4326 to safeguard new and existing structures.

DETAILED CONTENTS

1. Elements of Engineering Seismology (08 Periods)
General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Plate Tectonics, Elastic Rebound Theory.
2. Seismic Behaviour of Traditionally-Built Constructions of India (08 Periods)
Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)single degree of freedom system, fundamental time period, mode shapes.
3. Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building. (08 Periods)
4. Introduction to seismic zone of India provision given by IS: 1893: 2002 (part I) static and dynamic loading, base shear calculation. (08 Periods)

5. Seismic provision of strengthening and retrofitting measures for traditionally-built constructions (08 Periods)
6. Provision of reinforcement detailing in masonry and RCC constructions as per IS 13920 and IS 4326. (06 Periods)
7. Introduction to Earthquake early warning system (04 Period)
8. 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 Periods)

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
- Presentation

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. Earthquake Resistant Building Construction by Neelam Sharma
6. e-books/e-tools/relevant software to be used as recommended by AICTE/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	14
2	08	14
3	08	14
4	08	14
5	08	14
6	06	10
7	04	07
8	06	13
Total	56	100

5.4 SOIL MECHANICS AND FOUNDATION ENGINEERING

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6 - 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
- Apply different techniques for improving the engineering properties of soil.

DETAILED CONTENTS

1. Introduction (03 Periods)
 - 1.1 Importance of Soil Studies in Civil Engineering
 - 1.2 Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in UP, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.
 - 1.3 Names of organizations dealing with soil engineering work in India, soil map of India

2. Physical Properties of Soils (06 Periods)
- 2.1 Constituents of soil and representation by a phase diagram
 - 2.2 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
 - 2.3 Simple numerical problems with the help of phase diagrams
3. Classification and Identification of Soils (06 Periods)
- 3.1. Particle size, shape and their effect on engineering properties of soil, particle size classification of soils
 - 3.2 Gradation and its influence on engineering properties
 - 3.3 Relative density and its use in describing cohesionless soils
 - 3.4 Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance including numerical problems
 - 3.5 Field identification tests for soils
 - 3.6 Soil classification system as per IS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil
4. Flow of Water Through Soils (05 Periods)
- 4.1 Concept of permeability and its importance
 - 4.2 Darcy's law, coefficient of permeability, seepage velocity and factors affecting permeability
 - 4.3 Comparison of permeability of different soils as per Indian Standards
 - 4.4 Measurement of permeability in the laboratory
 - 4.5 Simple numerical problems
5. Effective Stress (Concept only) (05 Periods)
- 5.1 Stresses in subsoil
 - 5.2 Definition and meaning of total stress, effective stress and neutral stress
 - 5.3 Principle of effective stress
 - 5.4 Importance of effective stress in engineering problems
6. Deformation of Soils (06 Periods)
- 6.1 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
- 6.2 Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
- 6.3 Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects
- 6.4 Settlement due to construction operations and lowering of water table
- 6.5 Tolerable settlement for different structures as per IS
- 6.6 Simple numerical problems
7. Shear Strength of Soil (10 Periods)
- 7.1 Concept and Significance of shear strength
 - 7.2 Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law
 - 7.3 Determination of shearing strength by direct shear test, unconfined compression test and vane shear test. Drainage conditions of test and their significance
 - 7.4 Stress and strain curve, peak strength and ultimate strength, their significance
 - 7.5 Examples of shear failure in soils
 - 7.6 Numerical problems
8. Compaction (06 Periods)
- 8.1 Definition and necessity of compaction
 - 8.2 Laboratory compaction test (standard and modified proctor test as per IS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts
 - 8.3. Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction
9. Soil Exploration (08 Periods)
- 9.1 Purpose and necessity of soil exploration
 - 9.2 Reconnaissance, methods of soil exploration, Trial pits, borings (auger, wash, rotary, percussion to be briefly dealt)

- 9.3 Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.
- 9.4 Presentation of soil investigation results

10 Bearing Capacity of soil (14 Periods)

- 10.1 Concept of bearing capacity
- 10.2 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure
- 10.3 Guidelines of BIS (IS 6403) for estimation of bearing capacity
- 10.4 Factors affecting bearing capacity
- 10.5 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb
- 10.6 Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity
- 10.7 Plate load test (no procedure details) and its limitations
- 10.8 Simple numerical problems on bearing capacity.

