GOVERNMENT POLYTECHNIC NASHIK

(AN AUTONOMOUS INSTITUTE OF GOVT. OF MAHARASHTRA)

CURRICULUM - 2016

DIPLOMA PROGRAMME
IN
CIVIL ENGINEERING

INDEX

PREFACE

Government Polytechnic, Nashik is established in 1980. The institute has been conferred an academically autonomous status in 1995 by Government of Maharashtra because of excellent performance.

The vision of the institute is to develop professionally competent engineers for sustainable, socio-economical and community development with harmonious blending. For this the institute is committed to provide Diploma in engineering and technology, continuing education, and skill development programmes. The institute is also committed to create dynamic learning environment to achieve academic excellence and to provide testing and consultancy services to industry, business and community at large. To achieve this continuous efforts are made to design the curriculum considering the latest development in the industrial sector and technology.

The three year Diploma Programme in Civil Engineering is being offered since 1980 under MSBTE. After academic autonomy, first curriculum was implemented in 1995 and subsequently it was revised and implemented in 2001, 2007 and 2011. The curriculum revision is a regular activity and outcome based education approach is adopted for designing the curriculum. The revised curriculum is outcome based curriculum designated as "Curriculum 2016". The implementation of Curriculum 2016 will be effective from the academic year 2016- 17.

For designing the curriculum, the various domains have been identified. For Civil Engineering Programme these domains are Building Construction System, Transportation Engineering System, Irrigation Engineering System and Environmental Engineering System. The questionnaire has been designed to get the responses from these domain areas from different stake holders i.e. industries, teachers and students. The feedback from different stake holders has been analysed and roles, functions, activities, tasks and attitudes necessary for Diploma Civil Engineer have been identified. The programme structure is finalised and the content detailing of individual course has been carried out by group of experts, and approved by Programme Wise Committee (PWC), Board of Studies (BOS) and Governing Body (GB).

In this Curriculum-2016, the student has to acquire 200 credits for successful completion of Diploma Programme. The courses of curriculum are structured at different 5 levels i.e. Foundation Courses, Basic Technology Courses, Allied Courses, Applied Technology Courses and Diversified Courses.

The minimum entry level is 10^{th}. However, the curriculum provides "Multi Point Entry and Credit system (MPEC)" for the students opting admission after passing 12^{th}, ITI, MCVC. At higher entry level, the students will get exemptions in certain courses as per the rules.

There is flexibility for opting the courses as per the choice of students. The curriculum provides "Sample Path" as a guide line for selection of courses in each term for entry level as 10^{th}.

The List of Courses for Award of Class after completion of Diploma Programme is prescribed separately in this curriculum.

The fulfilment of programme outcome as stated in the Curriculum-2016 will depend on its effective implementation. The teachers who are implementing the curriculum were also involved in the design process of curriculum, hence, I hope that the Curriculum-2016 will be implemented in effective way and the passouts will acquire the requisite knowledge and skills to satisfy the industrial needs.

(Prof. DNYANDEO PUNDALIKRAO NATHE)
Principal
Government Polytechnic, Nashik

GOVERNMENT POLYTECHNIC NASHIK

VISION

To be a premier technical institute developing professionally competent engineers for sustainable, socio-economical and community development with harmonious blending

MISSION

Institute is committed to

- Provide Diploma in engineering and technology, continuing education and skill development programmes.
- Provide testing and consultancy services to industry, business and community at large.
- Create dynamic learning environment to achieve academic excellence.

VALUES

- Professionalism and integrity
- Responsibility and accountability
- Continuous improvement
- Collaboration and team work

CIVIL ENGINEERING DEPARTMENT

VISION

To develop professionally competent Diploma Civil Engineers for sustainable socio-economical development capable of managing the resources with qualitative approach.

MISSION

Department of Civil Engineering is committed

M1. To develop competent Diploma Civil Engineers with ethical values for socio-economical development.
M2. To inculcate employable, entrepreneurial and life-long learning skills for sustainable development of the society.
M3. To create a learning environment conducive for achieving academic excellence with latest technology trends.
M4. To offer continuing education programmes and consultancy services for betterment of society.

JOB PROFILE OF CIVIL ENGINEER

A Diploma Civil Engineer has to carry out various activities in various areas during his implementation of engineering knowledge.

Civil Engineering job opportunities are available in following domains:

a. Building Construction System
b. Transportation Engineering System
c. Irrigation Engineering System
d. Environmental Engineering System

In above domain areas Diploma Civil Engineer has to perform following duties.

1. Surveyor
2. Building Layout Planning
3. Site Supervisor
4. Estimator
5. Contractor
6. Entrepreneur
7. Labour Management
8. Maintaining Accounts
9. Design of Minor Works
10. Structural Designing Assistant.
11. Writing Technical Reports
12. Maintenance Engineer
13. Material Planning
14. Construction Manager
15. Execution of Civil Engineering Works
16. Valuer
17. Quality Control of Civil Engineering Works
18. Stores Management
19. Finance Management
20. Material Testing
21. Developer
22. Marketing of Civil Engineering Products/Structures
23. Building Services.

DIPLOMA PROGRAMME IN CIVIL ENGINEERING

RATIONALE

Civil Engineering is the basic branch of Engineering. All Engineering works involve Civil Engineering activities in the Nation development. Civil Engineering plays a vital role by creating a large employment potential. It involves about 20 percent of the labour force of India. Majority of this labour force is unskilled which is managed by Civil Engineers.

This Programme offers courses to acquire supervisory skills and knowledge in Foundation, Basic, Allied, Applied and Diversified fields of Civil Engineering. This programme intends to develop skills in Civil Engineers, so that they will be able to manage the Civil Engineering works.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

I. To develop a civil engineer capable of working in diversified fields of construction industry.
II. To inculcate professional and entrepreneurial abilities in the students.
III. To develop students with ethical, team building and lifelong learning skills

PROGRAMME OUTCOMES (POs)

On successful completion diploma pass outs will be able to

a. **Basic knowledge:** Apply knowledge of basic mathematics, science and engineering to solve the civil engineering problems.

b. **Discipline knowledge:** Apply course specific knowledge to solve core and applied civil engineering problems.

c. **Experiments and practice:** Plan and perform experiments to use results to solve civil engineering problems.

d. **Engineering Tools:** Apply appropriate technologies and tools with an understanding of the limitations.

e. **The engineer and society:** Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to civil engineering practices.

f. **Environment and sustainability:** Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

g. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the civil engineering practices.

h. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.

i. **Communication:** An ability to communicate effectively with society and engineering community.

j. **Project Management and Finance:** Understand engineering and management principles and apply these to manage projects in multidisciplinary environment.

k. **Life-long learning**: Recognize the need and be adaptable for independent and life-long learning in the context of technological changes.

MAPPING OF MISSION AND PROGRAMME EDUCATIONAL OBJECTIVES

Sr. No.	Mission	Component of Mission Statement	PEO/s
1	M1	To develop competent Diploma Civil Engineers with ethical values for socio-economical development.	I and III
2	M2	To inculcate employable, entrepreneurial and life-long learning skills for sustainable development of the society.	II and III
3	M3	To create a learning environment conducive for achieving academic excellence with latest technology trends	I and II
4	M4	To offer continuing education programmes and consultancy services for betterment of society.	I, II and III

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES AND PROGRAMME OUTCOMES

Sr. No.	Programme Educational Objectives (PEOs)	Programme Outcomes (POs)
1	To develop a civil engineer capable of working in diversified fields of construction industry.	a, b, c, d, j
2	To inculcate professional and entrepreneurial abilities in the students.	b, c, d, e, f, g, j
3	To develop students with ethical, team building and lifelong learning skills	g, h, i, j, k

MAPPING OF PROGRAMME OUTCOME AND COURSES

Sr. No.	Programme Outcome (POs)	Courses
a	**Basic knowledge:** Apply knowledge of basic mathematics, science and engineering to solve the civil engineering problems.	Basic Mathematics Engineering Mathematics Applied Physics Applied Chemistry Engineering Graphics Engineering Mechanics Applied Mathematics
b	**Discipline knowledge:** Apply course specific knowledge to solve core and applied civil engineering problems.	Building Drawing Concrete Technology Hydraulics Mechanics of Structures Geotechnical Engineering Highway Engineering Railway and Bridge Engineering Basic Surveying Construction Materials and Processes Construction Management Advanced Surveying Estimating and Costing Theory of Structures Design of R.C.C. Structures Design of Steel Structures Environmental Engineering Irrigation Engineering Building Supervision Construction Equipments
c	**Experiments and practice:** Plan and perform experiments to use results to solve civil engineering problems.	Engineering Graphics Workshop Practice Building Drawing Concrete Technology Hydraulics Geotechnical Engineering Basic Surveying Advanced Surveying Environmental Engineering Architectural Practices and Interior design Advanced Construction Techniques Earthquake Resistant Structures Advanced Concrete Technology
d	**Engineering Tools:** Apply appropriate technologies and tools with an understanding of the limitations.	Engineering Graphics Workshop Practice Computer Aided Graphics Basic Surveying

Sr. No.	Programme Outcome (POs)	Courses
		Computer Applications for Project Management Advanced Surveying Computer Aided Drawing Advanced Construction Techniques Construction Equipments Plumbing Services Prestressed and Precast concrete
e	**The engineer and society:** Demonstrate knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to civil engineering practices.	Construction Materials and Processes Environmental Studies Construction Management Entrepreneurship Development Contracts and Accounts Environmental Engineering Irrigation Engineering Project Architectural Practices and Interior design Building Maintenance Advanced Construction Techniques Urban Planning Plumbing Services Watershed Management Earthquake Resistant Structures Prestressed and Precast concrete
f	**Environment and sustainability:** Understand the impact of the engineering solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.	Construction Materials and Processes Environmental Studies Renewable Energy Sources Environmental Engineering Architectural Practices and Interior design Building Maintenance Urban Planning Watershed Management Advanced Concrete Technology
g	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the civil engineering practices.	Development of Life Skills Marketing Management Material Management Contracts and Accounts Professional Practices Building Supervision
h	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.	Development of Life Skills Construction Management Marketing Management Material Management Entrepreneurship Development Advanced Surveying

