CURRICULUM

DIPLOMA
IN

CIVIL ENGINEERING,

CIVIL ENGINEERING(Construction),

CIVIL ENGINEERING(PHEE)

And

CIVIL ENGINEERING (PART TIME)

GT

Revised by:

Board of Technical Education Delhi

EFFECTIVE FROM: 2014-15

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CE-640 to 643 Elective – II

CE-640	Repair and Maintenance of building
CE-641	Advanced construction Technology
CE-642	Introduction to seismic planning and disaster management
CE-643	Energy conservation Techniques in building construction

SIXTH SEMESTER Civil (Construction) Engg.

CE – 630	Elements of Steel Design and Drawing
CE – 631	Construction Management & Accounts
CE – 632	Highway and Airport Engineering
CM – 640	Advance construction Technology
CE – 651	Project Work

CE-640 to 643 Elective – II

CE-633	Irrigation Engineering
CE-540	Contract Laws & Regulations
CE-642	Introduction to seismic planning and disaster management
CE-643	Energy conservation Techniques in building construction

SIXTH SEMESTER Civil (PHEE) Engg.

CE – 630	Elements of Steel Design and Drawing
CE – 631	Construction Management & Accounts
CE – 632	Highway and Airport Engineering
CM – 634	Air Pollution
CE – 651	Project Work

CE-640 to 643 Elective – II

CE-633	Irrigation Engineering
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7. Resource requirements

8. Recommendation for Effective Implementation of Curriculum

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
5. Metro rail corporations.

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 engineering 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, 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 conducting surveys
6. Knowledge of behavior of various types of soils and their uses 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 and 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 of 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.

3. DERIVING CURRICULUM AREAS FROM COMPETENCY PROFILE

	COMPETENCY	CURRICULUM AREAS
1.	Skill in preparing, reading and interpreting drawings pertaining to civil engineering and allied works	- Engineering Drawing - Building Drawing - Irrigation Drawing - PHE Drawing
2.	Knowledge of various types of construction materials and their characteristics	- Construction Materials
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.	- Building construction - Highway and Airport Engg. - Irrigation Engineering - Railways Bridges and tunnel - Water and waste water Engineering
4.	Understanding of concepts, principles and practices in making concrete and concreting operations for different types of civil works	- Concrete Technology
5.	Knowledge of the principles and methods of surveying and skills in conducting surveys	- Surveying
6.	Knowledge of behavior of various types of soils and their use for civil works	- Soil and Foundation Engineering
7.	Knowledge in the analysis and design of simple structural elements in concrete and steel and skill of preparing and reading detailed structural drawing	- Analysis of Structures - RCC Design - Steel Design
8.	Competencies in estimating and costing and Contracting of civil works including measurement and billing	- Quantity surveying and Valuation
9.	Knowledge of planning, scheduling, controlling and skill of supervising civil works	- Construction Management - Generic Skills and Entrepreneurship development
10	Skill in managing construction materials, equipment, manpower and cash flow	- Construction Management
11.	Competencies in maintenance, repairs and upkeep of buildings	- Repair and maintenance of building
12	Knowledge of principles of water supply and sanitary engineering and methods of treating water and sewage	- Water Supply & Waste water Engineering
13	Knowledge of applied sciences and engineering sciences so as to develop	- Applied Maths - Applied Physics

	scientific temper and facilitate understanding of technical subjects	- Applied Chemistry - Applied Mechanics - Workshop Practices
14	Knowledge of interpersonal relations and skills in communication	- English and Communication Skills
15	Knowledge of appropriate attitude and values	- Project work
16	Skill in using computers in the field of construction engineering	- Computers and its Applications
17	Skills in 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 Studies
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 & Regulations

4. ABSTRACT OF CURRICULUM AREAS (CIVIL ENGG.)

1. English and Communication Skills (I and II)
2. Applied Mathematics (I and II)
3. Applied Physics
4. Applied Chemistry
5. Application and uses of various software in Civil Engineering
6. Engineering Drawing
7. Basics of information technology
8. Applied Mechanics
9. Environmental Studies
10. Hydraulics
11. Workshop Practice
12. Structural Mechanics
13. Highway and Airport Engineering
14. Construction Materials
15. Building Construction
16. Civil Engineering Drawing (I and II)
17. Concrete Technology
18. Irrigation Engineering
19. Water Supply and Waste water Engineering
20. Soil and Foundation Engineering
21. Surveying (I and II)
22. RCC Design
23. Elements of Steel Design and Drawing
24. Quantity surveying and valuation
25. Construction Management and Accounts
26. Generic skills and Entrepreneurship development
27. Field work/Exposure
28. Practical Training
29. Project Work

Elective-I (Any one of the following)

30. Railways, Bridges and Tunnels
31. Contract Laws & Regulations
32. Analysis of structures
33. Industrial Waste Treatment
34. Ecology and Environmental Chemistry

Elective-II (Any one of the following)

35. Advanced construction technology
36. Introduction to Seismic Planning & Disaster Management
37. Energy Conservation Technology in Building Construction
38. Repair and Maintenance of building

4. ABSTRACT OF CURRICULUM AREAS CIVIL (CONSTRUCTION) ENGG.

1. English and Communication Skills (I and II)
2. Applied Mathematics (I and II)
3. Applied Physics
4. Applied Chemistry
5. Application and uses of various software in Civil Engineering
6. Engineering Drawing
7. Basics of information technology
8. Applied Mechanics
9. Environmental Studies
10. Hydraulics
11. Workshop Practice
12. Structural Mechanics
13. Highway and Airport Engineering
14. Construction Materials
15. Building Construction
16. Civil Engineering Drawing (I and II)
17. Concrete Technology
18. Advanced Construction Technology
19. Water Supply and Waste water Engineering
20. Soil and Foundation Engineering
21. Surveying (I and II)
22. RCC Design
23. Elements of Steel Design and Drawing
24. Quantity surveying and valuation
25. Construction Management and Accounts
26. Generic skills and Entrepreneurship development
27. Field work/Exposure
28. Practical Training
29. Project Work

Elective-I (Any one of the following)

30. Contract law and regulation
31. Railways, Bridges and Tunnels
32. Analysis of structures
33. Industrial Waste Treatment
34. Ecology and Environmental Chemistry

Elective-II (Any one of the following)

35. Irrigation Engg.
36. Introduction to Seismic Planning & Disaster Management
37. Energy Conservation Technology in Building Construction
38. Repair and maintenance of building

4. ABSTRACT OF CURRICULUM AREAS CIVIL (PHEE) ENGG.

1. English and Communication Skills (I and II)
2. Applied Mathematics (I and II)
3. Applied Physics
4. Applied Chemistry
5. Application and uses of various software in Civil Engineering
6. Engineering Drawing
7. Basics of information technology
8. Applied Mechanics
9. Environmental Studies
10. Hydraulics
11. Workshop Practice
12. Structural Mechanics
13. Highway and Airport Engineering
14. Construction Materials
15. Building Construction
16. Civil Engineering Drawing (I and II)
17. Concrete Technology
18. Air Pollution
19. Water Supply and Waste water Engineering
20. Soil and Foundation Engineering
21. Surveying (I and II)
22. RCC Design
23. Elements of Steel Design and Drawing
24. Quantity surveying and valuation
25. Construction Management and Accounts
26. Generic skills and Entrepreneurship development
27. Field work/Exposure
28. Practical Training
29. Project Work

Elective-I (Any one of the following)

30. Contract law and regulations
31. Railways, Bridges and Tunnels
32. Analysis of structures
33. Industrial Waste Treatment
34. Ecology and Environmental Chemistry

Elective-II (Any one of the following)

35. Pollution Control Acts and Legislation
36. Environmental Impact Assesment
37. Solid Waste Management
38. Irrigation Engineering

STUDY AND EVALUATION SCHEME: CIVIL ENGG. / CIVIL (CONST) / CIVIL(PHEE)

FIRST SEMESTER

CODE NO.	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CM-102	*English and Communication Skills I	4	1	2	50	50	100	3	100	-	300
BS-112	*Applied Mathematics-I	4	2	-	50	-	100	3	-	-	150
BS-214	* Applied Chemistry	4	-	2	50	50	100	3	100	3	300
ES-121	*Engineering Drawing	2	-	6	-	50	100	3	-	-	150
CE-230	*Workshop Practice I	-	-	8	-	50	-	-	100	3	150
** Student Centered Activities		-	-	5							
TOTAL		**14**	**3**	**23**							**1200**

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* Common with Mechanical, Production, Mechanical Maintenance and Automobile Engineering Civil (Construction) and Civil(PHE).

** 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.

SECOND SEMESTER

CODE NO.	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
BS-212	*Applied Mathematics -II	4	2	-	50	-	100	3	-	-	150
BS-213	*Applied Physics	4	2	2	50	50	100	3	100	3	300
ME-131	*Environmental Studies	4	-	2***	50	-	100	-	-	3	150
ES 122	* Basics of Information technology	-	-	4	-	50	-	-	100	3	150
ES-120	*Applied Mechanics	4	2	2	50	50	100	3	100	3	300
CE-231	Construction Materials	3	-	2	50	50	100	3	100	3	300
** Student Centred Activities (Value Based Education) (Not for Exam)		-	-	3	-	-	-	-	-	-	-
TOTAL		**19**	**6**	**15**							**1200**

* Common with Mechanical, Production, Mechanical Maintenance and Automobile Engineering Civil (Construction) and Civil(PHE).

** 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.

***Field Visit

STUDY AND EVALUATION SCHEME: CIVIL ENGG. / CIVIL (CONST) / CIVIL(PHEE)

THIRD SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRACTICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-330	Hydraulics	4	-	2	50	50	100	3	100	3	300
CE-331	Structural Mechanics	4	-	2	50	50	100	3	100	3	300
CE - 332	Building Construction	4	-	2	50	50	100	3	100	3	300
CE-333	Surveying I	2	-	4	50	50	100	3	100	3	300
CE-334	Water supply & Waste water Engineering	4	-	2	50	50	100	3	100	3	300
CE-335	Civil Engineering Drawing -I	2	-	6	50	-	100	3	-	-	150
** SCA		-	-	2							
TOTAL		**20**	**-**	**20**							**1650**

** 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 ENGG. / CIVIL (CONST) / CIVIL(PHEE)

FOURTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY		EXTERNAL ASSESSMENT (EXAM) PRACTICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-430	Concrete Technology	4	-	2	50	50	100	3	100	3	300
CE-431	Soil and Foundation Engineering	4	-	2	50	50	100	3	100	3	300
CE-432	Surveying – II	2	-	6	50	50	100	3	100	3	300
CE-433	Quantity surveying & Valuation	4	-	2	100	50	100	3	100	-	300
CE-453	Field work/Exposure	-	-	8	-	50	--	-	100 (Viva)	3	150
CM-401	*English and Comm. Skills- II	4	-	2	50	-	100	3	-	-	150
** SCA		-	-	-							
	TOTAL 1500	**18**	**-**		**22**						

* Common with Mechanical, Production, Mechanical Maintenance and Automobile Engineering. Civil (Construction) and Civil(PHE)

** 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 ENGG. / CIVIL (CONST) / CIVIL(PHEE)

FIFTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
		PERIOD / WEEK			INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY	PRACTICALS	WRITTEN		PRACTICALS		
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-530	Civil Engineering Drawing II	2	-	6	-	50	100	3		-	150
CE-533	Computer Application in Civil Engg	-	-	4	-	50	-	-	100	3	150
CE - 531	Generic skills and Entrepreneurship Development	4	-	-	50	-	100	3	-	-	150
CE-532	RCC Design	4	-	-	100	-	100	3	-	-	200
CE-540 To 544,	Elective -I	4	-	-	50	-	100	3	-	-	150
CE-551	Practical Training	-	-	16*		100	-	-	300 (Viva)	3	400
** SCA		-	-	-							
	TOTAL	**14**	**-**	**26**							**1200**

** 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.

Elective –I (Any one of the following)

CE-540	Contract Laws & Regulations	CE-541	Railway, Bridges and Tunnels
CE-544	Ecology and Environmental Chemistry	CE-543	Analysis of structures
CE542	Industrial Waste treatment		

STUDY AND EVALUATION SCHEME: CIVIL ENGG.

SIXTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRACTICALS				
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-630	***Elements of Steel Design & Drawing	4		4	100*	-	100	4	-	-	200
CE-631	***Construction Mgmt. & Accounts	4	-	-	50	-	100	3	-	-	150
CE-632	***Highway Airport Engg.	4	-	2	50	50	100	3	100	3	300
CE-633	Irrigation Engg	4	-	-	50	-	100	3	-	-	150
CE-651	***Project Work	-	-	12	-	100	-	-	300(Viva)	-	400
CE-640 to 643	Elective - II	4		-	50		100	3			150
** SCA		-	-	2							
	TOTAL	**20**		**20**							**1350**

*Equal weight age be given to drawing.

*** Common with Civil (Construction) and Civil (PHEE)

Elective –II (Any one out of the following)

CE-640 Repair and Maintenance of building

CE-641 Advanced Construction Technology
CE-642 Introduction to seismic planning and Disaster management.
CE-643 Energy Conservation Techniques in Building Construction

STUDY AND EVALUATION SCHEME: CIVIL ENGG.(PHEE)

SIXTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-630	***Elements of Steel Design & Drawing	4		4	100*	-	100	4	-	-	200
CE-631	***Construction Mgmt. & Accounts	4	-	-	50	-	100	3	-	-	150
CE-632	***Highway Airport Engg.	4	-	2	50	50	100	3	100	3	300
CE-648	Air Pollution	4	-	2	50	50	100	3	100	-	300
CE-651	***Project Work	-	-	12	-	100	-	-	300(Viva)	-	400
CE-644 to 646 CE633	Elective - II	4		-	50		100	3			150
** SCA		-	-	-							
	TOTAL	**20**		**20**							**1500**

*Equal weight age be given to drawing.

*** Common with Civil and Civil (PHEE)

Elective –II (Any one out of the following)

CE 633	Irrigation Engg.
CE-644	Pollution Control Acts and legislation
CE-645	Environmental Impact Assesment
CE-646	Solid waste Management

STUDY AND EVALUATION SCHEME: CIVIL ENGG. (CONST)

SIXTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY	PRACTICALS	THEORY	HRS.	PRACTICALS	HRS	
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS		MAX MARKS		
CE-630	*** Elements of Steel Design & Drawing	4		4	100*	-	100	4	-	-	200
CE-631	***Construction Mgmt. & Accounts	4	-	-	50	-	100	3	-	-	150
CE-632	***Highway Airport Engg.	4	-	2	50	50	100	3	100	3	300
CE-641	Advanced Const. Technology	4	-	-	50	-	100	3	-	-	150
CE-651	***Project Work	-	-	12	-	100	-	-	300(Viva)	-	400
CE-641 to 643 CE-633	Elective - II	4		-	50		100	3			150
** SCA		-	-	2							
	TOTAL	**20**		**20**							**1350**

*Equal weight age be given to drawing.

*** Common with Civil (Construction) and Civil Engg.

Elective –II (Any one out of the following)

CE-633 Irrigation Engg.

CE-640 Repair and maintenance of building

CE-642 Introduction to seismic planning and Disaster management.
CE-643 Energy Conservation Techniques in Building Construction

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%

(c) Four year Diploma (I to VIII Semester)

I year (I & II Semester)	-	10%
II year (III & IV Semester)	-	20%
III year (V & VI Semester)	-	30%
IV year (VII & VIII semester)	-	40%

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

STUDY AND EVALUATION SCHEME: CIVIL ENGG (PART TIME)

FIRST SEMESTER

CODE NO.	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CM-102	*English and Communication Skills I	4	1	2	50	50	100	3	100	-	300
BS-112	*Applied Mathematics-I	4	2	-	50	-	100	3	-	-	150
ES-121	*Engineering Drawing	2	-	6	-	50	100	3	-	-	150
CE-230	*Workshop Practice	-	-	8	-	50	-	-	100	3	150
** Student Centered Activities		-	-	1							
TOTAL		**10**	**3**	**17**							**600**

0

* Common with Mechanical, Production, Mechanical Maintenance and Automobile 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 ENGG. (PART TIME)

SECOND SEMESTER

CODE NO.	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
BS-212	*Applied Mathematics -II	4	2	-	50	-	100	3	-	-	150
ME-131	*Environmental Studies	4	-	2***	50	-	100	-	-	3	150
ES 122	* Basics of Information technology	-	-	4	-	50	-	-	100	3	150
ES-120	*Applied Mechanics	4	2	2	50	50	100	3	100	3	300
CE-231	Construction Materials	3	-	2	50	50	100	3	100	3	300
** Student Centred Activities (Value Based Education) (Not for Exam)		-	-	3	-	-	-	-	-	-	-
TOTAL		**15**	**2**	**13**							**1050**

* Common with Mechanical, Production, Mechanical Maintenance and Automobile 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.

***Field Visit

STUDY AND EVALUATION SCHEME: CIVIL ENGG. (PART TIME)

THIRD SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRACTICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-330	Hydraulics	4	-	2	50	50	100	3	100	3	300
CE-331	Structural Mechanics	4	-	2	50	50	100	3	100	3	300
CE - 332	Building Construction	4	-	2	50	50	100	3	100	3	300
BS-214	* Applied Chemistry	4	-	2	50	50	100	3	100	3	300
CE-333	Surveying I	2	-	4	50	50	100	3	100	3	300
** SCA		-	-	-							
TOTAL		**18**	**-**	**12**							**1300**

** 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 ENGG. (PART TIME)

FOURTH SEMESTER

CODE NO.	SUBJECT	STUDY SCHEME			EVALUATION SCHEME						TOTAL MARKS
(Theory / Practical)		PERIOD / WEEK			INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY	PRACTICALS	WRITTEN	HRS.	PRAC TICALS	HRS	
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS		MAX MARKS		
CE-432	Surveying – II	2	-	6	50	50	100	3	100	3	300
CE-433	Quantity surveying & Valuation	4	-	2	100	50	100	3	100	-	300
CM-401	*English and Comm. Skills- II	4	-	2	50	-	100	3	-	-	150
BS-213	****Applied Physics***	***4***	***2***	***2***	***50***	***50***	***100***	***3***	***100***	***3***	***300***
** SCA		-	-	2							
	TOTAL 1050	**14**	**2**		**14**						

** 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 ENGG. (PART TIME)

FIFTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-530	Civil Engineering Drawing II	2	-	6	-	50	100	3		-	150
CE-550	Computer Application in Civil Engg	-	-	4	-	50	-	-	100	3	150
CE - 531	Generic skills and Entrepreneurship Development	4	-	-	50	-	100	3	-	-	150
CE-334	Water supply & Waste water Engineering	4	-	2	50	50	100	3	100	3	300
CE-335	Civil Engineering Drawing -I	2	-	6	50	-	100	3	-	-	150
** SCA		-	-	-							
TOTAL		**12**	**-**	**18**							**900**

** 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.

Elective –I (Any one of the following)

CE-540	Contract Laws & Regulations	CE-541	Railway, Bridges and Tunnels
CE-544	Ecology and Environmental Chemistry	CE-543	Analysis of structures
CE542	Industrial Waste treatment		

STUDY AND EVALUATION SCHEME: CIVIL ENGG. (PART TIME)

SIXTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY	PRACTICALS	WRITTEN		PRACTICALS		
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-631	Construction Mgmt. & Accounts	4	-	-	50	-	100	3	-	-	150
CE-633	Irrigation Engg	4	-	-	50	-	100	3	-	-	150
CE-430	Concrete Technology	4	-	2	50	50	100	3	100	3	300
CE-431	Soil and Foundation Engineering	4	-	2	50	50	100	3	100	3	300
CE-453	Field work/Exposure	-	-	8	-	50	--	-	100 (Viva)	3	150
** SCA		-	-	2							
	TOTAL	**16**		**14**							**1050**

- Equal weight age be given to drawing.

