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## 1. EMPLOYMENT OPPORTUNITIES FOR DIPLOMA HOLDERS IN CIVIL ENGINEERING

In our country more than 60 percent of plan (budget goes to construction activities/industry, directly or indirectly. According to the latest information available in eight five year plan (1992-97) much of the country's development' work, especially in rural and sub urban areas, is still pending, awaiting urgent attention. As per the plan document. 31 million units of shelter are required to be constructed; 3000 hard-cave problem villages remain in the category of 'No Source' and 1.5 lakh 'partially covered' villages having safe drinking water supply level less than 40 liters per capital per day within a walking distance of 1.6 kilometers or an elevation difference of 100 meters, less than 11 percent of country's total population have access to proper sanitation facilities; out of 5,67,000 villages in the country only 2,61,000 (46 percent) have all weather or fair weather road connectivity. 76.8 million hectare area is under irrigation out of potential 107 million hectare area which can be irrigated if water resources are fully exploited/managed. It has also been experienced that we construct good building but in the course of time they require continuous repair and maintenance. A realization is thus growing and picking up moments, particularly in urban sector for keeping the building and other structures in perfect condition. These and many more potential exist where civil engineering diploma holders can get wage/self employment.

There is considerable, scope of employment of diploma holders in civil engineering in service sector like repair and maintenance of buildings and building services. Marketing of new building material! is another potential area of employment. Polytechnics should provide knowledge and associated skills in the above areas and entrepreneurial support system should provide soft loans and guidance to such diploma holders.

There is a need to establish networking with selected number of field organizations for effective implementation of diploma course in civil engineering. Involvement of construction industry in providing appropriate professional experience to the students during course, involvement of professionals in teaching learning process, structured and supervised field visits to students, field oriented project activity to students are some of the areas of collaboration. Continuous interaction with world of work will bridge the gap, promote better rapport, develop appropriate professional competencies in the students and this may lead to better employment opportunities to diploma holders.

In the times to come, wage employment, particularly in the government sector is likely to dwindle. Polytechnics will have to provide guidance and career counseling to the entrants. Polytechnics will have to provide guidance and career counseling to the entrants, for promoting undertaking self-employment ventures like sub contractor ship, undertaking repair and maintenance services and installation of sanitary and water supply systems etc. In addition, students need to be counseled for opting their career in private sector for which Polytechnics have to build necessary linkages with reputed construction companies in the private sector.

Thus major employment of diploma holders in civil engineering is envisaged in the following construction organizations/departments.

1. Construction Industry in Private and Public Sector
- 2.. Self employed as Civil Engineering Contractor
- 3.. State and Central Public Works Departments and other Government undertakings.
4. State and Central Pollution Control Board

## 2. COMPETENCY PROFILE OF DIPLOMA HOLDERS IN CIVIL ENGINEERING

Based on employment opportunities and activity profile of diploma holders in civil engineering, following competency profile is arrived at :

1. Skill in preparing, reading and interpreting drawing pertaining to civil engineer and allied works
2. Knowledge of various types of construction materials and their characteristics
3. Knowledge of various construction techniques and ability to supervise various civil works such as buildings, industrial structures, bridges, tunnels roads, irrigation structures, water works etc.
4. Understanding of concepts I principles and practices in making concrete and concreting operations for different types of civil works
5. Knowledge of the principles and methods of surveying and skills in conduction Surveys
6. Knowledge of behavior of various types of soils and their use for civil works
7. Knowledge in the analysis and design of simple structural elements in concrete and steel and skill of preparing and reading detailed structural drawings
8. Competencies in estimating land costing and contracting of civil works including measurement and billing
9. Knowledge of planning, scheduling, controlling and skill of supervising civil works
10. Skill in managing construction materials, equipment, manpower and cash flow
11. Competencies in maintenance, repairs and upkeep of building
12. Knowledge of principles of water supply and sanitary engineering and methods J treating water and sewage
13. Knowledge of applied sciences and engineering sciences so as to develop scientific temper and facilitate understanding of technical subjects
14. Knowledge of interpersonal relations and skills in communication
15. Knowledge of appropriate attitude and values
16. Skill in using computers in the field of civil engineering
17. Awareness regarding hazards, safety measures at construction site
18. Awareness regarding facilities and support system to promote entrepreneurship among diploma holders
19. Awareness regarding ecology and environment engineering
20. Awareness about Contract laws & regulation. Disaster Management.

15	Knowledge of appropriate attitude and values	- Project work
16	Skill in using computer in the field of construction engineering	- Introduction to computers - Computer applications
17	Skills to preparation of drawing using Auto CAD	- CAD in Civil Engineering Practice
18	Awareness regarding facilities and support system to promote entrepreneurship amongst diploma holders	- Entrepreneurship Development
19	Awareness regarding ecology and environment engineering and values	- Environmental Education
20	Knowledge & conservation of non conventional sources	- New & Non Renewable Source of Energy
21	Knowledge of Earthquake & Disaster Management	- Introduction to Seismic Planning & Disaster Management
22	Knowledge of pollution from industry and its control	- Industrial waste treatment
23	Knowledge of laws & regulation regarding contract of Civil works	- Contract Laws & Regulation

3. DERIVING CURRICULUM AREAS FROM COMPETENCY PROFILE

	COMPETENCY	CURRICULUM AREAS
1.	Skills in preparing, reading and interpreting drawings pertaining to civil engineering and allied works	<ul style="list-style-type: none"> <li>- Engineering Drawing</li> <li>- Building Drawing</li> <li>- Irrigation Drawing</li> <li>- PHE Drawing</li> </ul>
2.	Knowledge of various types of construction materials and their characteristics	<ul style="list-style-type: none"> <li>- Construction Material</li> </ul>
3.	Knowledge of various construction techniques and ability supervise various civil works such as buildings, industrial structures, bridge tunnels, roads, irrigation structures, water works etc.	<ul style="list-style-type: none"> <li>- Building construction</li> <li>- Transportation Engineering</li> <li>- Irrigation Engineering</li> <li>- Water and waste water Engineering</li> </ul>
4.	Understanding of concepts, principles and practices in making concrete and concreting operations for different types civil works	<ul style="list-style-type: none"> <li>- Concrete Technology</li> </ul>
5.	Knowledge of the principle and methods of surveying and skills in conducting surveys	<ul style="list-style-type: none"> <li>- Surveying</li> </ul>
6.	Knowledge of behavior of various types of soils and their use for civil works	<ul style="list-style-type: none"> <li>- Soil and Foundation Engineering</li> </ul>
7.	Knowledge in the analysis and design of simple structural elements in concrete and steel and skill of preparing and reading detailed structural drawing	<ul style="list-style-type: none"> <li>- Analysis of Structures</li> <li>- RCC</li> <li>- Steel Design</li> </ul>
8.	Competencies in estimating and costing and Contracting of civil works including measurement and billing	<ul style="list-style-type: none"> <li>- Estimating, Costing and Contracting</li> </ul>
9.	Knowledge of planning scheduling controlling and skill of supervising civil works	<ul style="list-style-type: none"> <li>- Construction Management</li> <li>- Professional Studies</li> </ul>
10.	Skill in managing construction materials, equipment, manpower and cash flow	<ul style="list-style-type: none"> <li>- Construction Management</li> </ul>
11.	Competencies in maintenance repairs and upkeep of buildings	<ul style="list-style-type: none"> <li>- Maintenance of Rehabilitation of Structures</li> </ul>
12.	Knowledge of principles of water supply and sanitary engineering and methods of treating water and sewage	<ul style="list-style-type: none"> <li>- Water Supply &amp; Waste Water Engineering</li> </ul>
13.	Knowledge of applied sciences and engineering sciences so as to develop scientific temper and facilitate understanding of technical subjects	<ul style="list-style-type: none"> <li>- Applied Maths</li> <li>- Applied Physics</li> <li>- Applied Chemistry</li> <li>- Applied Mechanics</li> <li>- Workshop Practices</li> </ul>
14.	Knowledge of interpersonal relations and skills in communication	<ul style="list-style-type: none"> <li>- English and Communication Techniques</li> </ul>

**STUDY AND EVALUATION SCHEME : CIVIL ENGINEERING**

Firth Semester

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS	MAX MARKS	HRS	
CM-102	Communication Techniques-1	3	1	-	50		100	3	-	-	150
BS-112	*Applied Mathematics-1	3	2	-	50	-	100	3	-	-	150
BS-214	*Applied Chemistry	4	-	2	50	25	100	3	50	3	225
ES-120	*Applies Mechanics	3	2	2	50	25	100	3	50	3	225
ES-121	Engineering Drawing	4	-	6	-	50	100	4	-	-	150
MF-131	Elements of Electrical Engineering	3	-	2	25	25	100	3	50	3	200
	**Student Centered Activities	-	-	3	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>20</b>	<b>5</b>	<b>15</b>	<b>225</b>	<b>125</b>	<b>600</b>		<b>150</b>		<b>1100</b>

Common with Mechanical Automobile and Electrical Engineering Courses

\*\*Students Centered activities will include extension lectures field visits, soft skills seminars, debates, hobby clubs, library students awareness regarding ecology and environment conservation of energy (Petroleum products, electricity etc). social service camps and other co-curricular activities including games. Advanced planning for each semester had got to be made



#### 4. ABSTRACT CURRICULUM AREAS

1. English and Communication Techniques
2. Applied Mathematics
3. Applied Physics
4. Applied Chemistry
5. CAD in Civil Engineering Practice
6. Engineering Drawing
7. Applied Mechanics
8. Hydraulics
9. Elements of Mechanical Engineering
10. Elements of Electrical Engineering
11. Workshop Practice
12. Structural Mechanics
13. Transportation Engineering
14. Construction Materials
15. Building Construction
16. Civil Engineering Drawing
17. Concrete Technology
18. Irrigation Engineering
19. Water Supply System & Treatment
20. Soil and Foundation Engineering
21. Surveying
22. Elements of RCC Design
23. Elements of Steel Design and Drawing
24. Estimating, Costing and Contracting
25. Construction Management
26. Field/practice Based Project Work
27. Practical Training
28. Waste water Treatment Disposal
29. Elective-I (Any one of the following)
30. Maintenance and Rehabilitation of Structure
31. Rural Technology
32. Railways, Bridges and Tunnels
33. Town Planning
34. New & Non Renewable Source of Energy
35. Elective-II (Any one of the following)
36. Advanced construction technology
37. Introduction to Seismic Planning & Disaster Management
38. Entrepreneurship Development
39. Water shed Management
40. Urban & Rural Sanitation
41. Industrial Waste Treatment
42. Energy Conservation Technology in Building Construction
43. Contract Laws & Regulations

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING**

**Third Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICAL	THEORY		PRACTICAL		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS	MAX MARKS	HRS	
ES-320	Hydraulics	3	2	2	60	25	100	3	50	3	225
CE330	Structural Mechanics	4	2	2	50	25	100	3	50	3	150
CE-331	Construction Material	4	-	2	50	25	100	3	50	3	150
CE-302	Building Construction	4	-	2	50	25	100	3	50	3	225
CE-333	Civil Engineering Drawing -1	-	-	6	-	50	100	3	-	-	225
CE-340	Water & waste water Engineering	4	-	2	25	25	100	3	50	3	200
** Students Centered Activities (Value Based Education Not for Exam)		-	-	1	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>19</b>	<b>4</b>	<b>17</b>	<b>225</b>	<b>175</b>	<b>600</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>1250</b>

\*\* Student Centered activities will include extension lectures, field visits, soft skills , seminars debates, hobby, clubs library studies, awareness regarding ecology and environment conservation of energy (Petroleum products, electricity etc). social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING**

**Second Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
BS-212	*Applied Mathematics-II	3	2	-	50	-	100	3	-	-	150
BS-213	*Applied Physics	4		2	50	25	100	3	50	3	225
BE-131	*Elements of Mechanical Engineering	3	-	2	25	25	100	3	50	3	200
ES-122	*Introduction to Computers	1	-	4	-	50	-	-	100	3	150
CT-434	Surveying - I	3	2	6	50	25	100	3	50	3	225
CE-230	Workshop practice	-	-	6	-	50	-	-	100	3	150
** Students Centered Activities (Value Based Education Not for Exam)		-	-	2	-	-	-	-	-	-	-
<b>TOTAL</b>		14	4	22	175	175	400	-	350	-	1100

\* Common with Mechanical Automobile and Electrical Engineering

\* Course common with Automobile and Electrical Engineering.

\*\* Student Centered activities will include extension lectures, field visits, soft skills , seminars debates, hobby, clubs library studies, awareness regarding ecology and environment conservation of energy (Petroleum products, electricity etc). social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING**

**Fifth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CE-432	Civil Engineering-II	-	-	6	-	100	100	3	-	-	200
CE-546	CAD Civil Engineering Practice	-	-	4	-	100	100	3	-	-	200
CE-530	Elements of RCC Design	5	2	-	100	-	100	3	-	-	200
CE-540 To 545	Elective-1	3	1	-	50	-	100	3	-	-	150
CE-549	Practical Training	-	-	18	-	100	-	-	300 (Viva)	-	400
**	Students Centered Activities (Value Based Education )(Not for Exam)	-	-	1	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>8</b>	<b>3</b>	<b>29</b>	<b>150</b>	<b>300</b>	<b>400</b>	<b>-</b>	<b>300</b>	<b>-</b>	<b>1150</b>

\*\* Student Centered activities will include extension lectures field visits, soft skills, semester regarding ecology and environment, conservation of energy (Petroleum product, electricity etc). social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

**Elective – I (Any one of the following)**

- CE-540 Statement & Rehabilitation of Structures
- CE-541 Rural Technology
- CE-542 Railway, Bridges and Tunnel
- CE-640 Advanced construction Technology
- CE-543 New & Non Renewable Service Energy
- CE-547 Town Planning

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING**

**Fourth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CE-430	Concrete Technology	3	-	2	50	25	100	3	50	3	225
CM-401	*Communication Technique	3	1	-	50	-	100	3	-	-	150
CE-440	Analysis of Structures	4	2	-	50	-	100	3	-	-	150
CE-433	Soil and Foundation Engineering	3	-	2	50	25	100	3	50	3	225
CE-532	Surveying - II	3	1	6	50	25	100	3	50	-	225
CE-441	Estimating & Costing	2	-	3	50	25	100	3	-	-	175
CE-231	Field Work Exposure	-	-	4	25	-	-	-	75 (Viva)	-	100
** Students Centered Activities (Value Based Education Not for Exam)		-	-	1	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>18</b>	<b>4</b>	<b>18</b>	<b>325</b>	<b>100</b>	<b>600</b>	<b>-</b>	<b>225</b>	<b>-</b>	<b>1250</b>

\*\* Student Centered activities will include extension lectures, field visits, soft skills , seminars debates, hobby, clubs library studies, awareness regarding ecology and environment conservation of energy (Petroleum products, electricity etc). social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made.

In order to determine the division in which a candidate shall be placed at the end of the course, the following criteria shall be observed:-

(a) Three year Diploma- (I to VI Semester)

I year (I & II Semester)	-	20%
II year (III & IV Semester)	-	40%
III year (V & VI Semester)	-	40%

b) Vocational Stream (III to VI Semester): (Direct II year admission)

II year (III & IV Semester)	-	40%
III year (V & VI Semester)	-	60%

NOTE : For awarding of Diploma all the papers of Diploma Examinations should be cleared within the course duration plus two years For Regular/Part-time Diploma & Post Diploma Programmes:

70% and above Distinction	-	1 Division with
60% and above and less than 70%	-	Division
50% and above and less than 60%	-	II Division
40% and above and less than 50%	-	Pass

In order to determine the division in which a candidate shall be placed at the end of the course, the following criteria shall be observed:-

I year (I & II Semester)	-	50%
II year (III & IV Semester)	-	50%
III year (V & VI Semester)	-	100%
IV year (VII & VIII Semester)	-	100%

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING**

**Sixth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CE-630	Elements of Street Design & Drawing	<W>	1	3	50	25	100	4	-	-	175
CE-631	Construction Management & professional Practice	3	2	-	50	-	100	3	-	-	150
CE-531											
CE-131	Transportation Engg.	4	-	2	50	25	100	3	50	-	225
CE-633											
CE-640, 421,642-624	Irrigation Engg	3	1	-	50	-	100	3	-	-	150
	Project Work	-	-	12	-	100	-	-	300(Viva)	-	400
	Elective - II	3	2	-	50	-	100	3	-	-	150
<b>TOTAL</b>		17	6	17	250	150	500	-	350	-	1250

**Elective – II (Any one out of the following)**

- CE-641 Introduction to Seismic Planning and Disaster Management
- CE-647 Water shed Management
- CE-642 Entrepreneurship Development
- CE-643 Urban & Rural Sanitation
- CE-644 Industrial Waste Treatment
- CE-646 Energy Conservation Techniques in Building Construction
- CE-645 Contact Laws & Regulations

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING(Part- time)8 Semesters**

**Second Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						TOTAL MARKS
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
BS-221	* Applied Mathematics-II	3	2	-	500	-	100	3	-	-	150
BS-213	* Applied Physics	4	-	2	25	25	100	3	50	3	200
EE-131	*Elements of Mechanical Engineering	3	-	2	25	25	100	3	50	3	200
CE-331	Construction Material	5	-	2	25	25	100	3	50	3	200
CE-230	Workshop Practice	-	-	<w>	-	50	-	-	100	3	150
** Student Centered Activities (Value Education (Not for Exam))		-	-	1	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>15</b>	<b>2</b>	<b>13</b>	<b>575</b>	<b>125</b>	<b>400</b>	<b>-</b>	<b>250</b>	<b>-</b>	<b>900</b>

\* Common with Mechanical Automobile and Electrical

\* Course common with Automobile and Electrical Engineering

\*\* Student Centered activities will include extension lectures field visits, seminars, debates, hobby clubs, library studies awareness regarding ecology and environment conservation of energy (Petroleum products electricity etc). social service camps and other co-curricular activities including games .Advanced planning for each semester has got be made



**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING (Part-Time) 8 Semester**

**First Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CM-102	Communication Techniques-1	3	1	-	50	-	100	3	-	-	150
BS-112	*Applied Mathematics-I	3	2	-	50	-	100	3	-	-	150
BS-214	* Applied Chemise	4	-	2	50	25	100	3	50	3	225
ES-120	*Applied Mechanics	5	-	2	<W>	25	100	3	50	3	225
ME-131	Elements of Electrical Engineering	3	-	2	25	25	100	3	50	3	200
** Students Centered Activities		-	-	3	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>18</b>	<b>3</b>	<b>9</b>	<b>225</b>	<b>75</b>	<b>500</b>	<b>-</b>	<b>150</b>	<b>-</b>	<b>950</b>

\* Common with the Mechanical Automobile and Electrical Engineering Courses

\*\* Students Centered activities will include extension lecture, field visits, seminars, debates hobby clubs, awareness regarding ecology environment, conservation of energy (Petroleum products electricity etc).social service camps and other co-curricular activities including games. Advanced planning for each semester has go to be made.