Sr. No.	Programme Outcome (POs)	Courses
		Professional Practices Seminar Project
i	**Communication:** An ability to communicate effectively with society and engineering community.	Communication Skills Marketing Management Material Management Professional Practices Seminar Project Building Supervision
j	**Project Management and Finance:** Understand engineering and management principles and apply these to manage projects in multidisciplinary environment.	Construction Management Supervisory Skills Marketing Management Material Management Computer Applications for Project Management Entrepreneurship Development Estimating and Costing Contracts and Accounts Project
k	**Life-long learning**: Recognize the need and be adaptable for independent and life-long learning in the context of technological changes.	Development of Life Skills Professional Practices Seminar Project

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE

SCHEME AT A GLANCE

Level	Name of Level	Total Number of Courses offered	Number of Courses to be completed	TH	TU	PR	Total Credits	Marks
Level-1	Foundation Courses	09	09 Compulsory	24	02	20	46	950
Level-2	Basic Technology Courses	10	10 Compulsory	30	01	26	57	1275
Level-3	Allied courses	09	05 (03 Compulsory +02 Electives)	10	--	04	14	400
Level-4	Applied Technology Courses	12	12 Compulsory	30	01	38	69	1475
Level-5	Diversified Courses	11	O3 Electives	06	--	08	14	400
TOTAL		**51**	**34 compulsory +05 Electives 39**	**100**	**04**	**96**	**200**	**4500**
Grand Total		**51**	**39**	**100**	**04**	**96**	**200**	**4500**

Abbreviations :

TH : Theory, TU : Tutorial, PR: Practical.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 1
FOUNDATION COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6101	Communication Skills	CMS	03	--	02	05	03	80	20	--	--	50	150
02	6102	Development of Life Skills	DLS	01	--	02	03	--	--	--	--	--	50	50
03	6103	Basic Mathematics	BMT	03	01	--	04	02	80#	20#	--	--	--	100
04	6104	Engineering Mathematics	EMT	03	01	--	04	02	80#	20#	--	--	--	100
05	6105	Applied Physics	PHY	04	--	02	06	02	80#	20#	--	--	50	150
06	6106	Applied Chemistry	CHY	04	--	02	06	02	80#	20#	--	--	50	150
07	6107	Engineering Graphics	EGR	02	--	04	06	--	--	--	25	--	25	50
08	6108	Engineering Mechanics	EMH	04	--	02	06	03	80	20	--	--	50	150
09	6109	Workshop Practice	WSP	--	--	06	06	--	--	--	--	--	50	50
TOTAL			**--**	**24**	**02**	**20**	**46**	**--**	**480**	**120**	**25**	**--**	**325**	**950**

Level : 1

Total Courses : 09
Total Credits : 46
Total Marks : 950

Abbreviations :

Abbr : Course Abbreviation, TH : Theory, TU : Tutorial, PR: Practical, OR : Oral, TW : Term Work

Course code Indication :

First digit : Indicates last digit of Year of Implementation of Curriculum
Second digit : Indicates Level.
Third & Fourth digit : Indicates Course Number.

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.
4) # indicates Online theory Examination

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 2
BASIC TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6201	Computer Aided Graphics	CAG	--	--	04	04	--	--	--	--	--	50	50
02	6202	Building Drawing	BDG	02	--	04	06	04	80	20	--	25	25	150
03	6203	Concrete Technology	COT	03	--	02	05	03	80	20	--	25	25	150
04	6204	Hydraulics	HYD	03	01	02	06	03	80	20	--	25	25	150
05	6205	Mechanics of Structures	MOS	04	--	02	06	03	80	20	--	--	25	125
06	6206	Geotechnical Engineering	GTE	03	--	02	05	03	80	20	--	--	25	125
07	6207	Highway Engineering	HEG	03	--	02	05	03	80	20	--	--	25	125
08	6208	Railway and Bridge Engineering	RBE	04	--	-	04	03	80	20	--	--	--	100
09	6209	Basic Surveying	BSY	04	--	04	08	03	80	20	25	--	25	150
10	6210	Construction Materials and Processes	CMP	04	--	04	08	03	80	20	--	25	25	150
TOTAL			--	**30**	**01**	**26**	**57**	--	**720**	**180**	**25**	**100**	**250**	**1275**

Level: 2

Total Courses : 10
Total Credits : 57
Total Marks : 1275

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 3
ALLIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6301	Applied Mathematics	AMT	03	--	--	03	03	80	20	--	--	--	100
02	6302	Environmental Studies	EVS	--	--	02	02	--	--	--	--	--	50	50
03	6304	Construction Management	CNM	03	--	--	03	03	80	20	--	--	--	100
Elective I : Any **ONE** of the following														
04	6305	Supervisory Skills	SSL	03	--	--	03	03	80	20	--	--	--	100
	6306	Marketing Management	MKM	03	--	--	03	03	80	20	--	--	--	100
	6307	Material Management	MMT	03	--	--	03	03	80	20	--	--	--	100
Elective II : Any **ONE** of the following														
05	6308	Computer Applications for Project Management	CAP	01	--	02	03	--	--	--	--	--	50	50
	6309	Entrepreneurship Development	EDP	01	--	02	03	--	--	--	--	--	50	50
	6310	Renewable Energy Sources	RES	01	--	02	03	--	--	--	--	--	50	50
TOTAL			--	**10**	--	**04**	**14**	--	**160**	**40**	--	**--**	**100**	**400**

Level: 3

Total Courses : 05
Total Credits : 14
Total Marks : 400

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 4
APPLIED TECHNOLOGY COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6401	Advanced Surveying	ASY	04	--	04	08	03	80	20	50	--	25	175
02	6402	Computer Aided Drawing	CAD	--	01	04	05	--	--	--	25	--	25	50
03	6403	Estimating and Costing	ESC	04	--	04	08	04	80	20	--	25	50*	175
04	6404	Contracts and Accounts	CAA	03	--	02	05	03	80	20	--	25	25	150
05	6405	Theory of Structures	TOS	04	--	02	06	03	80	20	--	--	25	125
06	6406	Design of R.C.C. Structures	RCC	04	--	04	08	04	80	20	--	25	50*	175
07	6407	Design of Steel Structures	DSS	03	--	04	07	04	80	20	--	25	50*	175
08	6408	Environmental Engineering	ENE	04	--	02	06	03	80	20	25	--	--	125
09	6409	Irrigation Engineering	IRG	04	--	02	06	03	80	20	--	--	25	125
10	6410	Professional Practices	PPR	--	--	04	04	--	--	--	--	--	50	50
11	6411	Seminar	SEM	--	--	02	02	--	--	--	--	--	50	50
12	6412	Project	PRO	--	--	04	04	--	--	--	--	50	50*	100
TOTAL			--	**30**	**01**	**38**	**69**	**--**	**640**	**160**	**100**	**150**	**425**	**1475**

Level: 4

Total Courses : 12
Total Credits : 69
Total Marks : 1475

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 5
DIVERSIFIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
Elective III : Any **ONE** of the following														
01	6501	Building Supervision	BDS	--	**--**	04	04	--	--	--	--	50	50	100
	6502	Architectural Practices and Interior design	ARP	--	--	04	04	--	--	--	--	50	50	100
	6503	Building Maintenance	BDM	**--**	**--**	04	04	--	--	--	--	50	50	100
Elective IV : Any **ONE** of the following														
02	6504	Advanced Construction Techniques	ACN	03	--	02	05	03	80	20	--	--	50	150
	6505	Construction Equipments	CEQ	03	--	02	05	03	80	20	--	--	50	150
	6506	Urban Planning	URP	03	--	02	05	03	80	20	--	--	50	150
	6507	Plumbing Services	PBS	03	--	02	05	03	80	20	--	--	50	150
	6508	Watershed Management	WSM	03	-	02	05	03	80	20	-	-	50	150
Elective V : Any **ONE** of the following														
03	6509	Earthquake Resistant Structures	ERS	03	--	02	05	03	80	20	--	--	50	150
	6510	Prestressed and Precast concrete	PPC	03	--	02	05	03	80	20	--	--	50	150
	6511	Advanced Concrete Technology	ACT	03	--	02	05	03	80	20	--	--	50	150
TOTAL			--	**06**	**--**	**08**	**14**	**--**	**160**	**40**	**--**	**50**	**150**	**400**

Level: 5

Total Courses : 03
Total Credits : 14
Total Marks : 400

Assessment of PR / OR / TW :

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2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
Courses for Award of Class

Sr.No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				EXAMINATION SCHEME						
				TH	TU	PR	Total Credits	Theory Paper		Test	PR	OR	TW	Total
								Hrs	Mark					
01	6204	Hydraulics	HYD	03	01	02	06	03	80	20	--	25	25	150
02	6304	Construction Management	CNM	03	--	--	03	03	80	20	--	--	--	100
03	6403	Estimating and Costing	ESC	04	--	04	08	04	80	20	--	25	50*	175
04	6404	Contracts and Accounts	CAA	03	--	02	05	03	80	20	--	25	25	150
05	6405	Theory of Structures	TOS	04	--	02	06	03	80	20	--	--	25	125
06	6406	Design of R.C.C. Structures	RCC	04	--	04	08	04	80	20	--	25	50*	175
07	6407	Design of Steel Structures	DSS	03	--	04	07	04	80	20	--	25	50*	175
08	6408	Environmental Engineering	ENE	04	--	02	06	03	80	20	25	--	--	125
09	6409	Irrigation Engineering	IRG	04	--	02	06	03	80	20	--	--	25	125
10	6411	Seminar	SEM	--	--	02	02	--	--	--	--	--	50	50
11	6412	Project	PRO	--	--	04	04	--	--	--	--	50	50*	100
Any ONE from Elective IV														
12	6504	Advanced Construction Techniques	ACN	03	--	02	05	03	80	20	--	--	50	150
	6505	Construction Equipments	CEQ	03	--	02	05	03	80	20	--	--	50	150
	6506	Urban Planning	URP	03	--	02	05	03	80	20	--	--	50	150
	6507	Plumbing Services	PBS	03	--	02	05	03	80	20	--	--	50	150
	6508	Watershed Management	WSM	03	-	02	05	03	80	20	-	-	50	150
TOTAL				**35**	**01**	**30**	**66**	**--**	**800**	**200**	**25**	**175**	**400**	**1600**