11. Foundation Engineering (10 Periods)

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.

12. Ground improvement techniques (05 Periods)

Pre-loading, vibro compaction, stone columns, soil nailing, grouting, sand drain.

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 samples 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 behavior 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
- Actual Practical Performance
- Presentation
- 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/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	03	04
2	06	07
3	06	07
4	05	07
5	05	06
6	06	07
7	10	12
8	06	07
9	08	09
10	14	16
11	10	12
12	05	06
Total	84	100

5.5 SURVEYING – II

L T P
4 - 8

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 Periods)

Concept of contours, purpose of contouring, contour interval and horizontal equivalent, 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 (14 Periods)

Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; 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 Periods)

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 (10 Periods)

4.1 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

4.2 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

4.3 Vertical curve

Setting out of a vertical curve

5. Introduction to the use of Modern Surveying equipment and techniques such as (08 Periods)

- a) EDM or Distomat

- b) Planimeter (Digital)
 - c) Total station
 - d) Introduction to remote sensing and GPS
 - e) Auto level
 - f) Digital theodolite
6. Total station- installation, calibration concept of coordinate system (04 Periods)
7. Analysis of data, plotting, Remote sensing , GIS & GPS concept and application in various fields (04 Periods)

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

- Mid-term and end-term written tests
- Actual Practical Performance
- 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/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	14
2	14	25
3	08	14
4	10	18
5	08	14
6	04	08
7	04	07
Total	56	100

5.6 WASTE WATER & IRRIGATION ENGINEERING DRAWING

L	T	P
-	-	6

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

1. Drains and Sewers
 - 1.1 Cross section of standard types of open drains (circular, V-shaped and U-shaped) with their foundations
 - 1.2 Cross section of earthen ware and RCC sewer pipes
 - 1.3 Cross sections of masonry sewers (circular and egg shaped)
2. Traps, manholes and inspection chamber

- 2.1 Detailed section of floor trap and gully trap
 - 2.2 Detailed plan and section of an inspection chamber
 - 2.3 Detailed plan and section of a manhole
3. Septic Tank and Soak Pit
- Detailed plan and cross sections of a domestic septic tank for 10 users. Draw detailed X-section of an empty soak pit and filled soak.
4. Bath room and W.C connections:
- 4.1 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. Study of drawing of 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:

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.
2. Layout plan of a canal head works
3. 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
5. Cross section of a tubewell with pump house.

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 and Part B of equal 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 sheets
- Model Making

RECOMMENDED BOOKS

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

Websites for Reference:

<http://swayam.gov.in>

5.7 Universal Human Values

L-T-P
2-0-1

Course Objectives

This introductory course input is intended

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature

Thus, this course is intended to provide a much needed orientational input in value education to the young enquiring minds.

Course Methodology

1. The methodology of this course is explorational and thus universally adaptable. It involves a systematic and rational study of the human being vis-à-vis the rest of existence.
2. It is free from any dogma or value prescriptions.
3. It is a process of self-investigation and self-exploration, and not of giving sermons. Whatever is found as truth or reality is stated as a proposal and the students are facilitated to verify it in their own right, based on their Natural Acceptance and subsequent Experiential Validation.
4. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and then to continue within the student leading to continuous self-evolution.
5. This self-exploration also enables them to critically evaluate their pre-conditionings and present beliefs.