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING (Part-Time) 8 Semester**

Third Semester

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
ES-121	Engineering Drawing	2	-	6	-	50	100	4	-	-	150
CE-434	Surveying	3	1	6	50	50	100	3	50	3	250
ES-320	Hydraulic	3	2	2	50	50	100	3	50	3	250
ES-122	*Introduction to Computer	1	-	4	-	50	-	-	100	3	150
<b>TOTAL</b>		<b>9</b>	<b>3</b>	<b>18</b>	<b>100</b>	<b>200</b>	<b>300</b>	<b>-</b>	<b>200</b>	<b>-</b>	<b>800</b>

**STUDY AND EVALUATION SCHEME: CIVIL ENGINEERING(Part-Time) 8 Semester**

**Fourth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CE-430	Concrete Technology	2	1	2	50	50	100	3	50	3	250
EE-461	*Communication Techniques -II	<w >	1	-	50	-	100	3	-	-	150
CE-440	Analysis of Structure	4	2	-	50	-	100	3	-	-	150
CE-433	Soil and Foundation Engineering	2	1	2	50	50	100	3	50	3	250
CE-532	Surveying-II	3	1	6	50	50	100	3	50	3	250
** Students Centered Activities (Value Based Education Not for Exam)		-	-	2	-	-	-	-	-	-	-
<b>TOTAL</b>		14	6	12	250	150	500	-	150	-	1050

\*\* Students Centered activities will include extension lecture, field visit seminars, debates, hobby clubs, library studies, awareness regarding ecology and environment conservation of energy (Petroleum products electricity etc). social service camps and other co-curricular activities including games Advanced planning for each semester has got to be made

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING(Part-Time) 8 Semester**

**Fifth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICAL	THEORY		PRACTICAL		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS	MAX MARKS	HRS	
CE-333	Civil Engineering Drawing-I	-	-	8	-	50	100	3	-	-	150
CE-340	Water & Waste Water Engineering	4	-	2	25	25	100	3	50	3	200
CE-330	Structural Mechanics	4	2	2	<W>	50	100	3	50	3	250
** Students Centered Activities (Value Based Education)( Not for Exam)		-	-	8	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>8</b>	<b>2</b>	<b>20</b>	<b>75</b>	<b>125</b>	<b>300</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>600</b>

\*\* Students Centered activities will include extension lecture, field visits, seminars, debates hobby clubs, awareness regarding ecology environment, conservation of energy (Petroleum products electricity etc).social service camp and other co-curricular activities including games. Advanced planning for each semester has go to be made.

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING(Part-Time) 8 Semester**

**Sixth Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME							
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS	
					THEORY	PRACTICAL	THEORY		PRACTICAL			
					MAX MARKS	MAX MARKS	MAX MARKS	HRS	MAX MARKS	HRS		
CE-530	Elements of RCC Design	5	2	-	50	-	200	3	-	-	250	
CE-432	Civil Engineering Drawing - II		-	6	-	50	100	3	-	-	150	
CE-441		Estimating & Costing	2	-	3	50	50	100	3	-	-	200
CE-431		Irrigation Engg	3	1	-	50	-	100	3	-	-	150
** Students Centered Activities (Value Based Education Not for Exam)		-	-	8	-	-	-	-	-	-	-	
<b>TOTAL</b>		<b>10</b>	<b>3</b>	<b>17</b>	<b>150</b>	<b>100</b>	<b>500</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>750</b>	

\*\* Students Centered activities will include extension lecture, field visits, seminars, debates hobby clubs, awareness regarding ecology environment, conservation of energy (Petroleum products electricity etc).social service camps and other co-curricular activities including games. Advanced planning for each semester has go to be made.

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING(Part-Time) 8 Semester**

**Eight Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICAL	THEORY		PRACTICAL		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS	MAX MARKS	HRS	
CE-631	Constructi on Managem ent & professional practice  Project Work  Elective - II	3	2	-	25	-	100	3	-	-	125
CE-633		-	-	12	-	100	-	-	200(Viva )	-	300
CE-640,431 ,642-644		3	3	-	50	-	100	3	-	-	150
** Students Centered Activities (Value Based Education Not for Exam)		-	-	7	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>6</b>	<b>5</b>	<b>19</b>	<b>75</b>	<b>100</b>	<b>200</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>575</b>

\*\* Students Centered activities will include extension lecture, field visits, seminars, debates hobby clubs library studies , awareness regarding ecology environment, conservation of energy (Petroleum products electricity etc).social service camps and other co-curricular activities including games. Advanced planning for each semester has go to be made.

Elective – II (Any one out of the following)

- CE-641 Introduction to Seismic Planning and Disaster Management
- CE-647 Water shed Management
- CE-642 Entrepreneurship Development
- CE-643 Urban & Rural Sanitation
- CE-644 Industrial Waste Treatment
- CE-646 Energy Conservation Techniques in Building Construction
- CE-645 Contract Laws & Regulations

**STUDY AND EVALUATION SCHEME CIVIL ENGINEERING(Part-Time) 8 Semester**

**Seventh Semester**

CODE NO.	SUBJECT	STUDY SCHEME PERIOD/WEEK			EVALUATION SCHEME						
		L	T	P	INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				TOTAL MARKS
					THEORY	PRACTICALS	THEORY		PRACTICALS		
					MAX MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS.	
CE-630	Elements of Steel Design & Drawing	4	1	3	50	50	100	4	-	-	200
CE-540 To 545	Elective - I	3	1	-	50	-	100	3	-	-	150
CE-546	CAD in Civil Engineering Practice	-	-	4	-	50	100	3	-	-	150
CE-531	Transportation Engg	4	-	2	50	25	100	3	50	3	225
** Students Centered Activities (Value Based Education Not for Exam)		-	-	8	-	-	-	-	-	-	-
<b>TOTAL</b>		<b>11</b>	<b>2</b>	<b>17</b>	<b>150</b>	<b>125</b>	<b>400</b>	<b>-</b>	<b>50</b>	<b>-</b>	<b>725</b>

\*\* Students Centered activities will include extension lecture, field visits, seminars, debates, hobby, clubs, library studies, awareness regarding ecology and environment, conservation of energy (Petroleum products electricity etc).social service camps and other co-curricular activities including games. Advanced planning for each semester has go to be made.

Elective – II (Any one out of the following)

- CE-540 Maintenance & Rehabilitation of Structures
- CE-541 Rural Technology
- CE-542 Railway, Bridges and Tunnels
- CE-640 Advanced construction Technology
- CE-543 New & Non Renewable Technology
- CE-547 Town Planning

## COMMUNICATION TECHNIQUES – 1

Pds /week      L T P  
3 4 -

### RATIONALE

This course aims at developing reading; writing and communications skills in the students so as to develop confidence in them in written and oral techniques of communication in English language. This course will also help the students in their continuing education needs.

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. The Prose Textbook entitled "A Book of English for Polytechnic Students prepared by National Institute of Technical Teachers' Training and Research (NITTTR), Chandigarh and published by Macmillan India Limited. (30%)

Questions to test the comprehension and critical appraisal of the lesson are to be given. Three questions out of five are to be attempted. Word limit for answer is to be approximately 150 words each.

2. Vocabulary (10%)

Antonyms, synonyms, homonyms and] one-word substitution.

3. Grammar (20%)

A brief review of easy forms of tenses (present indefinite, present continuous, present perfect, present perfect continuous, past indefinite, past continuous, past perfect, past perfect continuous and future indefinite). *Conversions* of direct into indirect narration and vice versa (only simple sentence) Punctuation articles, prepositions, voice, auxiliary (be have, do and models).

4. Comprehension: (20 %)

A passage of 100 - 150 words may be given to test the comprehension skill of the students. Simple question to test the understanding of the contents and vocabulary may be given.

5. Essay (20%)

Choice of attempting one out of free topics may be given. The essay will be of 300 -350 words. Descriptive, narrative and reflective topics from areas such as science, technology, environment, current problems, Socio- economic issues may be given.



## APPLIED MATHEMATICS – I

L T P  
3 2

### RATIONALE

The course aims at developing analytical abilities in basics of applied mathematics such as: <w> algebra, matrices, elementary numerical analysis, coordinate geometry, differential and <w> calculus and solution of first order differential equations. Besides application of above the element in engineering, the course of study will also provide continuing education base to them.

NOTE: Weightage of each topic for external examination is given in the Brackets

### DETAILED CONTENTS

- I. ALGEBRA 15 %
- (i) Arithmetic Progression (A.P.) - its  $n^{\text{th}}$  term, sum to  $n$  terms. Geometric Progression (G.P.) – its  $n^{\text{th}}$  term, sum to  $n$  terms. And infinite Geometric series.
  - (ii) Partial Fractions.
  - (iii) Binomial theorem for positive integral index (without proof), Binomial theorem for any index; Expansions.
2. TRIGONOMETRY 15%
- (i) Sum and difference formulas for trigonometric ratios of angles and their application (without proof). Formula from product to sum. difference and vice-versa. Ratio multiple angles, sub multiple angles (like  $2A$ .  $3A$ .  $A/2$ ).
  - (ii) In a triangle sine formulas, cosine formulas, Napier's analogy. Solution of triangle,
  - (iii) Simple problems on height and distance.
  - (iv) Plotting of curves  $y = f(x)$ .  $f(x)$  being algebraic function (maximum upto third degree) or trigonometric functions (Sine, Cosine. Tangent).
3. COORDINATE GEOMETRY: 40%
- (i) Equation of straight line in various standard form. Intersection of two straight line and angle between them. Concurrent lines, perpendicular distance formula.
  - (ii) General equation of a circle and its characteristics. Equation of a circle given cent and radius, three point form and diametrical form
  - (iii) Definition of a conic section, standard equation of a parabola equation of Parabola given its focus and Directrix. Given the equation of parabola finding its focus axis vertex Directrix and latus section.
  - (iv) Ellipse and hyperbola (standard equation, without derivation) determining the equation of ellipse and hyperbola given the Directrix, focus and eccentricity. Give the equation of the ellipse and hyperbola finding the focii, Directrices, axes, latus rectum, vertex-and eccentricity.
4. VECTOR ALGEBRA. 100%
- (i) concept of a vector. Position vector of a point. Addition and subtraction of vectors
  - (ii) Multiplication of a vector by a scalar product and vector product of two vectors Application to problems on work done and moment (torque)

5.

DETERMINANT AND MATRIX.

20%

- (i) Definitions Evaluation of a determinant of order two and three. Minor and cofactor. Properties of determinants. Solving simultaneous equations by Cramer's rule.
- (ii) concept of a matrix, definitions Transpose of a matrix. Symmetric and  $\langle W \rangle$  Symmetric matrix Diagonal matrix. Unit matrix. Addition and Multiplication matrices. Adjoint and inverse of a matrix, solving simultaneous equations by matrix methods.

## APPLIED CHEMISTRY

L T P  
Pds/week 4 – 2

### RATIONALE

Applied Chemistry had been considered as one of core subject for diploma holder engineering and technology to develop in them scientific temper, appreciation of chief properties of materials and to develop learning to learn skills in the students. This course will with metallurgy, corrosion, and fuels. This will equip them to perform various activates effect Hence the course

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

#### 1. Structure of Atom (10%)

Rutherford model of the structure of atom. Boher's theory of H atom and equation deduced Quantum numbers and their significance, De-Broglie equation and uncertainty principle Electronic configuration of 1 to 30 elements.

#### 2. Periodic Properties of Elements 10%)

Periodic law. Periodic table, periodicity in properties like atomic radii and volume. radii, ionization energy and electron affinity. Division of elements into s.p.d. and f block

#### 3. Chemical Bonds (10%)

Electrovalent. covalent and coordinate bond and their properties. Metallic bonding (cloud model) and properties (like texture, conductance, lusture, ductility and malleability Orbital concept of covalence, hybridization (simple treatment).

#### 4. Fuel and their Classification (10%)

Definition, characteristics. Classification into solid, liquid idea of its refining into various fraction and their characteristics and uses.

#### 5. Water (10%)

Impurities in water, method of their removal, hardness of water, its types, causes removal. Disadvantage of Hard water in boilers pH value and its determination calorimetric method.

#### 6. Chemical equilibrium Law of mass action, equilibrium constant expression, relation between $K_p$ & $K_c$ . Calculation of Equilibrium concentration and constant for dissociation $NH_3$ , $Pcl_5$ ; and 111. characteristics of equilibrium. (10%)

- 7 Metals (10%)  
Cast iron and its properties, effect of sulphur, silicon and phosphorous impurities in cast iron. Elementary knowledge of heat treatment of steels-hardening, tempering, annealing, normalizing and case hardening.
- 8 Alloys (10%)  
Definition classification and necessity for making alloys. Composition, properties and uses of following alloys Brass, Bronze, Gun-metal and Duralumin. Effect of carbon, nickel chromium, manganese on steel.
- 9 Corrosion (10%)  
Its meaning theory of corrosion prevention of corrosion by various methods using metallic and non-metallic coatings
- 10 Plastics and Polymers (10%)  
Plastics-thermo-plastic and thermo setting. Introduction of Polythene. P.V.C. Nylon synthetic rubber and phenol-formaldehyde resin. Their application in industry.

#### LIST OF PRACTICALS

1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of standard oxalic acid solution.
2. Find the strength in grams per litre of given sodium hydroxide solution with the help of standard sodium-carbonate solution and intermediate solution of an acid.
3. Determine the total alkalinity in ppm in the given sample of water using standard sulphuric acid.
4. To find the amount of chloride ions present in water using silver nitrate solution (potassium chromate as indicator)
5. Determine the type of alkalinity in ppm present in a given sample of H<sub>2</sub>O using standard sulphuric acid.

# APPLIED MECHANICS

L T P  
3 2 2

## RATIOALE

The subject Applied Mechanics deal with basic concepts of mechanics like laws of forces moments, friction, centre of gravity, laws of motion and simple machines which are required to the students for further understanding of other applied subjects. Hence this course.

NOTE: Weightage of each topic for external examination is given in the brackets

## DETAILED CONTENTS

1. Introduction (5%)  
Concept of mechanics and applied mechanics – Explanation of mechanics and applied Mechanics, its importance and necessity giving suitable examples on bodies at rest and motion explanation of branches of this subject
2. Laws of Forces (5%)  
Force and its effects. Units and measurement of force. Characteristics of force characteristics representation Bow's notation. Types of forces, action and reaction tension & thrust. Force systems Coplanar and space for system. Coplanar, concurrent and non - concurrent forces. Free body diagrams.  
  
Resultant and components of forces, concept of equilibrium parallelogram law of forces. Equilibrium of two forces, super position and transmissibility of forces. Newton's third Law triangle law of forces, different cases of concurrent coplanar, two forces system, extension parallelogram law and triangle law to many forces acting at one point- polygon law of forces method of resolution into orthogonal components for finding the resultant, graphical method special case of three concurrent, coplanar. Lami's theorem.
3. Moments (15%)  
Concept of moment, Varignon's theorem – statement only Principle of moments – application of moments to simple mechanism. Parallel forces, like and unlike parallel forces, calculation their resultant concept of couple moving a force parallel to its line of action general cases coplanar force system general conditions of equilibrium of bodies under coplanar parallel forces.
4. Friction (10%)  
Concept of friction, laws of friction limiting friction and coefficient friction, sliding friction and rolling friction inclined plane.

5. Centre of Gravity and Centroid (15%)

Concept of gravity gravitational force centroid and centre of gravity. Centroid for regular lamina and centre of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CU of bodies and areas with portions removed.

6. Moment of Inertia of Plane Areas (15%)

Concept of Moment of Inertia and second moment of area and Radius of gyration, theorems of parallel and perpendicular axes, second moment of area of common geometrical sections rectangle triangle, circle (without derivations). Second moment of area for L.T and sections. Sections modulus without derivation

7. Laws of Motion (15%)

Concept of momentum. Newton's laws of motion, their application. derivation of force equation from second law of motion numerical problems on second law of motion, plies, lift, bodies tied with string. Newton's third law of low motion numerical problems, conservation of momentum, impulse and impulsive force (definition only)

8. Simple Lifting Machines (10%)

Concept of machine mechanical advantage velocity ratio and efficiency of a machine their relationship law of machine simple machines (lever wheel and axle pulleys jacks winch crabs only)

LIST OF PRACTICAL

1. Verification of the laws of polygon of forces.
2. To verify the forces in the different members of a jib crane.
3. To verify the reaction at the supports of a simply supported beam.
4. To find the mechanical advantage, velocity ratio and efficiency in the case of inclined planes
5. To find the mechanical advantage velocity ratio and efficiency in the case of Screw jack
6. To find the mechanical advantage velocity ratio and efficiency in the case of worm and worm wheel
7. To find the mechanical advantage velocity ratio and efficiency in the case of winch Crab-Single-Graphical representation.
8. To find out centre of gravity of regular and irregular laminas.

## ENGINEERING DRAWING

L T P  
4 - 6

### RATIONALE

Drawing is the language of engineers of technicians. Reading & interpreting engineering drawing their day to day responsibility. The course is aimed at in developing basic graphic skills so as to enable them to use these skills preparation of engineering drawings their reading interpretation. The emphasis while imparting instruction should be to develop conceptual skills the students.