Total Courses : 12
Total Credits : 66
Total Marks : 1600

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) * Indicates TW to be assessed by external & internal examiners.
3) Other TW are to be assessed by internal examiners.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
SAMPLE PATH
ENTRY LEVEL- 10+

Nature of Course	First Year		Second Year		Third Year		Total
	Odd Term	**Even Term**	**Odd Term**	**Even Term**	**Odd Term**	**Even Term**	
Compulsory	6102 (03) DLS	6101 (05) CMS	6202 (06) BDG	6204 (06) HYD	6304 (03) CNM	6404 (05) CAA	
	6103 (04) BMT	6104 (04) EMT	6203 (05) COT	6206 (05) GTE	6403 (08) ESC	6407 (07) DSS	
	6106 (06) CHY	6105 (06) PHY	6205 (06) MOS	6208 (04) RBE	6405(06) TOS	6408 (06) ENE	
	6107 (06) EGR	6109 (06) WSP	6207 (05) HEG	6401 (08) ASY	6406 (08) RCC	6410 (04) PPR	
	6108 (06) EMH	6201(04) CAG	6209 (08) BSY	6402 (05) CAD	6409 (06) IRG	6412 (04) PRO	
	6302(02) EVS	6210 (08) CMP	6301 (03) AMT		6411 (02) SEM		
Total credits (Compulsory)	**27**	**33**	**33**	**28**	**33**	**26**	**180**
Elective	--	--	--	I) Any **ONE** from **Elective :I** 6305 SSL, 6306 MKM, 6307 MMT : (**03**) I) Any **ONE** from **Elective : III** 6501 BDS, 6502 ARP, 6503 BDM : (**04**)	I) Any **ONE** from **Elective :II** 6308 CAP 6309 EDP, 6310 RES, : (**03**)	I) Any **ONE** from **Elective : IV** 6504 ACN, 6505 CEQ, 6506 URP, 6507 PBS, 6508 WSM :(**05**) II) Any **ONE** From **Elective : V** 6509 ERS, 6510 PPC, 6511 ACT :(**05)**	
Total Credits (Elective)	Nil	Nil	Nil	**07**	**03**	**10**	**20**
Total Courses	**06**	**06**	**06**	**07**	**07**	**07**	**39**
Total Credits (Compulsory + Elective)	**27**	**33**	**33**	**35**	**36**	**36**	**200**
Grand Total of Credits							**200**

Note : Figures in bracket indicates total credits.

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Communication Skills (CMS) **COURSE CODE** : 6101

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Proficiency in English is one of the basic needs of technical students hence this curriculum aims at developing the functional and communicative abilities of the students. As Communication skills play a decisive role in the career development and entrepreneurship this course will guide and direct to develop a good personality and effective communication too. This course is compiled with an aim of shaping minds of engineering students while catering to their needs.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand & use basic concepts of Communication in an organisation and social context.
2. Use reasonably and grammatically correct English language with reading competency.
3. Utilise the skills to be a competent communicator.
4. Develop comprehension skills, improve vocabulary and acquire writing skills.
5. Overcome language and communication barriers with the help of effective communication techniques.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the process and identify types of Communication for being an effective communicator
2. Identify the barriers in the communication process and apply ways to overcome them
3. Observe and interpret graphical information precisely
4. Acquire formal written skills for business correspondence.
5. Enhance listening & reading skills for improving competencies in communication.
6. Pronounce English sounds with correct stress and intonation in day to day conversations.
7. Construct correct grammatical sentences in oral and written communication.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Communication**	1a. Define communication & objectives 1b. Describe the process of Communication 1c. Differentiate between types of communication	1.1 Meaning of communication: definition, objectives and Importance of communication 1.2 Elements/Process of communication 1.3 Types of communication: Formal, Informal, Verbal, Nonverbal, vertical, Horizontal, Diagonal	04
Unit-II	2a. Explain types of	2.1 Barriers to Communication	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Communication Barriers	barriers 2b. Describe the principles of effective communication 2c. Discuss ways to overcome barriers. 2d. Identify various barriers	a) Physical Barrier • Environmental(time, noise, distance and surroundings) • Personal(deafness, stammering, ill-health, spastic, bad handwriting, temporary physical disabilities) b) Mechanical: Machines/means oriented c) Psychological : Day dreaming prejudice, emotional, blocked mind, generation gap, status, inactiveness, perception d) Language: Difference in language, technical jargons pronunciation and allusion 2.2 Ways to overcome barriers 2.3 Principles of effective communication	
Unit-III **Nonverbal & Graphical communication**	3a. Explain use of body language in oral conversations 3b. Label and interpret the graphical information correctly 3c. Describe the importance of graphical and nonverbal methods in technical field.	3.1 Non-verbal codes: • Proxemics • Chronemics • Artefacts 3.2 Aspects of body language(Kinesics) 3.3 Graphical communication • Advantages and disadvantages of graphical communication • Tabulation of data and its depiction in the form of bar graphs and pie charts.	06
Unit-IV **Formal Written Communication**	4a. Develop notices, circulars and emails 4b. Draft letters on given topics 4c. Prepare technical reports. 4d. Develop various types of paragraphs.	4.1 Office Drafting :Notice, Memo, Circulars and e-mails 4.2 Job application and resume 4.3 Business correspondence : Enquiry, Reply to an enquiry order, complaint, adjustment, 4.4 Technical Report Writing : Accident report, Fall in Production / survey, progress Investigation / maintenance 4.5 Paragraph writing -Types of paragraphs • Descriptive • Technical • Expository	12
Unit-V **Listening skills**	5a. Differentiate between hearing and listening. 5b. Apply techniques of effective listening.	5.1 Listening versus hearing 5.2 Merits of good listening 5.3 Types of listening 5.4 Techniques of effective listening	02
Unit-VI	6a. Describe various methods to	6.1 Reading for comprehension 6.2 Reading styles	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Reading Skills	develop vocabulary 6b. Develop reading competencies. 6c. Explain steps to comprehend passage	6.3 Developing vocabulary 6.4 Methods of word formation: prefixes, suffixes, collocations, synonyms, antonyms, Homophones, Homonyms. 6.5 Comprehension of unseen passages	
Unit-VII **Speaking Skills**	7a. Demonstrate Correct Pronunciation, stress and intonation in everyday conversation 7b. Develop formal conversational techniques. 7c. Deliver different types of speech	7.1 Correct Pronunciation -Introduction to sounds vowels, consonants, stress, intonation 7.2 Conversations : • Meeting & Parting • Introducing & influencing requests • Agreeing & disagreeing • Formal enquiries 7.3 Speech-Types of speech • Welcome Speech • Farewell speech • Vote of thanks	06
Unit-VIII **Language Grammar**	8a. Use grammatically correct sentence in day to day oral and written communication 8b. Distinguish between determiners & apply correctly in communicative use 8c. Use correct verb for given course. 8d. Use appropriate preposition as per time, place and direction. 8e. Transform the sentences.	8.1 Tense • Present Tense(Simple, Continuous, perfect, perfect Continuous) • Past Tense(Simple, Continuous, perfect, perfect Continuous) • Future Tense(Simple) 8.2 Determiners • Articles (A, An, The) • Some, Any, Much, Many, All, Both, Few, A few, The few, Little, A little, The little, Each, Every. 8.3 Modal Auxiliaries Can, Could, May, Might, Shall, Should, Will, Would, Must, Have to, Need, ought to 8.4 Sentence Transformation • Voice • Degree • Affirmative, Negative, Assertive, 8.5 Prepositions • Time • Place • Direction 8.6 Conjunctions	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Communication	--	02	04	06
II	Communication Barriers	02	02	02	06
III	Nonverbal & Graphical communication	--	02	08	10
IV	Formal Written Communication	--	04	18	22
V	Listening Skills	--	--	04	04
VI	Reading Skills	--	02	06	08
VII	Speaking Skills	02	02	04	08
VIII	Language Grammar	**--**	04	12	16
	TOTAL	**04**	**18**	**58**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Communicate on the given topic/situation.	02
2	II	Identify communication barriers	02
3	III	Non-verbal communication	02
4	IV	Business letter writing &job application	02
5	IV	Draft official letter	02
6	IV	Technical report writing on given topic	04
7	V	Attend a seminar and preparing notes	02
8	VI	Vocabulary building with different methods	02
9	VII	Language lab Experiment for correct pronunciation of sounds	04
10	VII	Write & present conversations on given situations	02
11	VIII	Grammar application-various exercises on grammar	04
12	I to VIII	Mini project (on given topic)	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Prepare charts on types of communication.
2. Convert language information in graphical or nonverbal codes.
3. Maintaining own dictionary of difficult words, words often confuse, homophones & homonyms.
4. Listening daily English news on television or radio & to summarise it in their language.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use audios of correct pronunciations.
2. Show videos about use of body language in oral formal conversations

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Effective English Communication	Krishna Mohan and Meenakshi Raman	Tata McGraw Hill Publishing Co. Ltd.
2	English for practical purpose	Z. N. Patil	Macmillan
3	Spoken English	Basal and Harrison	Orient Longman
4	Contemporary English Grammar	R. C. Jain, David Green	Macmillan
5	Business correspondence and Report writing	R. C. Sharma and Krishna Mohan	Tata McGraw Hill Publishing
6	English Communication for Polytechnics	S. Chandrashekhar & others	Orient Black Swan
7	Active English Dictionary	S. Chandrashekhar & others	Longman

B) Software/Learning Websites

1. http://www.communicationskills.co.in
2. http://www.mindtools.com
3. http://www.communication.skills4confidence
4. http://www.goodcommunication skills.net
5. http://www.free-english-study.com/
6. http://www.english-online.org.uk/
7. http://www.englishclub.com
8. http://www.learnenglish.de
9. http://www.talkenglish.com/
10. http://www.englishgrammarsecrets.com
11. http://www.myenglishpages.com/
12. http://www.effective-business-letters.com/
13. http://www.englishlistening.com/
14. http://www.class-central.com