Elective –II (Any one out of the following)

CE-640	Advanced construction Technology
CE-641	Contract Laws & Regulations
CE-642	Introduction to seismic planning and Disaster management.
CE-643	Energy Conservation Techniques in Building Construction

STUDY AND EVALUATION SCHEME: CIVIL ENGG. (PART TIME)

SEVENTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME INTERNAL ASSESSMENT THEORY PRACTICALS		EXTERNAL ASSESSMENT (EXAM) WRITTEN PRAC TICALS				TOTAL MARKS
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-532	RCC Design	4	-	-	**100**	-	100	3	-	-	200
CE-540 To 543,	Elective -I	4	-	-	50	-	100	3	-	-	150
CE-55100	Practical Training	-	-	16*		**100**	-	-	300 (Viva)	3	400
** SCA		-	-	6							
	TOTAL	**8 -**		**22**							**750**

** 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.

Elective –I (Any one of the following)

CE-540	Repair and Maintenance of building	CE-541	Railway, Bridges and Tunnels
CE-542	Industrial Waste Treatment	CE-543	Analysis of structures

STUDY AND EVALUATION SCHEME: CIVIL ENGG. (PART TIME)

EIGHTTH SEMESTER

CODE NO. (Theory / Practical)	SUBJECT	STUDY SCHEME PERIOD / WEEK			EVALUATION SCHEME						TOTAL MARKS
					INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAM)				
					THEORY PRACTICALS		WRITTEN PRAC TICALS				
		L	T	P	MAX. MARKS	MAX MARKS	MAX MARKS	HRS.	MAX MARKS	HRS	
CE-630	Elements of Steel Design & Drawing	4		4	100*	-	100	4	-	-	200
CE-632	Highway Airport Engg.	4	-	2	50	50	100	3	100	3	300
CE-651	Project Work	-	-	12	-	100	-	-	300(Viva)	-	400
CE-640 to 643	Elective - II	4		-	50		100	3			150
	TOTAL	**12**		**18**							**1050**

- Equal weight age be given to drawing.

Elective –II (Any one out of the following)

CE-640 Repair and Maintenance of building
CE-641 Advanced Construction Technology
CE-642 Introduction to seismic planning and Disaster management.
CE-643 Energy Conservation Techniques in Building Construction

CM102 ENGLISH AND COMMUNICATION SKILLS – I

L	T	P
4	1	2

Rationale

The curriculum aims to develop the use of English for three major purposes social interaction, academic achievement and professional use. Listening, speaking, reading, and writing skills can not be thought of as independent skills. They are generally perceived as interdependent where one skill often activates the other skills as well as the paralinguistic skills required for the achievement of effective communication. It is believed that the most effective way to achieve these purposes is through the adoption of a thematic, integrated, content-based approach to teaching and learning.

DETAILED CONTENTS

1. **INTRODUCTION** **(10%)**

Theory:

- Definition, Introduction and Process of Communication
- Objectives of Communication
- Essentials of Communication
- Media and Modes of Communication
- Channels of Communication
- Barriers to Communication
- Body language
- Humour in Communication
- Silence in Communication

Note: Teachers are expected to give practical examples, while teaching above topics

2. **LISTENING** **(10%)**

Theory: Significance, essentials, barriers and effectiveness of Listening.
Practicals: The following exercises to be conducted in practical sessions:

- Using pre-recorded CDs/DVDs with pre-listening exercise to prepare students about what they are going to hear and comprehension based on the audio
- Note-taking
- Listening for the main ideas
- Assessing listening proficiency

3. **SPEAKING** **(20%)**

Theory:
Significance, essentials, barriers and effectiveness of Speaking

- Introduction to phonetics (Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics)

Practicals: The following exercises to be conducted in practical sessions:

- Exercises on pronunciation of common words as given in the standard dictionary using symbols of phonetics
- Greetings for different occasions
- Introducing oneself, others and leave taking(talking about yourself)
- Just a minute (JAM) sessions: Speaking extempore for one minute on given topics
- Paper reading before an audience (reading unseen passages)
- Situational Conversation/role-playing with feedback, preferably through video recording
- Reading aloud of Newspaper headlines and important articles
- Improving pronunciation through tongue twisters

4. READING (10%)

Theory:

- Techniques of reading: Skimming, Scanning, Intensive and Extensive Reading
- Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

Section-I

- Homecoming – R.N. Tagore
- The Selfish Giant - Oscar Wilde
- The Stick – Justice Surinder Singh

Section-II

- I Have A Dream – Martin Luther King
- My struggle for An Education- Booker T Washington
- Life Sketch of Sir Mokshagundam Visvesvarayya

Section-III

- Ozymandias – P.B. Shelley
- Daffodils – William Wordsworth
- Stopping by Woods on a Snowy Evening – Robert Frost

- Comprehension exercises on unseen passages
- Exercises on interpretation of tables, charts, graphs, signs and pictures etc.

Practicals:

- Paper reading
- Poetry recitation
- Reading newspaper headlines

5. WRITING (15%)

Theory:

- Significance, essentials and effectiveness of writing
- Paragraph of 100-120 words

Practicals:

- Exercises on spellings
- Group exercises on writing paragraphs on given topics

6. VOCABULARY (15%)

Theory:

- Vocabulary of commonly used words
- Pair of words (Words commonly confused and misused)

Practicals:

- To look up words in a Dictionary: meaning and pronunciation of words as given in the standard dictionary using symbols of phonetics
- To seek information from an Encyclopedia

7. GRAMMAR (20%)

Theory:

- Identification of parts of speech
- Using a word as different parts of speech
- Correction of in-correct sentences
- Tenses
- Voice

Note: Teachers are expected to give practical examples, while teaching above topics

RECOMMENDED BOOKS

1. Text Book of English and Communication Skills Vol – 1, By Alvinder Dhillon and Parmod Kumar Singla; Published by: M/S Abhishek Publications, Chandigarh
2. Spoken English (2nd Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
3. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
4. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
5. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning

Pvt. Ltd; New Delhi.
7. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
8. Business Correspondence & Report writing (4th Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
9. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.
10. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
11. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
12. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
13. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
14. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
15. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
16. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
17. Basic Communication Skills for Technology by Andrea J Rutherfoord; Published by Pearson Education, New Delhi
18. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
19. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
20. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
21. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
22. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

BS-112 *APPLIED MATHEMATICS – I

	L	T	P
Pds/week	4	2	-

RATIONALE

The course aims at developing analytical abilities in basics of applied mathematics such as: vector algebra, matrices, elementary numerical analysis, coordinate geometry, differential and integral calculus and solution of first order differential equations. Besides application of above the elements 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

1. **ALGEBRA** (15%)
   - (i) Arithmetic Progression (A.P.) – its n^{th} term, sum to n terms. Geometric Progression (G.P.) - its n^{th} term, sum to n terms.
     And infinite Geometric series. Partial Fractions.
   - (ii) 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 of 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), trigonometric functions (Sine, Cosine, Tangent).

3. **COORDINATE GEOMETRY**. (40%)
   - (i) Equation of straight line in various standard forms. Intersection of two straight lines and angle between them. Concurrent lines, perpendicular distance formula.
   - (ii) General equation of a circle and its characteristics. Equation of a circle given center 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. Given the equation of the ellipse and hyperbola finding the focii, Directrixes, axes, latus rectum, vertex and eccentricity.

4. **VECTOR ALGEBRA**. (10%)
   - (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 cofactors. Properties of determinants. Solving simultaneous equations by Cramer's rule.

(ii) Concept of a matrix, definitions, Transpose of a matrix, Symmetric and Skew Symmetric matrix, Diagonal matrix, Unit matrix, Addition and Multiplication of matrices, Adjoint and Inverse of a matrix, solving simultaneous equations by matrix methods.

BS-214 * APPLIED CHEMISTRY

	L	T	P
Pds/week	4	-	2

RATIONALE

Applied Chemistry has been considered as one of the core subject for diploma holders in engineering and technology to develop in them scientific temper, appreciation of chemical properties of materials and to develop learning to learn skills in the students. This course will deal with metallurgy, corrosion, and fuels. This will equip them to perform various activities effectively. 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 uncertainity principle. Electronic configuration of 1 to 30 elements ,effect of temperature on conductivity of germanium and silicon.

2. **Periodic Properties of Elements** (10%)
   Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic 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 (electron cloud model) and properties (like texture, conductance, lusture, ductility and malleability). Orbital concept of covalence, hybridization (simple treatment).

4. **Fuel and their Classification** (12%)
   Definition, characteristics, Classification, into solid, liquid and gaseous fuel, Petroleum and brief idea of its refining into various fraction and their characteristics and uses.

5. **Water** (12%)
   Impurities in water, method of their removal, hardness of water, its types, causes and removal, Disadvantage of Hard water in boilers pH value and its determination by calorimetric method.

6. **Metals** (12%)
   Cast iron and its properties, effect of sulphur, silicon and phosphorous as impurities in cast iron. Elementary knowledge of heat treatment of steels-hardening, tempering, annealing, normalizing and case hardening.

7. **Alloys** (12%)
   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.

8. Corrosion (12%)

Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings.

9. 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 irons present in water using silver nitrate solution (potassium chromate as indicator)
5. Determine the type of alkalining in ppm present in a given sample of H_2O using standard sulphuric acid.

ES-120 *APPLIED MECHANICS

	L	T	P
Pds/week	4	2	2

RATIONALE

The subject Applied Mechanics deals 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 in motion, explanation of branches of this subject.

2. **Laws of Forces** (15%)

   Force and its effects. Units and measurement of force. Characteristics of force vector representation. Bow's notation.Types of forces, action and reaction, tension & thrust. Force systems: Coplanar and space force systems. 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 systems, extension of 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 methods, special case of three concurrent, coplanar forces, 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 of their resultant, concept of couple, moving a force parallel to its line of action, general cases of coplanar force system, general conditions of equilibrium of bodies under coplanar parallel forces.

3. **Friction** (10%)

   Concept of friction, laws of friction, limiting friction and coefficient of 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 center of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CG 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 I sections. Section 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, piles, lifts, bodies tied with string, Newton's third law of 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 PRACTICALS

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 single winch Crab.
8. To find out centre of gravity of regular and irregular laminas.

ES – 121 ENGINEERING DRAWING

	L	T	P
Pds/week	2	-	6

RATIONALE

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

NOTE:-1. Weightage of 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. INTRODUCTION (5%)

- Drawing instruments & their uses.
- Lines, lettering & dimensioning.
-

2. **SCALES** (10%)

Types of scales, plain scale, diagonal scale, vernier scale.

3. **PROJECTION OF POINTS AND LINES** (20%)

First angle and Third angle projections

Projection of Points : Introduction, Points situated in Ist, 2^{nd}, 3^{rd} and 4^{th} quadrants.

Projection of Lines: Introduction, Line parallel to one or both the planes, Line contained by one or both the planes, line parallel to one of the plane. Line inclined to one plane and parallel to others, Line inclined to both the planes.

4. THEORY OF PROJECTIONS (elaborate theoretical instruction) (15%)

- Introduction to first angle projections
- Drawing 3 views of given objects (at least 2 objects)
- Drawing 6 views of given objects (Non symmetrical objects may be selected for this exercise)
- Identification of surfaces on drawn views & objects drawn.
- Exercises on missing surfaces & 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.

Drawing of different conventions for materials in sections. Conventional breaks for shafts, pipes: Rectangular /square/circular, angle, channel and Rolled sections.

6. **ISOMETRIC VIEWS** (15%)

- Fundamentals of isometric projections (theoretical instructions)
- Isometric views from 2 or 3 given orthographic views

7. Symbols, Conventions and simple drawing (10%)

(a) Civil Engineering: Sanitary fitting symbols

(b) Electrical fittings: Symbols for domestic interior installations

(c) Building plan drawing with Electrical and Civil Engineering symbols.

REFERENCES

1. Engg. Drawing A Text Book of Engineering Drawing By Surjit Singh Dhanpat Rai & co.

2. Engineering drawing –planes & solid geometry ND Bhatt, V.M. Panchal Charotar publisher home

BS-212 *APPLIED MATHEMATICS-II

	L	T	P
Pds/Week	4	2	-

RATIONALE

The course aims at developing analytical abilities in basics of applied mathematics such as: differential and integral calculus and solution of first order differential equations. Besides applications of the above elements 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

1. **DIFFERENTIAL CALCULAS**. (40%)

Functions, concept of evaluation of following limits.

$\text{Limit}_{x\to 0} \frac{\text{Sin } x}{x}$, $\text{Limit}_{x\to a} \frac{x^n - a^n}{x - a}$,

$\text{Limit}_{x\to 0} (1+x)^{\frac{1}{x}}$, $\text{Limit}_{x\to a} \frac{a^x - 1}{x}$,

(i) Differential coefficient. Its physical application. As rate measure, Geometric interpretation as slope of a curve. Differentiation from first prim of functions like x^n, a^x, Log x , Sin x, Cos x and Tan x. Differentiation of sum, product and quotient of functions.

(ii) Differentiation of Trigonometric and inverse Trigonometric functions. Differentiation of function of a function, Implicit functions, parametric functions, Logarithmic differentiation.

(iii) Application of differentiation in finding errors, Tangent and normal of curves. Maxima of functions.

3. **INTEGRAL CALCULAS**. (35%)

(i) Integration as inverse operation of differentiation. Integral of standard functions. Integration by substitution, by parts and by partial fractions.

(ii) Evaluation of integral of rational and irrational functions of the form.

$\frac{dx}{ax^2+bx+c}$ $\quad ax^2+bx+c \quad dx$

(iii) Simple definite integrals and properties. Evaluation of $\int_0^{\pi/2} \text{Sin}^n x\, dx$, $\int_0^{\pi/2} \text{Cos}^n x\, dx$,

(iv) Applications of integration to finding area under a curve and axes, volume of solid of revolution of area about axes (simple problems). Mean value and R.M.S. value of a function.

(v) Numerical integrations. Approximate evaluation of definite integral by Trapezoidal rule and by Simpson's rule (without proof).

4. **PARTIAL DIFFERENTIATION**. (10%)

(i) First order and second order partial derivatives of functions of two variables.

(ii) Newton's forward and backward interpolation.

5. **SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**. (15%)

(i) Order and degree of a differential equation. Solving first order first degree

differential equation – variable separable form, Homogeneous form and linear differential equation.

BS-213 *APPLIED PHYSICS

	L	T	P
Pds/Week	4	2	2

RATIONALE

Applied physics is a foundation course. Its purpose is to develop proper understanding of physical phenomenon and scientific temper in the students. The course covers basics like Mechanics, Heat, Sound and Light.

DETAILED CONTENTS

1. Measurement (20%)

(i) Units and Dimensions

Fundamental and derived units, SI units, dimensions of physical quantities, dimensional formula and dimensional equation, principles of homogeneity of dimensions and applications of homogeneity principle in:

a. Checking the correctness of physical equation.
b. Deriving relations among various physical quantities.
c. Conversion of numerical values of physical quantities from one system of units into other system.

(ii) Errors in measurement accuracy, estimation of percentage error in the result of measurement.

2. Waves (20%)

Generation of waves by vibrating particles, progressive wave, equation of waves, energy transfer by particles and waves, superposition of waves and its applications to interference, beats and stationary waves (graphical); sound and light as wave – range of frequencies, wavelengths, velocities and their nature, electromagnetic spectrum.

3. Sound (15%)

(i) Acoustics

Reflection, refraction and absorption of sound waves by materials; definition of pitch, loudness, quality and intensity of sound waves, units of intensity (bel and decibel); Echo and reverberation and reverberation time, control of reverberation time. Acoustic insulation (qualitative treatment only of reverberation).

(ii) Ultrasonic

Production of ultrasonic waves by magnetostriction and piezoelectric effect, detection and properties of ultrasonic; applications to drilling, cold welding,

cleaning, flaw detection and exploration (sonar).

4. Light; Geometrical Optics: (20%)

Defect in image formation, eyepieces construction and principles of preparation of telephoto and zoom lens, principle of optical projectors, optical principles of OHP and slide film projectors.

5. Laser and its Applications (15%)

Laser principle, types of Lasers; detailed study of the He-Ne and Ruby lasers and their applications. Fluorescent tube; mercury arc light, xenon source, sodium lamp.

6. Radioactivy and Detection of Radiations (10%)

Natural radioactivity; half-life; decay constant; mean life; radioactive transformation. Principles of nuclear fission and fusion; energy generation. Source of background radiations; health Hazards of radiations. Units of radiation.

LIST OF PRACTICALS

1. Use of Vernier calipers and micrometer for determination of diameter of a wire.
2. Study of resonance in air column and determination of velocity of sound in air.
3. To make a telescope by combination of suitable lenses and determine its magnifying power.
4. To make a compound microscope by suitable combination of lenses and determine its magnifying power.
5. Setting an OHP lenses and mirrors for its best performance.
6. Determination of wavelength of various spectral lines of mercury lamp.
7. Measurement of illumination level of a white surface under: natural daylight, incandescent light and fluorescent light.
8. To compare the intensity of illumination by Bunsen's photometer.
9. Study of diffraction of He-Ne laser beam by markings on a Vernier scale and determination of its wavelength.
10. To measure the first ionization potential of Hg using a diode.