### NOTE:-

1. Weight age or each topic for external examination is given in the brackets.
2. First angle projection to be followed
3. Minimum of 12 sheets to be prepared by each student.
4. BIS SP 46 – 1988 should be followed.

### DETAILED CONTENTS

- |   |       |
|---|-------|
| 1. INTODUCITON  | (5%)  |
| • Ellipse parabola hyperbola  |       |
| • Lines lettering & dimensioning  |       |
| 2. SCALES   | (10%) |
| Types of scales plain scale diagonal scale, vernier scale                                     |       |
| 3. CURVES USED IN ENGINEERING PRACTICE  | (10%) |
| • Ellipse parabola hyperbola  |       |
| • Cycloid trochoid involutes  |       |
| • Spiral helix  |       |
| 4. PROJECTION   | (15%) |
| Types of solids projection solids in simple position  |       |
| (a) Axis perpendicular to the HP  |       |
| (b) Axis perpendicular to the VP  |       |
| (c) Axis parallel to both the HP & VP   |       |
| Theory of projections (elaborate theoretical instruction                                      | (10%) |
| • Introduction to first angle projections   |       |
| • Drawing 3 views of given objects (a least 2 objects)  |       |
| • Drawing 6 views of given objects (Non symmetrical objects may be selects for this exerciser |       |
| • Identification of surfaces on drawn views & drawn   |       |
| • Exercises on missing surface & views  |       |
| • Sketching practice of pictorial view from objects   |       |

5. SECTION (20%)  
Section planes true shape of a section
- Section of prism
    - (a) Section plane parallel to VP
    - (b) Section plane parallel to HP
  - Section of pyramids
    - (a) Section plane parallel to base of pyramid
    - (b) Section plane parallel to VP
  - Section of cylinder
    - (a) Section plane parallel to the base
    - (b) Section plane parallel to the axis

Importance & salient features methods of representing sections classification of section, conventions in sectioning

Drawing of full section, half section partial or broken out section, offset sections, revolved sections & removed sections. Exercises on sectional views of different objects.

6. DEVELOPMENT OF SURFACES (15%)  
Development of lateral surfaces of cube prism truncated pyramid & cone

7. ISOMETRIC VIEWS (15%)
- Fundamentals of isometric projections (theoretical instructions)
  - Isometric views from 2 or 3 given orthographic views

#### REFERENCE

1. Engg. Drawing  
A Text Book Engineering Drawing  
By  
Surjit Singh  
Dhanpat Rai & co
2. Engineering drawing planes & solid geometry  
ND Bhatt V.M. Panchal  
Charotar publisher home, Anand



## ELEMENTS OF ELECTRICAL ENGINEERING

L T P  
3 - 2

### RATIONALE

The purpose of the course is to impart basic knowledge and skills regarding electrical engineering which diploma engineers will come across in their professional life.

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Application and Advantages of Electricity (5%)  
Difference between AC and DC various applications of electricity advantages of electricity energy over other types of energy
2. Basic Quantities Electricity (8%)  
Definition of voltage, current, power and energy with their units, name of instruments used measuring above quantities. Connection of the instruments in an electric circuit
3. Electromagnetic Induction (7%)  
Production of e.m.f. idea of transformer and its principle of working
4. Various Types of Power Plants (10%)  
Elementary block diagrams of the <W> hydro and nuclear power stations. Brief explanation the principle of power generation in above power stations.
5. Elements of Transmission Line (10%)  
Pictorial diagram of 3-phase transmission and distribution system showing transformers supports conductors insulators and earth wire etc. Brief function of accessories of transmission lines
6. Distribution system (15%)  
Distinction between high and low voltage distribution system identification of 3- phase wire neutral wires and earth wire on a voltage distribution system identification of voltages between phases and between one phase and neutral. Distinction between 3-phase and I – phase supply.

## WORKSHOP PRACTICE

L T P

-- 6

### RATIONALE

This course aims at developing generic manual and machining skills in the students. Besides above the development of dignity of labour precision safety at work places team working and development of right attitude are other objectives.

### DETAILED CONTENTS

#### 1. Fitting Shop

- 1.1 Introduction to tools, work bench and work holding devices and measuring instruments their safekeeping safety precautions. Practical exercises involving sewing tilling marking square ness chipping
- 1.2 Fitting practice checking by straight edge and try square
- 1.3 Specification of files precautions while filing
- 1.4 Introduction to various types of drilling machines simple exercises including use of above machines

#### 2. Welding Shop

##### (i) Arc Welding

Introduction to tools and equipment safety precautions use of welding transformer/welding machine method of selecting current choices of electrode

##### (ii) Gas Welding

Introduction to gas welding equipment, safety precaution, selection of gas pressure welding torch, type of flame, flux, welding rod and welding technique.

Exercises in involving job preparation and making single joint. Brazing practice of brazing by gas

#### 3. Carpentry Shop

Identification of wood, introduction to tools, safety precaution.

Practical exercises involving practice of sawing, planing chiseling making various joints. To make some utility jobs such as brackets, office tray.

#### 4. Sheet Metal shop

Description of tools and operations involves in sheet metal fabrication such as shearing bending joining (locked grooves joints riveting Brazing) Exercise like tray mug funnel etc.

Note: - Making a record of exercise job completed by the students is a part of the work for evaluation.

# HYDRAULICS

L T P  
3 2 2

## RATIONALE

Subject of hydraulics is a basic science subject and helps in solving problems in the subject. Public Health Engineering / Environmental Engineering and Irrigation Engineering. Principles hydraulics also find its application in Bridge Engineering and in many other Civil Engineering subjects. The subject deals with basic concepts and principles in hydraulic, hydro kinematics and hydrodynamics and their application in solving fluid flow problems.

Note: Weightage of lead topic for external examination is given in the brackets.

## DETAILED CONTENTS

### THEORY

1. Introduction (5%)
  - 1.1 Fluid: Real fluid, ideal fluid.
  - 1.2 Fluid Mechanics. hydraulics, hydrostatics, hydro kinematics and hydrodynamics.
2. Properties of Fluids: (10%)

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

  - 2.1 Units of measurement,
3. Hydrostatic Pressure: (10%)
  - 3.1 Pressure, intensity of pressure, pressure head, Pascal's law and its applications.
  - 3.2 Total pressure, resultant pressure. and centre of pressure.
  - 3.3 Total pressure and centre, of pressure on vertical and inclined plane surface, Rectangular, triangular, trapezoidal, circular shapes.
4. Measurement of Pressure: (10%)

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

  - 4.1 Piezometer, simple manometer, differential manometer and mechanical gauges.
5. Fundamental of Fluid Flow: (15%)
  - 5.1 types of flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow.
  - 5.2 Discharge and continuity equation (flow equation).
  - 5.3 Types of hydraulic energy Potential energy, kinetic energy, pressure energy.
  - 5.4 Bernoulli's theorem: statement and description (without proof of theorem).
6. Flow Measurements: (10%)
  - 6.1 Venturimeter
  - 6.2 Pitot tube
  - 6.3 Orifice and orifice meter
  - 6.4 Current Meter. ; .
  - 6.5 Notches and weirs (simply Numerical Problems)
7. Flow through Pipes: (20%)
  - 7.1

iii) Pressure gauge/water meter/mechanical flow meter/Pitot tube.

#### INSTRUCTION STRATEGY

Hydraulics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problem in the class room and provide tutorial exercise so as to develop necessary knowledge for comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory.

#### REFERENCES

1. Jagdish Lal fluid and Hydraulics" Delhi Metropolitan Book Co. Pvt. Ltd.
2. Modi, PN and Seth, S.M; "Hydraulic; and Fluid Mechanics", Delhi Standard Publishers Distributors.
3. Khurmi RS. "Hydraulics and Hydraulics Machines", Delhi S Chand and Co.
4. Likhi SK. "Laboratory Manual in Hydraulics", Delhi Wiley Eastern.

- 7.2 Reynold's number, critical velocity and velocity distribution
  - 7.3 Head loss in pipeline due to friction. sudden expansion and sudden contraction. entrance obstruction and Change of direction (No derivation of formula).
  - 7.4 Hydraulic gradient line and total energy line,
  - 7.5 Flow from, one reservoir to another through long pipe of uniform and composite section.
  - 7.6 Water hammer phenomenon and its effects elementary treatment)
  - 7.7 Pipes in series and parallel.
8. Flow through open Channels: (15%)
- 8.1 Definition of a channel, uniform-flow and open channel flow.
  - 8.2 Discharge through channel using.
    - i) Chezy's formula (no derivation)
    - ii) Manning's formula
  - 8.3 Most economical sections
    - i) Rectangular
    - ii) Trapezoidal
9. Hydraulics Machines: (15 %)
- Reciprocating pumps.
  - 1.1 Centrifugal pumps
  - 1.2 Impulse turbines
  - 1.3 Reaction turbines

Sketching and description of principles of working of above mentioned machines

#### Practical Exercises

- i) To verify Bernoulli's Theorem.
  - ii) To find out venturimeter coefficient.
  - iii) To determine coefficient discharge (Cd) coefficient of contraction (Co) of an orifice and verify the relation between them.
  - iv) To perform Reynold's experiment.
  - v) To determine Darcy's coefficient of friction for flow through pipes.
  - vi) To verify loss of head due to
    - i) Sudden enlargement
    - ii) Sudden Contraction
  - vii) To determine velocity of flow of an open channel by using a current meter.
  - viii) To determine: coefficient of discharge of a rectangular notch/triangular notch.
- ix) Study of the following:
- (i) Reciprocating pump or Centrifugal pump.
  - (ii) Impulse turbine or Reaction turbine

#### 4. Centroid

- 4.1 Geometrical Properties, Definition of Centroid and center of gravity
- 4.2 Centroid of regular figures centroid of symmetric asymmetric and anti symmetric <W> sections
- 4.3 building up section Problems

#### 5. Second Moments of Area: (10%)

- 5.1 Concept of second moment of area, radius of gyration.
- 5.2 Theorems of parallel and perpendicular axes (no derivation)
- 5.3 Second moment of area for sections of Rectangle, Triangle, Circle, Trapezium. Angel Tee: 1 Channel and Compound (No Derivation)

#### 6. Bending and Shear Stresses: (10%)

- 6.1 Theory of simple bending with assumptions.
- 6.2 Application of the equation  $M/I = F/Y = E/R$  (No derivation)
- 6.3 Moment of resistance, sectional modulus and permissible bending stresses in circular. Rectangular. I.T. and L sections Comparison of strengths of the above sections.
- 6.4 Concept of shear stresses in beam shear stress distribution in rectangular. I. and T section (Formula to be stated no derivation).

#### 7. Stresses in shafts due to Torsion

#### Slope and Deflection (15%)

Introduction-couple:- Torque of Torsion or Twisting moment – Assumptions-Shear stress distribution in circular section due to torsion- Torsion Equation (No derivation). Strength and stiffness of shafts torsional rigidity – torsional Modulus-Power transmitted by a shaft- Comparative Analysis of hollow shafts and solid shafts – Problems methods (no derivation)

#### 8. Columns: (10%)

Theory of columns. Euler's critical load empirical design formulae. Rankin's I.S formulae Rankin – Merchant formulae

#### 9. Combined Direct and Bending Stresses: (10%)

- 9.1 Concentric and eccentric loads eccentricity.
- 9.2 Effect of eccentric load on the section stress due to eccentric loads examples in the case of short columns

#### 10. Analysis of Trusses (15%)

- 10.1 Concept of a frame redundant and deficient frame end supports.
- 10.2 Analysis of determinate trusses by:
  - a) Method of joints
  - b) Method of sections and
  - c) Graphical methods.

## STRUCTURAL MECHANICS

L T P

4 2 2

### RATIONALE

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

Note: Weightage of each topic for external examination is given in the brackets.

### DETAILED CONTENTS

1. Properties of Materials (2%)
  - 1.1 Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.
  - 1.2 Tensile test, compressive test, impact test, fatigue test torsion test.
2. Simple Stresses and Strains: (8%)
  - 2.1 Concept of stress, normal and shear stresses, stresses due to torsion.
  - 2.2 Concept of strain, strain and deformation, longitudinal and transverse strain poisson's ratio, volumetric strain.
  - 2.3 Hook's Law, modulus of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.
  - 2.4 Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight. stress produced in compound bars (two or three) due to axial load.
  - 2.5 Stress Strain diagram for mild steel mechanical properties factor of safety.
  - 2.6 Temperature stresses and strains
3. Bending Moment and Shear Force: (20%)
  - 3.1 Concept of a beam and supports (Hinges, Roller and Fixed), types of beam: simply supported cantilever, fixed and continuous beam.
  - 3.2 Type of loads (point, uniformly distributed and varying loads)
  - 3.3 Concept of bending moment and shear force sign conventions.
  - 3.4 Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrate uniformly distributed and uniformly varying loads.
  - 3.5 Relationship between load shear force and bending moment, point of maximum bending moment and  $\langle W \rangle$  flexure.

## PRACTICAL EXERCISES

Determination of yields stress, ultimate stress percentage elongation and plot the stress strain diagram and compute the value of young modulus on mild steel.

Determination of Young's modulus of elasticity for steel wire with Searl's apparatus.

Determination of modulus of rupture of timber beam.

Verification of forces in framed structure.

## STRUCTURAL STRATEGY

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

## REFERENCES:

- (i) Vazirani, VN and Ratwani, MM, "Analysis of structures Vol. I", Khanna Publishers.
- (ii) Ramamrutham, S, "Strength of Materials" New Delhi Dhanpat Rai and Sons.
- (iii) Punmia, BC, "Strength of Materials" Delhi, Standards Publishers Distributors.
- (iv) Natrajan, V, "Elements of Strength of Materials" New Delhi, Oxford and IBH Publishing
- (v) Ram Chandra, "Applied Mechanics and Strength of Materials", Delhi Standard Publishers.



## CONSTRUCTION MATERIALS

L T P

4 -

### RATIONALE

Construction engineering diploma holders have to supervise construction of various types of <W> Engineering works. For this purpose, they have to use various materials like stones, bricks and <W> cement and cement based products, and lime, timber and wood based products, paint and varnish metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests <W> determine suitability of materials for various construction purposes. Hence this subject.

### DETAILED CONTENTS

1. Building Stones: (10%)
  - 1.1 Classification of Rocks.
  - 1.2 Geological classification: Igneous, sedimentary and metamorphic rocks.
  - 1.3 Chemical classification: Calcareous argillaceous and siliceous rocks.
  - 1.4 Physical classification: Unstratified, stratified and foliated rocks.
  - 1.5 General characteristics of stones.
  - 1.6 Requirements of good building stones and their testing.
  - 1.7 Identification of common building stones.
  - 1.8 Various uses of stones in construction.
  
2. Bricks and Tiles: (20%)
  - 2.1 Introduction to bricks.
  - 2.2 Raw materials for brick manufacturing and properties of good brick making earth.
  - 2.3 Manufacturing of bricks.
    - 2.3.1 preparation of clay (manual/ mechanically)
      - \*\*\*2.3.2 Moulding hand moulding and machine moulding, hand moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench <W> and Hoffman's Kilns). Process of burning, size and weight of standard bricks traditional brick, refractory brick, clay-fly ash bricks sun dried bricks.
  - 2.4 Classification of bricks as per IS: 1077
  - 2.5 Size of brick
  - 2.6 Testing of common building bricks as per IS. 3495
    - 2.6.1 Compressive strength, water absorption, efflorescence test, Dimensional tolerance test.
  - 2.7 Special bricks.
    - 2.7.1 Building tiles; types of tiles-wall, ceiling, roofing and flooring tiles
    - 2.7.2 Ceramic and PVC tiles, their properties and uses.
  - 2.8 Laying of bricks and tiles at site.
  
3. Cement: - (30%)
  - 3.1 Introduction, raw materials, manufacture of ordinary Portland cement, flow
  - 3.2 Properties and uses of ordinary Portland cement.
  - 3.3 Testing of cement as per IS strength of cement, fineness by sieving consistency soundness, setting times.

- (ii) To determine the crushing strength of bricks.
- (iii) To determine the water absorption of bricks.
- (iv) To identify various types of timbers such as ; Teak, Sal, Chir, Shisham, Deodar, Kail, Mango etc.
- (v) To conduct field tests on cement.
- (vi) To determine fineness (by sieve methods) of cement.
- (vii) To determine normal consistency of cement.
- (viii) To determine initial and final setting times of cement.
- (ix) To determine soundness of cement.
- (x) To determine compressive strength of cement.

(c) **INSTRUCTIONAL STRATEGY**

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

(d) **REFERENCES**

- (1) Sharma SK and Mathur GC: "Engineering Materials:" Delhi-Jalandhar R. Chand and Co.
- (2) Surendra Singh: "Engineering Materials: "New Delhi" Vikas Publishing House Pvt. Ltd.
- (3) Chowdhuri N: "Engineering Material:" Calcutta Technical Publishers of India.
- (4) Bahl SK: "Engineering Materials "Delhi, Rainbow Book co.
- (5) TTTI. Chandigarh "Civil Engineering Materials: "Tata McGraw Hill.
- (6) Kulkarni GE "Engineering Materials: "Ahmedabad, Ahmedabad Book Depot.
- (7) Shahane: Engineering Materials: Poona Allied Book Stall.

- 3.4 Special cements and their uses.
- 3.5 Storage of cement

4. Lime: - (5%)

- 4.1 Introduction: Lime as one of the cementing materials.
- 4.2 Definition of terms; quick lime, fat lime, hydraulic lime, hydrated lime, lump lime.
- 4.3 Calcinations and slaking of lime
- 4.4 IS classification of lime
- 4.5 Testing of lime.

5. Timber and wood based products. (15%)

- 5.1 Identification of different types of timber: Teak Deodar, Shisham, Sal, Mango, Kail <W> chir
- \*\*5.2 Market forms of converted timber as per IS
- 5.3 Seasoning of timber: purpose, methods of seasoning, Kiln seasoning as per IS.
- 5.4 Defects in timber, decay in timber.
- 5.5 Preservation of timber and methods of treatment as per IS.
- 5.6 Properties of timber and specifications of structural timber.
- 5.7. Other wood based products, their brief description of manufacture and uses: Lamin board, Black board, fibre board. Hard board and gypsum board.