C) Major Equipment/ Instrument with Broad Specifications

1. Digital English Language Laboratory.
2. Computers for language laboratory software
3. Headphones with microphone

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1									H		M
CO2									H		M
CO3	M								H		M
CO4		M							H		M
CO5	M								H		M
CO6		M							H		
CO7	M								H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL /AE / DD / ID
COURSE : Development of Life Skills (DLS) **COURSE CODE :** 6102

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	---	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course will develop the student as an effective member of the team in the organization. It will develop the abilities and skills to perform at highest degree of quality. It enhances his/her capabilities in the field of searching, assimilating information, handling people effectively and solving challenging problems.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team.
2. Enhance capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.
3. Understand and use personal management techniques.
4. Analyse their strengths, weaknesses, opportunities and threats.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Analyse self attitude and behaviour.
2. Acquire self learning techniques by using various information sources
3. Identify personal strengths to get future opportunities.
4. Develop presentation skills with the help of effective use of body language.
5. Enhance leadership traits and recognise the importance of team work.
6. Face interview without fear
7. Resolve conflict and solve problems by appropriate methods.
8. Set the goal for personal development.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Self Analysis**	1a. Explain types of Motivation. 1b. Differentiate between types of attitude. 1c. Describe types of behaviour 1d. Analyse SWOT of an individual	1.1 Motivation-types, need 1.2 Attitude-types, tips for developing positive attitude 1.3 Behaviour-types-passive, assertive, aggressive 1.4 Confidence building-need, importance 1.5 SWOT analysis-(significance)	02
Unit-II **Self Learning Techniques (SLT**)	2a. Explain the self learning techniques by enhancing memory and concentration 2b. Apply practical skills for effective learning 2c. Identify the information sources	2.1 Need & importance of SLT 2.2 Information source-Primary, secondary, tertiary 2.3 Enhancing Memory and concentration 2.4 Learning Practical Skills- need of Practical Skills types of practical skills-technical, organisational, human Domains of learning 1)cognitive 2)Affective 3)psychomotor 2.5 information search techniques-library search, internet search	02
Unit-III **Self Development & management**	3a. Explain the Need of self Management 3b. Set the goals for personal development	3.1 Stress management-remedies to avoid, minimize stress 3.2 Health management –importance of Diet & exercise 3.3 Time management-time planning, tips for effective time management 3.4 Goal setting-need and importance 3.5 Creativity	03
Unit-IV **Emotions**	4a. Explain nature and types of human emotions 4b. Differentiate between cognitive and emotional intelligence	4.1 Basic emotions- 4.2 Emotional intelligence 4.3 Emotional stability/maturity	01
Unit-V **Presentation skills**	5a. Develop presentation skills with the help of body language 5b. Describe utilisation of voice quality in oral conversations	5.1 Body Language – Codes, dress and appearance, postures, gestures Facial expressions 5.2 Voice and language 5.3 Use of aids:-OHP, LCD projector, white board	02
Unit-VI **Group discussion and interview techniques**	6a. Participate in group discussion 6b. Face interview without fear.	6.1 introduction to group discussion 6.2 ways to carry group discussion 6.3 Parameters-analytical, logical thinking, Decision making 6.4 Interview techniques Necessity, tips for handling common questions	02
Unit-VII	7a. Recognise the importance of	7.1 stages of team development 7.2 Understand and work with dynamic	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Team work	team work 7b. Enhance leadership qualities	group 7.3 ingredients of effective teams. 7.4 leadership in teams, handling frustration in group	
Unit-VIII **Conflicts & Problem Solving**	8a. Describe sources of conflicts and resolve conflicts 8b. Develop lateral thinking abilities 8c. Identify innovative methods in solving Problems.	8.1 sources of conflict 8.2 Resolution of conflict 8.3 ways to enhance interpersonal relation 8.4 Steps in problem solving 8.5 Problem solving techniques-trial, error & brainstorming	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Self Introduction-giving personal details for introducing self	02
2	II	SLT-Access the book on biography of scientist/industrialist/invention from the library or internet	02
3	I	Deliver a seminar for 10 minutes using presentation aids.	02
4	IV	Prepare PowerPoint slides on given topic and make presentation	02
5	VII	Case study for problem solving in an organisation	04
6	V	Discuss a topic in a group & prepare minutes of discussion.	02
7	VI	Prepare questionnaire for your friend or any person in the organisation to check emotional intelligence.	02
8	VII	Goal setting for achieving the success-SMART goal.	02
9.	I	SWOT Analysis for yourself with respect to your Strength, Weakness, Opportunities & Threats	04
10	III	Attend a seminar or a guest lecture and note down the important points and prepare a report of the same.	02
11	VIII	Undertake any social activity in a team and prepare a report about it(i.e. tree plantation, blood donation, environment protection, rain water harvesting)	04
12	III	Management of self-stress management, time management, health management	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Preparing personal time table.
2. Performing YOGA as a routine part of daily life.
3. Practicing breathing exercises.
4. Improving concentration by chanting and meditation.
5. Focusing on behavior skills and mannerism
6. Searching information on internet and newspapers.
7. Concentrating on various aspects of personality development.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Use of videos on personality development.
2. Use of power point presentation on health, time & stress management
3. Case study of an organization
4. Use of videos to show interviews of successful personalities.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Make Every Minute Count	Marion E Haynes	Kogan Page India
2	Body language	Allen Pease	Sudha Publication Pvt. Ltd.
3	Presentation Skills	Michael Hatton	ISTE New Delhi
4	Organizational Behavior	Pearson Education Asia	Tata McGraw Hill
5	Working in Teams	Chakravarty, Ajanta	Orient Longman
6	Develop Your Assertiveness	Bishop, Sue	Kogan Page India
7	Adams Time Management	Marshall Cooks	Viva Books
8	Time Management	Chakravarty, Ajanta	Rupa and Company
9	Target setting & Goal Achievement	Richard hale, Peter whilom	Kogan page India
10	Creativity &problem solving	Lowe and Phil	Kogan page (I)P Ltd
11	Basic Managerial Skills for all	E. H. Mc Grah, S. J.	Pretice Hallof India, Pvt. Ltd.

B) Software/Learning Websites

1. http://www.mindtools.com
2. http://www.successconsciousness.com
3. http://www.studyhabits.com
4. http://www.motivateus.com
5. http://www.quickmba.com
6. http://www.success77.com
7. http://www.stress.org
8. http://www.topachievement.com
9. http://www.ethics.com
10. http://www.creativityforlife.com
11. http://www.motivation.com
12. http://www.queendom.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	L	M			L		L	M	H		H
CO2	M	M			L	L	H		M		H
CO3					M		M	M	H		H
CO4	L	L			L	M	M		H		M
CO5					L		M	M	H	M	L
CO6		L			L	M			H		M
CO7	L				M	M	L	M	M	L	L
CO8	L	L			L	M	L	L	H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Basic Mathematics (BMT) **COURSE CODE** : 6103

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam. Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	02	Max.	80#	20#	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

 # indicates online examination

1.0 RATIONALE:

This course is classified under foundation course and intends to teach the students basic facts, concepts and principles of Mathematics, as a tool to analyse the engineering problems and lay down the understanding of basic technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Acquire the knowledge of mathematical terms definitions, principles and procedure of algebra, trigonometry and co-ordinate geometry.
2. Develop the process of logical thinking.
3. Comprehend the principles of the other courses.
4. Solve problems by using analytical & systematic approach.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to apply mathematical definitions, principles and procedure to solve engineering and applied mathematical problem in

1. Logarithm
2. Determinant and matrix
3. Simultaneous equations in three variables
4. Partial fractions
5. Binomial theorem
6. Properties of triangle and solution of triangle
7. Coordinate geometry (straight lines and circle)

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Logarithm**	1a. Define logarithm use it for conversion 1b. Apply laws of logarithm to solving problems 1c. Identify common logarithm and Naperian logarithm	1.1 Concept and definition of Logarithm, conversion of exponential and logarithmic forms 1.2 Laws of logarithms and change of base formula 1.3 Common logarithm and **Naperian** logarithm definition and **notation only.**	03
Unit-II **Determinant & Matrix Algebra**	2a. Calculate determinant of order two and three and apply Cramer's Rule. 2b. Calculate area Of Triangle & condition of	2.1 Determinant of order two and three, Cramer's Rule for Three Variables. Area of Triangle and Condition of Co linearity. 2.2 Definition of a matrix, types of matrix, algebra of matrices, equality of	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	co linearity 2c. Define various types of matrices; solve problems using Algebra of matrix. 2d. Calculate Inverse of matrix	matrices, scalar multiplication, product of two matrices, Transpose of matrix. 2.3 Minor, cofactor and ad joint of matrix, Inverse of matrix by ad Joint matrix method.	
Unit-III **Partial Fraction**	3a. Identify proper & improper 3b. Resolve partial fraction method of Case I, Case II and Case III.	3.1 Rational function, proper and Improper rational Functions 3.2 Concept of partial fraction. Case-1. The denominator contains linear non repeated factors. Case-2. the denominator contains linear but repeated factors Case-3. the denominator contains quadratic irreducible factors	05
Unit-IV **Binomial Theorem**	4a. State Binomial Theorem for Positive integral Index. 4b. Use T_{R+1} for finding middle term general term 4c. Use approximation Theorem for solving problems	4.1 Binomial Theorem for positive integral index, formula for Tr+1, Middle term, particular term. 4.2 Binomial Theorem for rational and negative index (expansion up to four terms only), approximation theorem, simple problems	04
Unit-V **Measurement Of Angle**	5a. Conversion of sexagesimal systems & circular systems	5.1 Measurement of angles, sexagesimal systems & circular systems, co-terminal angles, positive and negative angles, conversion of angle to radian to degree and degree to radians.	02
Unit-VI **Trigonometric Ratios**	6a. Calculate trigonometric ratios of any angle, Solve problem using fundamental Identities. 6b. Solving problem using allied, Compound, Multiple and Sub multiple forms.	6.1 Trigonometric ratios of any angle, graph of trigonometric functions fundamental identities 6.2 Trigonometric ratios of allied, compound, multiple and sub multiple angles, sum &product forms.	08
Unit-VII **Inverse Trigonometric Functions**	7a. Convert & solving inverse trigonometry function 7b. Use of $\tan^{-1} x + \tan^{-1} y$ form to solve problem.	7.1 Concept and definition of trig. Function, Relation between inverse trig. functions	02
Unit-VIII **Properties Of Angle And Solution Of Triangle**	8a. Use properties of triangle : Sine rule, Cosine rule to solve mathematical problems 8b. Solve any triangle problems	8.1 Sine rule, cosine rule & law of tangent (simple problems) 8.2 solutions of triangle	04
Unit-IX **Equation Of**	9a. Calculate Slope, X and Y, intercept Use various form of	9.1 Slope and intercepts of straight line, various form of straight line, angle between two lines, condition for two	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Straight Line	Straight line to solve problems.	parallel or perpendicular lines, perpendicular distance formula, distance between two parallel lines.	
Unit-X **Equation Of Circle**	10a. Calculate Radius & Centre of general circle 10b. Apply various form of circle 10c. Calculate Equation of tangent & normal to the circle.	10.1 Equation Of std. circle, center radius form, general form of circle, Diameter form of circle, equation of tangent and normal to the circle.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS

Unit No.	Unit Title	Distribution of Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Logarithm	02	02	02	06
II	Determinant And Matrix Algebra	04	08	04	16
III	Partial Fraction	02	04	02	08
IV	Binomial Theorem	02	02	02	06
V	Measurement Of Angle	02	02	--	04
VI	Trigonometric Ratios	04	04	04	12
VII	Inverse Trigonometric Function	02	02	--	04
VIII	Properties of Triangle And Solution Of Triangle	02	02	04	08
IX	Equation Of Straight Line	02	04	04	10
X	Equation Of Circle	02	02	02	06
	TOTAL	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/ TUTORIAL /TASKS

Sr. No.	Unit No.	Batch wise Tutorial Exercises **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Logarithm	01
2	II	Determinant	01
3	II	Matrix Algebra	02
4	III	Partial Fraction	01
5	IV	Binomial Theorem	02
6	V	Measurement And Angle	01
7	VI	Trigonometric Ratios	01
8	VI	Trigonometric Ratios	01
9	VII	Inverse Trigonometric Ratios	02
10	VIII	Properties of Triangle And Solution Of Triangle	01
11	IX	Straight Line	02
12	X	Circle	01
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (I)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Trigonometry	S. L. Loney	S. Chand
3	Higher Engineering Mathematics	B. S. Grewal	Khanna
4	College Algebra	F.G. Valles	Charter Publication.
5	Higher Algebra	H. S. Halls & S.R. Night	
6	Matrices	F. Ayers	Schan Series. Metric Edition Book, Palace of India.

B) Software/Learning Websites

1. http://www.mathsisfun.com
2. http://mathinsight.org/logarithm_basics
3. http://www.mathportal.org/linear-algebra/determinants/determinant-of-a-matrix.php
4. http://www.math.hmc.edu/calculus/tutorials/matrixalgebra/
5. http://ibgwww.colorado.edu/~carey/p7291dir/handouts/matrix.algebra.pdf
6. http://www.purplemath.com/modules/binomial2.htm
7. http://www.themathpage.com/atrig/line.htm
8. http://i1.dainikbhaskar.com/web2images/education/maths_13659_13897.pdf
9. http://mathworld.wolfram.com/InverseTrigonometricFunctions.html
10. http://aieee.examcrazy.com/maths/formula-tips/Co-ordinate-Geometry-circle.asp

C) Major Equipment/ Instrument with Broad Specifications

1. Scientific Calculator
2. Computer system with Printerand Internet system .
3. LCD Projector

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		M								L
CO2	H		M								L
CO3	H		L								L
CO4	H		L								L
CO5	H		M								L
CO6	H		M								L
CO7	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Engineering Mathematics (EMT) **COURSE CODE** : 6104

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	Online Exam Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	--	04	02	Max.	80#	20#	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

 # indicates online examination

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential new for the disciplines like Genetic Engineering, Biotechnology and Information Technology etc. This course is extension of Basic Mathematics and stepping to learn applied mathematics. Engineering mathematics lays down the foundation to understand and express principles and laws involved in other technology courses.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Acquire knowledge of differential calculus, vector algebra, statistics and probability, complex numbers.
2. Develop the ability to apply mathematical methods to solve engineering problem
3. Acquire sufficient mathematical techniques necessary for daily and practical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate mathematical definitions, principles and procedure to solve engineering and applied mathematical problems in

1. Function and limit of function
2. Derivative and its application
3. Vector and its application
4. Statistics probability
5. Complex number

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Function**	1a. Solve problem of functions, State even & odd function, identify various types of function.	1.1 Definition of function, types of functions, Basic functions such as algebraic, exponential, logarithmic, trigonometric, inverse trigonometric functions, explicit, implicit, composite, inverse, parametric, exponential even & odd functions, simple problems	03
Unit-II **Limits**	2a. Apply limit of various types of Functions.	2.1 Definition of limit, limit of Functions such as algebraic Functions, trigonometric functions, logarithm and exponential functions	05
Unit-III **Derivatives**	3a. Solve problems of derivative with the help of rules & formulae of	3.1 Concept and definition of derivative, Notation, standard Formulae and rules of derivative	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	derivative. 3b. Differentiate various types of functions 3c. Calculate second order of derivative.	3.2 Methods of differentiation, derivative of composite functions, implicit function. Parametric function. Inverse function. Logarithmic Differentiation. 3.3 Second order derivatives, simple problems.	
Unit-IV **Application Of Derivatives**	4a. Apply geometrical meaning of derivative; solve the problem based on related rates, radius of curvature & maxima minima.	4.1 Geometric meaning of derivative 4.2 Error theorem. 4.3 Related rates, radius of curvature 4.4 Maxima & Minima	06
Unit-V **Vectors**	5a. Apply algebra of vector 5b. Calculate scalar and vector products 5c. Apply vector algebra to find work done and moment of force, Area of parallelogram	5.1 Definition of vector, position vector, algebra of vector (equality, addition, subtraction and scalar multiplication) 5.2 Dot (scalar) and vector (cross) product of two vectors. 5.3 Application of vectors, work done and moment of force about a point and line.	08
Unit-VI **Statistics & Probability**	6a. Calculate range, mean deviation, standard deviation for group and ungrouped data, coefficient of variance 6b. Apply the theory of probability to solve problem 6c. Apply addition and multiplication theorems	6.1 Measure of dispersion such as range, mean deviation, standard deviation, variation and coefficient of variation. 6.2 Definition of random experiment, sample space event, occurrence of events and types of events (impossible, mutually exclusive, exhaustive and equally likely) 6.3 Definition of probability, addition and multiplication theorems of probability.	08
Unit-VII **Complex Number**	7a. Solve problem based on complex number(real and imaginary part, polar form) 7b. Apply Algebra of complex number to solve problem 7c. Solve problem of Euler's function & circular function, Hyperbolic function.	7.1 Definition of complex number, Cartesian, polar and exponential forms of complex number. 7.2 Algebra of complex no. (equality, addition, subtraction multiplication and division) 7.3 De–Moiver's theorem (without proof) and simple problems. 7.4 Euler's form of circular functions, Hyperbolic functions and relation between them.	08
TOTAL			**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS:

Unit No.	Unit Title	Distribution of Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Function	02	02	--	04
II	Limits	02	04	02	08
III	Derivative	06	08	06	20
IV	Application Of Derivative	02	04	06	12
V	Vector	04	06	02	12
VI	Statistics And Probability	04	04	04	12
VII	Complex Number	04	04	04	12
	Total Marks	**24**	**32**	**24**	**80**

6.0 ASSIGNMENTS/TUTORIAL/TASKS:

Sr. No.	Unit No.	**Batch wise Tutorial Exercises** (Outcomes in Psychomotor Domain) **Tutorial:** Ten question of multiple choice with justification	Approx. Hrs. required
1	I	Function	01
2	II	Limits I	01
3	II	Limits II	01
4	III	Derivative I	01
5	III	Derivative II	01
6	III	Derivative III	02
7	III	Second Order Derivative	01
8	IV	Application Of Derivative	02
9	V	Vector	02
10	VI	Statistics	01
11	VI	Probability	01
12	VII	Complex Number	02
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot, Graph.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (II)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Higher Engineering Mathematics	B. S. Grewal	Khanna
3	Advanced Engineering Mathematics	H.K. Das	Khanna Publication
4	Calculus of single variable	R.T. Smith	Tata McGraw Hill.
5	Engineering Mathematics	S.S. Shastrii	Pretice Hall Publication

B) Software/Learning Websites

1. http://schools.aglasem.com/1341
2. http://www.emathzone.com/tutorials/calculus/types-of-functions.html
3. http://www.mathsisfun.com/algebra/vectors.html
4. http://www.mathsisfun.com/data/
5. http://mathworld.wolfram.com/ComplexNumber.html

C) Major Equipment/ Instrument with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Physics (PHY) **COURSE CODE :** 6105

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # Indicates online examination