SUGGESTIONS

While teaching the subject, teacher should make maximum use of demonstration to make the subject interesting to the students.

CM 232 ENVIRONMENTAL STUDIES

L	T	P
4	0	2

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

a) Natural resources and associated problems

- Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people.
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
- Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, case studies.
- Energy Resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources, casestudies
- Land Resources: Land as a resource, land degradation, man induces land slides, soil erosion, and desertification.

b) Role of individual in conservation of natural resources.

c) Equitable use of resources for sustainable life styles.

Unit 3: Eco Systems

- Concept of an eco system
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco systems:
- Forest ecosystem
- Grass land ecosystem
- Desert ecosystem.
- Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, national and local level.
- India as a mega diversity nation.
- Hot-spots of biodiversity.

- Threats to biodiversity: habitats loss, poaching of wild life, man wildlife conflicts.
- Endangered and endemic spaces of India.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit 5: Environmental Pollution

Definition Causes, effects and control measures of:
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards
Solid waste Management: Causes, effects and control measures of urban and industrial wastes
Role of an individual in prevention of pollution Pollution case studies Disaster management: Floods, earth quake, cyclone and land slides

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water shed management
- Resettlement and rehabilitation of people; its problems and concerns, case studies
- Environmental ethics: issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Wasteland reclamation
- Consumerism and waste products
- Environment protection Act
- Air (prevention and control of pollution) Act
- Water (prevention and control of pollution) Act
- Wildlife protection act
- Forest conservation act
- Issues involved in enforcement of environmental legislations
- Public awareness

Unit 7: Human population and the environment

- Population growth and variation among nations
- Population explosion- family welfare program
- Environment and human health
- Human rights
- Value education
- HIV / AIDS
- Women and child welfare
- Role of information technology in environment and human health
- Case studies

Unit 8: Field work

Visit to a local area to document environment assets river / forest / grassland / hill/ mountain. Visit to a local polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc (field work equal to 5 lecture works)

Recommended Books:

1. Textbook of Environmental studies, Erach Bharucha, UGC
2. Fundamental concepts in Environmental Studies, D D Mishra, S Chand & Co Ltd

ES 122 BASICS OF INFORMATION TECHNOLOGY

L	T	P
-	-	4

RATIONALE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office and internet form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

Note:

Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Information Technology – its concept and scope, applications of IT, ethics and future with information technology
2. Impact of computer and IT in society.-- Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more
3. Generations of computer, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data, processing of data.
4. Computers for information storage, information seeking, information processing and information transmission, computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. Input devices; keyboard, mouse, scanner, etc ; output devices ; VDU and Printer(Impact and non-Impact printers), Plotter etc. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory)
5. Introduction to Operating Systems such as MS-DOS and Windows, difference between DOS and Windows
6. Basics of Networking – LAN, MAN,WAN

LIST OF PRACTICALS

1. Identify and list functions of various components and peripherals of given computer.
2. Installation of operating system viz. * Windows XP, *Windows 2007 etc.
3. Installing a computer system by giving connection and loading the system software and application software and various sources to install software
4. Exercises on entering text and data (Typing Practice)
5. Features of Windows as an operating system:
   a) Start , shutdown and restore
   b) Creating and operating on the icons
   c) Opening, closing and resizing the windows
   d) Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file , creating and operating on a folder
   e) Introduction to all properties such as changing settings like, date, time, calculator, colour (back ground and fore ground)
   f) Using short cuts

6. Word Processing (MS Office/Open Office)

a) File Management:

Opening, creating and saving a document, locating files, copying contents in some different file(s)

b) Editing a document:

- Entering text, cut, copy, paste using toolbars
- Use of spell check
- PDF file and its conversion in different file formats (MS Word/Excel etc.)
- Scanning, editing and printing of a document

c) Formatting a document:

- Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document ,Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers, inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools

d) Tables and Borders:

- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- How to change docx file to doc file
- Print preview, zoom, page set up, printing options
- Using Find, Replace options

7. Spread Sheet Processing (MS Office/Open Office)

a) Starting Excel

open worksheet, enter, edit data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets

b) Menu commands:

Create, format charts, organize, manage data, solving problem by analyzing data, creating graphs

c) Work books:

- Managing workbooks (create, open, close, save, rename), working in work books
- Editing a worksheet: copying, moving cells, pasting, inserting, deleting cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

d) Creating a chart:

- Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

e) Formulas:

Addition, subtraction, division, multiplication, percentage and auto sum

8. Power Point Presentation (MS Office/Open Office)

a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout, templates etc.
- Opening a new/existing presentation

- Different views for viewing slides in a presentation: normal, slide sorter etc.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements

- Adding text boxes, importing pictures, tables and charts etc.

d) Formatting slides

- Text formatting, changing slide layout, changing slide colour scheme
- Changing background, Applying design template

e) How to view the slide show?

- Viewing the presentation using slide navigator, Slide transition
- Animation effects etc.

9. Antivirus

a) What is virus and its types

b) Problems due to virus

c) Installation and updation of antivirus (anyone out of Kaspersky, Mcafee, Norton, Quickheal etc).

d) How to scan and remove the virus

10. Internet and its Applications

a) Log-in to internet, introduction to search engine

Browsing and down loading of information from internet

b) Creating e-Mail Account

- Log in to e-mail account and Log out from e-mail account

c) Managing e-Mail

- Creating a message
- Sending, receiving and forwarding a message
- Attaching a file
- Deleting a message

INSTRUCTIONAL STRATEGY

Since this subject is practical oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals etc. and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently. This subject should be taught with the help of LCD projector, (while teaching a group) using PowerPoint presentation slides.

RECOMMENDED BOOKS

1. Fundamentals of Computer by E Balagurusamy,Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Fundamentals of Computer by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. Fundamentals of Computer by Sumita Arora by Dhanpat Rai and Co , New Delhi
4. Computers Today by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.
5. Internet for Every One by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. A First Course in Computer by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. Computer Fundamentals by PK Sinha; BPB Publication, New Delhi
8. Fundamentals of Information Technology by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. Information Technology for Management by Henery Lucas; Tata McGraw Hill Education Pvt Ltd , New Delhi
10. MS Office by BPB Publications, New Delhi

CE-230 GENERAL WORKSHOP PRACTICE - I

L	T	P
-	-	8

RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

DETAILED CONTENTS (PRACTICAL EXERCISES)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus:

1. Carpentry Shop-1
2. Painting Shop-1
3. Fitting Shop -I
4. Welding Shop-I
5. Sheet Metal Shop

Note:

1. Carpentry Shop – I

1.1 Safety precautions in carpentry shop

1.2 Introduction to various types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).

1.3 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.

Job I Marking, sawing, planning and chiseling & their practice (size should be mentioned)

1.4 Introduction to various types of wooden joints, their relative advantages and uses.

Job II Preparation of half lap joint

Job III Preparation of Mortise and Tenon Joint

2. Painting Shop- I

a. Demonstration of various methods of painting wooden items.

b. Introduction to various types of paints and safety precaution observed in painting shop

Job I Preparation of wooden surface before painting including primer coating

Job II Painting Practice by brush/spray

3. Fitting Shop

3.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. Such as Steel, Brass, Copper, Aluminium etc. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

3.2 Description and demonstration of various types of work benches, holding devices and files. Precautions while filing.

3.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

Job I Marking of job, use of marking tools and measuring instruments.

Job II Filing a dimensioned rectangular or square piece of an accuracy of

(0.5mm

Job III Filing practice (production of flat surfaces). Checking by straight edge.

3.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set.

4. Welding Shop – I

4.1 (a) Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, electrode holder, electrodes and their specifications, welding screens and other welding related equipment, accessories and gloves.

(b) Safety precautions during welding

(c) Hazards of welding and its remedies

4.2 Electric arc welding, (a.c. and d.c.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc. Earthing of welding machine.

Job I Practice of striking arc bending and tacking while using electric arc welding set.

Job II Welding practice on electric arc welding for making uniform and straight weld beads

4.3 Various types of joints and end preparation.

Job III Preparation of butt joint by electric arc welding.

Job IV Preparation of corner joint by using electric arc welding.

5. Smithy Shop

5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.

5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.

5.3 Demonstration and description of tongs, fullers, swages etc.

Job I To forge a L-hook.

Job II To prepare a job involving upsetting process

Job III To forge a chisel

Job IV To prepare a cube from a M.S. round by forging method.

6. Sheet Metal Shop

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.

6.1 Introduction and demonstration of hand tools used in sheet metal shop.

6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. shearing machine, bar folder, burring machine, power press, sheet bending machine.

6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

6.4 Study of various types of rivets, steel screw etc.

Job I Shearing practice on a sheet using hand shears.

a) Practice on making single riveted lap joint/double riveted lap Joint.

b) Practice on making single cover plate chain type, seam joint and riveted butt joint

RECOMMENDED BOOKS

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary; Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III; India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuwansh;, Dhanpat Rai and Co., New Delhi

6. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi.

CE231/250 CONSTRUCTION MATERIALS

L	T	P
4	-	2

RATIONALE

Construction engineering diploma holders have to supervise construction of various types of Civil Engineering works. For this purpose, they have to use various materials like stones, bricks and tiles, cement and cement based products, and lime, timber and wood based products, paint and varnishes metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. 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 Classification of bricks as per IS: 1077
2.4 Testing of common building bricks as per IS: 3495
Compressive strength, water absorption, efflorescence test, Dimensional tolerance test.
2.5 Special bricks.
2.5.1 Building tiles: types of tiles-wall, roofing and flooring tiles.
2.5.2 Ceramic tiles and their properties and uses.
2.5.3 Hollow masonry blocks, Fly ash bricks,

3. Cement: (30 %)

3.1 Introduction, raw materials, manufacture of ordinary Portland cement, flow diagram for wet and dry process.
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.
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.

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

5.1 Identification of different types of timber: Teak, Deodar, Shisham, Sal, Mango, kail and 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..
5.7.1 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 Types, properties and uses of varnishes
6.5 Trade name of different products.

7. Metals: - (5 %)

7.1 Ferrous metals: composition, properties and uses of cast iron, steel (mild and high tension 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 aluminum.
7.3 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. Miscellaneous Materials: (5 %)

9.1 Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes
9.2 Fibre Sheets and their manufacture process.
9.3 Types and uses of insulating materials for sound and thermal insulation
9.4 Construction chemicals like water proofing compound, epoxies, polymers
9.5 Water proofing, termite proofing and fire resistance materials – types and uses
9.6 Materials used in interior decoration works like POP, methods of doing POP

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

(b) PRACTICAL EXERCISES:

i. To determine the crushing strength of bricks.
ii. To determine the water absorption of bricks.
iii. To conduct field tests on cement.
iv. To determine fineness (by sieve method) of cement.
v. To determine normal consistency of cement.
vi. To determine initial and final setting times of cement.
vii. To determine soundness of cement.
viii. To determine compressive strength of cement.
ix. A report on use of new and latest material being used in construction industry.

(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, GJ; "Engineering Materials; "Ahmedabad, Ahmedabad Book Depot.
(7) Shahane; Engineering Materials; Poona, Allied Book Stall.

CE 330 HYDRAULICS

	L	T	P
Pds/week	4	-	2

RATIONALE

Subject of hydraulics is a basic science subject and helps in solving problems in the subject of Public Health Engineering / Environmental Engineering and Irrigation Engineering. Principles of 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 each 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 %)

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

3.5 Total pressure, resultant pressure, and centre of pressure.

3.6 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).

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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 (simple Numerical Problems)

7. Flow through Pipes: (20 %)

7.1 Definition, laminar and turbulent flow, explain through Reynold's experiment.
7.2 Reynold's number, critical velocity and velocity distribution.
7.3 Head loss in pipelines due to friction, sudden expansion and sudden contraction, entrance, exit, 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: (No Numericals) (15 %)

8.1 Definition of a channel, uniform flow and open channel flow.
8.2 Discharge through channels using.
i) Chezy's formula (no derivation)
ii) Manning's formula

8.3 Most economical sections
i) Rectangular
ii) Trapezoidal

9. Hydraulics Machines:(No Numericals) (5 %)

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 (Cc) 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
   a) Sudden enlargement
   b) 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.
   iii) Pressure gauge/water meter/mechanical flow meter/Pitot tube.

INSTRUCTIONAL 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, SM; “Hydraulics 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.

CE 331 STRUCTURAL MECHANICS

	L	T	P
Pds/week	4	-	2

RATIONALE

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

DETAILED CONTENTS

THEORY:

1. Properties of Materials (5%)

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

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

2. Simple Stresses and Strains: (10%)

2.1 Concept of stress, normal and shear stresses,

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

2.3 Hooke's law, modulii 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 and HYSD steel, mechanical properties, factor of safety.

2.6 Temperature stresses and strains

3. Shear Force and Bending Moment: (15%)

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

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

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 concentrated, uniformly distributed

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

4. Moment of Inertia: (10%)

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

5. Bending Stresses in Beams: (10%)

5.1 Concept of pure/simple bending

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

5.3. Moment of resistance

5.4 Calculations of bending stresses in simply supported beam

6. Combined Direct and Bending Stresses: (10%)

6.1. Concentric and eccentric loads single axis eccentricity only
6.2. Effect of eccentric load on the section stresses due to eccentric loads, Numerical in the case of short columns.
6.3. Simple problems on stability of masonry dams and retaining walls

7. Shear Stresses in Beams (5%)

7.1 Concept of shear stresses in beams, shear stress distribution in

rectangular, circular I, T, L sections (Formula to be stated, no derivation)

8. Slope and Deflection: (5%)

Necessity for determination of slope and deflection
Moment area theorem (no derivation, numerical problems)

9. Columns: (10%)

9.1 Theory of columns
9.2 Eulers and Rankine Formula (No derivation)

10. Analysis of Trusses: (10%)

10.1 Concept of a perfect, redundant and deficient frames
10.2 Assumptions and analysis of trusses by:

a) Method of joints
b) Method of sections
c) Graphical method

PRACTICAL EXERCISES

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

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

iii) Determination of modulus of rupture of a timber beam.

iv) Verification of forces in framed structure.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

i) Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi

ii) Ram Chandra, "Applied Mechanics and Strength of Materials", Standard

Publishers. Delhi:

iii) Punmia, BC., "Strength of Materials", Standard Publishers, Delhi,

iv) Prasad VS " Structural mechanics Galgotia publications Pvt Ltd, Delhi

v) Sadhu Singh "Strengths of Materials" Standard Publishers, New Delhi

vi) Singh Birinder "Structural Mechanics" Kaption Publishers, Ludhiana

vii) Singh Harbhajan, " Structural Mechanics" ., Abhishek Publishers, Chandigarh

viii) Singh Harbhajan, "Design of Masonry and Timber Structures" Abhishek Publishers, Chandigarh.

CE 332 BUILDING CONSTRUCTION

	L	T	P
Pds/week	4	-	2

RATIONALE

Diploma holders in Civil Engineering are supposed to supervise construction of buildings. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their construction is very important for Civil Engineering diploma holders. Exposure to National Building Code shall be encouraged.

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

DETAILED CONTENTS

1. **Introduction:** (5%)
   - 1.1 Definition of a building, classification of buildings based on occupancy
   - 1.2 Different parts of a building
   - 1.3 Orientation and ventilation of buildings
   - 1.4 Concept of Agronomy

2. **Foundations:** (12%)
   - 2.1 Concept of foundation and its purpose
   - 2.2 Types of foundations-shallow and deep
   - **2.2.1 Shallow foundation-constructional 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, raft 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 and Classification of walls- load bearing, non-load bearing, dwarf, retaining, breast walls and partition walls
   - 3.2 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, 1-1/2 and 2 Brick thick walls in English Bond. T, X and right-angled corner junctions Thickness for 1, 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 (Toothing, raking back and block bonding)

3.4.3 Construction, expansion and contraction joints; purpose and constructional details.

3.5 **Stone Masonry:

3.5.1 Glossary of terms-Natural bed, bedding planes, string course, corbel, cornice, block-incourse, 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

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

3.2 Mortars-preparation, use, average strength and suitability of cement, lime, lime cement, lime surkhi and mud nortar

3.3 Scaffolding: Constructional details and suitability of mason's brick layers and tubular scaffolding

3.4 Shoring and under pinning: Types and uses

3.5 Safety in construction of low rise and high rise buildings

4. **Arches and Lintels:** (8%)

4.1 Meaning and use of arches and lintels:

4.2 Glossary of terms used in arches and lintels – abutment, peir, arch ring, intrados, soffit, 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 their construction

4.3.3 Brick arches and their construction

5 **Doors and Windows: (5%)

5.1 Glossary of Terms used in Doors and windows

5.2 Doors – name, uses and Types: 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 Types: 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: sources, causes and its ill effects,

6.2 Types of dampness, Damp proofing materials and their specifications

6.3 Methods of damp proofing: basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills

6.4 Plinth protection and aprons

7. **Floors: (8%)

7.1 Ground floors

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

7.1.2 Types of floor finishes –case-in-situ, concrete flooring (monolithic, bonded) Terrazo flooring, Stone flooring(marble/Granite),Timber flooring, PVC floor, ceramic floor
description with sketches of the methods of construction of the floors and their specifications, floor polishing.

7.2 Upper floors

7.2.1 Flooring on RCC/RB Slab

7.3 Maintenance of floors.

8. **Roofs:** (9%)

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

8.2 Glossary of terms for pitched roofs – Various types of Trusses: Timber and steel, batten, eaves, barge, facia board, gable hip, lap, purlin, rafter, rag bolt, valley, ridge, etc.

8.3 Drainage arrangement for pitched and flat roofs

9. **Stairs: (5%)

9.1 Glossary of terms: different means of access to various floor, stair case, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand rail, nosing, etc.

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

10. **Surface Finishes:** (5%)

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 types 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 Seismic 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 residential, commercial, industrial and public building

12.2 Building planning, arrangement of doors, windows, cupboards etc for residential building.

12.3. Modern construction practices: Concept of pre engineered building (PEB), High rise buildings, Lift slab construction, slip formwork, Tunnel Boring Machine (TBM)

13. Anti Termite Measures (As per IS 6313 –I – III) (5%)

13.1 Introduction, site preparation and chemicals used in anti-termite treatment

13.2 Treatment of masonry foundation

13.3 Treatment of RCC foundation

13.4 Treatment of top surface of earth filling

13.5 Treatment of junction of walls and floors

13.6 Treatment along external perimeter of building

13.7 Treatment and selection of timber

13.8 Treatment in existing buildings

14 Building Services (5%)

Introduction to fire fighting systems, Ducting for Air-conditioning, service lines for cable telephone, and electrical wiring , garbage disposal systems. Water supply system (internal and external).