The syllabus for the lectures is given below:

- After every two lectures of one hour each, there is one hour practice session.
- The assessment for this subject is as follows:
- Sessions Marks (Internal): 20
- Practical Marks (External): 30
- Total Marks: 50

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education
2. Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

1. Understanding human being as a co-existence of the sentient 'I' and the material the Body'
2. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure *Sanyam* and *Swasthya*
-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. *Understanding Harmony in the family – the basic unit of human interaction*
2. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*;
 - a. Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship
3. Understanding the meaning of *Vishwas*; Difference between intention and competence
4. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
5. Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitvaas* comprehensive Human Goals
6. Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyawastha*)- from family to world family!
-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
3. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
4. Holistic perception of harmony at all levels of existence
-Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics:

- a) Ability to utilize the professional competence for augmenting universal human order
 - b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
 - c) Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
 6. Strategy for transition from the present state to Universal Human Order:
 - a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - b) At the level of society: as mutually enriching institutions and organizations
 7. To inculcate Human Values among Students: The Role of self, Parents and Teachers
-Practice Exercises and Case Studies will be taken up in Practice Sessions.

Practical Session also Includes Different Yogic Exercises and Meditation Session

INSTRUCTIONAL STRATEGY

The content of this course is to be taught on conceptual basis with plenty of real world examples.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests,
- Mid-term and end-term written tests
- Practical assessment

Reference Material

The primary resource material for teaching this course consists of

a. The text book (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

b. The teacher's manual (Latest Edition)

R.R Gaur, R Asthana, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi.

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, *Indian Ethos and Modern Management*, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Purblishers.
3. Sussan George, 1976, *How the Other Half Dies*, Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity*, The Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, *limits to Growth*, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming*, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ekParichay*, Divya Path Sansthan, Amarkantak.

8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Value Education websites, <http://uhv.ac.in>, <http://www.aktu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, *An Inconvenient Truth*, Paramount Classics, USA
4. Charlie Chaplin, *Modern Times*, United Artists, USA
5. IIT Delhi, *Modern Technology—the Untold Story*
6. Case study Hevade Bazar Movie
7. RC Shekhar , *Ethical Contradiction* , Trident New Delhi
8. *Gandhi A.*, *Right Here Right Now*, Cyclewala Production

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allotted (%)
1	08	20
2	08	20
3	08	20
4	08	20
5	10	20
Total	42	100

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 OUTCOMES

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

- Interpret the contours
- Work in a teamwork
- Mark a road alignment of (L-section, Cross-section) 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 on Auto Cad. 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

6.1 QUANTITY SURVEYING AND VALUATION

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6 - -

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 (04 Periods)
2. Types of estimates (08 Periods)
 - 2.1 Preliminary estimates
 - Plinth area estimate
 - Cubic content estimate
 - 2.2 Detailed estimates

- Definition, Type of detailed estimate- Detail estimate you new work, Revised Estimate, Supplementary estimate, Maintenance and Repair estimate
- Stages of preparation – details of measurement and calculation of quantities and abstract

3. Measurement (08 Periods)
 - 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 and Abstract Estimates from Drawings by following CSR rates for: (08 Periods)
 - 4.1 A small residential building with a flat roof comprising of
 - Two rooms with W.C., bath, kitchen and verandah
 - 4.2 Earthwork for unlined channel
 - 4.3 WBM road and pre-mix carpeting
 - 4.4 Single span RCC slab culvert
 - 4.5 Earthwork for plain and hill roads
 - 4.6 RCC work in beams, slab, column and lintel, foundations
 - 4.7 10 users septic tank

5. Calculation of quantities of materials for (Periods)
 - 5.1 Cement mortars of different proportion
 - 5.2 Cement concrete of different proportion
 - 5.3 Brick/stone masonry in cement mortar of different proportion
 - 5.4 Plastering, pointing and painting
 - 5.5 D.P.C. and flooring
 - 5.6 Steel in beam, slab, column, foundation

6. Analysis of Rates (08 Periods)
 - 6.1 Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads
 - 6.2 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 along with lead diagram
- RCC in roof slab/beam/lintels/columns
- Brick masonry in cement mortar
- Cement Plaster
- White washing, painting- RCC foundation