1.0 RATIONALE:

Physics is associated with our lives at every stage. A good scientific attitude is essential for every human being to increase his/her quality of life. Today learning Physics has become more challenging because it is no more a watertight compartment. The approach is now inter-disciplinary and integrated with emphasis on the principle with their application.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand and apply the laws of Physics in various contexts.
2. Apply their knowledge of basic physics to solve problems and present the solution in a clear and concise manner.
3. Acquire and develop experimental skills including the use of variety of laboratory instruments, taking of data for interpretation and its analysis.
4. Develop skill in the presentation of clear and concise written accounts of laboratory work.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Differentiate between various systems of measurement and identify proper unit of a physical quantity.
2. Identify the properties of Laser and Optical fibre as well as their engineering applications.
3. Acquire the knowledge about superconductors, indoor lighting.
4. Identify conductors & insulators of heat and analyse the relation between pressure, volume and temperature of gas.
5. Recognise elastic properties of materials and types of modulus of elasticity.
6. Identify the properties such as surface tension of liquids and viscosity of fluids.
7. Be aware of the propagation of sound and acoustics of building.
8. Distinguish between various effects produced by an electric charge.
9. Gain broad ideas about capacitors, semiconductors and p-n junction diode.
10. Discover the basics and applications of photoelectric cell and X rays.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Units & Measurements**	1a. Differentiate between fundamental &derived quantities/units.	1.1 Need of measurements, units of measurements, systems of units, SI units, fundamental & derived units, fundamental & derived quantities.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1b. Determine dimension of a physical quantity. 1c. Calculate different types of errors in measurements. 1d. Illustrate use of vernier caliper and screw gauge for linear measurements.	1.2 Dimension of physical quantity, dimensional analysis & its uses, order of magnitude & significant figures. 1.3 Accuracy & errors, instrumental, systematic and random error, estimation of error-average value, absolute error, relative error & percentage error, numerical. 1.4 Measuring instruments-vernier caliper and micrometer screw gauge.	
Unit-II **Light**	2a. Calculate refractive index of material of prism. 2b. Identify advantages of optical fibre over conducting wire. 2c. Differentiate between types of optical fibre. 2d. Recognise the principle of photometry. 2e. Acquire knowledge about indoor lighting.	2.1 Refraction of light, refractive index and its significance, Refraction through prism, Derivation of Prism formula. 2.2 Total internal reflection of light (TIR), Optical fibre, advantages and disadvantages, construction of optical fibre. 2.3 Transmission characteristics of Optical, fibre, types of optical fibre-step & graded index fibre, Application of optical fibre. 2.4 Luminous flux, luminous intensity, illumination, candela, lumen, illuminance, inverse square law of illuminance, principle of photometry. 2.5 Indoor lighting-direct, indirect, semi-indirect, utilization factor, efficiency of source, maintenance factor, space to height ratio, total luminous flux, numerical.	08
Unit-III **Laser**	3a. Describe the principle of laser. 3b. Acquire knowledge about He-Ne laser 3c. Identify applications of holography	3.1 Laser, Properties of laser, spontaneous absorption, spontaneous emission and stimulated emission, population inversion, pumping, life time, meta-stable-state. 3.2 Construction, advantages & disadvantages of Helium-Neon Laser, applications of Laser. 3.3 Holography recording and Reconstruction of hologram, Application of holography.	06
Unit-IV **Current Electricity**	4a. Demonstrate ohm's law, use of metre bridge to find resistance. 4b. Use potentiometer to find internal resistance. 4c. Identify positive/	4.1 Ohm's law, Specific resistance, conductance, conductivity, Wheatstone's network, balancing condition, meter bridge. 4.2 Theory of shunt, fall of potential along wire, potentiometer. 4.3 Effect of temperature on resistance of metals, semiconductors &	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Negative temperature coefficient of resistance of material. 4d. Calculate electrical energy consumed in kWh. 4e. Distinguish between properties of conductor & superconductor.	insulators, temperature coefficient of resistance, positive& negative temperature coefficient of resistance. 4.4 Heating effect of electric current, electric power, electric energy, kilowatt hour. 4.5 Superconductivity, graph of temperature versus resistivity for mercury, superconductors, properties and application of superconductors, Numerical.	
Unit-V **Transfer of Heat & Gas laws**	5a. Illustrate conversion of temperature. 5b. Distinguish between good & bad conductors of heat on the basis of thermal conductivity. 5c. Calculate coefficients of expansion of solids. 5d. Identify the relation between pressure, volume & temperature of gas. 5e. Gain idea about specific heats of gases. 5f. Distinguish between isothermal, adiabatic, isobaric & isochoric process.	5.1 Temperature & heat, Celsius & Fahrenheit scale, conduction, convection, radiation. 5.2 Conduction of heat –variable state, steady state and temperature gradient, law of thermal conductivity, coefficient of thermal conductivity, applications of thermal conductivity. 5.3 Expansion of solids, Coefficient of linear, areal and cubical expansion and relation between them. 5.4 Statement of Boyle's law, Charle's law, Gay Lussac's law, concept of absolute zero, Kelvin scale of temperature. 5.5 General gas equation, universal gas constant, Work done in expanding a gas at constant pressure, specific heats of a gases and relation between them (equation only). 5.6 Isothermal, isobaric and isochoric and adiabatic process, difference between these processes, numerical.	08
Unit-VI **(ONLY For CE / ME / PS / AE)** **Elasticity**	6a. Differentiate between elasticity, plasticity & rigidity 6b. Calculate moduli of elasticity of materials. 6c. Illustrate applications of elasticity.	6.1 Deforming force, restoring force, elasticity, plasticity and rigidity. 6.2 Stress and strain with their types, elastic limit, Hooke's law, moduli of elasticity (Y, η, K) and their significance, Poisson's ratio. 6.3 Stress-strain diagram for wire under increasing load, factor of safety, applications of elasticity, Numericals.	06
Unit-VII **(ONLY For CE / ME / PS / AE)** **Surface**	7a. Acquire knowledge about surface tension of liquids & its effects. 7b. Recognise effects of impurities & temperature on	7.1 Cohesive and adhesive force, range of molecular forces surface, sphere of influence, surface energy, Surface tension, molecular theory of surface tension. 7.2 Effect impurities and temperature	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Tension	surface tension of liquid. 7c. Calculate surface tension of liquid.	on surface tension, relation between surface tension & surface energy 7.3 Angle of contact, capillary action relation between surface tension, capillary rise, radius of capillary, application of surface tension, numericals.	
Unit-VIII **(ONLY For CE / ME / PS / AE)** **Viscosity**	8a. Identify applications of Pascal's law. 8b. Gain knowledge about viscosity of fluids. 8c. Find viscosity of fluids using Stokes law 8d. Distinguish between types of flow of fluid. 8e. Identify significance of Reynolds number.	8.1 Pressure, pressure due to liquid column, hydrostatic paradox, Pascal's law and its applications. 8.2 Viscosity, velocity gradient, Newton's law of viscosity, coefficient of viscosity and its unit. 8.3 Stoke's law, expression for relation between coefficient of viscosity and terminal velocity. 8.4 Types of flow, Streamline and turbulent flow, advantages of streamline flow. 8.5 Critical velocity, Reynolds's number and its significance, Bernoulli's principle & its applications, application of viscosity, Numericals.	06
Unit-IX **(ONLY For CE / ME / PS / AE)** **Sound and acoustic**	9a. Recognise frequency of audible & other sound waves. 9b. Calculate sound intensity in decibel scale. 9c. Illustrate properties & applications of Ultrasonic waves. 9d. Calculate reverberation time using Sabine formula. 9e. Plan acoustical planning of a hall.	9.1 Introduction to sound, frequency of sound and limits of Audibility, intensity of sound. 9.2 Reflection of sound, absorption coefficient, transmission coefficient, reflection coefficient, Loudness and intensity level, threshold of hearing & pain, Decibel scale. 9.3 Ultrasonic waves-properties & applications. 9.4 Echo, Reverberation, standard reverberation time, Sabine's formula. 9.5 Condition for good Acoustics, factors affecting acoustical planning of auditorium. Numericals.	08
Unit-VI **(only for EE / IF / CM / EL)** **Electrostatics**	6a. Calculate force between two charges using Coulomb's law. 6b. Illustrate different properties of electric lines of force. 6c. Calculate electric potential due an electric charge. 6d. Identify importance of potential of earth.	6.1 Coulomb's inverse square law, permittivity of medium, unit charge, electric field, electric field intensity. 6.2 Electric lines of force and their properties, electric flux, Electric flux density and relation between them, Electric flux associated with charge. 6.3 Electric potential, potential difference, potential gradient, dielectric strength, breakdown potential, expression for PD between two points due to point charge, expression for absolute potential at point.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		6.4 Potential due to charged sphere. (three cases), potential of earth, numerical.	
Unit-VII **(only for EE / IF / CM / EL)** **Capacitance**	7a. Illustrate charging &discharging of capacitor. 7b. Calculate effective capacitance of combination of capacitors. 7c. Identify types of capacitors. 7d. Calculate energy stored by a capacitor.	7.1 Capacitor, Capacitance and its unit, dielectric, effect of dielectric, dielectric constant, dielectric breakdown, Principle of capacitor. 7.2 Charging and discharging of Capacitor, Capacitor in series and parallel. 7.3 Types of capacitor- fixed & variable. 7.4 Expression for capacitance of parallel plate capacitor, capacitance of spherical and cylindrical capacitor equation only, energy stored by charged capacitor (equation only), numerical.	06
Unit-VIII **(only for EE / IF / CM / EL)** **Photo electricity and X-rays**	8a. Acquire knowledge about photoelectric effect. 8b. Identify characteristics of Photoelectric effect. 8c. Calculate KE of photoelectrons using Einstein's equation. 8d. Recognise production of x-rays. 8e. Illustrate properties & applications of x- rays.	8.1 Planck's quantum theory, Photo electric effect, experiment to study photoelectric effect. 8.2 Characteristics of photoelectric effect, threshold frequency, threshold-wavelength, photoelectric work function, stopping potential. 8.3 Einstein's photoelectric equation, photoelectric Cell and types, applications of photoelectric cell. 8.4 Origin of x-rays, production of X-rays using Coolidge's x-ray tube, minimum wavelength of X-ray. 8.5 Properties of X-rays, applications of x- rays, numerical.	06
Unit-IX **(only for EE / IF / CM / EL)** **Band Theory of Solids**	9a. Classify solids on the basis of band theory. 9b. Classify Semiconductors. 9c. Illustrate forward & reverse bias of P-N Junction diode.	9.1 Energy bands in solids-valence band, conduction band and forbidden energy gap, classification of solids on the basis of band theory : conductor, insulator and semiconductor. 9.2 Properties of semiconductor, classification of semiconductors intrinsic & extrinsic, P type & N type semiconductors. 9.3 P-N junction diode, forward & reverse bias characteristics of P-N junction diode, advantages of semiconductor devices.	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks

Units common for all programmes					
I	Units and measurements	04	02	04	10
II	Light	02	04	04	10
III	Laser	02	04	02	08
IV	Current electricity	02	04	04	10
V	Transfer of heat & gas laws	02	04	04	10
Units ONLY FOR CE/ME/PS/AE					
VI	Elasticity	02	04	02	08
VII	Surface tension	02	04	02	08
VII	Viscosity	02	02	04	08
IX	Sound and Acoustics	02	02	04	08
Units ONLY FOR EE/IF/CM/EL					
VI	Electrostatics	02	04	02	08
VII	Capacitance	02	04	02	08
VIII	Photo electricity & X-rays	02	02	04	08
IX	Band theory of solids	02	02	04	08
	TOTAL	**20**	**30**	**30**	**80**

Legends: R = Remembrance (Knowledge); U= Understanding; A= Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		Common practicals	
1	I	Measure the dimensions of different objects using Vernier caliper	02
2	I	Measure the dimensions of different objects using micrometer screw gauge	02
3	II	Determine the refractive index of material of prism using spectrometer	02
4	IV	Verify ohm's law and determine resistivity of material of given wire.	02
5	IV	Verify law of resistance in series & parallel using metre bridge.	02
6	V	Determine coefficient of linear expansion using Pullinger's apparatus.	02
7	V	Verify Boyle's law	04
8	IV	Verify principle of potentiometer.	02
		Practicals for CE/ME/PS/AE	
1	VI	Verify Hooke's law of elasticity and determine Young's modulus of material of wire using Searle's apparatus.	04
2	VII	Determine surface tension of water using capillary rise method.	02
3	VIII	Verify Stoke's law of viscosity and determine coefficient of viscosity of given fluid.	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
4	IX	Determine coefficient of absorption of sound of given acoustical material.	04
		Practicals for EE/IF/CM/EL	
1	VII	Verify law of capacitance in series/parallel.	02
2	VII	Charging & discharging of capacitor and determine its time constant.	04
3	VIII	To study I-V characteristic of photoelectric cell.	04
4	IX	To study I-V characteristics of PN junction diode in forward/reverse biased condition.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Prepare charts of Vernier caliper, screw gauge, travelling microscope, Spherometer & spectrometer for lab demonstration.
2. Study acoustical planning of institute's auditorium hall.
3. Study lighting system of institute's conference hall.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show videos based on topics in the curriculum (total internal reflection, population inversion, different laws of physics) for better understanding of the concepts.
2. Show videos of practical demonstration before performance of practical for better understanding of practical.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Physics	R K Gaur & S L Gupta	Dhanpat Rai Pub.
2	Applied Physics	Prof. Arthur Beiser	Tata McGraw hill Pub.
3	Engineering Physics	D K Bhattacharya	Oxford University press
4	Physics	Halliday & Resnick	Wiley India

B) Software/Learning Websites

1. www.physicsclassroom.com
2. www.physics.org
3. www.physics.brown.edu
4. http://scienceworld.wolfram.com/physics/
5. http://hyperphysics.phy-astr.gsu.edu/hbase
6. www.msu.edu/~brechtjo/physics
7. http://www.rp-photonics.com/laser_applications.html
8. http://webphysics.davidson.edu/alumni/jimn/He-Ne/Pages/Theory.htm
9. http://physix_jun.tripod.com/fibres_4.htm
10. http://www.suite101.com/content/optics-total-internal-reflection-a51310
11. http://teachers.web.cern.Ch/teachers/archiv/HST2001/accelerators/superconductivity/superconductivity.htm
12. http://en.wikipedia.org/wiki/Acoustics

C) Major Equipment/ Instrument with Broad Specifications

1. Vernier Caliper (LC = 0.02mm)
2. Micrometer screw gauge (LC = 0.01mm)
3. Aneroid barometer
4. Digital stop watch
5. Travelling Microscope
6. Regulated power supply
7. Apparatus to verify Boyles law
8. Stoke's App to measure viscosity
9. Meter bridge
10. Searle's apparatus for Young's modulus
11. Pullinger's apparatus
12. Gas burner with regulator, LPG gas cylinder and lighter
13. Spectrometer
14. Bunsen's photometer.
15. Ammeter, voltmeter, galvanometer, rheostat, resistance box
16. Potentiometer.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M	M	L			H	L		L
CO2	H		M	L	L			M	L		
CO3	H		M	L	L			M			
CO4	H	M	M	L	M	L		M			L
CO5	H	M	M	L	M			M			
CO6	H	M	L	L	M			M			
CO7	H		L	L	M	L		M	L		L
CO8	H		M	L	M			L	L		
CO9	H		M	L	M			M	L		
CO10	H		L	L	M	L		L	L		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Chemistry (CHY) **COURSE CODE** : 6106

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	Online Exam. Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	-	02	06	02	Max.	80#	20#	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

 # indicates online examination

1.0 RATIONALE:

Chemistry is the basic science course which is essential to all engineering programmes. The basic aim of teaching science is to develop in the students the habit of scientific inquiry, ability to establish the cause and effect. The study of basic concepts of chemistry like atomic structure, water treatment, metals and alloys, corrosion, lubricants, non metallic materials, fuels, environmental effects etc will help the students to understand engineering courses where the emphasis is laid on the application of these concepts. Teaching of chemistry should be aimed at developing the right type of aptitude in the students and the ability to predict the result under given conditions.

Thus good foundation in basic science will help the students in their self development to cope up with continuous flow of innovation.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Develop scientific attitude in students.
2. Apply knowledge of chemistry in engineering situations.
3. Develop in students the habit of scientific enquiry, ability to establish cause and effect.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply the principles of chemistry to engineering situations.
2. Apply knowledge to correlate the properties of materials, their engineering uses and protection.
3. Write electronic configuration of various elements.
4. Apply various applications of electrolysis in engineering situations.
5. Illustrate various methods of softening of hard water.
6. Use the appropriate metals and alloys for different engineering applications.
7. Differentiate various types of corrosion and gain knowledge on control measures associated with corrosion
8. Select lubricants for machines.
9. Enlist the various characteristics of good fuel.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
Unit-I **Atomic Structure**	1a. Describe structure of an atom 1b. Explain Bohr's theory and distinguish between orbit and orbital	1.1 Structure of an atom, fundamental particles of an atom, concept of atomic number, mass number. 1.2 Bohr's theory, orbit, orbital, shapes of orbital, energy level, sub energy level	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	1c. Describe rules for arrangement of electrons 1d. Give electronic configuration 1e. Describe the different types of compounds 1f. Explain the formation of various electrovalent and covalent compounds	1.3 Hund's rule, Aufbau principle, Rules for distribution of electrons in shell and subshells. 1.4 Electronic configuration of atoms having atomic number 1-30 1.5 Electrovalent and covalent compounds, electrovalency and covalency 1.6 Formation of covalent compound e.g. H_2O, CH_4, O_2, N_2, C_2H_2 1.7 Formation of electrovalent compound e.g. NaCl, $CaCl_2$, $AlCl_3$	
Unit-II **Electro chemistry**	2a. Explain basic concepts of electrochemistry. 2b. Explain theory of ionization and factors affecting it 2c. Explain mechanism of electrolysis with examples. 2d. Describe faraday's first and second laws and solve numerical. 2e. Explain the applications of electrolysis 2f. Describe the construction and working of cells	2.1 Definition of electrochemistry, atom, ion, electrode, cell, electrolysis, electrolytes, non-electrolytes, anode, cathode etc. 2.2 Arrhenius theory of ionization, degree of ionization, factors affecting degree of ionization. 2.3 Electrolysis, mechanism, electrolysis of fused NaCl, aqueous NaCl using platinum electrode, $CuSO_4$ solution using Copper 2.4 Faraday's first and second law, 2.5 Numericals on Faraday's laws. 2.6 Process of electroplating and electro refining 2.7 Types of cell- e.g. Dry cell, Ni-Cd cell, introduction to solar cell	08
Unit-III **Water**	3a. Explain sources, impurities, properties of water. 3b. Differentiate between hard and soft water 3c. Describe the ill effect of hard water in domestic and industrial field 3d. Explain the different methods for removal of hardness of water. 3e. Describe the different treatments of drinking water 3f. Explain the concept of pH and pOH numerical related with it, applications of pH in engineering.	3.1 Sources of water- Rain, surface, underground water. Impurities in water- suspended, colloidal, dissolved, biological 3.2 Physical and chemical properties of water. 3.3 Hard and soft water. Types of hardness of water, Salts producing hardness of water, Units of hardness of water. 3.4 Domestic field- cooking, washing, bathing, drinking. Industrial field- paper, textile, dye, sugar industry. 3.5 Temporary hardness- boiling, Clark's method. 3.6 Permanent hardness- Permutit's method, ion exchange method. 3.7 Methods of purification of water: Screening, Sedimentation, coagulation, filtration, Sterilization of water. 3.8 Definition of pH and pOH, pH scale and numerical. 3.9 Applications of pH in engineering. -	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
		city water supply, corrosion, effluent treatment, electroplating.	
Unit-IV **Metals**	4a. Explain the basic concepts of metallurgy. 4b. Describe different characteristics of metal. 4c. Explain the metallurgy of iron. 4d. Describe the physical properties and applications of metals.	4.1 Definition of ore, mineral, gangue 4.2 Hardness, toughness, brittleness, tensile strength, malleability, ductility, machinability, weldability 4.3 Flow sheet of metallurgy 4.4 Steps of metallurgy : a. Concentration: physical, chemical. b. Reduction: smelting, alumino thermic process. c. Refining: poling, liquation, distillation, electrorefining. 4.5 Physical properties and applications of Fe, Cu, Al, Cr, Ni, Sn, P	08
Unit-V **Alloys**	5a. Describe the meaning of alloy, its preparation and its purposes of formation. 5b. Explain the classification of alloys and their applications	5.1 Definition of alloy, different methods of preparation of alloy, 5.2 Purposes of formation of an alloy. 5.3 Classification of alloys • Ferrous alloy- alloys steel and its applications. • Non ferrous alloy-Copper alloy-brass, bronze, gun metal, Monel metal Aluminum alloy-Duralumin • Solder alloy and its types.	06
Unit-VI **Corrosion**	6a. Describe magnitude of corrosion, meaning of corrosion, types of corrosion 6b. Explain the factors affecting the atmospheric and immersed corrosion 6c. Explain different methods of protection of metal from corrosion	6.1 Magnitude of corrosion, definition of corrosion, types of corrosion- a) Atmospheric corrosion- definition, types – b) corrosion due to oxygen, mechanism of corrosion due to oxygen, nature of film and its role in corrosion process c) Corrosion due to other gases 6.2 Immersed corrosion- definition, it's mechanism, galvanic and concentration cell corrosion 6.3 Factors affecting atmospheric and immersed corrosion 6.4 Methods of protection of metal from corrosion- hot dipping, metal spraying, sherardizing, electroplating of metal cladding, organic coating-paints and varnish	10
Unit-VII **Lubricants**	7a. Describe lubricants, its function and classification of lubricants. 7b. Explain lubrication and it's types 7c. Describe physical and chemical properties of lubricants	7.1 Definition of lubricant, function of lubricants, classification of lubricants. 7.2 Definition of lubrication, types of lubrication 7.3 Physical properties- viscosity, viscosity index, oiliness, flash and fire point, volatility, cloud and pour point. 7.4 Chemical properties- acid value, saponification value, emulsification.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics & subtopics	Hours
	7d. Explain selection of lubricants for various machines	7.5 Properties and names of lubricants used for various machines like delicate instruments, heavy load and low speed machine, gears, cutting tools, I.C. Engine, steam engine	
Unit-VIII **Fuels**	8a. Describe fuels, characteristics of good fuel, types of fuel 8b. Describe solid fuel-e.g. coal in detail 8c. Describe liquid fuel e.g. -petroleum 8d. Describe gaseous fuel their advantages 8e. Distinguish between solid liquid and gaseous fuels	8.1 Definition of fuel, characteristics of good fuel, classification of fuel 8.2 Solid fuel-e.g. coal, it's types, properties of good coal, selection of coal, analysis of coal, determination of C and H in coal 8.3 Liquid fuel-e.g. petrol, classification of petrol, refining of petrol 8.4 Gaseous fuel e.g. LPG, natural gas, biogas 8.5 Advantages of gaseous fuel over solid and liquid fuels 8.6 Comparison between solid, liquid and gaseous fuels	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No	Unit title	Distribution of Theory marks			
		R level	U level	A level	Total
1	Atomic Structure	04	02	02	08
2	Electrochemistry	04	04	04	12
3	Water	04	04	04	12
4	Metals	04	02	04	10
5	Alloys	02	02	02	06
6	Corrosion	04	02	06	12
7	Lubricants	04	02	04	10
8	Fuels	04	02	04	10
	TOTAL	**30**	**20**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1 to 5	I	Inorganic qualitative analysis of any five solutions	10
6	II	Determination of electrochemical equivalent of copper.	02
7 to 8	III	Strength of given acidic solution using standard base solution.	04
9	III	Determination of pH of different unknown solutions.	02
10	III	Determination of chloride content in given water sample.	02
11 to 12	III	Determination of hardness of water	04
13	V	Determination of % of Fe in given ferrous alloy sample.	02
14	VI	To find relation between decrease in weight due to corrosion of metal and time.	02
15	VII	Determination of viscosity of given lubricating oil.	02
16	VIII	Determination of % of moisture in given coal sample by proximate analysis.	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Draw structures and write electronic configurations of atoms having atomic number 1-30.
2. Testing of water samples.
3. Sampling and collection of coal.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. CAI package, video demonstration, charts, models, visits and expert seminar/lecture.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Chemistry	Jain & Jain	Dhanpat Rai and Sons
2	A Text Book of Polytechnic Chemistry	V. P. Mehta	Jain Brothers
3	Engineering Chemistry	S. S. Dara	S. Chand Publication
4	Industrial Chemistry	B. K. Sharma	Goel Publication
5	Environmental Chemistry & Pollution control	S. S. Dara	S. Chand Publication
6	Engineering Chemistry	M. M. Uppal	Khanna Publisher New Delhi