15. Elementary idea of interior decoration, wall paneling, false ceiling, flooring etc. (5%)

NOTE: * An expert may be invited from field/industry for extension lecture

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

PRACTICAL EXERCISES

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 specific report about the works seen
    a) Timbering of excavated trenching
    b) Damp roof courses
    c) Construction of masonry walls
    d) Flooring: Laying of flooring 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 specialized 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.

REFERENCES

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; “A Text Book of Building Construction”; Ludhiana, Katson Publishing House
2. Deshpande, RS and Vartak, GV; “A Text Book of Building Construction”, Poona, United Book Corporation
3. Rangwala, SC: “Building Construction”; Anand, Charotar Book Stall
4. Kulkarni, GJ; “A Text Book of Building Construction”, Ahmedabad Book Deport
5. Arora, SP and Bindra, SP; “A Text Book if Building Construction”; New Delhi Dhanpt Rai and Sons
6. Sharma, SK and Kaul, BK; “A Text Book of Building Construction”, Delhi, S Chand and Co.
7. Sushil Kumar; “Building Construction”, Delhi Standard Publishers Distributors
8. Moorthy, NKR; “A Text Book of Building Construction”, Poona, Engineering Book Publishing Co.

CE 333 SURVEYING - I

	L	T	P
Pds/week	2	-	4

RATIONALE

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

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

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

DETAILED CONTENTS

1. Introduction: (10%)
   - 1.1 Basic principles of surveying
   - 1.2 Concept and purpose of surveying, measurements-linear and angular, units of measurements
   - 1.3 Instruments used for taking these measurements, classification based on surveying instruments

2. Chain surveying: (15%)
   - 2.1 Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages
   - 2.2 Obstacles in chain surveying
   - 2.3 Direct and indirect ranging offsets and recording of field notes
   - 2.4 Errors in chain surveying and their corrections

3. Compass surveying: (30%)
   - 3.1 Purpose of compass surveying. Use of prismatic compass: Setting and taking observations
   - 3.2 Concept of following with simple numerical problems:
     - a) Meridian - Magnetic and true
     - b) Bearing - Magnetic, True and Arbitrary
     - c) Whole circle bearing and reduced bearing
     - d) Fore and back bearing
     - e) Magnetic dip and declination
   - 3.3 Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in

a compass traverse

5. Levelling: (30%)

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

4.2 Types of levels, Identification of various parts, uses, advantages and disadvantages of
Dumpy level & Auto level.

4.3 Levelling staff- single piece, folding, invar precision staff, telescopic

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

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

4.6 Temporary adjustments and permanent adjustment of dumpy level

4.7 Level book and reduction of levels by Height of Instrument method and rise and fall
method (Arithmetic checks, problem on reduction of levels)

4.8 Differential leveling, Fly levelling, check leveling, profile levelling (L-section and X-section) and reciprocal leveling

4.9 Errors in levelling, permissible limits

5. Plane Table Surveying (15%)

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

5.2 Setting of a plane table:
(a) Centering
(b) Levelling
(c) Orientation

5.3 Methods of plane table surveying
(a) Radiation,
(b) Intersection
(c) Traversing

(d) Resection

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

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

PRACTICAL EXERCISES

1. Chaining, ranging and off-setting of a survey line
2. To find out the area usnig chain survey.
3. Tarversing using chain surveying
4. To measure the angles between the lines meeting at a point
5. Traversing using compass survey
6. To findout the reduced levels of different stations using Height of Instrument (HI) method.
7. To findout the reduced levels of different stations using rise and fall method.
8. Plotting few points by:
    i. Radiation
    ii. Intersection
9. Traversing an area with a plane table
10. Layout of a Building

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd.

2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation

3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House

4. Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan

5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan

6. Mahajan, Sanjay “Surveying -I”, Tech. Publication, Delhi

7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.

8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co.

CE 334 WATER SUPPLY AND WASTE WATER ENGINEERING

	L	T	P
Pds/week	4	-	2

RATIONALE

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

DETAILED CONTENTS

A. WATER SUPPLY

1. Introduction (5%)

1.1 Necessity and brief description of water supply system.

2. Quantity of Water (5%)

2.1 Water requirement

2.2 Rate of demand and variation in rate of demand

2.3 Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)

2.4 Population Forecasting

3. Quality of Water (5%)

3.1 Meaning of pure water and methods of analysis of water

3.2 Physical, Chemical and bacteriological tests and their significance

3.3 Standard of potable water as per Indian Standard

3.4 Maintenance of purity of water (small scale and large scale quantity)

4. Water Treatment (brief introduction) (10%)

**4.1 Sedimentation - purpose, types of sedimentation tanks

**4.2 Coagulation floculation - usual coagulation and their feeding

**4.3 Filtration - significance, types of filters, their suitability

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

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

5. Conveyance of Water (10%)

**5.1 Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.

5.2 Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses

5.3 Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes

5.3.1 Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories.

5.3.2 Wastage of water - preventive measures

5.3.3 Maintenance of distribution system

5.3.4 Leakage detection

6. Laying out Pipes (10%)

6.1 Setting out alignment of pipes

6.2 Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil.

6.3 Handling, lowering beginning and jointing of pipes

6.4 Testing of pipe lines

6.5 Back filling

6.6 Use of boring rods

7. Building Water Supply (5%)

7.1 Connections to water main (practical aspect only)

**7.2 Water supply fixtures and installations and terminology related to plumbing

B. WASTE WATER ENGINEERING

8. Introduction (5%)

8.1 Purpose of sanitation

8.2 Necessity of systematic collection and disposal of waste

8.3 Definition of terms in sanitary engineering

8.4 Collection and conveyance of sewage

8.5 Conservancy and water carriage systems, their advantages and Disadvantages

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

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

9. Sewerage System (5%)

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

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

10. Laying and Construction of Sewers: (10%)

10.1 Setting out/alignment of sewers

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

10.3 Construction of surface mains and different sections required

11 Sewage characteristics: (5%)

11.1 Properties of sewage and IS standards for analysis of sewage

11.2 Physical, chemical and bacteriological parameters

12. Natural Methods of Sewerage Disposal (10%)

12.1 General composition of sewage and disposal methods

12.2 Disposal by dilution

12.3 Self purification of stream

12.4 Disposal by land treatment

12.5 Nuisance due to disposal

13. Sewage Treatment (10%)

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

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

14. Building Drainage (5%)

14.1 Aims of building drainage and its requirements

**14.2 Different sanitary fittings and installations

14.3 Traps, seals, causes of breaking seals

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

LIST OF PRACTICALS

1) To determine turbidity of water sample
2) To determine dissolved oxygen of given sample
3) To determine pH value of water
4) To perform jar test for coagulation
5) To determine BOD of given sample
6) To determine residual chlorine in water
7) To determine conductivity of water and total dissolved solids
8) To study the installation of following:
   a) Water meter
   b) Connection of water supply of building with main
   c) Pipe valves and bends
   d) Water supply and sanitary fittings
9) To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes,

D.I. pipes and PVC pipes.

10) To demonstrate the laying of SW pipes for sewers
11) Study of water purifying process by visiting a field lab.
12) To test house drainage

INSTRUCTIONAL STRATEGY:

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

REFERENCES

1. Duggal, KN; "Elements of Public Health Engineering";, S. Chand and Co. New Delhi
2. Rangwala, SC; "Water Supply and Sanitary Engineering"; Anand Charotar Book Stall
3. Kshirsagar, SR; "Water Supply Engineering"; Roorkee Publishing House, Roorkee
4. Kshirsagar, SR; "Sewage and Sewage Tratement"; Roorkee, Roorkee Publishing House
5. Hussain, SK; "Text Book of Water Supply and Sanitary Engineering"; Oxford and IBH Publishing Co, New Delhi,
6. Birdie, GS; "Water Supply and Sanitary Engineering"; Dhanpat Rai and Sons, Delhi
7. Garg, Santosh Kumar; "Water Supply Engineering"; Khanna Publishers, Delhi
8. Garg, Santosh Kumar; "Sewage and Waste Water Disposal Engineering"; Khanna Publishers, Delhi
9. Steel, EW; "Water Supply and Sewerage"; McGraw Hill.
10 Duggal, Ajay K and Sharma, Sanjay, "A Laboratory Manual in Public Health Engineering", , Galgotra Publications, 2006, New Delhi
11 Gurjar,B.R. " Sludge Treatment & Disposal" Oxford and IBH Co Pvt Ltd New Delhi.
12. Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya Prakashan Ltd., Delhi.

CE 335 CIVIL ENGINEERING DRAWING-I

	L	T	P
Pds/week	2	-	6

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 detailed constructional drawing of various components ofbuilding for the purpose of communication with the craftsman. Planning of small building, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

NOTE: IN EXTERNAL EXAM SIX NOS OF DRAWING QUESTIONS SHALL BE ASKED. OUT OF WHICH STUDENT SHALL BE ASKED TO ATTEMPT THREE QUESTIONS MAXIMUM.

DETAILED CONTENTS

Drawing No. 1:

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

Drawing No.2:

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

Drawing No. 3:

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

Drawing No. 4:

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

Drawing No. 5:

Drawing plan, elevation of a small building by measurement.

Drawing No. 6:

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. 8:

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

Drawing No. 9:

Drawing of a small single storey building showing position of sanitary fittings house drainage and electrical fittings

Drawing No. 10:

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.

CE 430 CONCRETE TECHNOLOGY

	L	T	P
Pds/week	4	-	2

RATIONALE

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

DETAILED CONTENTS
THEORY

11. Introduction: Definition of concrete, uses of concrete in comparison to other building materials. (5%)

2. Ingredients of Concrete: (10%)

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

2.2 Aggregates:

2.2.1 Classification of aggregates according to size and shape

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

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

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

3. Water Cement Ratio: (10%)

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

4. Workability: (15%)

4.1 Workability factors affecting workability, Measurement of workability:

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

5. Properties of Concrete: (15%)

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

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

6. Proportioning for Normal Concrete: (5%)

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

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

6.3 Difference between nominal and controlled concrete

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

7. Introduction to Admixtures (chemicals and minerals) for improving performance of concrete (5%)

8. Special Concretes (only features) (5%)

8.1 Concreting under special conditions, difficulties and precautions before, during and after concreting
8.1.1 Cold weather concreting
8.1.2 Under water concreting
8.1.3 Hot weather concreting

8.2 Ready mix concrete

8.3 Fibre reinforced concrete

8.4 Polymer Concrete

8.5 Fly ash concrete

8.6 Silica fume concrete

9. Concreting 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 aggregate at site

9.3 Batching (to be shown during site visit)

9.3.1 Batching of Cement
9.3.2 Batching of aggregate by:
9.3.2.1 Volume, using gauge box (farma) selection of proper gauge box
9.3.2.2 Weight spring balances and 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 mixers, choosing appropriate size of mixers, operation of mixers
9.4.3 Maintenance and care of machines

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

9.6 Placement of concrete:

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

** 9.7 Compaction:

9.7.1 Hand compaction

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

9.7.3 Selection of suitable vibrators for different situations

9.8 Finishing concrete slabs - screeding, floating and trowelling

9.9 Curing:

9.9.1 Objectives of curing, methods of curing like ponding, membrane

curing, steam curing, chemical curing

9.9.2 Duration for curing and removal of form work

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

9.11 Defects in concrete: Identification of and methods of repair

10. Importance and methods of non-destructive tests (introduction only) (5%)

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

PRACTICAL EXERCISES:

i) To determine the physical properties of cement as per IS Codes
ii) To determine flakiness and elongation index of coarse aggregates
iii) To determine silt in fine aggregate
iv) Determination of specific gravity and water absorption of aggregates
v) Determination of bulk density and voids of aggregates
vi) To determine surface moisture in fine aggregate by displacement method
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
ix) To determine workability by slump test:
x) Compaction factor test for workability
xi) Non destructive test on concrete by:
    a) Rebound Hammer Test
    b) Ultrasonic Pulse Velocity Test
xii) Tests for compressive strength of concrete cubes for different grades of concrete.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

i) Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi

ii) Krishnamurthy, KT; Rao, A Kasundra and Khandekar, AA; "Concrete

Technology"; Dhanpat Rai and Sons, Delhi,

iii) Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.

iv) Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi

v) Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London

vi) Orchard; "Concrete Technology"; Vol I, II, and III

vii) Handoo, BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; Satya Prakashan, New Delhi,

viii) Sood, Hemant, Mittal LN and Kulkarni PD; "Laboratory Manual on Concrete Technology", CBS Publishers, New Delhi, 2002

ix) Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers, Delhi,

x) Gambhir, ML; "Concrete Technology";, MacMillan India Ltd., New Delhi

xi) Siddique, R., “Special Structural Concretes”, , Galgotia Publishers Pvt. Ltd. Delhi

xii) Birinder Singh, “Concrete Technology”, Kaption Publications, Ludhiana,

(xiii) Module on ‘Special Concretes by Dr Hemant Sood , NITTTR Chandigarh

(xiv) Concrete Technology by P Dayaratman

(xv) Video programme on different experiments in ‘Concrete Technology’ developed by NITTTR, Chandigarh.

CE431 SOIL AND FOUNDATION ENGINEERING

	L	T	P
Pds/week	4	-	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 soil 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 the 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: (5 %)

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 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 problems 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 BIS1498 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. Permeability of 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 soils as per BIS
4.4 Measurement of permeability in the laboratory

5. Deformation of soils
(10%)

5.1 Effective Stress: (Concept only) Stresses in subsoil Definition and meaning of total stress, effective stress and neutral stress Principle of effective stress Importance of effective stress in engineering problems
5.2 Definitions: Consolidation and consolidation settlement, Creep, Plastic flow, Heaving, Lateral movement
5.3 Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
5.4 Meaning of total settlement, uniform settlement, differential settlement and rate of settlement and their importance
Settlement due to construction operations and lowering of water table
Tolerable settlement for different structures as per BIS

6. Shear Strength Characteristics of Soils: (15%)

6.1 Concept of shear failure in soils along with examples
6.2 Factors contributing to shear strength of soils, Coulomb's law
6.3 Determination of shearing strength direct shear test and unconfined compression test. Brief idea about tri-axial shear test
6.4 Drainage conditions of test and their significance
6.5 Stress and strain curve, peak strength and ultimate strength, their significance
6.6 Comparisons between laboratory and field test.

7. Soil Compaction: (10%)

7.1 Definition of compaction and its necessity
7.2 Laboratory compaction test (as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relations for typical soils.
7.3 Field compaction: methods and equipment, choice of equipment
7.4 Compaction requirements
7.5 Compaction control; Density control, field density test, (sand replacement), moisture control, Proctor's needle and its use, thickness control.

8. Bearing Capacity (10%)

1.2 Concept of bearing capacity
1.3 Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure
1.4 Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil
1.5 Factors affecting bearing capacity
1.6 Concept of vertical stress distribution in soils due to foundation loads, pressure bulb

1.7 Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity
1.8 Plate load test (no procedure details) and its limitations
1.9 Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

9. Soil Exploration: (10%)

9.1 Purpose and scope, Planning of subsurface investigations

9.2 Possibility of misjudgment and Influence of soil conditions on exploratory programme

9.3 Location, depth and spacing and number of bore holes based on project size/type of structure.

9.4 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)

9.5 Ground water level measurement

9.6 Sampling; undisturbed, disturbed and representative samples; selection of different type of samples; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, sealing and preservation of samples.

9.7 Presentation of soil investigation results

10. Foundation Engineering: (10%)

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

PRACTICAL EXERCISES

1. To determine the moisture content of a given sample of soil

2. Auger Boring and Standard Penetration Test
a) Identifying the equipment and accessories
b) Conducting boring and SPT at a given location
c) Collecting soil samples and their identification
d) Preparation of boring log and SPT graphs
e) Interpretation of test results

3. Extraction of Disturbed and Undistrubed Samples
a) Extracting a block sample
b) Extracting a tube sample
c) Extracting a disturbed samples for mechanical analysis.
d) Field identification of samples

4. Field Density Measurement (Sand Replacement and Core Cutter Method)
a) Calibration of sand
b) Conducting field density test at a given location

c) Determination of water content
d) Computation and interpretation of results

5. Liquid Limit and Plastic Limit Determination:
a) Identifying various grooving tools
b) Preparation of sample
c) Conducting the test
d) Observing soil behaviour during tests
e) Computation, plotting and interpretation of results

6. Mechanical Analysis
a) Preparation of sample
b) Conducting sieve analysis
c) Computation of results
d) Plotting the grain size distribution curve
e) Interpretation of the curve

7. Laboratory Compaction Tests (Standard Proctor Test)
a) Preparation of sample
b) Conducting the test
c) Observing soil behaviour during test
d) Computation of results and plotting
e) Determination of optimum moisture content and maximum dry density

8. Demonstration of Unconfined Compression Test
a) Specimen preparation
b) Conducting the test
c) Plotting the graph
d) Interpretation of results and finding/bearing capacity

9. Demonstration of:
a) Direct Shear and Vane Shear Test on sandy soil samples
b) Permeability test apparatus

INTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy loads. This can be shown by making use of photographs of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of viva examination at the end of each practical work will develop clear understanding about type concepts and principles related to this subject.

REFERENCES

i) Punia, BC; “Soil Mechnics and Foundations”; Delhi Standard Publishers

Distributors.
ii) Bharat ingh and Shamsher Prakash; “Soil Mechanics and Foundations Engineerin g”; Roorkee, Nem Chand and Bros.
iii) Alam Singh, ‘Soil Engineering in 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 souls and their Measurement” Mc Graw Hill.
vi) Parcher, JV and Means, RE; “Soil Mechanics and Foundations” Prentice Hall of India.
vii) Sutton, BHC; “Solution of Problems in Soil Mechanics “ PItman
viii) Gulati, SK; “Enigneering Properties of Soils”, Tata Mc Graw Hill
ix) Ramanna TR; Krishnamurthy S. and Duggal, AK; “Soil Sampling and testing” A laboratory manual (TTTI), Marketed by New Age International Publishers Ltd.

CE 432 SURVEYING – II

	L	T	P
Pds/week	2	-	6

RATIONALE

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

While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surverying, curves and use of minor and modern instruments have been included in this subject.