6.3 C.C Flooring

Standard schedule of rates, full rates and labour rates

7 Contractorship (08 Periods)

- 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) (12 Periods)

- 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 (06 Periods)

- 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

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
- 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/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	04	05
2	08	10
3	08	10
4	20	24
5	08	10
6	08	10
7	08	10
8	12	14
9	06	07
Total	84	100

6.2 CONSTRUCTION MANAGEMENT, ACCOUNTS AND ENTREPRENURESHIP DEVELOPMENT

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
- Knowledge of scope and benefit of Entrepreneurship
- Know about the various program running in India, state Govt.
- Know about leadership qualities

DETAILED CONTENTS THEORY

CONSTRUCTION MANAGEMENT

- | | | |
|-----|---|--------------|
| 1. | Introduction | (06 Periods) |
| 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
- 1.6 The construction team: owner, engineer, architect and contractors, their functions and inter-relationship
- 1.7 Resources for construction industry

- 2. Construction Planning (08 Periods)
 - 2.1 Importance of construction planning
 - Stages of construction planning
 - Pre-tender stage
 - Contract stage
 - Contracts and e-tendering
 - Different types of contracts
 - Penalties and Arbitration
 - 2.2 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
 - 2.3 Scheduling by network techniques
 - Introduction to network techniques; PERT and CPM, differences between PERT and CPM terminology

- 3. Organization (02 Periods)
 - 3.1 Types of organizations: Line, line and staff, functional and their characteristics

- 4. Site Organization (06 Periods)
 - 4.1 Principle of storing and stacking materials at site
 - 4.2 Location of equipment
 - 4.3 Preparation of actual job layout for a building
 - 4.4 Organizing labour at site

- 5. Construction Labour (06 Periods)
 - 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)

- Acts relating to Labour Safety
6. Control of Progress (08 Periods)
- 6.1 Methods of recording progress
- 6.2 Analysis of progress
- 6.3 Taking corrective actions keeping head office informed
- 6.4 Cost time optimization for simple jobs - Direct and indirect cost, variation with time, cost optimization
7. Inspection and Quality Control (07 Periods)
- 7.1 Need for inspection and quality control
- 7.2 Principles of inspection
- 7.3 Stages of inspection and quality control for
- Earth work
 - Masonry
 - RCC
 - Sanitary and water supply services
8. Accidents and Safety in Construction (08 Periods)
- 8.1 Accidents – causes and remedies
- 8.2 Safety measures for
- Excavation work
 - Drilling and blasting
 - Hot bituminous works
 - Scaffolding, ladders, form work
 - Demolitions
- 8.3 Safety campaign and safety devices, safety training
- 8.4 Fire safety

ACCOUNTS

9. Public Work Accounts (10 Periods)
- 9.1 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.

9.2 Filling of PWD accounts forms

10. Entrepreneurship (09 Periods)

Definition and concept, role and significance, risk and awards, Requirement of an entrepreneur development, Programmes Existing in India, Forms of business enterprises, sole proprietorship-partnership-private limited- cooperatives.

Industrial legislation and taxes:

- GST
- Income Tax
- Excise duty
- Labourcess

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
- Presentations
- 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/ NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	08
2	08	10
3	02	04
4	06	08
5	06	12
6	08	12
7	07	10
8	08	12
9	10	12
10	09	12
Total	70	100

6.3 DESIGN OF STEEL STRUCTURES

L T P
6 - -

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.