6. Paints and Varnishes: (5%)

- 6.1 Purpose and use of paints.
- 6.2 Types, ingredients, properties and uses of oil paints, water paints and Cement paints.
- 6.3 covering capacity of various paints.
- 6.4 Types, Properties and uses of varnishes
- 6.5 Trade name of different products.

7. Metal:- (5%)

- 7.1 Ferrous metals: composition, properties and uses of cast iron, Steel (mild and high tensions steel) requirements of mild steel as per IS.
- 7.2 Non-ferrous metals: properties and uses of the following non-ferrous metals in civil Engineering works – copper, lead Zinc, tin and aluminium. Commercial forms of ferrous and non-ferrous metals.

8. Mortar: (5%)

Definition- Properties and uses of Mortar Types of mortar cement & lime Mortar Preparation of cement Mortar

9. Concrete: - (5%)

Definition, constituents of concrete and their requirements  
Uses of concrete, Types of concrete – Lime concrete, cement and light weight concrete, Preparation of concrete by Hand mixing and ready mix concrete, compaction of concrete, methods, curing of concrete, methods.

Note: - A field visit may be planned to explain and show the relevant things

- (b) Practical Exercises
- (i) To identify different types of Stones.

### 3.5 Stone Masonry

- 3.5.1 Glossary of terms-Natural bed. bedding planes, string course, corbel, cornice, block-in course, grouting, mouldings, templates, throating, through stones, parapet, coping pilaster and buttress
- 3.5.2 Types of stone Masonry  
Rubble Masonry: random and coarsed. Ashlar Masonry: Ashlar fine. Ashlar rough. Ashler facing, specifications for coarsed rubble masonry, principles to be observed in construction of stone masonry walls
- 3.6 Partition walls Constructional details,. suitability and uses of brick and wooden partition walls.
- 3.7 Mortars-preparation, use average strength and suitability of cement, lime, lime, cement lime, surkhi and <W> nortar
- 3.8 Scaffolding: Constructional details and suitability of mason's brick layers and tubular scaffolding
- 3.9 Shoring and under pinning: Types and uses
- 3.10 Safety in construction of low rise and high rise buildings
- 4. Arches and Lintels: (10%)
  - 4.1 Meaning and use of arches and lintels:
  - 4.2 Glossary of terms used in arches and lintels - abutment, peir, arch ring, intrados. <W>. extrados. voussoiers. springer, springing line, crown, key stone, skew back, span. rise, depth of a arch, haunch, spandril. jambs, bearing, thickness of lintel. effective span
  - 4.3 Arches:
    - 4.3.1 Types of Arches - Semi circular, segmental, elliptical and parabolic, flat inverted and relieving
    - 4.3.2 Stone arches and heir construction
    - 4.3.3 Brick arches and heir construction
- \*\*5. Doors and windows (10%)
  - 5.1 Glossary of Terms used in Door and windows
  - 5.2 Doors - name, uses an ketches of metal doors, ledged and battened doors, ledged, battened and braced door, framed and paneled doors, glazed and paneled doors, flush doors, collapsible doors, rolling steel shutters, side sliding doors, door frames, PVC shutters and metal doors.
  - 5.3 Window-names, uses and sketches of metal windows, fully paneled windows, fully glazed windows, casement windows, fanlight windows and ventilators, sky light window frames, louvered shutters (emphasis shall be given for using metals and plastics etc. in place of timber.)
- 6. Damp Proofing: (8%).
  - 6.1 Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to asthetic appearance, damage to hear insulating materials, damage to stored articles and health sources and caused of dampness
  - 6.2 Types of, dampness-moisture penetrating the building from outside e.g. rainwater. surface water, ground moisture
  - 6.3 Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc.
  - 6.4 Moisture which originates in the building itself i.e. water in kitchen and bath rooms etc.

# BUILDING CONSTRUCTION

L Pds/week 4

## RATIONALE

Diploma holders in Civil Engineering are supposed to supervise construction of buildings perform above task, it is essential that students should have knowledge of various sub <W> of buildings like foundations, walls, roofs, stair cases, floors etc. and their construction is <W> important for Civil Engineering diploma folders.

NOTE: Weightage of each topic for external examination is given in the brackets

## DETAILED CONTENTS

1. Introduction (3%)
  - 1.1 Definition of a building, classification of buildings based on occupancy
  - 1.2 Different parts of a building
  
2. Foundations: (12%)
  - 2.1 Concept of foundation and its purpose
  - 2.2 Types of foundations-shallow and deep
    - \*\*2.2.1 Shallow foundation-constructural details of: Spread foundations for walls thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns, <W> foundation, combined tooting.
    - 2.2.2 Deep foundations Pile, foundations; their suitability, classification of piles according to function, material and installation of concrete piles (undreamed bored, compacted)
    - 2.2.3 Construction-preparing foundation plans, setting out, excavation, timbering. and dewatering
  
3. Walls: (10%)
  - 3.1 Purpose of walls
  - 3.2 Classification of walls- load bearing, non-load bearing. dwarf. retaining, breast walls and dhaji walls
  - 3.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
  - \*\*3.4 Brick masonry-Definition of terms: mortar, bond, facing, backing, hearting, column. pillar, jambs, reveals, soffit, plinth, plinth masonry, header, stretcher, bed of brick. bat. queen closer, king closer, frog and quoin
    - 3.4.1 Bond-meaning and necessity; English bond; Bond only 1. 1- / 2 and 2 Brick thick walls in English Bond. T, X and right-angled corner junctions Thickness for 1, 1 - / 2 and 2 Brick square pillars in English bond.
    - 3.4.2 Construction of Brick Walls-Method of laying bricks in walls, precautions observed in the construction of walls, method of bonding new brick work with old (Tooting <W>raking back and block bonding)
    - 3.4.3 Construction, expansion and contraction joints; purpose and constructional details.

- 6.5 Damp proofing material and their specifications: rich concrete and mortar, bitumen. bitumen mastic.
  - 6.6 Methods of damp proofing basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing arrangements in bathroom WC and kitchen. Damp proofing for roofs and window sills
  - 6.7 <W> protection and aprons
- \*\*7. Floors: (8%)
- 7.1 Ground floors
    - 7.1.1. Glossary of temp-floor finish, topping, under layer, base course, rubble riling and their purpose
    - 7.1.2 Types of floor finishes -case-in-situ. concrete flooring (monolithic, monded) Terrazo tile flooring, cast-in-situ, Terrazo flooring, Timber flooring, description with sketches of the methods of construction of the floors and their specifications floor polishing equipment
    - 7.1.3 PVC floor, ceramic floor
  - 7.2 Upper floors
    - 7.2.1 Flooring on RCO Slab Flooring on RB Slab
- 8 Roofs: (9%)
- 8.1 Types of roofs, concept of flat, pitched, hiped. arched and cell roofs
  - 8.2 Glossary of terms for pitched roofs - batten, eaves, barge, facia board, gable hip, lap. purlin, rafter, rag bolt, valley, ridge
  - 8.3 Drainage arrangement for pitched roofs
  - 9.4 Drainage arrangements for flat roofs
9. Stairs: (10%)
- 9.1 Glossary of terms: stair case winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand rail nosing
  - 9.2 Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc.
  - 9.3 Various types of layout-straight flight, dog legged, open well, quarter turn, half turn (newel and geometrical stairs), Bifurcated stair, spiral stair
110. Surface Finishes: (10%)
- 10.1 Plastering - classification according to use and finishes like grit finish, rough cast, pebble dashed, plain plaster etc dubbing, proportion of mortars used for different plasters, preparation of mortars, techniques of plastering and curing
  - 10.2 Pointing - different type of pointing, mortar used and method of pointing
  - 10.3 Painting - preparation and application of paints on wooden, steel and plastered wall surfaces 10.4 White washing, colour washing and distempering, application of cement and plastic paints.
  - 10.5 Commonly used water repellent for exterior surfaces, their names and application
11. Concept of Seismics in Planning and Design of Buildings (5%)
- 11.1 Introduction to earthquakes
  - 11.2 Magnitude and intensity, seismic zoning, seismograph
  - 11.3 Precautions to be observed in the design of earthquake prone buildings

12. Building Planning: (5%)
- 12.1 Site selection: Factors to be considered for selection of site for resident commercial, industrial and public building
  - 12.2 Basic principles of planning, arrangement of doors, windows, cupboard
  - 12.3 Orientation of building as per BIS: 7662 in relation to sun and wind direction. Internal circulation and placement of rooms within the available area.

NOTE: \* An expert may be invited from field-industry for extension lecture  
\* A field visit may be planned to explain and show me relevant things

#### PRACTICAL EXERCISES

- i) Demonstration of tools and plants used in building construction
- ii) Layout of building
- iii) To construct brick bonds (English bond only) in one, one and half and two brick thick
  - a) Walls for L-T and cross junction
  - b) Columns
- iv) Visit to construction site for showing the following items of works and to write <W> report about the works seen
  - a) Timbering of excavated trenching
  - b) Damp roof courses
  - c) Construction of masonry walls
  - d) Flooring: Laying of Boring on an already prepared lime concrete base
  - e) Plastering and pointing
  - f) White and colour washing
  - g) Use of special type of shuttering/cranes/heavy machines in construction work

#### INSTRUCTIONAL STRATEGY

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

## REFERENCE

Gupta. Sushil Kumar. Singla DR. and Juneja BM : "A Text Book of Building",  
Construction Ludhiana Kat son Publishing House Deshpande. RS and <W> GV: "A Text Book of  
Building Construction", Poona. United Book Corporation  
Rangwala, SC : "Building Construction";  
Anand. Charotar Book Stall Kulkarni. GJ: "A Text Book of Building Construction",  
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## CIVIL ENGINEERING DRAWING-I

Pds/week

### RATIONALE

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

NOTE : Weightage Of each topic for external examination is given in the brackets

### DETAILED CONTENTS

Drawing. No. 1: (8%)

Details of spread footing foundations for load bearing and non-load bearing wall for give<W> thickness of walls with, the help of given data or rule of the thumb, showing offsets, position DPC: details of basement showing necessary damp proofing.

Drawing No.2: (5%)

Plans of T and Corner junction of walls 1 Brick. 1-1 2 Brick and 2 brick thick in English bond.

Drawing.No.3: (10%)

Elevation, sectional plan and sectional side elevation of paneled and glazed floor, steel window and aluminium windows

Drawing No. 4: (15%)

Wooden roof truss showing details<w> joints, fixation of roof coverings, eaves and gutters. (King and queen post)

Drawing No. 5: (8%)

Drawing plan. elevation of a small building by measurement.

Drawing No.6: (8%)

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

Drawing No. 7:

(8%)

Drawing detailed working drawing of <w> building on a given plot, keeping in view building bye laws, showing also roof of surface driftage plan and flooring details

Drawing NO.8:

(10%)

Drawing plan and section of a dog legged stair. quarter turn stair in a given room (excluding reinforcement details)

Drawing No. 9:

(20%)

Drawing a small double storey building with a sloping roof showing position of sanitary fittings house drainage and electrical fittings

Drawing No.10:

(8%)

Drawing details of damp proofing arrangement of roofs, basement floors and walls as per BIS Code

- NOTE :
- a) All drawings should be as per BIS code and specification in SI units.
  - b) Intensive practice of reading and interpreting building drawings should be given.

#### INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation of water supply and sanitary engineering and irrigation engineering drawings as per IS code of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy. At different intervals of time, practice of reading and interpreting actual field drawing should also be practiced so as to develop necessary competencies in the students.

## WATER AND WASTE WATER ENGINEERING

L T P

4 - 2

### RATIONALE

After passing the diploma the students will have to examine the quality of water in <W> before it's treated. The knowledge about various sources and quality parameters of water is essential along with the details of conducting various tests for measuring the water quality, <w> the subject.

Note :- Weight age of each topic for external examination is given in the brackets.

### DETAILED CONTENTS

#### PART A WATER SUPPLY

1. Introduction (5%)
  - Importance of water-supply
  - Need for protected water supply
  - Objectives of water supply system
  - Role of agencies
  - water supply and sanitation development in India.
2. Quantity of water (5%)
  - Estimating requirements
  - Design period
  - Per capita consumption
  - Fluctuation in rate of consumption
  - forecasting of population, various methods
  - problems
3. Sources of water supply (5%)
  - Major surface and underground water sources
  - Quality and quantity of water in surface and under ground sources.
  - Selection of suitable sources of water supply
  - Necessity & determination of capacity of storage capacity of
  - Storage reservoir by Mass curve method
4. Intakes and Conveyance of water (5%)
  - Intakes. types of intakes
  - Location and requirements of an Intake
  - Types of conduits. Pipe material
  - Various types of pipe joints
  - Laying of pipes
  - Hydro static test
5. Quality of Water (5%)
  - Impurities in water and their importance
  - collection of water samples
  - Physical, Chemical and Bacteriological analysis of water
  - Standards of quality for domestic water supply
6. Sedimentation (5%)
  - Necessity of sedimentation (5%)

- Sedimentation aided with coagulation
  - Various coagulants
  - Mechanism of coagulation and floc formation
  - Stages in coagulation
7. Filtration (10%)
- Theory of Filtration
  - Types of filters
  - Theory and working and comparison of slow and rapid sand filter
  - Sectional elevation and plan of slow sand filter and rapid sand filter
  - Pressure filter
8. Disinfection of water: (5%)
- Necessity of disinfection
  - Requirements of good disinfectant
  - Methods of Disinfection
  - Theory of disinfection by chlorine
  - chlorine demand
  - Different practices of chlorination
  - sketch of chlorinator
  - Use of bleaching powder
9. Storage of clear and it's distribution (5%)
- Layout of water distribution systems along with their advantages and disadvantages
  - Design of distribution system
  - Causes, detection and prevention of wastage of water

## PART B WASTE WATER

- I. Introduction (5%)
- Terns and Definitions
  - System of sanitation and their merits and demerits
  - System of waste water and then advantages and disadvantages
  - Choice of wastewater system and suitable system for India
  - Quantity of sanitary and storm sewage
2. Design of sewers (5%)
- Quantity of sanitary and storm water
  - Variations in flow of sewage and their importance
  - Dry weather Flow
  - Types of sewers .
  - condition of flow in sewers
  - Self cleansing and limiting velocities in sewers
3. Construction and Maintenance of Sewers (5%)
- Sewer appurtenances
  - Materials for sewer
  - Laying of sewers
  - Joints and testing of sewers joints
  - Maintenance operation and precaution before entering a manhole

4. Characterization and Examination of Sewage (10%)
- physical, chemical and biological characteristics of sewage
  - physical chemical and biological examination of sewage including pH, BOD COD and allied numerical problem
5. Disposal of Sewage (10%)
- Methods of disposal
  - The favorable conditions for adopting different methods
  - Dilution methods. Standards of dilution
  - Self purification of natural streams
  - Permissible loads and limits of pollution to be discharged into inland surface water and public sewer
  - Disposal by land treatment method
  - Treatment standards for sewage effluents
  - Effluent irrigation and sewage farming
  - Sewage sickness and its preventive measures
6. Treatment of Sewage (10%)
- Definitions of Preliminary, Primary, Secondary and Final Treatment.
  - Types of treatment units employed in sewage treatment, their function and efficiencies comparative statement
  - Grit chambers and detritus tank
  - Skimming tanks
  - Primary sedimentation ,
  - Filtration of sewage, Trickling filters
  - Activated sludge process.
  - Comparison of trickling filters and ASP
  - Oxidation Ponds and Aerated lagoons
7. Septic and Imhoff Tanks (5%)
- Theory, working and design criteria of septic and imhoff tanks.  
Advantages and disadvantages of septic and imhoff tanks  
sectional elevation and plan of septic and imhoff tanks.

#### PRACTICALS

1. Determination of suspended solids
2. Determination of dissolved solids
3. Determination of total solids
4. Determination of optimum dosage of coagulant
5. Determination of MPN by membrane filtration technique
6. Determination of fluoride concentration in water
7. Determination of dissolved oxygen in water by winkler method
8. Determination of turbidity, colour and pH in water
9. Determination of electrical conductivity of water
10. Determination of volatile solids and fixed solids
11. Determination of BOD
12. Determination of COD

## REFERENCES

1. Water supply Engineering S.K Garg Vol I khanna Publishers
  2. Water supply and sanitary Engineering G.S. Birdie , J.S.Birdie. Dhanpat Rai Pub. Co.
  3. Water supply and waste water engineering B.S. N. Raju Tata Mc Graw -Hill
  4. Govt of India Manual on water supply system & treatment
  5. Water supply Engineering B.C. Punmia , Laxmi Publishers
-

## CONCRETE TECHNOLOGY

Pds/week      L T P  
                         3 <W>

### RATIONALE

Diploma holders in Civil Engineering are supposed to supervise concreting operations <w>proportioning, mixing transporting, placing, compacting, finishing and curing of concrete perform above functions, it is essential to impart knowledge and skills regarding ingredients concrete and their properties; properties of concrete in Plastic and hardened stage, water <w> ratio and workability; proportioning for ordinary concrete; form work, concreting operations<w> joins in concrete. Hence this subject.