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

DETAILED CONTENTS

1. Contouring: (20%)

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

2. Theodolite Surveying: (30%)

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

3. Tacheo-metric surveying (10%)

   Tacheometry-principle of tacheometry, additive and multiplying constants, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, examples of stadia tachometry and simple numerical problems.

4. Curves: (25%)

4.1 Simple Circular Curve:

Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of intersection (Apex point), tangent point, length of curve, long chord, deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve:

a) By linear measurements only:
   - Offsets from the tangent
   - Successive bisection of arcs
   - Offsets from the chord produced

b) By tangential angles using a theodolite

4.2 Transition Curve:

Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve, length of transition curve for roads

4.3 Vertical curves

Types of curves, Setting out of a vertical curve

5. Introduction to the use of Modern Surveying equipment and techniques such as: (15%))

a) EDM
b) Digital Planimeter
c) Total station
d) Introduction to GIS & Remote Sensing and GPS

PRACTICAL EXERCISES

1. Computation of horizontal angle between two intersecting lines using repetition method
2. Computation of horizontal angles using re-iterartion
3. To find out height of an object
4. To measure magnetic bearing of a line
5. To prolong a line in the field
6. Running a closed traverse with a theodolite (at least five sides) and its plotting
7. To compute tacheometric constants (k & c)
8. Preparing a contour plan by radial line method
9. Preparing a contour plan by method of squares
10. Setting out of a simple circular curve by different methods
11. Study of Total Station (only demonstrations)
12. Demonstration of digital instruments through field visits and government agencies.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delhi
2. Deshpande, RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,
3. Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,
4. Kanetkar,TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan, Pune
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling-Vol.2" AVG Prakashan, Pune
6. Punmia, BC; "Surveying and Leveling ", Standard Publishers Distributors, Delhi
7. Shahai, PB; "A Text Book of Surveying ", Oxford and IBH Publishing Co.
8. Lilly Sant “Remote Sensing and Image Interpretation”
9. Mahajan, Sanjay, “Surveying-II”, Satya Prakashan, Delhi

CE 443 QUANTITY SURVEYING AND VALUATION

	L	T	P
Pds/week	4	-	2

RATIONALE

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

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

DETAILED ESTIMATE

1. BUILDINGS: (20%)

(a) Introduction to estimating:

Types of estimates ;- Preliminary estimates ,Plinth area estimate, Cubic rate estimate Estimate per unit base

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

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

Rules for measurements

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

(d) Preparation of detailed estimate complete with detailed reports, specifications, abstract of cost and material requirement statements for a small residential building with flat roof.

(e) Sub heads and items of work

Preparation of Detailed and Abstract Estimates from Drawings for: A small residential building with a flat roof and pitched roof building comprising of - Two rooms with W.C., bath, kitchen and verandah

2. ANALYSIS OF RATES: (20%)

Detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation

(A) Steps in the analysis of rates for any item of work: Requirement of materials, labour, sundries, water charges and contractor's profit.

(B) Calculation of quantities of materials for:

a) Cement mortars of different proportion
b) Cement concrete of different proportion
c) Brick/stone masonry in cement mortar
d) Plastering and pointing
e) White washing, painting
f) R.C.C. work in slab, beams

(C) Analysis of Rates

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

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

a) Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift
b) RCC in roof slab/beam/lintels/columns
c) Brick masonry in cement mortar
d) Cement Plaster
e) White washing, painting
f) Stone masonry in cement mortar

(D) Running and maintenance cost of construction equipment

4. IRRIGATION:** **(10%)**

(A) Calculation of earth work for inclined channels with the help of drawings for different cross sections.

(B) Preparation of detailed estimate for brick lined distributor from a given section.

5. **ROADS: **(10%)**

(a) Calculation of earth work in roads: by Cutting, Filling, Cutting and filling, average depth, average cross sectional area and graphical method.

(b) Calculation of quantities of materials for roads in plains with the given drawings.

(c) Preparation of detailed estimate using the above quantities .

(d) Calculation of quantities of different items of works for a masonry boundary wall from the given drawings.

**** One problem on Earth work may be asked either from Roads or Irrigation involving cross sections at THREE to FOUR locations.**

5. CONTRACTING: **(20%)**

a) Meaning of contract
b) Qualities of a good contractor
c) Essentials of a contract
d) Types of contracts, their advantages, dis-advantages and suitability, system of payment
e) Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period
f) Classification and types of contracting firms/construction companies
g) Introduction to CSR and calculation of cost based on premium on Common

Schedule Rates (CSR)

7. BILLING (10%)

(a) Measurement of work for payment of contractors and suppliers. Type of Measurement book,

Maintenance of measurement book.

(b) Types of payments: First, running, advance, first & final and final payment.

8. VALUATION (NO NUMERICALS) (10%)

a) Purpose of valuation, principles of valuation

b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.

c) Methods of valuation (i) replacement cost method (ii) rental returnmethod

PRACTICAL

(USE OF SPREAD SHEET SHALL BE COMPULSORY FOR FOLLOWING EXERCISES)

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

Preparation of Detailed and Abstract Estimates from Drawings for:

a) A small residential building with a flat roof and pitched roof building comprising of - Two rooms with W.C., bath, kitchen and verandah
b) Earthwork for unlined channel
c) WBM road and pre-mix carpeting
d) Single span RCC slab culvert
e) Earthwork for plain and hill roads
f) RCC work in beams, slab, column and lintel, foundations
g) users septic tank - 10 users- 50 users

INSTRUCTIONAL STRATEGY

This is an applied engineering subject. Teachers are expected to provide working drawings for various civil engineering works and students be asked to calculate the quantities of materials required for execution of such works. Teachers should conceptualizes making analysis of rates for different types of works along with valuation of property.

Reference:

1. IS Code of Practice – IS 1200
2. Estimating and Costing – Rangawala
3. Quality surveying – PL Bhasir & Co.,
4. Estimating and Costing – Birdie
5. Estimating and Costing – Vazirani & Chandola,
6. Chakraborti. M, "Estimating , Costing Specification and Valuation in Civil Engg"

7. Datta.B.N., “Estimating and Costing in Civil Engg” UBS Publishers (P) ltd. Delhi.
8. Quantity surveying – P.L.Bhasin , M/s. Chand Publication.

CE 453 FIELD WORK/EXPOSURE

	L	T	P
Pds/week	-	-	8

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 beyond the facilities at the polytechnic. Following suggestions are made for effective implementation of this subject.

i) Two visits to building construction site (one residential and one commercial) to study construction processes and building components.

ii) Visit to Sewage treatment plant.

iii) Visit to Water treatment plant.

iv) Visit to water supply works.

v) Visit to a bridge/flyover site to study various components.

vi) Visit to metro rail project site.

vii) Visit to asphalt mixing plant.

viii) Visit to an excavation site at project.

ix) Visit to RMC plant.

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

CM401 ENGLISH AND COMMUNICATION SKILLS – II

	L	T	P
Pds/week	4	-	2

RATIONALE

The curriculum aims to develop the use of English for three major purposes social interaction, academic achievement and professional use. Listening, speaking, reading, and writing skills can not be thought of as independent skills. They are generally perceived as interdependent where one skill often activates the other skills as well as the paralinguistic skills required for the achievement of effective communication. It is believed that the most effective way to achieve these purposes is through the adoption of a thematic, integrated, content-based approach to teaching and learning.

DETAILED CONTENTS

1. LISTENING (5%)

Practical:

- Pre-recorded CDs of famous speeches and dialogues: Comprehension exercises based on the audio
- Note-taking
- Drawing inferences
- Summarizing

Note: Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

2. SPEAKING (20%)

Practical:

- Voice Modulation: Horizons (pitch, tone, volume, modulation)
- Word stress, rhythm, weak and strong form, pauses, group-sense, falling and rising tones, fluency, pace of delivery, dealing with problem sounds, accent, influence of mother tongue etc.
- Situational Conversation/role-playing with feedback, preferably through video recording
- Telephonic Conversation: Types of calls, agreeing and disagreeing, making and changing appointments, reminding, making complaints and handling complaints, general etiquettes,
- A small formal and informal speech
- Seminar
- Debate

Note: Teachers are expected to give necessary demonstrations, instructions and guidelines, while teaching above topics

3. READING (10%)

Theory:

- Comprehension, Vocabulary enrichment and grammar exercises based on the following selective readings:

Section-I

- The Portrait of a Lady - Khushwant Singh
- The Lost Child by Mulk Raj Anand
- The Refugees – Pearl S. Buck

Section-II

- Life Sketch of Dr. Abdul Kalam
- Abraham Lincoln's letter to his son's Headmaster

Section-III

- All The World's A Stage – W. Shakespeare
- Say Not, The Struggle Nought Availeth – A.H. Clough
- Pipa's Song – Robert Browning
- A Viewpoint – RP Chaddah

- Comprehension exercises on unseen passages

4. WRITING (25%)

Theory:

- The Art of Précis Writing
- Correspondence: Business and Official
- Drafting
  - Report Writing: Progress report and Project report
  - Inspection Notes
  - Notices: Lost and found; Obituary; Auction
  - Memos and Circulars
  - Notices, Agenda and Minutes of Meetings
  - Use of internet and E-Mails
  - Press Release
  - Applying for a Job: Resume writing; forwarding letter and follow-up
- Writing Telephonic messages
- Filling-up different forms such as Banks and on-line forms for Placement etc.

Note: Teachers are expected to give practical examples, while teaching above topics

5. VOCABULARY AND GRAMMAR (25%)

Theory and Practical exercises on following:

- Vocabulary of commonly used words
- Glossary of Administrative Terms (English and Hindi)
- One word substitution
- Idioms and Phrases
- Prefixes and Suffixes
- Punctuation
- Narration
- Forms of verbs: Regular and irregular

6. EMPLOYABLE SKILLS (15%)

Theory:

Importance of developing employable and soft skills; List and tips for developing of employable skills

Practicals:

- Group discussions
- Presentations, using audio-visual aids (including power-pooint)
- Interview techniques: Telephonic interviews, Group interviews, face to face interviews
- Mannerism and etiquette etc.

RECOMMENDED BOOKS

1. Text Book of English and Communication Skills Vol – 2, By Alvinder Dhillon and Parmod Kumar Singla; Published by: M/S Abhishek Publications, Chandigarh
2. Spoken English (2nd Edition) by V Sasikumar & PV Dhamija; Published by Tata MC Graw Hills, New Delhi.
3. Spoken English by MC Sreevalsan; Published by M/S Vikas Publishing House Pvt. Ltd; New Delhi.
4. Spoken English –A foundation course (Part-I & Part-II) By Kamlesh Sdanand & Susheela Punitha; Published by Orient BlackSwan, Hyderabad
5. Practical Course in English Pronunciation by J Sethi, Kamlesh Sadanand & DV Jindal; Published by PHI Learning Pvt. Ltd; New Delhi.
6. A Practical Course in Spoken English by JK Gangal; Published by PHI Learning Pvt. Ltd; New Delhi.
7. English Grammar, Composition and Usage by NK Aggarwal and FT Wood; Published by Macmillan Publishers India Ltd; New Delhi.
8. Business Correspondence & Report writing (4th Edition) by RC Sharma and Krishna Mohan; Published by Tata MC Graw Hills, New Delhi.
9. Business Communication by Urmila Rani & SM Rai; Published by Himalaya Publishing House, Mumbai.

10. Business Communication Skills by Varinder Kumar, Bodh Raj & NP Manocha; Published by Kalyani Publisher, New Delhi.
11. Professional Communication by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
12. Business Communication and Personality Development by Bsiwajit Das and Ipseeta Satpathy; Published by Excel Books, Delhi
13. Succeeding Through Communication by Subhash Jagota; Published by Excel Books, Delhi
14. Communication Skills for professionals by Nira Konar; Published by PHI Learning Pvt. Ltd; New Delhi.
15. Developing Communication Skills (2nd Edition) by Krishna Mohan & Meera Banerji; Published by Macmillan Publishers India Ltd; New Delhi.
16. Effective Technical Communication By M .Ashraf Rizwi; Published by Tata MC Graw Hills, New Delhi.
17. Basic Communication Skills for Technology by Andrea J Rutherfoord; Published by Pearson Education, New Delhi
18. English & Communication Skills for students of Science & Engineering by SP Dhanavel; Published by Orient BlackSwan, Hyderabad.
19. Technical Communication- Principles & Practices by Meenakshi Raman & Sangeetha Sharma; Published by Oxford University Press, New Delhi.
20. Technical English by S. Devaki Reddy & Shreesh Chaudhary; Published by Macmillan Publishers India Ltd; New Delhi.
21. Advanced Technical Communication, by Kavita Tyagi & Padma Misra; Published by PHI Learning Pvt. Ltd; New Delhi.
22. Communication Skills for Engineer & Scientist by Sangeeta Sharma & Binod Mishra; Published by PHI Learning Pvt. Ltd; New Delhi.

CE 530 CIVIL ENGINEERING DRAWING - II

	L	T	P
Pds/week	**2**	**-**	**6**

Note:

For all the drawings detailed specifications shall be given.
Designs are not to be included in the examinations.
The drawings must include layout plans, Plan, sections, details of components, elevation, etc., as applicable to each topic.
Preparation of bar bending schedules in respect of RCC drawings shall be encouraged.
There are Two Groups of drawings that are to be taught. The question paper will include three questions from group A and three questions from group B with due weight age given to each group.
Students shall be asked to attempt one question from each group.

Group 'A' (50 %)

1. Detail of standard accessories in a toilet and drainage plan of a building.
2. One pipe and two pipe system.
3. Manhole: circular and Rectangular.
4. Septic tank and soak pit.
5. Drainage scheme of the residential building on given single line plan.

Group 'B' (50 %)

1. Simply supported one-way slab.
2. Simply supported two-way slab.
3. Restrained two-way slab.
4. Cantilever Beam, Singly and Doubly reinforced beams
5. Tee Beams and continuous slab.
7. Dog-legged staircase.
8. RCC column and Footing

REFERENCE BOOKS:

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

CE533 COMPUTER APPLICATION IN CIVIL ENGINEERING

	L	T	P
Pds/week	-	-	4

RATIONALE

Computer applications plays a very vital role in present day life and more so, in the professional life of diploma engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer softwares in civil engineering.

DETAILED CONTENTS

PRACTICAL EXERCISES

1. Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of 2 rooms building, RCC beam, slab, column, footing and plumbing and sewer drainage drawing.
1. Demonstration of various civil engineering softwares like STAAD-Pro, ETAB, MS Project or Primavera Project Planner, Auto Civil, MX Road or any other equivalent software for above mentioned software

Note:

i) The polytechnics may use any other software available with them for performing these exercises

ii) If the above softwares are not available in the institution, the demonstration of the above said software should be arranged outside the institute.

CE531 GENERIC SKILLS AND ENTREPRENEURSHIP DEVELOPMENT

	L	T	P
Pds/week	4	-	-

RATIONALE

Generic Skills and Entrepreneurship Development is one of the courses from "Human Science" subject area. Generic skills have emerged as an important component of employability skills, which enable an individual to become and remain employable over lifetime and to lead happy and prosperous life. Entrepreneurship development aim at developing conceptual understanding for setting-up one's own business venture/enterprise. This aspect of Human Resource Development has become equally important in the era, when wage employment prospects have become meager.

Both the subject areas are supplementary to each other and soft skills are required to be developed in diploma passouts for enhancing their employability and self confidence.

DETAILED CONTENTS

1. Introduction to Generic Skills (10%)

    1.1 Importance of Generic Skill Development (GSD)
    1.2 Global and Local Scenario of GSD
    1.3 Life Long Learning (LLL) and associated importance of GSD.

2. Managing Self (20%)

    2.1 Knowing Self for Self Development
    - Self-concept, personality, traits, multiple intelligence such as language intelligence, numerical intelligence, psychological intelligence etc.

    2.2 Managing Self - Physical
    - Personal grooming, Health, Hygiene, Time Management

    2.3 Managing Self – Intellectual development

    - Information Search: Sources of information
    - Listening: Effective Listening
    - Speaking: Effective Oral Communication
    - Reading: Purpose of reading, different styles of reading, techniques of systematic reading; Note Taking: Importance and techniques of note taking
    - Writing: Correspondence - personal and business

Note: Practical sessions should be coupled with teaching of effective listening, speaking, reading and writing.

2.4 Managing Self – Psychological

- Stress, Emotions, Anxiety-concepts and significance (Exercises related to stress management)
- Techniques to manage the above

3. Managing in Team (10%)

3.1 Team - definition, hierarchy, team dynamics
3.2 Team related skills- sympathy, empathy, co-operation, concern, lead and negotiate, work well with people from culturally diverse background
3.3 Communication in group - conversation and listening skills

4 Task Management (10%)

4.1 Task Initiation, Task Planning, Task execution, Task close out
4.2 Exercises/case studies on task planning towards development of skills for task management

5. Problem Solving (10%)

5.1 Prerequisites of problem solving- meaningful learning, ability to apply knowledge in problem solving
5.2 Different approaches for problem solving.
5.3 Steps followed in problem solving.
5.4 Exercises/case studies on problem solving.

6. Entrepreneurship

6.1 Introduction (40%)

- Concept/Meaning and its need
- Competencies/qualities of an entrepreneur
- Entrepreneurial Support System e.g., District Industry Centres (DICs), Commercial Banks, State Financial Corporations, Small Industries Service Institute (SISIs), Small Industries Development Bank of India (SIDBI), National Bank of Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State/National level.

6.2 Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small-scale industry
- List of items reserved for exclusive manufacture in small-scale industry
- Assessment of demand and supply in potential areas of growth.
- Understanding business opportunity

- Considerations in product selection
- Data collection for setting up small ventures.

6.3 Project Report Preparation

- Preliminary Project Report
- Techno-Economic Feasibility Report
- Exercises on Preparation of Project Report in a group of 3-4 students
-

INSTRUCTIONAL STRATEGY

This subject will require a blend of different teaching and learning methods beginning with lecture method. Some of the topics may be taught using question answer, assignment, case studies or seminar. In addition, expert lectures may be arranged from within the institution or from management organizations. Conceptual understanding of Entrepreneurship, inputs by teachers and outside experts will expose the students so as to facilitate in starting ones own business venture/enterprise. The teacher will discuss success stories and case studies with students, which in turn, will develop managerial qualities in the students. There may be guest lectures by successful diploma holding entrepreneurs and field visits also. The students may also be provided relevant text material and handouts.