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

DETAILED CONTENTS

1. Structural Steel and Sections: (06 Periods)
 - 1.1 Properties of structural steel
 - 1.2 Designation and classification of structural steel sections as per IS handbook and IS: 800: 2007
 - 1.3 Tubular Sections
2. Riveted Connections (10 Periods)

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 member (No staggered rivetting)
3. Bolt Connections: (10 Periods)

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: (10Periods)
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 (10 Periods)
Analysis and design of single and double section tension members and their rivetted and welded connections with gusset plate as per IS:800-2007. Introduction to Lug Angle and Tension splice.
6. Compression Members (10 Periods)
Angle struts, type of section used, effective length, radius of gyration, slenderness ratio and its limits, permissible compressive stress Analysis and design of single and double angle sections compression members subjected to axial load. Introduction to analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on lacing and battening)
7. Roof Trusses (08 Periods)
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 (08 Periods)
Types of column bases i.e. slab base, gusseted base. Design of slais base and concrete block. Introduction to gusseted base (no numerical problems on gusseted base). Introduction to beam columns design of simple built up beams (Symmetrical I section with cover plates only)
9. Beams (08 Periods)
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 (04 Periods)

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
- Model Making
- 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/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	70
2	10	12
3	10	12
4	10	12
5	10	12
6	10	12
7	08	10
8	08	10
9	08	10
10	04	03
Total	84	100

6.4 STEEL STRUCTURES DRAWINGS

L T P
- - 4
RATIONALE

Diploma holders in Civil Engineering are required to supervise the construction of steel structures. 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

- 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

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

MEANS OF ASSESSMENT

- Assignments and quiz/class tests

- Mid-term and end-term written tests
- Model Making
- Drawing sheets
- Software installation and operation
- Viva-voce

RECOMMENDED BOOKS

1. Civil Engineering Drawing by Layal JS; SatyaParkashan, 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. Steel Structures Design and Drawing by SinghBirinder; Kaption Publishing House, New Delhi
6. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

6.5 SOFTWARE APPLICATIONS IN CIVIL ENGINEERING

L T P
- - 8

RATIONALE

Computer applications plays 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 softwares 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/MS Project Primavera Project Planner, Auto CIVIL 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

- Mid-term and end-term written tests
- Presentations
- Software installation and operation
- Viva-voce

6.6.1 REPAIR AND MAINTENANCE OF BUILDINGS

L T P
5 - -

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 Periods)
 - 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 Periods)
 - 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
 - 2.3 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 (10 Periods)
 - 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 (10 Periods)
 - 4.1 Define defects 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 Column and Beams
 - 4.3.4 Roof and Terraces
 - 4.3.5 Joinery
 - 4.3.6 Decorative and protective finishes
 - 4.3.7 Services
 - 4.3.8 Defects caused by dampness

5. Materials for Repair, maintenance and protection (12 Periods)
 - 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 Waterproofing systems for roofs
 - 5.2.7 Protective coatings

6. Remedial Measures for Building Defects (22 Periods)
 - 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 surface defects 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 guniting 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 Form and pump
 - 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 Waterproofing 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 systems and 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

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
- Presentations
- Report Writing
- Repair work
- 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/UBTE/NITTTR, Chandigarh.

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	06	05
2	10	07
3	10	07
4	10	07
5	12	10
6	22	14
Total	70	50

6.6.2 PLUMBING SERVICES

L T P
5 - -

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 geyser, etc.

DETAILED CONTENTS

1. Plumber's Tools (10 Periods)

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 (15 Periods)

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, relevant IS codes are to be taught.

3. Water Supply System (10 Periods)

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 (15 periods)

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 (10 Periods)

Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Popup waste, water efficient appliance.

6. Heating System (10 Periods)

Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

The teacher will ensure demonstration of following during teaching session:

1. Practice cutting, threading and bending of metal pipes; cutting and shaping of PVC pipes

2. Carry out simple pipe connections requiring use of bends, tees, elbows etc.
3. Test drainage lines by using different testing methods as per IS codes
4. Practice fixing of different valves
5. 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

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

Websites for Reference:

<http://swayam.gov.in>

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	10	15
2	15	20
3	10	15
4	15	20
5	10	15
6	10	15

Total	70	100
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6.6.3 ANALYSIS OF STRUCTURES

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5 - -

RATIONALE

Analysis of structures is the core subject of Civil Engineering knowledge of this subject is essential for a Civil Engineer to understand the behaviour of structure under various forces. Study of subjects will help the students to understand clearly the need of reinforcement in various structural elements made or reinforce concrete. Knowledge of the subject will be very useful while operating structural analysis software.