NOTE:             Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1.     Introduction (5%)  
        Definition of concrete, brief introduction to properties of concrete, advantage of concrete uses of concrete in comparison to other building materials
2.     Ingredients of Concrete: (10%)
  - 2.1     Cement  
          The chemical ingredients causing changes in properties situations of use and special precautions in the use of following types of cements:  
  
          Ordinary Portland cement rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, quick setting white and colored cements Portland pozzolana cement
  - 2.2.     Aggregates:
    - 2.2.1 Classification of aggregates according to source, size and shape
    - 2.2.2 Characteristics of aggregates: Particle size and shape, crushed and rounded aggregates, surface texture, specific gravity of aggregate; bulk density; water absorption, surface: moisture, bulking of sand, deleterious materials in the aggregate
    - 2.2.3 Grading of aggregates; coarse aggregate, fine aggregate; All in aggregate fineness modulus; interpretation grading charts and combination of two aggregates
  - 2.3     Water:  
          Limits on the impurities as per IS; effect of excessive impurities on concrete ascertaining the suitability of water with help of concrete cube test
3.     Properties of Concrete: (10%)
  - 3.1     Properties in plastic stage workability, segregation, bleeding
  - 3.2     Properties of hardened concrete: strength, durability. Impermeability, dimensional changes

4. Water Cement Ratio: (10%)
  - 4.1 Hydration of cement, effect of various water cement ratios on the physical struck of hydrated cement, water cement ratio law and the conditions under which the is valid; internal moisture, temperature, age and size of specimen
  - 4.2 Definition of cube strength of concrete, relations between water cement ratio strength of concrete
  - 4.3 Use of CRR.I charts and BIS codes
  
5. Workability. (10%)
  - 5.1 Definition phenomenon of workability concept of internal friction segregation harshness; factors affecting workability; water content: shape, size and percentage finesses passing 300 micron
  - 5.2 Measurement of workability: slump test and compaction factor test; recommend slumps for placement n various conditions as per IS 456-2000 SP-23
  
6. Proportioning for Nominal concrete: (10%)
  - 6.1 Object of mix design, strength required for various grades from IS 456, 2(preliminary test, cube test, proportioning for nominal mix as prescribed by Is 4 2000 Adjustment on site for: Bulking of sand. water absorption of aggregate, workability.
  - 6.2 Difference between nominal and controlled concrete. Introduction to no <W> concrete.
  
7. Form Work: (5%)
  - 7.1 Concept of factors affecting the design of form work (shuttering and staging)
  - \*\*7.2 Materials used for form a work (including new materials)
  - 7.3 Sketches of form <w> for column, beam and slab
  - 7.4 Precautions to be taken before during and after RCC construction
  - 7.5 Striping time for form work as per BIS (no problem on the design of form work
  - 7.6 Removal of form work
  
8. Special Concretes: (5%)
  - 8.1 New Materials:
    - 8.1.1 Materials for light weight concrete
    - 8.1.2 Flyash
    - 8.1.3 Materials for high strength concrete
  8. 1.4 Accelerators and retarders
  - 8.1.5 Air entraining agents
  - 8.1.6 Water reducing and set controlling agents
  - 8.1.7 Water proofing agents
  - 8.1.8 Special bonding agents like epoxy
  - 8.1.9 Polymer concrete
  - 8.2 Concreting under special conditions
    - 8.2.1 Cold weather concreting
    - 8.2.2 Under water concreting
    - 8.2.3 Hot weather concreting
    - 8.2.4 Special locations i.e. mass concreting, high strength concreting
  
9. Concrete Operations (25%)
  - \*\* 9.1 Storing of Cement



- 9.1.1 Storing of cement in a warehouse
- 9.1.2 Storing of cement at site
- 9.1.3 Effect of storage on strength of cement
- 9.1.4 Determination of warehouse capacity for storage of cement
- 9.2 Storing of Aggregate: Storing of an aggregate on site for maintaining uniformity <w> and Cleanliness
- 9.3 Batching:
  - 9.3.1 Batching of Cement
  - 9.3.2 Batching aggregate by:
    - 9.3.2.1: Volume, using gauge box (farma) selection of proper gauge box
    - 9.3.2.2 Weight spring balances and by batching machines
  - 9.3.3 Measurement of water
- \*\*9.4 Mixing:
  - 9.4.1 Hand mixing
  - 9.4.2 Machine mixing-types of mixers, capacities of operation of mixers
- \*\*9.5 Transportation of concrete:

Transportation with and situations of use of the following: pans, wheel, barrows, truck mixers, chutes, belt conveyors, pimps, tower crane and hoists etc.
- 9.6 Placement of concrete:
  - 9.6.1 Prior preparation before placement: when put on natural soil. rocky base, specially prepared sub base (brick soling and water bond macadam base), hardened concrete base checking of form work, checking provision for joints
  - 9.6.2 Placement of concrete- Precautions to be taken.
- \*\*9.7 Compaction:
  - 9.7.1 Hand compaction- pavement, narrow and deep members
  - 9.7.2 Machine compaction-types of vibrators internal screed vibrators and form vibrator, methods of handling screed vibrators and immersion vibrators, suitability of concrete mixes for compaction with vibrators
  - 9.7.3 Selection of suitable vibrators for various situations
- 9.8 Finishing concrete slabs- screeding, floating, and trowelling
- 9.9 Curing:
  - 9.9.1 Object of curing, method of curing, shading concrete works, covering surfaces with besian, gunny bags, sprinkling of water, ponding method and membrane curing, steam curing
  - 9.9.2 Recommended duration for curing and removal of form work
- 9.10 Jointing

Location of construction joints, treatment of construction joint before the concrete is poured concreting at these joints, expansion joints in concrete in buildings-their importance and location
- 9.11 Defects in concrete: Identification and methods of repair
- 10 Importance and methods of non destructive tests ( introduction only)

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

## PRACTICAL EXERCISES:

- i) To determine the compressive strength of Portland Cement (IS : 269)
- ii) To determine flakiness index and elongation index of coarse aggregate (IS 2386-Part-I)
- iii) Field method to determine fine silt in aggregate
- iv) Determination of specific gravity and water absorption of aggregates (IS 2386-Part-III for aggregates of size 40 mm to 10 mm)
- v) Determination of bulk density and voids of aggregates (IS: 2386-Part-III) vi) Determination of surface moisture in fine aggregate by displacement method (IS 2383 – Part III)
- vii) Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
- viii) To determine necessary adjustment for bulking of fine aggregate by field method (IS 2383 Part-III)
- ix) test for work <w>(slump test) :
  - a.) To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/cement ratio on slump
  - b) To test cube strength of concrete with varying water cement ratio
- x) Compaction factor test for workability ((IS: 1199)
- xi) Tests for compressive strength of concrete cubes for M-15 or M-20 grade.

## INSTRUCTIONAL STRATEGY

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

## REFERENCES

- i) Kulkarni PD and [Mittal](#) LN; "Laboratory Manual for Concrete Technology", TTTI, Chandigarh
- ii) Kulkarni. PD; Ghosh, RK and Phull. YR: "Text Book of Concrete Technology". New Delhi Oxford and BH Publishing Co.
- iii) Krishnamurthy. KT; Rao. A Kasundra and Khandekar, AA: "Concrete Technology". Delhi. Dhanpat Rai and Sons
- iv) Gupta BL . Text Book of Concrete Technology", Standard Publishers
- v) Varshney.RS "Concrete Technology", New Delhi. Oxford and IBH Publishing
  - vi) Neville. AM "Properties of Concrete London, Pitman (ELBS Edition available)
  - vii) Orchard: "Concrete Technology New Delhi, Satya Prakashan
  - viii) Handoo. BL and Puri, LD; "Concrete Technology", New Delhi. Satya Prakashan
  - ix) Vazirani VN; and Chandola, <w> Concrete Technology ", Delhi Khanna Publishers
  - x) Gambhir. ML: "Concrete Technology". New Delhi. Mac Millan India Ltd.

## Communication Technique –II

L T P  
3 1 -

### RATIONALE

Diploma holders are support to communicate verbally and in written forms. Further technical <w> writing forms another essential requirement of these people. Keeping in view above requirement this subject has been added to develop necessary competencies in written and oral communication Efforts should be made to give practice of communication to the students.

### Contents

Note: Weightage for each topic for external examination is given in the brackets.

1.     Precis writing : (15%)  
  
      Precis writing of simple passages of about 250 words.
  
2.     Concepts of Communication: (20%)  
      Importance of communication one way and two way communication, methods 1  
      communication - oral, written and non -verbal, barriers to communication and techniques  
      overcoming the barriers. concept of effective communication, telephonic communication  
      public speaking and attending interviews.
  
3.     Correspondence: (40%)
  - a)     Business, official social letters and letters to pres. Two questions of 10 marks each  
      are to be attempted out of four.
  - b)     Telegrams, press release, advertisement, notices and memorandum. Two questions of  
      10 marks each are to be attempted out of four.
  
4.     Report Writing. (15%)  
  
      Choice to attempt one out of three topic is to be given.
  
5.     Practice of writing resume and applications for job. (10%)

fill - level surcharge - earth pressure due to soils - Retaining walls with vertical back only - maximum and minimum stresses - stress distribution diagrams - problems - stability of earth retaining walls- problem to check stability.

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Revision & Test

Reference Books:

1. Theory of structures by S. Ramamrutham.
2. Theory of structures by B.C. Punmia. Ashok Jain & Arun Jain
3. Statically Determinate Structures part 1 by R.S. Khurmi
4. mechanics of structures (Vol.I) by S.B. Junnarkar
5. Analysis of structures by V.N. Vizirani & M.M. Ratwani
6. Elementary theory of structures by R.L. Jindal
7. Strength of materials by F.V. Warnock

## ANAYLYSIS OF STRUCTURES

### 1. SLOPE AND DEFLECTION OF BEAMS (15%)

Deflected shapes of beams with different support conditions – Flexural rigidity and stiffness of beams – derivation of differential equation of flexure Area moment method – Mohr's theorem for slope and deflection of beams- Derivation of expressions for maximum slope and maximum deflection of simple standard cases by area moment method for cantilever and simply supported beams subjected to symmetrical UDL & point loads – Numerical problems on slope & deflections at salient points from first principles – simple problems.

### 2. PROPPED CANTILEVERS (10%)

Definition of Prop – Statically indeterminacy – Prop reaction from deflection consideration – SF & BM Diagram by area moment method for UDL Throughout span, central and non-central.

### 3. FIXED BEAMS (15%)

Introduction to fixed beam – sagging & hogging bending moments – Determination of fixing moments by area moment Method – standard case – Fixed beams subjected to symmetrical & unsymmetrical concentrated loads and UDL – SF & BM diagrams for supports at the same level (sinking of supports at different levels not included) – slope and deflection of fixed beams Subjected to symmetrical UDL & concentrated loads by area moment method only - Problems.

### 4. CONTINUOUS BEAMS – THEOREM OF THREE MOMENTS (15%)

Introduction Definition of indeterminate structures – General methods of analysis of indeterminate structures – Clapeyron's theorem of three moments – statement – Application of Clapeyron's theorem of three moments for the following case – problems on two span – simply supported ends – one end fixed and the other simply supported – simply supported with one end overhanging – Propped cantilever – sketching of SFD & BM D for the above cases.

### 5. CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD (15%)

5. Introduction – sign conventions – stiffness factor – carry over factor – Distribution factor – Application to continuous beams upto three spans & Propped cantilever – Problems – Portal frames symmetrical frames only (no sway correction) – sketching BMD only for beams and frames.

### 6. MASONRY DAMS

Introduction – derivation for maximum and minimum stress – stress distribution diagrams Problems – problems – Factors affecting stability of masonry dams – factor of safety problems on stability minimum base width & maximum height for no tension – Elementary profile of a dam – Minimum base width of elementary profile for no tension.

### 7. EARTH PRESSURE AND RETAINING WALLS

Definition – Angle of repose – state or equilibrium of soil – Active and passive earth pressure – Rankine's Theory of earth pressure – Assumptions – lateral earth pressure with level back

6. Deformation of soils (10%)
- 6.1 Meaning, conditions/situations of occurrence with emphasis on practical significance of:
- Consolidation and consolidation settlement
  - Creep
  - Plastic flow
  - Heaving
  - Lateral movement
- 6.2 Definition and practical significance; of compression index, coefficient of consolidation, degree of Consolidation.
- 6.3 Meaning of total settlement, uniform settlement, differential settlement and rate of settlement and their importance
- 6.1 Settlement due to construction operations and lowering of water table
- 6.2 Tolerable settlement for different structures as per BIS
7. Strength Characteristics of Soils: (12%)
- Examples of shear failure in soils
  - Factors contributing to smear strength of soils. Coulomb's law
  - Determination of shearing strength direct shear test and unconfined compression test. Brief idea about triaxial shear test
  - Drainage conditions of test and their significance
  - Stress and strain curve, peak strength and ultimate strength, their significance
  - Discrepancies between laboratory and field test.
8. Soil Compaction: (8%)
- Definition of compaction and its necessity
  - Laboratory compaction test (light and heavy as per BSI) definition and importance of optimum water content, maximum dry density: moisture dry density relations for typical soils with different compactive efforts
  - Field compaction: methods and equipment, choice of equipment
  - Compaction requirements
  - Compaction control: Density control, field density test, (sand replacement) moisture control. Proctor's needle and its use, thickness control, jobs of an embankment, supervisor in relation to compaction
9. Bearing Capacity: (10%)
- Concept of bearing capacity
  - Definition and significance of ultimate bearing capacity safe bearing capacity and allowable bearing .
  - Bearing capacity from building codes.
  - Concept of vertical stress distribution in soils due to foundation loads
  - Plate load test and interpretation of its results, limitations of plate load test
  - Bearing capacity by SPT and unconfined compression test
  - Soil properties governing choice of foundation type
10. Soil Exploration: (10%)
- Purpose and scope of soil exploration
  - Undertaking, planning of subsurface investigations
  - Influence of soil conditions on exploratory programme
  - Possibility of misjudgment of subsoil conditions
  - Location, depth and spacing of exploration
  - Influence of size of project and type of structure on exploratory programme
  - Methods of soil exploration Reconnaissance, Trial pits, borings, (Auger, wash, rotary percussion to be briefly dealt) SPT and dynamic cone penetration test (Brief description and information collected)

## SOIL AND FOUNDATION ENGINEERING

L T P  
P d s/week 3 - 2

### RATIONALE

Civil Engineering technicians are required to supervise the construction of roads and pavements dams, embankments, and other Civil Engineering structures. As such the knowledge of basic engineering is the prerequisite for technicians for effective and sufficient performance of his duties. This necessitates the introduction of soil Engineering subject in the curriculum for Diploma course in Civil Engineering.

The subject covers only such topics as will enable the technicians to identify and classify different types of soils, their selection and proper use in the field of engineering construction.

NOTE : Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Introduction: (7%)
    - 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, dunes and loess glacial deposits, conditions in which above deposits are formed and their engineering characteristics.
  2. Physical Properties of Soils: (10%)
    - 2.1 Constituents of soil, phase diagram for soil
    - 2.2 Definitions and meaning of void ratio, porosity, degree of saturation, water content specific gravity of soil, grains, unit weight, dry unit weight
    - 2.3 Simple numerical problem's with the help of phase diagrams
  3. Soils Classification and Identification: (10%)
    - 3.1 Particle size, shape and their effect on engineering properties of soil
    - 3.2 Gradation and its influence on engineering properties
    - 3.3 Relative density and its use in describing cohesion less soils
    - 3.4 Behavior of cohesive soils with change in water content. Atterberg limits definitions, use and practical significance
    - 3.5 Field identification test for soils
    - 3.6 BIS soils classification system: basis, symbols major divisions and sub divisions groups, plasticity chart; procedure to be followed in classifying a given soil- into a group
  4. Flow of Water Through Soils: (10%)
    - 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 as per BIS
    - 4.4 Measurement of permeability in the laboratory
- <L> (3%)

- 10.8 Ground water level measurement
- 10.9 Sampling undisturbed disturbed and representative sample selection of type sample thin wall and piston samples area ratio, recovery ratio of samples are their significance number and quantity of sample, resetting sealing are preservation of sample.
10. 10 Presentation of soil investigation results
11. Foundation Engineering (10%)  
 Concept of shallow and deep foundation types of shallow foundation and their suitability Factor affecting the depth of shallow foundations deep foundations, type of piles and the suitability load carrying capacity of piles constructional features of pile foundations.

#### PRACTICAL EXERCISES

- i) Auger Boring and standard penetration test
  - a) Identifying the equipment penetration test
  - b) Conducting boring and SPT at a given location
  - c) Collecting soil sample and their identification
  - d) Preparation of boring <w> and SPT graphs
  - e) Interpretation of test results
- ii) Extraction of Disturbed and undisturbed samples
  - a) Extracting a block sample
  - b) Extracting a tube sample
  - c) Extracting disturbed samples for mechanical analysis. Compaction and Limit test
  - d) Field identification of samples
- iii) Field Density Measurement (Sand Replacement and Core Cutter Method)
  - a) Calibration of sand
  - b) Conducting field density test at a given location
  - c) Conducting the test
  - d) Observing soil behavior during tests
  - e) Computation, plotting and interpretation of results
- iv) 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
- v) Mechanical Analysis
  - a) Preparation of sample
  - b) Conducting sieve analysis
  - c) Computation f results
  - d) Plotting the grain size distribution curve
  - e) Interpretation of the curve
- vi) Laboratory Compaction Tests (Standard Proctor test)
  - a) Preparation of sample
  - b) Conducting the test
  - c) Observing soil behavior during test
  - d) Computation of results and plotting
  - e) Determination of optimum moisture and maximum dry density
- vii) Determination of permeability of soil samples by constant head and falling head methods
- viii) Unconfined Compression Test
  - (a) Specimen preparation



- b) Conducting the test
- c) Plotting the graph
- d) Interpretation of result and finding /bearing capacity
- e) Direct shear test on sandy soil samples
- f)

#### 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 concept principles involved, teachers should organize demonstrations in the laboratories and fields necessary to create understanding that soils fail either under shear or settlement due to heavy load. This can be shown by making use of photographs of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of examination at the end of each practical work will develop clear understanding about type concept and principles related to this subject.

#### REFERENTS:-

- i) Punia. BC "Soil Mechanics and Foundations"; Delhi Standard Publishers Distributors.
- ii) Bharat Singh and Shamsheer Prakash; "Soil Mechanics and Foundations Engineering Roorkee. Nem Chand and Bros!
- iii) Alam Singh, Soil Engineering Theory and Practice", New Delhi. Asia Publishing House.
- iv) Sehgal. SB: "A text Book of Soil Mechanics"; Delhi, CBS Publishers and Distributors
- v) Bowles. Joseph E;"Engineering Properties of soils and their Measurement" Mc Graw Hill
- vi) Parmer IV and Means, RE; Soil Mechanics and Foundations" Prentice Hall of India.
- vii) Sutton.BHC "Solution of Problems in Soil Mechanics " Pitman
- vii) Gulati. SK "Engineering Properties of Soils". Tata Mc Graw Hill
- ix) Rarnanna YR; Krishnamurthy S.and Duggal. AK; "Soil Sampling and testing" A laboratory manual (TTTTI), Marketed by New Age International Publishers Ltd.