RECOMMENDED BOOKS

1. Soft Skills for Interpersonal Communication by S.Balasubramaniam; Published by Orient BlackSwan, New Delhi
2 Generic skill Development Manual, MSBTE, Mumbai.
3 Lifelong learning, Policy Brief (www.oecd.orf)
4 Lifelong learning in Global Knowledge Economy, Challenge for Developing Countries – World Bank Publication
5 Towards Knowledge Society, UNESCO Paris Publication
6 Your Personal Pinnacle of Success by DD Sharma, Sultan Chand and Sons, New Delhi
7 Human Learning, Ormrod
8 A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
9 Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
10. Handbook of Small Scale Industry by PM Bhandari

CE532 RCC DESIGN

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

RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per IS:456-2000

DETAILED CONTENTS

1. Introduction (5%)

    1.1 Concept of Reinforced Cement Concrete (RCC)
    1.2 Reinforcement Materials:
        - Suitability of steel as reinforcing material
        - Properties of mild steel and HYSD steel
    1.3. Loading on structures as per IS: 875

2. Introduction to following methods of RCC design (5%)
    2.1 Working stress method
    2.2 Limit state method

3. Shear and Development Length (5%)

    3.1 Shear as per IS:456-2000 by working stress method
        i) Shear strength of concrete without shear reinforcement
        ii) Maximum shear stress
        iii) Shear reinforcement

4. Singly Reinforced Beam (Working stress method) (10%)

    4.1 Basic assumptions and stress strain curve, neutral axis, balanced, under-reinforcement and over reinforced beams, Moment of resistance for singly reinforced beam.

    4.2 Design of singly reinforced beam including sketches showing reinforcement details.

5. Concept of Limit State Method (5%)

5.1 Definitions and assumptions made in limit state of collapse (flexure)
5.2 Partial factor of safety for materials
5.3 Partial factor of safetyfor loads
5.4 Design loads
5.5 Stres block, parameters

6. Singly Reinforced beam (10%)

Theory and design of singly reinforced beam by Limit State Method

7. Doubly Reinforced Beams (10%)

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

8. Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals) (5%)

9. One Way Slab (10%)

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

10. Two Way Slab (5%)

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

11. Axially Loaded Column (10%)

11.1 Definition and classification of columns

11.2. Effective length of column,

11.3. Specifications for longitudinal and lateral reinforcement

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

12 . STAIRCASES BY L.S.M. (5%)

Structural behavior of stairs, effective span of stairs, estimation and distribution of loads, effective breadth of flights, design of cantilever steps, design of doglegged and open well stairs spanning parallel to the flight. **** Design of stair-case not for exam**

13. DESIGN OF COLUMN FOOTINGS by L.S.M. (10 %)

Types of RCC footings, Footings with uniform thickness and sloped footings – minimum thickness – critical sections – minimum reinforcement , distribution of reinforcement, development length, cover, minimum edge thickness requirements as per IS 456 – 2000 . **Only design of isolated footing (square and rectangular) with uniform thickness is to be asked.**

14. Prestressed Concrete (No Numericals) (5%)

a) Concept of pre-stressed concrete
b) Methods of pre-stressing : pre-tensioning and post tensioning
c) Advantages and disadvantages of prestressing
d) Losses in pre-stress

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
3. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
4. Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
5. Singh Harbhajan "Design of Reinforced Concrete Structure Design" Abhishek Publishers Ltd., Chandigarh
6. Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi.
6. Singh Harbhajan, Limit Stat of RCC Design"; Abhishek Publishers Ltd.

CE 534 PRACTICAL TRAINING

(Including field Visits/Exposure and Practice on Computers)

	L	T	P
Pds/week	-	-	**16**

The object of this training is to:

i). Most of the Civil Engineering works are executed through contracts and with reference to relevant codle practices, technical specification hence exposure of the students to industrial/field procedures and practices will give due focus in sensitizing the students about these aspects so that the student 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 filed/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 wi11 conducts performance assessment of the students. The criteria of the assessment will be as follows:

Criteria	Weightage
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 3-4 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

CE540 CONTRACT LAWS AND REGULATIONS

	L	T	P
Pds/week	4	-	-

1. CONSTRUCTION CONTRACTS (20%)

Indian Contracts Act-Essential elements of Contracts-Types of contracts-Features: Suitability, advantages and disadvantages – Documents: Standard contract Document.

2. TENDERS (20%)

Definitions, tender notice, Prequalification, Bidding, Accepting, Evaluation of Tender from Technical, Contractual and commercial points of view, acceptance of tender, contract formation and interpretation-Potential contractual problems

3. ARBITRATION (20%)

Need of arbitration, Arbitration Act, Types of arbitration, Procedure for settlement of disputes including arbitration award. Agreements, subject matter, Violations, Powers and duties of Arbitrator, Rules of Evidence.

4. LEGAL REQUIREMENTS (20%)

Insurance and Bonding Laws. Taxation Laws: Sale Tax, Income Tax, Excise and customs duties and their influence on construction costs. Agency Law,

5. LABOUR REGULATION (20%)

Necessity, Aims and objectives,(Social Security-Welfare Legislation) Statutory Regulations: Workman compensation act, minimum wages act, ESI act, EPF act, Payment of wages act, Bonus and Industrial Disputes.

References:

1. Gajaria G.T., " Laws Relating to Building and Engineering Contracts in India ", M.M.Tripathi Private Ltd., Bombay, 1982.
2. Jimmie Hinze, " Construction Contracts ", 2nd Edition, McGraw Hill, 2001.
3. Joseph T. Bockrath, " Contracts and the Legal Environment for Egineers and Architects ", 6th Edition, McGraw Hill, 2000.
4. Chakraborti.M, “Estimating , Costing Specification and Valuation in Civil Engg”
5. Datta.B.N., “Estimating and Costing in Civil Engg” UBS Publishers (P) ltd. Delhi.

CE541 RAILWAY, BRIDGES AND TUNNELS

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

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 fasterners; 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 of each topic for external examination is given in the brackets (NO Numericals)

DETAILED CONTENTS

PART – I: RAILWAYS (40%)

1. **Introduction to Indian Railways**

2. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey

3. Classification of permanent way describing its component parts

4. Rail Gauge: Definition, types, practice in India

5. Rails – types of rails

6. Rail Fastenings: Rail joints, types of rail joints, fastenings for rails, fish plates, bearing plates

7. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers.

8. Ballast: Function of ballast, requirements of an ideal material for ballast

9. Crossings and signallings: Brief description regarding different types of crossings/ signallings (Latest electronics operated signal devices)

10. Maintenance of track: Necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools

11. **Earth work an drainage:** Features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system

PART-II: BRIDGES (40%)

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

13. Classification of Bridges
Their structural elements and suitability:
13.1 According to life-permanent and temporary
13.2 According to deck level – Deck, through and semi-through
13.3 According to material –timber, masonry, steel, RCC, pre-stressed
13.4 According to structural form; - Grade Seperators-Railway Overbridges (ROB), Railway underbridge (RUB)
- Beam type –RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever, Trussed bridges.
- Arch type – open spandrel and filled spandrel barrel and rib type - Suspension type – unstiffened and stiffened and table (its description with sketches) - According to the position of highest flood level submersible and non submersible
13.5 IRC classification

14. **Bridge Foundations:** Introduction to open foundation, pile foundation, well foundation

15. Piers, Abutments and Wingwalls
15.1 Piers-definition, parts; types –solid (masonry and RCC), open
15.2 Abutments and wing walls – definition, types of abutments (straight and tee), abutment with wing walls (straight, splayed, return and curved)
15.3 Launching of Equipment Bridges

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

17. Maintenance of Bridges
17.1 Inspection of Steel and Equipment bridges
17.2 Routine maintenance

PART - III: TUNNELS (20%)

18. Definition and necessity of tunnels
19. Typical section of tunnels for a national highway and single and double broad gauge railway track
20. Ventilation –necessity and methods of ventilation, by blowing, exhaust and combination of blowing and exhaust
21. Drainage method of draining water in tunnels
22. Lighting of tunnels

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Vaswani, NK, “Railway Engineering”, Publishing House, Roorkee
2. Rangwala, SC, “Railway Engineering”, Anand, Charotar Book Stall
3. Deshpande, R, “A Text Book of Railway Engineering”, Poonam United Book Corporation
4. Algia, JS “Bridge Engineering”, Anand, Charotar Book Stall
5. Victor Johnson, “Essentials of Bridge Engineering” Oxford and IBH, Delhi
6. Rangwala S.C., “Bridge Engineering”, Anand, Charotar Book Stall
7. IRC Bridge Codes

CE 542 INDUSTRIAL WASTE TREATMENT

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

INTRODUCTION

Effects of Industrial Wastes on streams, land, Air and Waste Water Treatment plants, Water Quality Criteria, Effluent Standards: Process Modification, Methods and Materials changes, House keeping etc., to reduce waste discharges, and Strength of the waste and established recovery and reuse methods for by products within the plant operations.

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

Characterization of major Industrial wastes (liquid wastes) and detailed treatment methods for different types of industries.
(15%)

CHEMICAL INDUSTRIES: Petro chemicals and refineries, Pharmaceuticals. **(10%)**

APPAREL INDUSTRIES: Textiles, synthetic Fibers, leather, paper. **(10%)**

AGRO IDNUSTRIES: Fertilizer. **(5%)**

FOOD INDUSTIRES: Meat packing, pickles, canning, poultry, Distilleries, Sugar, Dairy. **(10%)**

METALLURGICAL INDUSTRIES: **(10 %)**

Steel plants, Mines, Non-Ferrous metal industries and collieries.

POWER INDUSTRIES: Thermal Power station, Nuclear Power plants.
(**10%)**

RADIO ACTIVE INDUSTRY: Conventional methods of Treatment and disposal of Industrial wastes. Equalization and Neutralization, sedimentation and filtration.
(**10%)**

REMOVAL OF ORGANIC CONTENTS: Biological Treatment method, Aerobic Digestion and An aero Digestion - Trickling filters, stabilization ponds, activation sludge process – oxidation ditch. (**5%)**

REMOVAL OF INORGANIC DISSOLVED SOLIDS: Evaporation, Dialysis, Ion exchange, Miscellaneous methods.
(**5%)**

PHYSICO - CHEMICAL TREATMENT METHODS: Neutralization, Coagulation,

Flocculation, Adsorptions, Absorption and precipitation. Combined Treatment of Industrial and Municipal Wastes.

(**10%)**

REFERENCES:

1. Theories and Practices of Industrial Waste Treatment Nemerow-N.L.
2. Principles of Industrial Waste Treatment – Gurnham C.F.
3. Treatment and Disposal of Industrial Waters. – Southgate

CE 543 ANALYSIS OF STRUCTURES

	L	T	P
Pds/week	4	-	-

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 AND FIXED BEAMS (20 %)

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

Introduction to fixed beam – sagging & hogging bending moments – Determination of fixing moments by area moment method – standard cases – 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.

3. 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 cases – 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 & BMD for the above cases.

4. CONTINUOUS BEAMS – MOMENT DISTRIBUTION METHOD (15 %)

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.

5. MASONRY DAMS (20 %)

Introduction – derivation for maximum and minimum stresses – stress distribution diagrams – 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.

6. EARTH PRESSURE AND RETAINING WALLS (15 %)

Definition – Angle of repose – state of equilibrium of soil – Active and passive earth pressure – Rankine's theory of earth pressure – Assumptions – lateral earth

pressure with level back 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 – problems to check stability.

Reference Books:

1. Theory of structures by S. Ramamrutham
2. Theory of structures by B.C. Punmia, Ashok Jain & Arun Jain
3. Mechanics of structures (Vol.I) by S.B. Junnarkar
4. Analysis of structures by V.N. Vazirani & M.M. Ratwani
5. Elementary theory of structures by R.L. Jindal
6. Strength of materials by F.V. Warnock

CE-544 ECOLOGY & ENVIRONMENTAL CHEMISTRY

	L	T	P
Pds/week	4	-	-

RATIONALE

The Diploma holders are supposed to have basic knowledge about ecology , environmental chemistry so that they can comprehend the various subjects. Hence this subject.

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

DETAILED CONTENTS

1.0 Ecology (40%)

Basic definition of Ecology . The Scope of Ecology . Eco system , Component of the Ecosystem,
Major Ecosystems –Pond , Forest, Desert, Lake, Streams, River, and Estuaries .

Types of Ecosystem

Energy Flow Within the Ecosystem - Energy and Materials , The Solar Radiations Environment.

Food Chains And Tropic level , Grazing and Detritus Food chains , Primary Production .

Biogeochemical Cycles – Hydrological cycle , Carbon dioxide cycle ,Nitrogen Cycle , Sulphur cycle

2.0 Environmental Chemistry (30%)

Environment Segments . Composition of atmosphere.

Atmospheric Structure . Radiation balance of the earth .

Chemical species and particulate present in the atmosphere .

Reaction in the atmosphere .

3.0 Environmental Toxicology (30%)

Fate and Transport of Chemicals in the Environment.

Principal of Toxicology. Mechanism of Toxicity.

Toxic Chemical in the Environment .

Effect of Toxic Chemical in the environment –Lead , Mercury,

Manganese , Chromium , Arsenic, Cadmium , Zinc Copper , Pesticides

REFERENCES

1.New Process of wastewater treatment and recovery G.Mattock(ED) Ellis Horwood
2.Biochemical Engineering fundamentals 2nd ed. By J.E. Bailey and D.F. Ollis , McGraw-Hill (1986)
3.Sawyer, C. N. and Mc. Carty . P.L. chemistry for sanitary Engineers
4. Stanley E. Manohar Environmental Chemistry (Second edition) Willard Grant Press, Beston
Massachusetts.
5.Gallsstone and Lewis , elements of Physical chemistry
6. Albaigeo J. Analytical Techniques in Environmental chemistry Pergamon Press, New york
7. Odum p. fundamentals of ecology WB saunters Co Philadelphia 1975 or latest edition.
8. Kormondy EJ , Concepts of Ecology , Prentice Hall

CE 630 ELEMENTS OF STEEL DESIGN AND DRAWING

	L	T	P
Pds/week	4	-	4

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 (angle 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. Adherence to relevant Indian Standards shall be encouraged. The question paper will include questions on drawing worth 35 % weight-age.

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

DETAILED CONTENTS

THEORY

1. Structural Steel and Sections: (5%)

1.1 Properties of structural steel as per IS Code

1.2 Designation of structural steel sections as per IS handbook and IS:800 - 2007

2. Riveted Connections (10%)

Types of rivets, permissible stresses in rivets, types of riveted joints, specifications for riveted joints as per IS 800. Failure of a riveted joint. Assumptions in the theory of riveted joints. Strength and efficiency of a riveted joint. Design of riveted joints for axially loaded members (No Staggered riveting).

3. Bolted and Welded connections (10%)

3.1 Types of bolts and bolted joints, specifications for bolted joints as per IS: 800 - 2007

3.2 Types of welds and welded joints, advantages and disadvantages of welded joints and bolted joints design of fillet and butt weld. Plug and slot welds (Descriptive No numerical on plug and slot welds)

4. Tension Members (10%)

Analysis and design of single and double angle section tension members and their rivetted and welded connections with gusset plate as per IS:800

5. Compression Members (10%)

Analysis and design of single and double angle sections compression members(struts) and their welded connections with gusset plate as per IS:800

6. Roof Trusses (5%)

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)

7. Columns: **(5%)**

7.1 Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions. Analysis and Design of axially loaded single section steel column

7.2 Types of column bases (Descriptive only)

7.3 Beam and column, frame and seated connections (descriptive only, no design)

8. Beams **(5%)**

Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder (descriptive only, no design)

9 Fabrication and Erection of Steel Structures like trusses, columns and girders (02 hrs) **(5%)**

8. DRAWING (35%)

Structural drawing from given data for following steel structural elements.

(i) Drawing No. 1: Roof Truss – Drawing of Fink Roof Truss with details of joints, fixing details of purlins and roof sheets.

(ii) Drawing No.2 : Column and Column Bases - Drawing of splicing of steel columns. Drawings of slab base, gusseted base and grillage base for single section steel columns.

(iii) Drawing No.3 : Column Beam Connections

(a) Sealed and Framed Beam to Beam Connections

(b) Sealed and Framed beam o Column Connections

(iv) Drawing No. 4 : Plate Girder Plan and Elevation of Plate Girder with details at supports and connection of stiffness, flange angles and cover plate with web highlighting curtailment of plates.

(vi) Drawing No. 5 : Draw atleast one sheet using CAD software

Important Note:

Use of IS: 800 – 2007 and Steel Tables are permitted in examination.