LEARNING OUTCOME

After understanding the subject student will be able to:

- Calculate various forces and moments used in design of structures
- Calculate shear force and bending moment in redundant beams and frames
- Calculate design moments and shear force in framed structures with different support conditions
- Design of elementary profile of dam by fixing the base width
- Understand the effect of wind force on vertical structures like chimneys
- Use structural analysis softwares

DETAIL CONTENT

1. Fixed and continuous Beams (08 Periods)

Calculation of fixed end moments using moment theorem and to draw bending moment and shear force diagrams. Three moment theorem (no derivation) for continuous beams and to draw shear force and bending moment diagrams.

2. Principal stress and strain (08 Periods)

Stress on inclined planes, principal plane and principal stress in elements subjected to direct and shear stress and their combinations. Mohr Circle for calculation of stress on inclined planes and principal strain for above cases

3. Combined Direct and Bending stress (08 Periods)

Eccentric loading middle third rule columns subjected to uni-axial and bi-axial eccentric loading. Dams- application of middle third rule for fixing the base width calculation of stresses at the base of dam and stability of dam against overturning and sliding vertical structures like chimney subjected to movement due to wind forces.

4. Strain Energy (14 Periods)

Strain energy stored in a member due to axial loading and vinding. Strain energy stored by a beam due to uniform vending moment. Work done by a force on a member law of reciprocal deflection, Betti's law. The first thorem of castigliano. Deflection of truss joints.

5. Redundant frames (10 Periods)

Statically indeterminate structures. The second theorem of castigliano redundant trusses Degree of redundancy. Portal frames further application of principle of least work.

6. Moment Distribution Method (12 Periods)

Basic proposition relative stiffness, continuous beams with and without fixed ends. Sinking of support portal frames with and without sway (simple problem only)

7. Slope Deflection Method (10 Periods)

Basic concepts, stiffness of members with far end fixed or linged. Development of slope deflection equations and their application to beam and frames.

RECOMMENDED BOOKS

- Analysis of structures by Rama murtham
- Analysis of structures by R.S Khurmi
- Analysis of structures by Vazirani&Ratwani Vol I & II

MEANS OF ASSESSMENT

- Assignments
- Subject Quiz
- Presentation
- Viva-voce
- Midterm and Semester exam

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allotted (%)
1	08	12
2	08	12
3	08	10
4	14	20
5	10	14

6	12	18
7	10	14
Total	70	100

6.7 PROJECT WORK

L T P
- - 10

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 firsthand 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. Review/ and existing for various parameters as per green building, Raling system 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. Study of 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:13920
22. Design of car parking in your polytechnic
23. To prepare analysis of rates for non -schedule items e.g. aluminium door, windows, work stations etc.
24. Study of retrofitting of a given Civil Engineering works.
25. Survey of your polytechnic by using total station.
26. Traffic volume study and analysis on different roads in a city
27. Case study of a flyover with regard to its various construction components
28. Study and preparation of detailed project report of ready mix concrete (RMC) unit
29. 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 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:

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.

	Range of maximum marks	Overall grade
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

10. RESOURCE REQUIREMENT

10.1 PHYSICAL RESOURCES

(A) Space requirement

Norms and standards laid down by All India Council for Technical Education (AICTE) are to be followed to work out space requirement in respect of class rooms, tutorial rooms, drawing halls, laboratories, space required for faculty, student amenities and residential area for staff and students.

(B) Equipment requirement:

Following Laboratories are required for Diploma Programme in Civil Engineering:

- Communication Laboratory
- Applied Physics Laboratory
- Applied Chemistry Laboratory
- Engineering Drawing
- Electrical Engineering Laboratory
- Applied Mechanics Laboratory
- Basics of IT/Computer Laboratory
- Carpentry Shop
- Painting and Polishing Shop
- Electrical Shop
- Welding Shop
- Fitting and Plumbing Shop