- 3.3 Vertical curves  
Setting out of a vertical curve.
4. Trigonometrical Levelling (10%)  
Finding elevation of objects, base accessible-base inaccessible-single plane & double plane & double simple problems.
5. Tacheometry (15%)  
System of tacheometry- Stadia and Tangential systems- Principles-Fixed hair method-distance and elevation formulae- analatic lens(No proof) Advantages and use-simple problems. Distomats (Description Only) determination of constants of tacheometer- Tacheometric Traverse- Errors in Tacheometric work- Problems
6. Introduction to Digital Survey Instruments (20%)  
Study and use of the instruments given below to be explained
- a) Auto level
  - b) Digital Level
  - c) Digital Theodolite
  - d) Total station

#### PRACTICAL EXERCISES

- I Contouring:
1. Preparing a contour plan by radial line method by the use of a lagent chnometer Tacheometer
  2. Preparing a contour plan by method of squares
  3. Preparing a contour plan of a Road/Railway track/way trach/Canal by taking cross sections.
- II Theodolite:
1. Taking out the Theodilite, mounting on the tripod and placing it back in the box
  2. Study of a transit vernier theodolite; temporary adjustment of theodolite
  3. Reading the vernier and working out the least count, measurement of horizontal angles by repetition and <w> methods
  4. Measurement of vertical angles and use of techeometric tables
  5. Measurement of magnetic bearing of a line prolonging a line
  6. Running a closed traverse with a theodolite (at least five sides) and its plotting
- III. Curves:
- 1 Setting out of a simple circular curve with give data by the following methods:
    - a) Offsets from the chords produced
    - b) One theodolite method
  - 2 Setting out a circular curve with transition length by linear measurements
- IV Tacheometry
1. Determination of constants of a Tacheometer
  2. determination of distance and elevation of a point by Tacheometric observations
  3. determination of gradient between two points of different elevations

#### SURVEY CAMP

1. Duration 7 days
2. 15 marks to be allotted for Survey Camp file in Examination

## SURVEYING-II

Pds/week L T P  
3 - 6

### RATIONALE

One of the main responsibilities of Civil Engineering technicians is survey work. They are required to carry out survey work of a project either in its preparation or in its implementation stage. They require a thorough knowledge of methods of surveying and leveling, plotting of the survey work and also setting out works for excavation. The technician has to be skilled in the use of survey instruments.

In Surveying-I, knowledge and skills regarding chain, compass and levels was imparted. In this subject, knowledge and skills of plane contouring, theodolite surveying, curves and use of minor instruments have been included. Number of field exercises has been set through which students will gain knowledge and skills methods of surveying and use of instruments.

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Contouring: (10%)  
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 contour map; making alignment of a road, railway and a canal on a contour map, computation of earth work and reservation capacity from contour map.
2. Theodolite Surveying: (30%)  
Working of a transit vernier theodolite, fundamental axes of a theodolite and their relation; temporary adjustment of a transit theodolite; concept of vernier, least count and reading a vernier; 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 line; traversing by included angles and <w> angle method; traversing by stadia measurement theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in the theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Brief introduction to tacheometry and use of tacheometric tables.
3. Curves: (15%)
  - 3.1 Simple Circular Curves;  
Need and definition of a simple circular curve; Elements of simple circular curves- Degree of the curve, radius of 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 tangents
      - Successive bisection of arcs
      - Offsets from the chord produced
    - b) By tangential angles using a theodolite
  - 3.2 Transition Curves:  
Need (centrifugal force and super elevation ) definition of transition curve; requirements of transition curves; length of transition curves for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only.

## CIVIL ENGINEERING DRAWING-II

L T D  
- - 6

Note :

For all the drawings detailed specification shall be given.

Designs are not to be included in the examinations.

The drawings must include <w> out plans, full plan, sections, details of components, elevation, etc., as applicable to each topic. There are three Groups of drawings that are to be taught. Only one question will have to be answered by the students in the examination out of the two questions. The question paper will include only two questions, one from each Group from the combinations of Groups A & B or from Groups B & C or from Groups A & C

Group 'A' (PH Engineering Drawing) (30%)

1. Rapid Sand Filter
2. Septic Tank with dispersion Trench Soak pit
3. Bio gas plant Floating type
4. R.C.C square overhead tank supported by four columns
5. Tube well

Group 'B' (Bridge Drawing) (30%)

6. R.C.C Slab Culvert with splayed wing walls
7. Two span Pipe Culvert
8. Two span Fee Beam Fridge with square returns

Group 'C' (Structural Engineering Drawing with Bar Bending Schedule) (40%)

9. Simply supported one-way slab.
10. Simply supported two-way slab.
11. Restrained two-way slab.
12. Singly reinforced beam.
13. Doubly reinforced beam.
14. Fee Beams supporting continuous slab.
15. Dog- legged staircase
16. Lintel and Sunshade.
17. R.C.C. Column with footings. (swear)

REFERENCE BOOKS;

- |   |                                  |                       |
|---|----------------------------------|-----------------------|
| 1 | Drawing manual                   | - T.T.T.I- Chand & Co |
| 2 | Structural Drawing and Detailing | - Krishnamoorthy      |

## FIELD WORK/EXPOSURE

L T D  
- - 4

The purpose of field work exposure is to expose the students in the world of work with a view to create motivation in the students for better understanding and learning civil engineering courses in the later semesters. Another purpose is to provide appropriate learning experiences which are implementation of this subject.

- |   |  |   |
|---|--|---|
| i)  |  | V |
| isit to aggregate crushing units. To study the crushing operations and screening aggregates in the different size.                    |  |   |
| ii)   |  | V |
| isit to <w> Sand Query to study the retrieval of sand.  |  |   |
| iii)  |  | T |
| wo visits to building construction site (one residential and one commercial) to study construction processes and building components. |  |   |
| iv)   |  | V |
| isit to Okhla Sewage Works.   |  |   |
| v)  |  | V |
| isit to bridge flyover site to study various components.  |  |   |
| vi)   |  | V |
| isit to asphalt mixing plant.   |  |   |
| vii)  |  | V |
| isit to Railway museum.   |  |   |

The students are supposed to prepare a small report along with photograph drawing sketches of each visit and preserve the same for semester viva.

- g) Title block showing - Joinery details, Specification , Area Statement, color Index. Title of the property Space for Owners Signature and. Licensed Surveyor's Signature and Planner company Address etc.

Note: - The above drawings are suggestive only and the subject Teacher can modify according to the need time to time.

#### REFERENCE

- 1) Building Drawing – Khanna Publishers . New Delhi.
- 2) AutoCAD quick reference manual - Bpb Publications.

Preparation of drawing using AUTOCAD

- 1) Auto CAD
  - 1.1) Definition of various commands used
  - 1.2) Simple Exercises using AutoCAD commands
- 2) Produce drawing using AUTOCAD and output of all the drawings are taken print out in A4sheet using INKJET / LASER PRINTER or PLOTTER and produced in file form as regard (Approximate sizing of Important Components)
  - 2.1) Elevation of door partly paneled and partly glazed.
  - 2.2) Section of a lean – to roof.
  - 2.3) Section of Spread footing foundation.
  - 2.4) Section of a load bearing wall from parapet to Foundation. Partly showing all the details across the section (single storey)
  - 2.5) Plan section and elevation of a prayer Hall .
  - 2.6) Plan section and elevation of a Rapid sand filter.
  - 2.7) Plan, section and elevation of a over head tank.
  - 2.8) Plan, section and elevation of single bed roomed building (R.C.C. Roof)
  - 2.9) Plan , section and elevation of a school Building.
  - 2.10) Preparation of approval drawing to be submitted to Corporation or Municipality showing required details in one sheet such as
    - a) Site plan( Land boundary , Building boundary , car parking ,passage, sanitary layout, septic tank location etc).
    - b) G.F. Plan , F F Plan, Section and Elevation ( line diagram is enough).
    - c) Key plan
    - d) Septic Tank plan and section (line diagram)
    - e) Rain water harvesting pit (with all detail)
    - f) Typical foundation details (column foundation or Spread footing)

## ELEMENTS OF RCC DESIGN

Pds /week      L T P  
5 2 -

### RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RCC construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). He must be able to read and interpret structural drawings of different elements. This subject thus deals with elementary design principles as per BIS code of practice and their relevant drawings.

### DETAILED CONTENTS

1.      GENERAL (5%)  
Reinforced cement concrete-Concept of composite material-Purpose of providing reinforcement-materials used in R.C.C and their requirement -different grades of cement and steel-Characteristic strength and grades of concrete-modular ratio of R.C.C-type of loads on structures as per (IS:875)
  
2.      INTRODUCTION TO WORKING STRESS METHOD (5%)  
Assumption made in the working stress method-Permissible stresses(IS:456-2000) Flexural members-singly reinforced rectangular section-strain and stress distribution due to bending-actual and critical neutral axes-under/over reinforced sections-balanced sections-lever arm-moment of resistance of singly reinforced rectangular sections (simple problems).
  
3.      INTRODUCTION TO LIMIT STATE METHOD (10%)  
Concept-different limit states- Characteristic strength and design strength of materials-Characteristic loads-partial safety factor for loads and material strength limits state of collapse in flexure-assumption -stress strain curves for concrete and steel-stress block-maximum strain in concrete-limiting values of neutral axis for different grades of steel- moment of resistance of singly doubly reinforced rectangular sections- problems
  
4.      DESIGN OF BEAMS FOR FLEXURE BY L.S.M (10%)  
Effective span of cantilever, simply Supported and continuous beam-breadth and depth requirement of beam-control of deflection -minimum and maximum reinforcement, spacing for main enforcement and side face reinforcement as per IS 456-2000-design bending moments-design of singly and doubly reinforced rectangular beams - cantilever, simply supported beams
  
5.      DESIGN OF T- BEAM AND CONTINUOUS BEAMS BY L.S.M (10%)  
Design of singly reinforced T-beam -cantilever /simply supported beams -design of continuous beam using B.M coeffs (equal spans & u.s.l only)-use of design aids (not for examination).



6. DESIGN OF BEAMS FOR SHEAR BY L.S.M. (10%)

Limit, state of collapse in shear - design shear strength of concrete - design strengths vertical/inclined stirrups and bent up bars in shear - principle of shear design - critical sections shear - nominal shear stress - design of vertical stirrups, inclined stirrups and bent up bars rectangular beams using limit state method - simple problems - use of design aids (not for exam).

7. DESIGN OF ONEWAY SLABS BY L.S.M (10%)

Classification of slabs - Effective spans- Imposed loads on slabs (IS : 875) - strength and stiffness requirements - minimum and maximum permitted size, spacing and area of main and second reinforcement as per IS 456 - 2000 Design of cantilever, simply supported, slabs and sunshades limit state method Design of continuous slabs using B.M. coefficients - check for shear and stiffness - curtailment of tension reinforcement - use of design aids (not for exam).

8 DESIGN OF TWO WAY SLABS BY L.S.M (10%)

Introduction - Effective span - thickness of slab for strength and stiffness requirements Middle and edge strips -B.M. coefficients - design B. Ms. - simply supported and restrained slabs - tension and torsion reinforcement requirement - design of two way slabs using B.M. coefficients curtailment of reinforcement - check for stiffness.

9 DESIGN OF STAIRCASES BY L.S.M (10%)

Types of stairs according to geometry and structural behavior planning a staircase - effective  $\langle w \rangle$  of stairs - effective breadth of flight  $s$  - design of cantilever steps - design of doglegged and open well stairs spanning parallel to the flight.

10.DESIGN OF COLUMNS BY L.S.M (10%)

Limit state of collapse in compression - assumptions - limiting strength of short axially loaded compression members effective length of compression members - slenderness limits for columns -classification of column minimum eccentricity for column loads longitudinal and transverse reinforcement as per IS 456 - 2000 . Design of axially loaded short columns with lateral ties/ helical reinforcement - Use of design aid (not for exam).

11. DESIGN OF COLUMN FOOTINGS (10%)

Types of footings - Footings with uniform thickness and sloped footings - minimum thickness - critical sections minimum reinforcement, distribution of reinforcement , development length anchorage , cover , minimum edge thickness requirements as per IS 456 - 2000 - Design, of isolated footing (square and rectangular) with uniform / varying thickness by limit state method.

REFERENCES

1. Jai Krishna and Jain. OP; "Plain and Reinforced Concrete". Vol.1. Roorkee. Nem Chand and Bros
2. Handoo ,BL; Mahajan. VM and Singla. DR; "Elementary- of RCC Design" New Delhi Satya Prakashan
3. Mallick. SK; and Gupta, AP; "Reinforced Concrete" New Delhi. Oxford and IBH Publishing Co.
4. Punmia BC; "Reinforced Concrete Structure Vol. I Delhi Standard Publishers Distributors

## ELECTIVE-I

### MAINTENANCE AND REHABILITATION OF STRUCTURES

	Pds/week	L T P
RATIONALE		3 1 -

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

#### DETAILED CONTENTS

- 1. GENERAL (15%)**  
Quality assurance for concrete construction as built concrete properties strength, permeability. thermal properties and cracking
- 2 INFLUENCE ON SERVICE BILITY AND DURABILITY (15%)**  
Effects due climate, temperature, chemicals, wear and erosion. Design and construction errors. corrosion mechanism. Effects of cover thickness and cracking, methods of corrosion protection. corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection
- 3. MAINTENANCE AND REPAIR STRATEGIES (15%)**  
Definitions : Maintenance, repair and rehabilitation. Facets of Maintenance importance of Maintenance Preventive measures on various aspects Inspection. Assessment procedure for evaluating a damaged structure causes of deterioration - testing techniques.
- 4. MATERIAL FOR REPAIR (20%)**  
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain. Expansive-polymer concrete, Sulphur infiltrated concrete, ferro cement. Fibre reinforced concrete.
- 5. TECHNIQUES FOR REPAIR (20%)**  
Rust eliminators and polymers coating for rebars during repair foamed concrete, mortar and dry pack, vacuum concrete. Guniting and Shotcrete Epoxy injection. Mortar repair for cracks, shoring and underpinning.
- 6. EXAMPLES OF REPAIR TO STRUCTURES (15%)**  
Repairs to overcome low member strength. Deflection. Cracking. Chemical disruption, weathering wear, fire. leakage marine exposure.  
Engineered demolition techniques for Dilapidated structures - case studies

5. Sushil Kuan "Treasurers of Reinforced Concrete Design," Delhi Standard Publishers Distributors
6. Ramamrutham. S: "Design and Testing of Reinforced Structures". Delhi Dhanpat Rai and
7. Dayartham P; "Design of Reinforced Concrete Structures" New Delhi. Oxford and IBH Publishing Co.
8. Gambling ML "Reinforced Concrete Design" Macmillan India Limited.
9. Limit state Design by Karve
10. Limit state Design by P C Venghese.
11. Limit state Design by S.Ramchandra
12. Limit state Design by Syal and Goel
13. Reinforced Cement Concrete by Park and Pauley
14. Reinforced Cement Concrete by Mallick and Rangasamy

## ELECTIVE –I

### RURAL TECHNOLOGY

Pds/week L T P  
- 3 1

#### RATIONALE

Considerable employment opportunities are available in rural sector if diploma holders in civil engineering are trained to undertake small entrepreneur activity in the rural areas. This subject aims at imparting knowledge and skill in the use of local materials for low cost housing, rural water supply and sanitation rural roads and other appropriate technologies, which can be promoted for upgrading standard; of life in rural areas.

NOTE: Weightage of each topic for external examination is given in the brackets.

#### DETAILED CONTENTS

1. Introduction. (5%)  
Scope and concept of appropriate technology as applicable to civil engineering, importance of low cost construction in rural areas .
2. Materials: (10%)  
Importance of locally available material, bamboo, tree bushes, grass, mud, sand etc. treatment of materials for protection against termite, decay and for increasing their strength.
3. Mud Walls (10%)  
Construction of plane and block mud walls, bamboo/bush reinforced mud walls, water proofing of mud wall, thickness of mud walls, mud plaster. Bitumen combine mud plaster.
4. Thatched Roofs: (10%)  
Constructional method of thatched roofs, fire proofing of thatched roof, low cost treatment of thatched roof.
5. Low Coast Housing: (15%)  
Planning and construction of low cost houses, cluster of houses, ventilation, low cost doors, constructional of mud floors, construction of smokeless chullahs, construction of cement treated gunny sheds construction of sheds for animals.
6. Rural Water Supply: (15%) .  
Construction of open well, chlorination of open well, construction of hand pumps, constructions of bathing cubicals, construction of low cost drains
7. Rural Sanitations: (10%)  
Construction of low cost latrines construction of pre-fabricated septic tanks, construction of soak pits.
8. Rural Roads: (10%)  
Soil stabilization and construction of fair weather roads, construction of bunds
9. Miscellaneous: (15%)  
Low lift pumps, ferro-cement <w> tanks, ferro-cement grain bins, red clay tiles for roof and floors, construction of rapid burning low cost brick kilns solar seasoning plants. Solar cookers, fiber corrugated sheets, individual and community biogas plants.

Concrete blocks for wall construction, brick panels, pre cast lintels, slabs and beams etc.

Text Book:

1. Denison Campbell: Allen and Roper. "Concrete Structures", Materials. Maintenance and Repair, Longman Scientific and Technical UK.1991.
2. R.T. Allen and S.C. Edwards, "Repair of Concrete Structures" Blakie and Sons, UK 1987

References:

1. M.S. Shetty "Concrete Technology – Theory and Practice" S .Chand and Company <w> Delhi. 1992.
2. Santhakumar , A.R. " Training Course notes on Damage. Assessment and repair in <w> Cost Housing". "RIIDC – NBO" Anna University, July, 1992
3. Raikar . <w> "Learning from failures – Deficiencies in Design" Construction and Service <w> Centre (SDCPL). Raikar Bhavan Bombay. 1987.
4. <w> "Estate Management, Anna Institute of Management". Chennai ,1992
5. Lakshmipathy Metal Lecture notes of Workshop on " Repairs and Rehabilitation of Structures" , 29-30<sup>th</sup> October,1999.