CE631 CONSTRUCTION MANAGEMENT AND ACCOUNTS

	L	T	P
Pds/week	4	-	-

RATIONALE

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

DETAILED CONTENTS
THEORY

CONSTRUCTION MANAGEMENT:

1. Introduction: (10%)

   1.1 Significance of construction management

   1.2 Main objectives of construction management and overview of the subject

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

   1.4 Classification of construction into light, heavy and industrial construction

   1.5 Stages in construction from conception to completion

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

2. Construction Planning: (10%)
   2.1 Importance of construction planning
   2.2 Stages of construction planning

   - Pre-tender stage
   - Contract stage

   2.3 Scheduling construction works by bar charts

   - Definition of activity, identification of activities
   - Preparation of bar charts for simple construction work

   - Preparation of schedules for labour, materials, machinery and finances for small works

- Limitations of bar charts

2.4 Scheduling by network techniques

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

3. Organization: (10%)

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

4. Site Organization: (10%)

4.1 Principle of storing and stacking materials at site

4.2 Location of equipment

4.3 Preparation of actual job layout for a building

4.4 Organizing labour at site

5. Construction Labour: (10%)

5.1 Conditions of construction workers in India, wages paid to workers

5.2 Important provisions of the following Acts:

- Labour Welfare Fund Act 1936 (as amended)
- Payment of Wages Act 1936 (as amended)
- Minimum Wages Act 1948 (as amended)

6. Control of Progress: (10%)

6.1 Methods of recording progress

6.2 Analysis of progress

6.3 Taking corrective actions keeping head office informed

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

7. Inspection and Quality Control: (10%)

7.1 Need for inspection and quality control 7.2 Principles of inspection 7.3 Stages of inspection and quality control for

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

8. Accidents and Safety in Construction: (15%)

8.1 Accidents – causes and remedies

8.2 Safety measures for

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

8.3 Safety campaign and safety devices

ACCOUNTS

9. Public Work Accounts: (15%)

Introduction, technical sanction, administrative approval, allotment of funds, re-appropriation of funds bill, contractor ledger, measurement book running and final account bills complete, preparation of bill of quantities (BOQ), completion certificate & report, hand receipt, aquittance roll. Muster Roll labour, casual labour roll-duties and responsibility of different cadres, budget-stores, returns, account of stock, misc. P.W. advances T & P – verification, survey report, road metal material charged direct to works, account - expenditure & revenue head, remittance and deposit head, defination of cash, precaution in custody of cash book, imprest account, temporary advance, treasury challan, preparation of final bills. Students must learn to prepare accounts register, stock register.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

1. Harpal Singh, "Construction Management and Accounts", Tata McGraw Hill Publishing Company., New Delhi
2. Peurifoy, RL, "Construction Planning, Equipment and Methods", McGraw Hill, Tokyo
3. Singh, Harbhajan " Construction Project Management" Abhishek Publishers, Chandigarh
4. Verma, Mahesh; "Construction Equipment and its Planning and Application
5. Dharwadker, PP; "Management in Construction Industry", , Oxford and IBH Publishing Company, New Delhi
6. Gahlot PS; Dhir, BM; "Construction Planning and Management", Wiley Eastern

Limited, New Delhi

7. Softwares :
   (a) MS Project – Microsoft USA
   (b) Primavera

CE 632 HIGHWAY AND AIRPORT ENGINEERING

	L	T	P
Pds/week	4	-	2

RATIONALE

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

DETAILED CONTENTS

1. Introduction (5%)

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

2. Road Geometrics (10%)

2.1 Glossary of terms used in road geo-metrics and their importance: Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient
2.2 Average running speed, stopping and passing sight distance
2.3 Necessity of curves, horizontal and vertical curves including transition curves. Super elevation and methods of providing super elevation
2.4 Sketch of typical cross-sections in cutting and filling on straight alignment and at a curve

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

3. Highway Surveys and Plan (10%)

3.1 Topographic map, reading the data given on a topographic map
3.2 Basic considerations governing alignment for a road in plain and hilly area
3.3 Highway location; marking of alignment

4. Road Materials (10%)

4.1 Different types of road materials in use; soil, aggregate, binders – bitumen, cutback, Emulsion and Modified Bitumen (CRMB, PMB)
4.2 Binders: Common binders; bitumen, properties as per BIS specifications, penetration, softening point, ductility and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers

5. Road Pavements (10%)

5.1 Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components
5.2. Introduction to California Bearing Ratio, method of finding CBR value and its significance. Aggregate : Source and types, important properties, strength, durability
5.3 Sub-grade preparation: Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profiles of embankment,

construction of embankment, compaction, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation. Stabilization of subgrade. Types of stabilization mechanical stabilization, lime stabilization, cement stabilization, fly ash stabilization etc.(introduction only)

5.4 Introduction to Sub Base Course and Base Course:

a) Granular base course:

(i) Water Bound Macadam (WBM)

(ii) Wet Mix Macadam (WMM)

b) Bitumen Courses:

(i) Bituminous Macadam

(ii) Dense Bituminous Macadam (DBM)

c) *Methods of construction as per MORT&H

5.5 Surfacing:

a) * Types of surfacing

i) Prime coat and tack coat

ii) Surface dressing with seal coat

iii) Open graded premix carpet

iv) Mix seal surfacing

v) Semi dense bituminous concrete

vi) Bituminous Concrete/Asphaltic concrete

vii) Mastic Asphalt

b) * Methods of constructions as per MORT&H specifications and quality control..

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

6. Hill Roads: (10%)

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

6.2 Special problems of hill areas

6.2.1 Landslides: Causes, prevention and control measures, use of geogrids, geoflexiles, geo-synthetics

6.2.2 Drainage

6.2.3 Soil erosion

6.2.4 Snow: Snow clearance, snow avalanches, frost

6.2.5 Land Subsidence

7. Road Drainage: (10%)

7.1 Necessity of road drainage work, cross drainage works

7.2 Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage.

Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections

8. Road Maintenance: (10%)

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

8.2 Maintenance of bituminous road such as seal-coat, patch-work and recarpetng.
8.3 Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices

9. Road Construction Equipment: (10%)

Output and use of the following plant and equipment
9.1 Hot mix plant
9.2 Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline
Hoist and lifts, cranes, trenching machines, tunnel boring machines.
9.3 Asphalt mixer and tar boilers
9.4 Road pavers

10 Airport Engineering :- (15%)

10.1 Necessity of study of airport engineering, aviation transport scenario in India.
10.2 Factors to be considered while selecting a site for an airport with respect to zoning laws.
10.3 Introduction to Runways, Taxiways and Apron
*** An expert may be invited from field/industry for extension lecture on this topic.**

PRACTICAL EXERCISES

1. Determination of penetration value of bitumen
2. Determination of softening point of bitumen
3. Determination of ductility of bitumen
4. Determination of impact value of the road aggregate
5. Determination of abrasion value (Los Angeles') of road aggregate
6. Determination of the California bearing ratio (CBR) for the sub-grade soil
7. Visit to Hot mix plant
8. Visit to highway construction site for demonstration of operation of:
Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB etc.
9. Mixing and spraying equipment
10 A compulsory visit to Ready Mix Concrete plant.

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

i) Khanna, SK and Justo, CEG, "Highway Engineering", Nem Chand and Bros.,Roorkee
ii) Vaswani, NK, "Highway Engineering" , Roorkee Publishing House, Roorkee,
iii) Priyani, VB, "Highway and Airport Engineering" Anand, Charotar Book Stall
iv) Sehgal, SB; and Bhanot, KL; "A Text Book on Highway Engineering and Airport" S Chand and Co, Delhi

v) Bindra, SP; "A Course on Highway Engineering" , Dhanpat Rai and Sons, New Delhi
vi) Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", Asia Publishing House, New Delhi
vii) Duggal AK, Puri VP., "Laboratory Manual in Highway Engineering", New Age Publishers (P) Ltd, Delhi,
viii) NITTTR, Chandigarh “Laboratory Manual in Highway Engineering”,
ix) RK Khitoliya, “Principles of Highway Engineering (2005)”, Dhanpat Rai Publishing Co., New Delhi
x) Rao, GV’ Transportation Engineering
xi) Duggal AK, “Maintenance of Highway – a Reader”, NITTTR, Chandigarh
xii) Duggal AK “Types of Highway constitution “, NITTTR Chandigarh
xiii) Rao, “Airport Engineering”
xiv) Singh,Jagrup, ”Highway Engineering”, Eagle Publications Jalandhar

IRC Publications

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

CE 633 IRRIGATION ENGINEERING

	L	T	P
Pds/week	4	-	-

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 (No Numericals)

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
1.1 Sources of irrigation water

2. Hydrological Cycle Catchment Area and Run-off (10%)

2.1 Rainfall , definition rain-gauges – automatic and non-automatic,
2.2 Methods of estimating average rainfall (Arithmatic system);
2.3 catchment area runoff, factors affecting runoff,
2.4 Hydrograph, basic concept of unit hydrograph.

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, Intensity of Irrigation, Irrigable area
3.4 Water requirement of different crops-Kharif and Rabi

3. Methods of Irrigation (10%)

4.1 Flow irrigation - its advantages and limitations
4.2 Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages
4.3 Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts
4.4 Drip irrigation, suitability of drip irrigation, layout, component parts, Advantages

1. Canals (10%)

5.1 Classification, apurtenancs of a canal and their functions, sketches of different canal cross-sections (unlined)

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

5.3 Breaches and their control

5.4 Maintenance of lined and unlined canals

2. Canal Head Works: (5%)

6.1 Definition, object, general layout, functions of different parts of head works

6.2 Difference between weir and barrage

3. Regulatory and Cross Drainage works : (10%)

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

3.2 Sketches of the above cross drainage works

***4.* Dams: (10%)**

4.1 Classification of dams; earthen dams - types, causes of failure; crosssectionof zoned earthen dams, method of construction, gravity dams –types, cross-sections of a dam, method of construction

4.2 Concept of small and micro dam

4.3 Concept of spillways and energy dissipaters

5. Definitions of following Hydraulic Structures with Sketches (10%)

5.1 Falls

5.2 Cross and head regulators

5.3 Outlets

5.4 Canal Escapes

6. Water logging and Drainage: (5%)

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

6.2 and remedies

6.3 Reclamation of soil

6.4 Surface and sub-surface drains and their layout

6.5 Concept and various techniques used for ground water re-charge

7. Tube well Irrigation: (10%)

7.1 Introduction, occurrence of ground water, location and command, advantages of tube wells

7.2 Tube wells, explanation of terms :water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers

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

7.4 Method of construction, boring, installation of well assembly, development of well.

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

8. River Training Works (5%)

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

INSTRUCTIONAL STRATEGY

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

REFERENCES

1. Singhal, RP; 'A Text Book on Irrigation Engineering', Singhal Publications
2. Bharat Singh, 'Fundamentals of Irrigation Enginering', Roorkee, Nem Chand and Bros
3. Garg, Santosh Kumar, 'Irrigation Engineering and Hydraulics Structures', Delhi, Khanna Publishers
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.
7. Varshney RS, Gupta SC, Gupta RL at all. "Theory and Design of Irrigation Structures", Vol. I and II,
8. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"
9. Priyani BB, 'The Fundamental Principles of Irrigtion and Water Power
10. BIS Codes
11. Wan. E. Houk, "Irrigation Engineering" Vol. I and II
12. Central Ground Water Board and Central Water Commission Guidelines and

CE-635 AIR POLLUTION

	L	T	P
Pds/week	4	-	2

RATIONALE

To make students acquainted with the classification, sources, effects of air pollution , various methods and equipments available for controlling it.

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

DETAILED CONTENTS

THEORY:

1. Air pollution and meteriology (30%)
   - Air pollution
   - Sources and types of air pollutants
   - Effects of air pollution on human and economy.
   - Influence of meteorological factors on air pollution
   - Plume dispersion
   - Sampling of particulate and gaseous pollutants

2. Air quality standards (5%)
   - Ambient air quality standards
   - Emission standards
   - Air pollution indices

3. Control of Air Pollution (30%)

   - Particulate control, Source control, control equipments like settling chambers, cyclone separators, ESP, Scrubber , Filters.
   - Control of Gaseous Pollutants , absorption, adsorption devices , combustion , condensation devices.
   - dilution by Stack height , open space, Planning and zoning.

   - Simple design problems (Settling chambers, Cyclone, ESP, Filters)

4. Indoor Air pollution (5%)

   - Sources, factors causing Indoor air pollution
   - Simple Mass balance (Simple box model),
   - Control of Indoor Air Pollution

5. Vehicular Pollution (5%)

   - Pollutant formation
   - Effect of driving mode, type & density of vehicles

- Effect of Urbanization on Automobile Pollution
- Control

6. Noise Pollution (10%)

- Definition of Noise
- Sources and methodology of noise measurement
- Sound level meter, Vehicular noise measurement techniques
- Techniques for characterization of Acoustical materials
- Health effects of noise
- Noise standards and Limits
- Noise control Techniques

7.Current issues and topics

- \Green house effect and climate change
- Acid rain
- Depletion of ozone layer
- Kyoto protocol
- Clean development mechanism

PRACTICALS

1) Estimation of the SPM in the ambient air
2) Estimation of the RSPM in the ambient air
3) Estimation of the SOx in the ambient air
4) Estimation of the NOx in the ambient air
5) Estimation of the CO in the ambient air
6) Measurement of noise level

REFERENCES

1. Air Pollution and Control KVSG Murali Krishna ,Kaushal & Co Kakinada -2 (A.P)
2. Environmental Engineering Howard S. Peavy, McGraw-Hill Company
3. Air Pollution Vol I – V Stern A. C Academic press Newyork 1968
4. Air Pollution M.N. Rao & HVN RaoTata McGraw Hill Publishing Co Ltd. New Delhi
5. Environmental Pollution control Engineering C.S. Rao wiley eastern Ltd., New Delhi

CE640 REPAIR AND MAINTENANCE OF BUILDINGS

	L	T	P
Pds/week	4	-	-

RATIONALE

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

DETAILED CONTENTS

1. Need for Maintenance (10%)

    1.1 Importance and significance of repair and maintenance of buildings

    1.2 Meaning of maintenance

    1.3 Objectives of maintenance

    1.4 Factors influencing the repair and maintenance

2. Agencies Causing Deterioration (Sources, Causes, Effects) (15%)

    2.1 Definition of deterioration/decay

    2.2 Factors causing deterioration, their classification

        2.2.1 Human factors causing deterioration
        2.2.2 Chemical factors causing deterioration
        2.2.3 Environmental conditions causing deterioration
        2.2.4 Miscellaneous factors

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

3. Investigation and Diagnosis of Defects (10%)

    3.1 Systematic approach/procedure of investigation

    3.2 Sequence of detailed steps for diagnosis of building defects/problems

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

4. Defects and their root causes (15%)

4.1 Define defects in buildings

4.2 Classification of defects

4.3 Main causes of building defects in various building elements
- 4.3.1 Foundations, basements and DPC
- 4.3.2 Walls
- 4.3.3 Column and Beams
- 4.3.4 Roof and Terraces
- 4.3.5 Joinery
- 4.3.6 Decorative and protective finishes
- 4.3.7 Services
- 4.3.8 Defects caused by dampness

5. Materials for Repair, maintenance and protection (10%)

5.1 Compatibility aspects of repair materials

5.2 State application of following materials in repairs:
- 5.2.1 Anti corrosion coatings
- 5.2.2 Adhesives/bonding aids
- 5.2.3 Repair mortars
- 5.2.4 Curing compounds
- 5.2.5 Joints sealants
- 5.2.6 Waterproofing systems for roofs
- 5.2.7 Protective coatings

6. Remedial Measures for Building Defects (40%)

6.1 Preventive maintenance considerations

6.2 Surface preparation techniques for repair

6.3 Crack repair methods
- 6.3.1 Epoxy injection
- 6.3.2 Grooving and sealing
- 6.3.3 Stitching
- 6.3.4 Adding reinforcement and grouting
- 6.3.5 Flexible sealing by sealant

6.4 Repair of surface defects of concrete
- 6.4.1 Bug holes
- 6.4.2 Form tie holes
- 6.4.3 Honey comb and larger voids

6.5 Repair of corrosion in RCC elements

6.5.1 Steps in repairing
6.5.2 Prevention of corrosion in reinforcement

6.6 Material placement techniques with sketches
6.6.1 Pneumatically applied (The gunite techniques)
6.6.2 Open top placement
6.6.3 Pouring from the top to repair bottom face
6.6.4 Birds mouth
6.6.5 Dry packing
6.6.6 Form and pump
6.6.7 Preplaced – aggregate concrete
6.6.8 Trowel applied method

6.7 Repair of DPC against Rising Dampness
6.7.1 Physical methods
6.7.2 Electrical methods
6.7.3 Chemical methods

6.8 Repair of walls
6.8.1 Repair of mortar joints against leakage
6.8.2 Efflorescence removal

6.9 Waterproofing of wet areas and roofs
6.9.1 Water proofing of wet areas
6.9.2 Water proofing of flat RCC roofs
6.9.3 Various water proofing systems and their characteristics

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

INSTRUCTIONAL STRATEGY

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

RECOMMENDED BOOKS

9. Gahlot P.S. and Sanjay Sharma, “Building Defects and Maintenance Management”, CBS Publishers, New Delhi

10. Nayak, BS, "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi

11. Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span

12. Hutchinson, BD; et al, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

E 641 ADVANCED CONSTRUCTION TECHNOLOGY

	L	T	P
Pds/week	4	-	-
-			

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 operations and piles has been given. Adherence to relevant Indian Standards shall be encouraged.

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 Dewatering 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 Form works and scaffolding: Requirements, Types, erection & removal and maintenance

3. Precast and Prestressed Concrete Construction (35%)

3.1 Introduction of pre-stressed and precast concrete, general theory, various technical terms, advantages.

3.2 Pretensioning – general, pretensioning yards set up, forms for pretensioned structural elements, special techniques of pretensioning.

3.3 Post tensioning: systems of post tensioning, special requirements for forming and false work, ducts and closures, placing of ducts or tendons, concreting, stressing procedure, grouting, protecting anchorage from corrosion.

3.4 Materials of prestressing – cement, aggregates, concrete, admixtures, high strength steel bars, high strength strands, vibration, curing, Codes specifications and inspection.

4. Piles: (25%)

4.1 Introduction, necessity and classification

4.2 Choice of type of pile,

4.3 Piling methods of construction of various types of piles, Pile testing: Initial load test and cyclic load test,

4.4 Anchoring techniques
4.5 Problems in pile construction.

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 manufacturers of various construction equipment and collect information from practical demonstrations, discussions and technical information received from the firms.

CE 642 INTRODUCTION TO SEISMIC PLANNING & DISASTER MANAGEMENT

	L	T	P
Pds/week	4	-	-

RATIONALE

Since 56% landmass in the Indian subcontinent lies in Zone 4 and 3 on the seismic map, it is essential to give a broad overview of geo-technical engineering to the civil engineers even at diploma level. Intricacies of complex situations are meant to be taken up at Graduate and Post-Graduate levels.

INTRODUCTION:

Major Earthquakes & Causes

I Causes of earthquakes, Tectonic Plate theory, Types of earthquakes, Seismic waves, magnitude, intensity etc. **(10%)**

II Theoretical concepts & Structural Behavior- Soil deposits and seismic response of foundation soils, behavior of ground motion and earthquake wave transmission, liquefaction, ductility requirements and stiffness factor, Failures-Shear, sliding, flow, deformation, etc. Detailing provisions for flexural members. **(20%)**

III Hazard Resistant Construction-Building response to ground shaking. Symmetry, eccentric loading, framed, structures, openings in walls masonry bond, soft floors, simple configurations & other protection measures.Introduction to building codes and other recommended practices, Building materials, components and different construction techniques. **(30%)**

IV Introduction to case study, damage profile and analysis. Uttarkashi/Latur/Bhuj etc. **(20%)**

V Disaster Management: Need for an integrated approach, Roles of engineers, Rescuer, communication system during disaster, Cyclones & Land slides – causes and remedies. **(20%)**

REFERECES

1 IS-4326-1993 CODE of practice for earthquake resistant construction of building. Bureau of Indian Standards.
2. Ductile detailing of reinforced concrete structure subjected to seismic forces IS 13920-1993
3. Journal of Indian Building congress Vol. IV 1997
4. Seismic design Handbook, and edition FARZAD NAEIM
5. IS 1893-1984-Criteria for earthquake resistant design for structures
6. IS 13827:1993 Guidelines for improving earthquake resistance.

CE643 ENERGY CONSERVATION TECHNIQUES IN BUILDING CONSTRUCTION

	L	T	P
Pds/week	4	-	-

INTRODUCTION **(25%)**

Fundamentals of Energy-Energy production systems-Heating, Ventilating and Air conditioning-Solar Energy and conservation-Energy -Energy conservation and audits-Domestic energy consumption-Savings-Challenges-Primary energy use in buildings-Residential-commercial-Institutional and public buildings

ENVIRONMENTAL **(25%)**

Energy and resource conservation-Design of green buildings-Evaluation tools for building energy-Embodied and operating energy-Peak demand-Comfort and indoor air quality-Visual and acoustical quality-Land, water and materials-Airborne emissions and Waste management

SERVICES **(25%)**

Energy efficient and environmental friendly building-Thermal phenomena-Thermal comfort-Indoor air quality-Climate, Sun and solar radiation-Psychometrics-Passive heating and cooling systems-Energy analysis -Active HVAC systems-Energy audit-Types of Energy audit-Energy flow diagram-Energy consumption/Unit production-Identification of wastage-Priority of conservative measures-Maintenance of energy management programme

ENERGY MANAGEMENT **(25%)**

Energy management of electrical equipment-Improvement of power factor-Management of maximum demand -Energy savings in pumps-Fans-Compressed air systems-Energy savings in lighting systems-Air conditioning systems-Applications-Facility operation and maintenance-Facility modifications-Energy recovery dehumidifier-Waster heat recovery-Steam plants and distribution systems-Improvement of boiler efficiency-

References:

1. MooreF., " Environmental control systems ", McGraw Hill, Inc., 1994.
2. Brown, G.Z, Sun, " Wind and Light: Architectural design Strategies ", John Wiley & Sons., 1985.
3. Cook, J, " Award - Winning Passive Solar Design ", McGraw Hill, 1984.

CE 644- POLLUTION CONTROL ACTS AND LEGISLATION

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

RATIONALE

While working for any private or public organisation in the field these diploma holders have to keep various acts and legislations at the background of their knowledge so as to adhere to the standards given by BIS, WHO and other organisations. Hence this subject.

DETAILED CONTENTS

1.0 GENRAL ACTS & LAWS (60%)

Environment protection Act and rules -1986, Environmental Tribunal Act -1995 . The National Environment Appellate Authority Act 1997. The Environment (Siting for Industrial Projects) Rules 1999 . The Biomedical Waste (Management & Handling) Rules 1998. The Municipal Solid Wastes Managements and Handling Rule 2000. The Noise Pollution (Regulation and Control) Rules 2002 . The Biological Diversity Act- 2002.

2.0 Forest and Wild Life Acts (15%)

The Indian Forest Act -1927 and Amendment 1984. The Wild life Protection Act 1972 . The Forest (Conservation)Act 1980 .

3.0 WATER Acts (10%)

The Water (Prevention and Control of Pollution) Act 1974. The Water (Prevention and Control of Pollution) Cess Act 1977.

4.0 Air Acts (15%)

The Motor Vehicle Act 1988. The Air (Prevention & Control of Pollution) Act 1981. The Factories Act 1948 & Amendment in 1987.

CE-645 ENVIRONMENTAL IMAPCT ASSESSMENT, MANAGEMENT & AUDIT

	L	T	P
Pds/week	4	-	-

RATIONALE

In order to asses the impact of various environmental pollution control measures as a follow up and management of environmental pollution control projects this subject is essential.

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

DETAILED CONTENTS

1.Environmental Impact Assessment (40%)

Introduction to environmental Impact Assessment-Frame work of Environmental Assessment- Description of Environmental Setting-Prediction and Assessment of impact on the air environment- Prediction and Assessment of impact on the water environment- Prediction and Assessment of impact on the biological environment- Prediction and Assessment of impact on the socioeconomic environment-methods of impact analysis-public participation in Decision making-Future Environmental impact assessment- some specific studies on environmental impact assessment of certain industries like mineral processing plant, thermal power project.

Role of remote sensing and GIS in Environmental Impact Assessment

2. Environmental Management (30%)

Principles of Environmental Management

Policies and Legal Aspect of Environmental Management

Environmental Management Systems Standards: ISO 14000 (EMS)

Environmental Economics.

3.Environmental Audit (30%)

Introduction-Types of Audits- Features of Effective auditing-programme Planning-Definition-Organization of Auditing Programme-Pre visit data collection Audit Protocol-onsite audit-Data sampling-Inspections-Evaluation and presentation Exit Interview-Audit report - Action Plan - other types of audits- Management of Audits-Waste Management contractor Audits – Related Audits.

REFERENCES

1. Cahill LB Environmental Audits, Govt Industries

2. Environmental Impact Assessment Larry w. Canter
3. Man & EnvironmnetD.H. Carson 1976 Interactions Part I and III

CE- 646 SOLID WASTE MANAGEMENT

	L	T	P
Pds/week	4	-	-

RATIONALE

Besides air, water solid waste also causes considerable pollution to the environment. The diploma holders should be given in-depth knowledge about sources, characteristics and disposal of solid wastes. Hence this subject.

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

DETAILED CONTENTS

THEORY

1.0 Perspectives (20%)

1.1 The impacts of solids waste generation, Waste generation in a technology society, Quantities of wastes, projections for the future challenges and opportunities ,

1.2 The evolution of solid waste management , Functional elements , solid waste management systems , solid waste planning , Legislation & government agencies

2.0 Engineering principles

2.1 Generation of solid (5%)

Sources and types of solid wastes Composition of Municipal solids wastes, Generation rates

2.2 On site handling ,storage and processing (5%)

Public health & aesthetics, On site handling, On sites storage, On site processing of solid wastes

2.3 Collection of solid wastes (5%)

Collection services, Collection systems equipments & labour requirements', Analysis of collection systems, Collection routes

2.4 Transfer and Transport (5%)

The need for transfer operation transfer station, Transport means & methods, Location of transfer stations

2.5 Processing Techniques &equipment (10%)

Purpose of processing, Mechanical volume reduction, chemical volume reduction, Mechanical size reduction, Component separation, Drying & Dewatering, Recovery of Resources, Conversion products & energy, Materials processing & recovery systems , Recovery of Chemical conversion products, Recovery biological conversion product ,Recovery of energy from conversion products , Materials &energy recovery system flow sheets

2.6 Disposal of Solid Wastes & Residual matter (10%)

Side selection, Land filling methods & operations , Reactions occurring in completed landfills , Gas & leachate moment and control , Design of landfills , Oceans disposal of solid wastes,

3.0 Management Issues (20%)

Planning in solid waste Management , Choices in onsite handling storage and processing ,Collection alternative , Transfer &transport operation , Choices in processing in material and energy recovery , Plan development , Selection and implementation

4.0 Hazardous Wastes (20%)

Identification of Hazardous Wastes , Classification of Hazardous wastes , Regulations , Generations onsite storage , Collection , Transfer & Transport , Processing , Disposal

REFERENCES

1. Manual on Municipal solid waste Management, Ministry of urban development , Government of India
2. Environmental Engineering Sincero & Sincero Macro hill publication

CE651 PROJECT WORK

	L	T	P
Pds/week	-	-	12

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 in which students are going to play their role after completing the courses of study.
ii) Develop understanding of subject based knowledge given in the class room in the context of its application at work places
iii) Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.
iv) Develop special skills and abilities like interpersonal skills, communication skills, 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:

a) Punctuality and regularity 10%
b) Initiative in learning/working at site 10%
c) Level/proficiency of practical skills acquired 10%
d) Sense of responsibility 10%
e) Self expression/Communication skills 10%
f) Interpersonal skills and presentation 10%
g) Report writing skills 20%
h) Viva voce 20%

Some of the suggested project areas 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 using structural design softwares like ETAB, STAAD Pro., Etc.

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 requirement

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.

Some of the suggested project activities are given below:

1. Construction of a small concrete road consisting of following activities
   - Survey and preparation of site plan
   - Preparation of drawings i.e. L-Section and X-Section
   - Estimating earth work
   - Preparation of sub grade with stone ballast
   - Laying of concrete
   - Testing of slump, casting of cubes and testing
   - Material estimating and costing with specifications
   - Technical report writing

2. Water Supply system for a one or two villages
   - Surveying
   - Design of water requirements and water distribution system
   - Preparation of drawing of overhead tank
   - Material estimating and costing
   - Specifications
   - Technical report writing

3. Construction of toilets and baths for a shopping complex in a township

4. Construction of bridal path 4 kms long

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

6. Rainwater harvesting
- Assessment of catchment's area
- Intensity of rainfall
- Collection of water
- Soak pit design
- Supply of water
- Monitoring during rainy season

7. Design and construction of septic tank with soak pit for 100 users

8. Preparing plumbing detailed drawings of a two storey building and material estimate and costing

9. Planning and design of sports stadium in a township or cluster of villages

10. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system

11. Concrete Mix Design

12. Construction of concrete cubes by mixing appropriate quantity of fly ash with fibres
(i) the fibres like polypropylene, carbon, steel etc. can be used
(ii) students will show the comparison between concrete mixed with fibres verses the quality controlled concrete.

13. Estimation and designing of a State Highway Road
(i) Reconniance survey of proposed road
(ii) To take L - section and cross sections
(iii) Fixing of grades
(iv) Estimation of cutting and filling of earth mass
(v) Plane tabling survey of proposed road
(vi) Estimation of proposed road

14. Designing a small height gravity dam
(i) Constructing of catchment area
(ii) Calculating the reservoir capacity
(iii) Designing of gravity dam by taking into account various forces

15. Designing of ferro-cement water tank and toilet. Testing of the ferro-cement products in civil engineering labs.

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

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7. RESOURCE REQUIREMENT:

7.1 Physical Resources

7.1.1 Total Space Requirements

Total space for lecture room, tutorial rooms and drawing halls may be worked out as per AICTE norms.

7.1.2 Equipment Requirement:

1. NAME OF LABORATORY: CONSTRUCTION MATERIALS TESTING

A) Concrete

B) transportation and Soils

Sl.No.	Item	Qty	Remarks
A)	CONCRETE LABORATORY		
1.1	Compression testing machine	1	
1.2	Vibration machine	1	
1.3	Electrically heated oven (Thermostatically controlled)	1	
1.4	Blaine Air permeability Apparatus (For testing fineness of cement)	1	
1.5	Vicat's Apparatus	6	
1.6	Le Chatelier's soundness apparatus (to determine quantity of free lime in cement)	6	
1.7	Slump cone (to determine the workability of concrete)	3	
1.8	Compacting factor apparatus (to determine the workability of concrete)	1	
1.9	Vee-Bee apparatus (to determine the workability of concrete)	1	
1.10	Plateform weighing machine	1	
1.11	Concrete cube moulds	12	
1.12	Concrete mixers	1	
1.13	Sieve shaker	1	
1.14	Set of sieves	2 set	
1.15	Beam mould	2	
1.16	Impact testing machine	1	
1.17	Needle vibrator	1	
1.18	Flakiness index apparatus	3	
1.19	Elongation index apparatus	3	
1.20	Digital weighing machine (20 kg)	2	
1.21	Bulk density apparatus	3	
1.22	Wire basket	3	
1.23	Riffle sampler	3	
1.24	Table vibrator	1	

1.25	Concrete test hammer	1	
1.26	Ultrasonic pulse velocity apparatus	1	

B. TRANSPORTAION AND SOILS LABORATORY

1.1	Ring and Ball apparatus	1	
1.2	CBR apparatus with loading machine	1	
1.3	Flash point and fire point apparatus	1	
1.4	Abrasion testing machine apparatus	1	
1.5	Water bath (Thermostatically controlled)	1	
1.6	Aggregate impact value testing	1	
1.7	Penetration value apparatus	1	
1.8	Tar viscometer	1	
1.9	Triaxial cell test apparatus	1	
1.10	Direct shear test apparatus	1	
1.11	Drying oven (Thermostatically controlled)	1	
1.12	Digital weighing machine (20 kg)	2	
1.13	Standard penetration test equipment	1	
1.14	Soil exploration equipment	1 set	
1.15	Sand replacement method apparatus	4	
1.16	Liquid limit and plastic limit apparatus	4	
1.17	Compaction apparatus using light compaction	2	
1.18	Grain size distribution test apparatus	2 sets	
1.19	Sieve shaker	1	
1.20	Permeability apparatus	1	
1.21	Plate load apparatus	1	
1.22	Proctor panetrometer	1	
1.23	Core cutter apparatus	1	
1.24	Rapid moisture meter	1	
1.25	Pycnometer with burrette	6	
1.26	Liquid limit apparatus (LCPC cone method)	1	
1.27	Attrition Testing Apparatus	1	

2. Name of Laboratory: SURVEYING LAB

2.1	Plane Table with stand and accessories	10	
2.2	Dumpy level, quick setting level and engineers level i) Dumpy level ii) Quick setting level	 6 1	

	iii) Engineer level	1	
2.3	Transit theodolite (Vernier type)	6	
2.4	Prismatic compass	10	
2.5	Planimeter	2	
2.6	Leveling staves (All aluminium)	8	
2.7	Micro Optic Theodolite	1	
2.8	Ranging rods	30	
2.9	Pantograph	2	
2.10	Optical square	6	
2.11	Abney level	6	
2.12	Tangent clinometer (Indian Pattern)	6	
2.13	Mirror stereoscope	1	
2.14	Telescopic Alidade	2	
2.15	Prismatic binoculars	1	
2.16	Metric chain	10	
2.17	Metallic taps/Fibre glass	10	
2.18	Tentage, camp equipment and other misc. items and instruments	LS	
2.19	Total Station	1	
2.20	Auto Level	1	
2.21	Digital Level	1	
2.22	Digital Theodolite	1	

3. Name of the Laboratory: HYDRAULICS LABORATORY

3.1	Hydraulic Bench	2	
3.2	Impact of Jet apparatus	1	
3.3	*Flow measurement apparatus by Venturimeter and Orifice meter	1	
3.4	*Pipe Friction apparatus	1	
3.5	*Orifice and Mouthpiece apparatus	1	
3.6	*Bernoulli's Theorem apparatus	1	
3.7	*Flow over a notch apparatus	1	
3.8	*Losses in pipe bends apparatus	1	
3.9	Reyonolds's apparatus	1	
3.10	Working models of : - Pelton wheel Turbine - Francis Turbine - Reciprocating pump - Centrifugal pump - Hydraulic Ram - Kaplan turbine	 1 1 1 1 1 1	
3.11	Manometers of different types and pressure gauges like: - Piezoneter - Differential Manometers (Double column type manometer) - Universal manometers	 6 10 2	

	(Single column type manometer) - Inclined tube manometer - Bourden pressure gauges - Compound Gauges (Vacuum and pressure gauge combined)	 2 2 2	
3.12	Current meter	1	
3.13	Centrifugal pump test Rig.	1	
3.15	Misc. for tools etc.	LS	

*These apparatus should be purchased along with hydraulic bench as the design of these apparatus depend upon the design of Hydraulic bench

4. **Name of the Laboratory : BUILDING CONSTRUCTION**

4.1	Masonry erection tools, such as iron pans, towels, plumb bobs, showels, pick axes, corner squares etc.	2 sets	
4.2	Models of Centering, shuttering and scaffolding (for an ordinary residential building)	1 set	
4.3	Models of small trusses, reinforcement cages, small girder, column beam connections, column truss connection, etc.	1 set	

5. Name of the Laboratory:
WATER SUPPLY AND SANITARY ENGINEERING

5.1	Lovibond comparator (for colour determination)	1	
5.2	Colourimeter (for colour determination)	1	
5.3	Centrifuge	1	
5.4	Turbiditi meter	1	
5.5	pH meter	1	
5.6	Jar test apparatus (Flocculator)	1	
5.7	Dissolved oxygen meter	1	
5.8	BDO incubator	1	
5.9	Water bath, thermostatically controlled	1	
5.10	Hot air oven	1	
5.11	Hot plate	2	
5.12	Bacteriological incubator	1	
5.13	Colony counter	1	
5.14	Water sampler	1	
5.15	Water analyzing kit	1	

5.16	Water distill	1	
5.17	Gas detector	1	
5.18	Electronic balance	1	
5.19	Chemical Balance	2	
5.20	Inverted microscope	1	
5.21	Model of oxidation ditch	1	
5.22	Working model of Trickling Filter	1	
5.23	Misc. Items like noise measurement apparatus etc.	LS	
5.24	Spectro Photometer		
5.25	Membrane Filtration Assembly		

6. STRUCTURAL MECHANICS LAB:

1	Universal Testing Machine	1	
2	Impact Testing Machine	1	
3	Torsion Testing Machine	1	
4	Searl,s Apparatus	1	

7. AUTO CAD LAB

1	Latest Computer with operating software, with compactibility to Auto CAD / STAAD Pro/ ANSYS /Prima vera/ M.S. Office software etc.	**15**	
2.	Plotter (Black & White)	1	
3.	Software: Auto CAD or equivalent	20 users	
4.	Software: STAAD Pro/ANSYS/ETAB	5 users	
5.	Software: M.S. Project / Prima vera	5 users	
6.	LCD Projector with all its accessories	1 unit	

NOTE: In addition to above laboratories in respect of physics, chemistry, applied mechanics, strength of materials, general engineering, workshops, computer centre etc will be required for effective implementation of the course. Provision of Modern teaching aids shall be encouraged.

7.2 HUMAN RESOURCE REQUIREMENT

Weekly work schedule, annual work schedule, student teacher ratio for various group and class size, staffing pattern, work load norms, qualifications experience and job description of teaching staff, workshop staff and other administrative and supporting staff may be worked out as per norms and standards laid down by the AICTE.

8. RECOMMENDATIONS FOR EFFECTIVE IMPLEMENTATION OF CURRICULUM

The following recommendations are made for effective implementation of this curriculum.

a) While imparting instructions, stress should be laid on the development of practical skills in the students. For this purpose, as far as possible, classes should be conducted in the laboratories itself.

b) Field visits be organized as and when required to clarify the concepts, principles and practices involved. For this purpose, time has already been provided in student centered activities.

c) Extension lectures from professionals should be organized to impart instructions in specialized areas

d) Considerable stress should be laid in civil contracting and repair and maintenance of civil works

e) Teachers should generate competitiveness among the students for the development of professional skills.

f) Teachers should take working drawings from the fields and provide practices in reading these drawings

g) Hobby clubs and other co-curricular activities be promoted to develop creativity in the students.