ELECTIVE – I  
RAILWAY , BRIDGES AND TUNNELS

L T P  
Pds/week      3 1 -

RATIONALE

This subject will cater to the needs of those technicians who would like to find employment in the construction of railways, bridges and tunnels. The subject aims at providing broad based knowledge regarding track materials, fixtures and fasteners : geometrics of broad gauge, points and crossings: track laying procedure, track maintenance: classification of bridges, site selection, bridge foundations, piers and abutments, bridge, bearings, temporary bridges, maintenance of bridges and various aspect of tunnel construction,

NOTE: Weightage each topic for external examination is given in the brackets

DETAILED CONTENTS

I. RAILWAYS

1. Introduction (5%)  
Railways –An important system of communication in India
2. Permanent Way: (10%)
  - 2.1 Definition of a permanent way, components of a permanent way: sub grade, ballast sleepers, rails, fixtures and fastenings
  - 2.2 Concept of gauge and different gauges prevalent in India. Suitability of these gauges under different conditions.
3. Track materials: (10%)
  - 3.1 Rails: Function of rails: different types rail sections- double headed, bull headed and flat footed, their standard, length, weight and comparison: Welded rails; appropriate length of welded rails and advantages of welded rails, Creep: its definition, causes effects and prevention, wear of rails: its causes and effects
  - 3.2 Sleepers: Function of sleepers; different types of sleepers - wooden, steel. cast iron (Plot type), concrete and prestressed concrete, their sizes, shapes characteristics and spacing.
  - 3.3 Ballast: Function; materials used for making ballast stone, brick, slag and cinder, their characteristics
  - 3.4 Fixtures and Fastenings:
    - Connections of rail to rail = fish plate and fish bolts
    - Rail to sleepers – sketches of connection between flat footed rails with various type of sleepers with details of fixtures and fasteners used.
4. Geometrics for Broad Gauge: (10%)  
Typical cross sections of single and double broad gauge railway track in cutting and embankment: Permanent and temporary land width; Gradient: ruling. maximum, minimum for drainage, gradients in station yards; Curves: limiting radius of a curve for broad gauge, transition length to be providing for railway curves as per railway code; Super elevation: its necessity and limiting value; Definition of equilibrium cant and cant deficiency; gauge on curves.

5. Points and Crossings: (15%)  
Necessity and details of arrangements; sketch of a turnout, definition of stock rail, tongue rail, check rail, lead rails, wing rail, point rail, splicerail, stretcher bar, throw of switch, heel points; Diamond crossing; over, triangle
6. Track Laying: (5%)  
Preparation of sub-grade; Collection of materials: setting up a material depot and carrying out initial operations such as adzing of sleepers, bending of rails and assembling of crossings, Definitions of base and rail head .Transportation by material trollies, rail carriers and materials trains; Method of track laying (parallel, telescopic and American methods). Organization of labour at rails head; ballasting the track.
7. aintenance of Track: (5%)  
7.1 Routine maintenance of formation and side slopes, rails, fixtures and drainage  
7.2 Special maintenance – Replacement of defective sleepers and rails  
7.3 Tools used for the above operations

NOTE The study of the subject must be supplemented by a note to the nearby railway station

## II. BRIDGES

8. Introduction (2%)  
Bridge – its function and component parts, different between a bridge and a culvert
9. Classification of bridges: (5%)  
Their structural elements and suitability:
  - 9.1 According to life- permanent and temporary
  - 9.2 According to road way level- Deck, through and semi- through
  - 9.3 According to material – wooden, steel; RCC, pre-stressed and masonry
  - 9.4 According to structural form;
    - Beam type – RCC, T- Beam, steel girder bridges, plate girder and box girder, trused bridges, N and warren
    - Arch-type-open spandrel and filled spandrel barrel and rib type
    - Suspension type- unstiffened sling type, its description with sketches
    - According to the position of highest flood level submersible and non submersible
10. Site Selection and Collection of Data (2%)  
Factors affecting the selection of site for a bridge, data to be collected
11. Foundations: (5%)  
Depth of foundation types of foundations, wall foundation and caisson (open type only),their details of construction with sketches.  
  
Laying of foundations on (i) dry soil (ii) soil charged with water (iii) under water, coffer dams their types and construction
12. Piers, Abutments and Wing walls: (5%)  
Piers – definition parts; type – solid ( masonry and RCC), open; cylindrical and abutment piers. Definition of the terms; height of pier, water way ( natural and artificial ); afflux and clearance.  
  
Abutments and wing walls – definition, types of abutments ( straight and tee), abutment with wing walls straight splayed, return and curved)

## NEW&NON RENEWABLE SOURCES OF ENERGY

L T P

3 1 -

### DETAILED CONTENTS

1. Introduction (5%)  
Importance, availability, requirements, scope and future scenario: prospects of non-conventional sources of energy and their comparison with conventional sources. Conservation of energy
- 2.1 Introduction
- 2.2 Solar radiation and its measurement (10%)  
Solar constant, solar radiation at the Earth's surface, solar radiation measurements, estimation of Average solar radiation, solar radiation on tilted surfaces-
- 2.3 Solar energy collectors: (10%)  
Flat plate collectors, thermal analysis of flat plate collector and useful heat gained by the fluid  
Concentrating collectors Cylindrical parabolic concentrating collators Advantages and disadvantages of various types of collectors
- 2.4 Solar Energy storage (10%)  
Solar energy storage system, solar pond, applications of solar ponds
- 2.5 Application of solar energy (10%)  
Principle, construction details, operation and maintenance of following solar devices
  - i) Solar water heating
  - ii) Space Heating
  - iii) Space cooling
  - iv) Solar thermal electric conversion
  - v) Solar photo voltaic (solar electric power generator)
  - vi) Solar distillation
  - vii) Solar pumping
  - viii) Solar furnace
  - ix) Solar cooking
  - x) Solar Stills



13. Bridge Bearing: (2%)  
Purpose of bearings; types of bearing – fixed plate, sliding plate, deep cast base, rocker, rocker and roller, their functions with sketches
14. Temporary Bridges: (2%)  
Necessity, description with sketches of pontoon and boat bridges
15. Maintenance of Bridges: (2%)  
15.1 Inspection of Bridges  
15.2 Routine maintenance
- III TUNNELS:
16. Necessity of tunnels: (2%)
17. Typical section of tunnels for a National Highway and a single and double broad gauge railway track (5%)
18. Transfer of centre line of tunnel by shaft method (2%)
19. Method of construction of tunnels in soft rock by needle beam method (2%)
20. a) Method of construction of tunnels in hard rock with face heading and safety precaution to be taken.
- b) Lining of tunnels with concrete (2%)
21. a) Ventilation - necessity and methods of ventilation, by combination of blowing and exhaust  
b) Drainage methods of draining water in tunnels (2%)

REFERENCES:

1. Vaswani NK; "Railway Engineering" Roorkee, Roorkee Publishing House
2. Rangwala, <w> "Railway Engineering" Anand, Charotar Book Stall
3. Deshpande, RS. "A Text Book of Railway Engineering", Poona, United Book Corpn.
4. Algia, JA; "Bridgte Engineering ", Anand Charotar Book Stal
5. Bindra, SP; " Principles and practice of Bridge Engg", Delhi, Dhanpat Rai and Sons
6. Saxena, subhas, " Tunnel Engineering"
7. Victor, D Johnson; "Essentials of Bridge Engineering" New Delhi, Oxford and IBH
8. Gupta, BL; "Road, Railway, Bridge and Tunnel Engineering" New Delhi. Standard Publishers Distributors

- xi) Solar green house
- xii) Solar production of hydrogen
- xiii) Agriculture and industrial process heat

3. Energy from Biomass (10%)

Introduction

Wet and dry biomass conversion technologies

Photo synthesis

Biogas generation – principle

Factors affecting biogas generation

Type of biogas plants – their construction and operational details – advantages and disadvantages of different types of biogas plants

Applications of biogas

Problems in biogas generation and their remedial measure

Biomass Gasification

Classification of biomass <w> their applications and problem in development of gasifiers

Smokeless chullah, Principle, types, constructional, Operational and maintenance details

4. Magneto Hydro Dynamic (MHD) Power Generation (10%)

Principle of MHD power generation

Advantages of MHD system

Electrical conditions to power output of MHD

5. Small Scale Hydroelectric (Mini and Micro hydel) (10%)

Introduction

Difference between mini micro and large scale hydel project

Natural of small hydro development

Turbines for small scale hydro electric

- i) Bulb or tubular turbine
- ii) Tube turbine
- iii) Straflo turbine

Advantages and limitations of small scale hydro electric Hybrid systems

6. Wind Energy (10%)

Introduction

Basic principle of wind energy conversion system (WECS)

- i) Nature of wind
- ii) Power of wind
- iii) Forces on the blades
- iv) Wind energy conversion

Site selection considerations

Basic components of wind energy conversion system (WECS)

Advantages and disadvantages of WECS

Type of wind machines

Applications of wind energy

7. Principle, applications, advantages and limitation of following: (15%)

Geothermal energy

Ocean thermal electric conversion (OTEC)

Chemical energy sources

Hydrogen energy

Magneto hydro dynamic (MHD) Power generation

Thermo electric power

Thermionic generation

Thermo nuclear fusion energy

Tidal energy

LIST OF BOOKS

1. Solar Energy Utilisation by G.D. Rai ; Khanna Publishers, Delhi

## TOWN PLANNING

L T D

3 1 -

### TOWN PLANNING PRINCIPLES

(10%)

Introduction – objectives principles – necessity origin of towns – forms of planning – representation technique – neighborhood layout –master plans- planning concept of lecorbusier, garden city- EHoward & C.A. Doxia Das. Preparation of <W> layout.

### ROAD AND STREET PLANNING

(20%)

Planning principle and technique – objective of –road street:- classification of street systems- road junction – parking – road and street layout including details of road junction.

Traffic managements – street lighting –regional road and arterial road – sub arterial road- local streets – off street parking spaces foot path cycle tracks.

Plantation of shrubs : trees and greenery – norms of planning of shrubs and trees – types of plants – distance between trees. Effect of plants on environment projection.

### HOUSING

(25%)

Demand draft for housing- classification – residential buildings- housing policies & programs in India- various agencies of housing & their operation – housing finance – role of HDFC, LIC, HUDCO & banks. Economics and administrative policies in housing programmes – New Developments – housing layouts – CMDA guidelines - tamilnadu Towns & country planning Rules – Urbanland ceiling act- problem of redevelopment and slum clearance – sites and services scheme- organization of construction industry – co-operative societies, housing boards.

Planning of landscape architecture for residential areas- silent features.

### ECONOMY, SOCIETY, ENVIRONMENT AND TRANSPORT POLICY AND PLANNING (20%)

Production of built environment- relationship between economy, society and the built environment – relationship and conflicts between developers. Planners architects, designers and <w>

Transport policy and planning – range over the technical problem involved in transport analysis and planning- need to travel, patterns of trip making and modes of travel and the policy issues surrounding transport.

## TOWN PLANNING RULES, BUILDINGS BYE LAWS & DEVELOPMENT CONTROL RULES (25%)

Necessity of framing town planning rules and by laws- principle involved objectives- local by laws- local by laws as compared to NBC-1983-zoning-principles- objectives use of zones- height zones- density zones – density- net density- gross density- local density calculate a density for a given area- study of local bye-laws and local zoning plans as applied to the residential buildings- salient feature of multi storeyed and public building- parking space- technical terms- land use <w> -site plan- F.A.R – plot coverage- E.S.I. set back carpet area, plinth area light plan-TDR floating E.S.I- green belt.

Importance of framing building by laws-study of National buildings bye laws in the designs and lay out of building with reference to National building rules- development control rules-general rules as applied to metropolitan area- CMDA rules.

### REFERENCE BOOKS:

1. National building code of India-part-III
2. Municipal & panchayat by laws
3. CMDA rules
4. Corporation by laws
5. Town planning- SC, Rangwala
6. Urban and regional planning- KA, Ramegowda, university of Mysore
7. The urban pattern, city planning and design-Ms DVan
8. The timer saver standard for site planning- Mc graw hill book company
9. An introduction to town and country planning – john rate life London
10. The art of home landscaping – Mc graw hill book company
11. A guide of site an environmental planning- Harvey M.Rubenstein Newyork

PRACTICAL TRAINING  
(Including field Visits/Exposure and Practice on Computers)

L T P  
-- 18

The object of this training is to :

- i). Most of the work in Civil Engineering is executed through contracts and with reference to relevant codal practices, technical specification hence expose to the students to industrial/field procedures and practices will give due focus in sensitizing the students about this aspects so that the students is able to properly comprehend, apply & understand the implications..
- ii). Develop comprehension regarding concepts, principles and practices taught in the class room in their application in solving field/industrial tasks/problems. For this purpose students are required to be sent for a period of 8-9 weeks for practical training in field industry.

For effective planning and implementation of this training, it is proposed to:

- i) Identify adequate number of industrial/field organizations where students will be sent for practical training.
- ii) Prepare a work book, which can be used by students for guiding students to perform definite task during practical training.
- iii) Identification of teachers who would supervise the students and provide guidance during practical training.

Each student is supposed to prepare a detailed report of the operations/processes seen by him/her. The students should be guided by respective subject teacher, Each teacher may guide a group of four to five students. The teacher along with person from the Industry will conducts performance assessment of the students. The criteria of the assessment will be as follows:

<u>Criteria</u>	<u>Weightage</u>
i) Attendance and Punctuality	15%
ii) Initiative in performing task learning new things	15%
iii) Relations with people	15%
IV) Report writing	55%

Note: Out of the Eight-Nine Weeks training (including 2-3 weeks training during vacations) in the industry field about two weeks may be spent by the students along with the teachers in visits to various organizations dealing with civil Engineering.

## ADVANCED CONSTRUCTION TECHNOLOGY

L T P  
3 1 -

### RATIONALE

This is an applied technology elective subject. In this subject, knowledge regarding earth work, construction of high rise buildings and pre-cast and pre stressed concreting and piles has been given.

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Earth Work (20%)
  - 1.1 Excavation in ordinary and hard soils, excavation in soft and hard rock, blasting techniques excavation in weak soils
  - 1.2 Side slopes of excavation; minimum working space at bottom, shoring, strutting
  - 1.3 <w> technique – pumping and well points
  - 1.4 Disposal of spoil and balancing
  - 1.5 Safety aspects
  - 1.6 Embankment, compaction of earth fills, protection and drainage of embankments
  
2. High rise construction (20%)
  - 2.1 Construction techniques for high rise buildings
  - 2.2 Construction techniques for chimneys and cooling towers.
  
3. Precast and Prestressed Concrete Construction (20%)
  - 3.1 Introduction of prestressed concrete, general theory. Liner post tensioning general, post tensioning advantages to the design engineer and the contractor
  - 3.2 Linear post tensioning system high strength post tensioned stands, parallel lay wire, high strength alloy steel bars
  - 3.3 Techniques of post tensioning – general special requirements for forming and false work, ducts and closures, placing of ducts or tendons, concreting, stressing procedure, <w> , protecting anchorage from corrosion.
  - 3.4 Pretensioning – general, pretensioning yards set up, forms for pretensioned structural elements, special techniques of pretensioning.
  - 3.5 Materials of prestressing - cement, aggregates, concrete, admixtures, vibration, curing, light weight aggregates, high strength steel bars, high strength stand, stress relaxation, galvanization. Codes specifications and inspection, manufactures of prestressing equipment, specifications, sizes and costs.
  
4. Piles: (20%)

Piles, Basic piling methods for various types of piles, methods of pile driving, non-displacement piles, problem in pile construction , pile testing.

### INSTRUCTIONAL STRATEGY

The subject shall consist of visits by the students to various construction sites where they shall see the heavy construction works. They shall also contact the representatives of the manufactures of various construction equipments and collect information from practical demonstration, discussions and technical information received from the firms.

## ELEMENTS OF STEEL DESIGN AND DRAWING

Pds/week L T P  
4 1 3

### RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise fabrication and erection of steel structures. He may also be required to design simple steel structural elements, make changes in design depending upon availability of materials (angles and channels of different sizes). He must be able to read and interpret structural drawings of different elements. This subject thus deals with elementary design principles as per BIS code of practice and their relevant drawings.

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Structural Steel and Sections: (2%)
  - 1.1 Properties of structural steel as per IS: 226 and IS:197
  - 1.2 Designation of structural steel sections as per IS handbook and IS:800
2. Structural Steel and Connections: (10%)
  - 2.1 Riveted connections, types of rivets, permissible stresses in rivets as per IS: 800, types of riveted joints, specifications as per IS 800 for riveted joints, design of riveted joints for axially loaded members, testing and inspection of riveted joints as per IS:800
  - 2.2 Welded connections: Types of welds, permissible in welds, types of welded connections, design of butt and fillet welded connections subjected to axial loads, testing and inspection of welded joints as per IS:800
3. Tension Members: (10%)

Permissible stresses in tension for steel, design of tension members as per IS:800 (Flats, angles and tee sections only).
4. Compression Members: (10%)
  - 4.1 Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS 800, strength of columns of single and built up sections with the help of table of permissible compressive stresses.
  - 4.2 IS specifications for design of compression members, design of angle, struts and axially loaded columns ( no built up columns); use of tacking rivets.
  - 4.3 Column base sketch of slab base and gusseted base, beam and column connections ( no design )
5. Beams: (10%)

IS specifications for the design of simply supported steel beams including design of base plate at the ends ( laterally restrained beams only),structural behavior deflected shapes and function of various elements of a plate girder and freehand sketching of a plate girder and its elements.
6. Roof Trusses and Industrial Buildings (10%)

Types of roof trusses, Provision of bracings for columns and gable ends(layout only), Purlins, grits and sag rods (description only), Types of loads as per IS 875
7. Plate Girder (3%)

Names or various components and their functions

### B. STEEL DRAWING



1. Preparation of a working drawing (elevation, plan, details of joints as ridge, canes and connections) for a riveted steel roof truss resting on a masonry wall with the given span,  $\langle w \rangle$  the truss and the design data regarding the size of the members and the connections. Also  $\langle w \rangle$  the quantity of steel for the truss. (15%)
2. Steel connections (a,b,c,d) riveted and (e) welded all unstiffened (15%)
  - Beam to beam connections (Seated and framed)
  - Beam to column (Seated and framed)
  - Column base connections (Slab base and gusseted base)
  - Details of column splices
  - Connections of a steel bracket with flange of a column
3. Detailed drawing showing plan and elevation for a riveted plate girder with the given design data regarding the sized of its parts, with details at the supports and connection, of stiffeners, flange angles and cover plates with the web (15%)

#### 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 given to the students for solving. It would be advantageous if students are taken at site to show various details of steel structures. Practice of reading steel structural drawings is another important feature of the course.

#### REFERENCES

1. Malhotra, MM; "Design of Steel structures", Delhi, Jain Brothers
2. Arya, AS and Ajmani, JL; "Design of Steel Structures", Roorkee, Nem Chand and Bros
3. Ram Chandra, "Design of Steel Structures", Delhi Standard Publishers Distributors

## CONSTRUCTION MANAGEMENT AND PROFESSIONAL PRACTICES

L T P

3 2 -

### RATIONALE

The student must know the basic management concepts and skills, inculcate humane values. Entrepreneurship concept should be clear to him. He should be able to start a company and administer it properly by knowing the basic economics, accounting and financing. As a manager of a construction company he should know the concept and tools of project management, cash flow, depreciation and quality control measures. He should also have knowledge of construction machines and its maintenance, should know the basic construction materials, its specifications, its quality control. He should also know the quality of the end product, its troubles and its maintenance.

Note :- Weight age of each topic for external examination is given in the brackets.

### DETAILED CONTENTS

1. Basic Principles of Management: (5%)  
Management principles, planning, organizing, directing, controlling, organization, structure of organization, structure of construction organization both government and project organizations, case study
2. Personnel Management: (10%)  
Manpower Planning, sources, recruitment and selection process, testing, interviewing, training and development strategies for workers, supervisors, and managers, career planning, Industrial relations, discipline, industrial fatigue, leadership, attitudes and human behaviour, motivation, duties towards workers, peers and seniors, Wage payment.
3. Finance Management: (10%)  
Types of economic systems, ownership, Money banking, international trade, foreign exchange, taxes, finance forecasting, capital, sources of finance, shares, debentures, mutual fund, types of accounts and account statements, final accounts and balance statements, demand and supply theories
4. Project Management: (20%)  
Project planning, Man, machine, money and material, work break down, scheduling, Bar Charts, CPM and PERT, types of construction machines- crawler and wheel tractors, Power shovels, cranes, lifts, hoes, trenching machines etc., operation, cost, troubles and maintenance, store and inventory management, cash flow, depreciation, installments, interest, manpower planning, organizational chart, purchasing- case study.
5. Quality Control: (10%)  
Specification, inspection, stages of inspection, testing, tolerances, BIS code specifications for cement, aggregates, steel, concrete & mild steel, Quality Management Systems- ISO: 9000 Series, Environmental Quality Management System-ISO: 14001 Series, Total Quality Management.

6. Accident, Safety and Housekeeping: (10%)  
Types, causes, cost, and investigation of accidents, hazards, safety analysis. planning implementation and education. BIS measures for safety (especially in construction industry) fighting, First aid, security, pilferage, job layout-location of store, equipments, materials project office, security guards etc.
7. Marketing in Civil Engineering: (10%)  
Importance of marketing, marketing of housing, building materials, infrastructures, toll bridges, water supply and sanitation services, consultancy, pricing, construction equipments shuttering and centering, etc., market survey, marketing mix of product and services, tenders and contracts, quotations, branding and packaging, invoicing, property dealing, credit facilities and after sales maintenance etc.
8. Entrepreneurship: (10%)  
Concept and need of Entrepreneurship, entrepreneurial qualities, small scale ustries, procedure for setting up an industry/ construction firm, project report preparation
9. Professional Ethics: (10%)  
Ethics, morality, social and spiritual values and need, professional bodies, code of conduct, dilemma before a civil engineer, conflict management
10. Industrial Laws: (15%)  
Labor laws, Factories act 1948, Workmen's compensation act, 1923, Minimum wages act 1948, ESI Act 1948, EPF Act 1952, Industrial Dispute Act 1947, Payment of wages act 1936 Union
- (1. One 3- day Entrepreneurship Awareness Camp should be organized for the students.  
2. One construction site visit must be organized for the preparation of Case Study report of its job layout, organizational structure, equipments and quality control measures )

## TRANSPORTATION ENGINEERING

L T P  
L T P Pds/week      L T P  
4 - 2

### RATIONALE

Construction of roads is one of the area in which diploma holders in Civil Engineering get employment. These diploma holders are responsible for construction and maintenance of highways. Basic concepts of road geometries, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course.

### DETAILED CONTENTS

#### Highways

1. Introduction: (5%)
  - 1.1 Importance of Highway transportation; Important organizations like Central Road Research Institute, Indian Roads Congress, Ministry of Surface Transport
  - 1.2 Nagpur plan, Ribbon development, Requirements of an ideal road
  - 1.3 IRC classification of roads
  - 1.4 Organization of state highway department
2. Road Geometries: (10%)
  - 2.1 Glossary of terms used in geometries and their importance: Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs formation levels, camber and gradient
  - 2.2 Sight distances
  - 2.3 Curve necessity, horizontal and vertical curves including transition curves and super elevation. Methods of providing super elevation
3. Highway Surveys and Plans: (10%)
  - 3.1 Basic consideration governing alignment governing alignment for a road in plan and hilly area
  - 3.2 Highway location; marking of alignment; importance of various Stage viz.
    - a) Reconnaissance survey. Conduct reconnaissance and prepare reconnaissance report
    - b) Preliminary survey: Object, organizing, conducting and information to be collected
    - c) Location Survey
    - d) Standards for preparing the highway plans as per Ministry of Surface Transport (MOST)
4. Road Materials: (10%)
  - 4.1 Low cost roads- Earthen and gravel roads- construction details with sketches-Maintenance
  - 4.2 Water Bound Macadam Road- Materials used- Construction details with sketches -Maintenance
  - 4.3 Bituminous Roads- Bitumen-coal-Tar-Asphalt-Cutback- <w>. Tests on bitumen-Flash and fir point test-Penetration-softening point-Types of bituminous-roads- surface dressing semi grouting-full grouting-Bituminous concrete-Maintenance of bituminous roads.
  - 4.4 Concrete roads- classification of concrete road - constructional details Merits and demerits
  - 4.5 Hill Roads- Factors considered in alignment- Formation- Hairpin bends-Drainage- Retaining and Breast walls.

5. Road Arboriculture (5%)  
Introduction- Objects- Selection of trees - Location of Trees- highway <w>. Benefits

6. Traffic Engineering (5%)  
Traffic signals-Advantages-Types of road signal- purpose-Traffic Surveys- Express ways- necessary and requirements-Grade intersection-Grade separation-Location- Types, Road accidents- causes of accidents -Preventive measures.

7. Railways: (30%)

7.1 Classification of Indian railway, Different types of gauges, Difficulties in having different gauges

9.1 Rail function, Types of rail sections, coning of wheels, welding of rails, Bending of rails, Length of rails, wear of rails, flogged rails, creep

9.2 Railway ballast and sleepers

9.3 Track fixtures, fastenings and plate laying

9.4 Maintenance of Track

9.5 Purpose and definition of points and crossing- Turnouts- points and <w>- Sleepers laid for points and Crossings- Types of Crossing

9.6 Types of Stations and yards, Level crossings

9.7 Station equipment; engine sheds, water column, Drop pits. turnouts, <w> Triangles, Buffer stops. Foul Marks, Sand hump, weigh bridges

9.8 Signaling: objects. Classification according to location, special signals.

9.9 Interlocking: Essential principles of interlocking, methods of interlocking

8. Bridges (20%)

8.1 introduction: Components of a bridge - IRC loading, Different types of bridges and culverts cause way

10.1 Factors governing the ideal site selection - alignment of <w> <W> to be considered

10.2 Bridge foundations, Control of ground water for foundation- <w> foundation -coffer dams

1 0.3 Types of Piers, Abutments, wing walls

10.4 Types of superstructure, Grider bridges, Balanced cantilever, Continous, Arched Suspension, Cantilever, Steel arched, rigid frame, steel bridges, bridge bearings.

12. Construction Equipment: (5%)

Output and use of the following plant and equipments

12.1 Hot mix plant and mix all battery

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

12.2 Asphalt mixer and tar boilers

12.3 Road pavers

## PRACTICAL EXERCISES

- i) Determination of the California bearing ratio (CBR) for the sub-grade soil (demonstration)
- ii) Determination of penetration value of bitumen
- iii) Determination of softening point of Bitumen
- iv) Determination of impact value and crushing value of the road aggregate
- v) Determination of abrasion value of road aggregate
- vi) Determination of ductility of bitumen
- vii) Determination of viscosity of tar/bitumen

## INSTRUCTIONAL STRATEGY

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

## REFERENCES

1. Khanna, SK and Justo, CEG, "Highway Engineering" Roorkee Nem Chand and Bros.
2. Vaswani, NK, "Highway Engineering" Roorkee, Roorkee publishing House
3. Priyani, VB, "Highway and Airport Engineering" Anand, Charotar Book Stall
4. Sehgal, SB; and Bhanot, KL;"A Text book on Highway Engineering and Airport" Delhi, S Chand and Co.
5. Bindra, SP; "A Course on Highway Engineering" New Delhi Dhanpat Rai and Sons
6. Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", New Delhi, Asia Publishing House
7. Duggal AK; Puri VP;"Laboratory Manual in Highway Engineering" New Delhi, New Age International Publication (P) Ltd.

## IRRIGATION ENGINEERING

L T P  
Pds/ week     3 1 –

### RATIONALE

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

NOTE: Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

1. Introduction: (5%)
  - 1.1 Definition of irrigation
  - 1.2 Necessity of irrigation
  - 1.3 History of development of irrigation in India
  - 1.4 Types of irrigation
  - 1.5 Sources of irrigation water
2. Rain Fall and Run-off (5%)
  - 2.1 Definition of rainfall and run-off. Catchment area, Dicken's and Rybe's formulae
  - 2.2 Types of rain gauges-Automatic and non-automatic
  - 2.3 Stream gauging
3. Water Requirement of Crops (10%)
  - 3.1 Definition of crop season
  - 3.2 Duty, Delta and Base Period, Their relationship
  - 3.3 Gross command area, culturable command area, Intensive of irrigation Irrigable area  
Irrigable area
  - 3.4. Water requirement of different crops- Kharif and Rabi
4. Lift Irrigation: (10%)
  - 4.1 Types of wells-shallow and deep well, aquifer types, ground water flow, construction of open wells and tube wells
  - 4.2. Yield of an open/tube well and problems
  - 4.3. Methods of lifting water - Manual and mechanical devices , use of wind mills
5. Flow Irrigation: (15%)
  - 5.1 Irrigation Canals
  - 5.2 Perennial Irrigation
  - 5.3 Different parts of irrigation canals and their functions
  - 5.4 Sketches of different canal cross-sections
  - 5.5 Classification of canals according to their alignment
  - 5.6 Design of irrigation canals - Chezy's Formula. Mannings formula, Kennedy's and Lacey's Silt theories and equations, comparison of above two silt theories, critical velocity ratio
  - 5.7 Various types of canal lining - Advantages and disadvantages'
6. Canal Head Works: (10%)
  - 6.1. Definition, object, general layout, functions of different parts of head work;
  - 6.2. Difference between weir and barrage
7. Regulatory works: (10%)
  - 7.1. Functions and explanation of terms used
  - 7.2. Cross and head regulators

- 7.3 Falls
- 7.4 Energy dissipaters
- 7.5 Outlets – different types
- 7.6 Escape
- 8. Cross Drainage Works: (10%)  
Functions and necessity of the following types : aqueduct, siphon, super passage, level crossing, inlet and outlet
- 8.1. Constructional detail of the above
- 9. Dams : (10%)
- 9.1 Eathen dams – types, causes of failure
- 9.2 Classification into masonry and concrete dams
- 9.3 Labelled cross section of gravity dfam
- 9.4 Spill ways
- 10. Water logging and Drainage : (5%)
- 10.1 Definition, causes and effects, detection, prevention and remedies
- 10.2 Surface and sub-surface drains and their layout
- 11. Tube well Irrigation: (10%)
- 11.1 Introduction, occurrence of ground water, location and command , advantage of tube Wells
- 11.2 Tube wells, explanation of terms water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers
- 11.3 Types of tube wells and their choice-cavity strainer and slotted typeo;
- 11.4 Method of construction boring, installation of well assembly, development of well, assembly, development of well, pump selection and installation and maintenance

#### INSTRUCTION STRATEGY

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

#### PREFERENCES

1. Singhal, RP; ‘A Text Book on Irrigation Engineering’, Singhal Publications
2. Bharat Singh, ‘Fundamentals of Irrigation Engineering’, Roorkee, Nem Chand and Bros
3. Garg, Santosh Kumar, ‘irrigation Engineering and Hydraulics Structures’, Delhi, Khanna Publications
4. Punmia, BC; and Pande Brij Bansi Lal, ‘Irrigation and Water Power Engineering’, Delhi, Standard Publishers Distributors
5. Sharma, RK: ‘Text Book of irrigation Engineering and Hydraulics Structures’, New Delhi, Oxford and IBH Publishing Company
6. Sharma, SK; ‘Principles and Practice of Irrigation Engineering’, New Delhi, Prentice Hall of India Pvt. Ltd.



## PROJECT WORK

L T P

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### RATIONALE

The practical training cum project work is intended to place students for project oriented practical training in actual work situations for the stipulated period with a view to :

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

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with minimal supervision. This experience is required to be planned and supervised on regular basis by the polytechnic faculty, for the fulfillment of above objectives, polytechnic may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organization is visited well in advance and activities to be performed by student are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Each teacher is expected to supervise and guide 5.6 Students

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria are given below:

- 1) Punctuality and regularity
- 2) Initiative in learning/working at site
- 3) Level/proficiency of practical skills acquired
- 4) Ability to solve like practical problems  
Sense of responsibility
- 5) Self expression/Communication skills
- 6) Interpersonal skills/Human Relation
- 7) Report writing skills
- 8) Viva Voce

Some of the suggested project activities are given below:

- i) Setting up of an enterprise
- ii) Projects connected with repair and maintenance of Civil works
- iii) Estimating and costing projects

- iv). Design of residential buildings including design of structural members
- v) Project work related to quality control of materials, concrete and construction activities
- vi) Project work related to waste minimization and waste utilization
- vii) Preparation of bar bending schedules and estimation of steel requirements
- viii). Survey work
- ix). Valuation of buildings
- x). Alignment of roads
- xi) Design of septic tanks
- xii) Design of water supply scheme for a locality
- xiii). Design of flood water disposal system
- xiv). Pollution prevention and control studies etc.

NOTE: The above mentioned list is only suggestive. Depending on the availability of project works in other areas may be given.

## ELECTIVE II

### ENTREPRENEURSHIP DEVELOPMENT

L T P

3 2-

#### RATIONALE

In view of potential contribution of entrepreneurship in employment generation and accelerating economic development in the country, we need to promote entrepreneurship amongst diploma holders. Civil Engineering as a discipline holds vast potential for self employment and entrepreneurial career. Teaching of entrepreneurship to Civil Engineering students is expected to motivate students with latest entrepreneurial traits to opt for self employment and entrepreneurial career. Contents listed below should help our diploma holders in civil engineering to start small enterprises of their own.

NOTE: Weightage of each topic for external examination is given in the brackets

#### DETAILED CONTENTS

1. Need and scope of Entrepreneurship: (10%)
  - 1.1 Need, scope and characteristics of entrepreneurs.
  - 1.2 Assistance to small scale industries from National Level Organization Like SIDO, NSIC, SIS and state level organizations like DOI DIC, SSIC, SFC, SISI Commercial banks etc.
  - 1.3 Special schemes for technical entrepreneurs
  - 1.4 Identification of opportunities: Exposure to demand based, resource, based, service based, import substitute, export promotion, trading and consultancy ventures
  - 1.5 Market survey techniques
2. Project formulation Process: (20%)
  - 2.1 Steps in Planning a small scale industry
  - 2.2 CPM and PERT as planning tools
  - 2.3 Structure of a project report
  - 2.4 Analysis of sample project reports and preparation of project report
  - 2.5 Techno-economic feasibility of the project
3. Technological Dimensions: (10%)
  - 3.1 Choice of technology, plans and equipment
  - 3.2 Product development
  - 3.3 Energy requirement and utilization
  - 3.4 Practice of shop layout and process planning
4. Marketing Perspective: (15%)
  - 4.1 Elements of sales and marketing management
  - 4.2 Nature of product and marketing strategy required
  - 4.3 Costing and pricing
  - 4.4 Packaging and advertising
5. Finance and Accounting: (15%)
  - 5.1 Working capital and fixed capital assessment and management

- 5.2 Exercise on working capital and fixed capital calculations
- 5.3 Credit institutions and financing procedures, financial incentives
- 5.4 Financial ratios and their significance
  
- 6. Managing the Enterprise: (15%)
  - 6.1 Understanding the concept of total quality management in small enterprise
  - 6.2 Understanding the human behavior
  - 6.3 Enhancing manpower productivity in small enterprises
  - 6.4 Oral communication
  - 6.5 Written communication
  
- 7. Rules and Regulations: (15%)
  - 7.1 Licensing and registration procedure
  - 7.2 Appreciation of important provisions of Factory Act Shop and commercial Establishments Act, Negotiable Instrument Act, Partnership Act,
  - 7.3 Income Tax, Sales Tax and Excise Rules
  - 7.4 Municipal bye-laws and insurance coverage