B) Software/Learning Websites

1. http://chemistry.osu.edu/~woodward/ch121/ch2_atoms.htm
2. http://www.nyu.edu/pages/mathmol/textbook/atoms.html
3. www.chemguide.co.uk/atoms/properties/gcse.html
4. http://www.water-research.net/index.php/water-treatment/tools/hard-water-hardness
5. http://www.unitedutilities.com/documents/WaterhardnessFactSheet.pdf
6. http://www.explainthatstuff.com/alloys.html
7. http://www.gordonengland.co.uk/xcorrosion.htm
8. http://cuiet.info/notes/chemistry/Lubricants.pdf
9. http://www.ignou.ac.in/upload/unit-3.pdf

C) Major Equipment/ Instrument with Broad Specifications

1. Muffle furnace
2. Distillation Plant
3. Computer lab with 20 Computers for online theory exam.
4. Digital pH meter
5. Ostwald's viscometer
6. Electronic weighing balance (0 to 100gm capacity).
7. Digital Stop watch.
8. Lovi Bond comparator
9. Regulated DC power supply
10. Rheostat
11. Ammeter

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M	M		L			L			L
CO2	H		M	M	L						L
CO3	H			M							L
CO4	H			M							L
CO5	H	M	L		M			L			
CO6	H	M		M	M						L
CO7	H			M	M						L
CO8	H			M	M						L
CO9	H										L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / EE / IF / CM / EL / AE
COURSE : Engineering Graphics (EGR) **COURSE CODE** : 6107

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	04	06	--	Max.	--	--	--	25	--	25	50
					Min.	--	--	--	10	--	10	--

1.0 RATIONALE:

Engineering Graphics is the language of engineers. The concepts of Engineering Graphics are used to develop & express the ideas and convey the instructions, which are used to carry out jobs in the Engineering field. This preliminary course aims at building a foundation for the further course in drawing and other allied courses.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the use of drawing tools and equipments.
2. Understand the significance of engineering curves for various applications.
3. Understand the projections of point and line inclined to one reference plane.
4. Interpret the pictorial view and understand orthographic projection of the simple object.
5. Interpret the orthographic projection and understand pictorial view of the simple object.
6. Understand the significance of sectional view in the drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw the engineering curves for given engineering applications.
2. Draw the projections of point and lines inclined to one reference plane only.
3. Draw and dimension orthographic projections of given object.
4. Interpret orthographic projections of object and draw isometric view.
5. Draw sectional view of simple objects as per IS convention.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Drawing instruments and their uses**	1a. Use Instruments for drawing, Scales, Lines, & their applications.	1.1 Letters and numbers (single stroke vertical) 1.2 Convention of lines and their applications. 1.3 I.S. codes for planning and layout. 1.4 Scale (reduced, enlarged & full size) plain scale and diagonal scale. 1.5 Sheet layout. 1.6 Geometrical constructions and drawing polygons	04
Unit-II **Engineering curves**	2a. Draw Conic curves, involutes, Cycloid. 2b. State the applications of engineering curves.	2.1 Methods for drawing an ellipse concentric circle, directrix focus and arc of circle method. 2.2 Methods for drawing parabola by directrix focus and rectangular method.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		2.3 Methods for drawing an hyperbola by directrix focus and rectangular method. 2.4 Procedure for drawing involutes of circle and polygon (up to hexagon) 2.5 Procedure for drawing cycloid, epicycloid and hypocycloid	
Unit-III **Projections of Point and Line**	3a. Draw the projection of point 3b. Draw projection of line	3.1 Projection of point in the different quadrants. 3.2 Projection of line parallel to one plane and inclined to another reference plane only.	04
Unit-IV **Orthographic Projections**	4a. Interpret & draw orthographic views from given pictorial view.	4.1 Concept of Orthographic projections. 4.2 Conversion of pictorial view into Orthographic views only first angle projection method for simple objects.	06
Unit-V **Isometric Projections**	5a. Interpretation of isometric view. 5b. Draw isometric view from given orthographic views	5.1 Use of Isometric scale. 5.2 Comparison of true scale with isometric scale 5.3 Conversion of orthographic views into isometric View / projection	06
Unit-VI **Sectional View**	6a. Draw sectional view of simple drawing	6.1 Representation of sectional plane 6.2 Conversion of orthographic views into sectional View	04
		TOTAL	**32**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (Theory)

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Two sheet on letters, numbers and representation of lines and redraw the figures.	08
2	II	Sheet on six engineering curves	12
3	III	Sheet on projections of line . (04 problems)	12
4	IV	Sheet on orthographic projection.(02 problems)	12
5	V	Sheet on isometric views and projection. (04 problems)	12
6	VI	Sheet on sectional view. (02 problems)	08

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect the information about application of engineering curves.
2. Sketch the orthographic views of simple engineering product in sketch book.
3. Sketch isometric view of simple engineering product in sketch book.
4. Sketch sectional view of simple engineering product in sketch book.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Three Dimensional models of different objects.
2. Use software's, CAI packages for better imagination.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Engineering Drawing	N. D. Bhatt	Charotar Publishing House
2	Engineering Drawing	P. J. Shaha	S. Chand
3	Engineering Drawing and Graphics	K. Venugopal	New Age International

B) Software/Learning Websites

1. AutoCAD
2. Solid works.

C) Major Equipment/ Instrument with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H	H								L
CO2	H	H									
CO3	H	M	M	M					L		L
CO4	H	M	M	M					L		
CO5	H	M		H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / AE
COURSE : Engineering Mechanics (EMH) **COURSE CODE :** 6108

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

This course helps students in understanding correlation between different engineering and day to day's problems with the knowledge of different laws and principles of mechanics. It helps in solutions to problem related to forces acting on body. It also helps in understanding concept and application of Equilibrium, friction, centroid and Kinetics.

It helps in understanding concept of work, power and energy. Study of simple machines gives idea about input, output, efficiency and friction of machine. Understanding of this course facilitates easy learning of higher level course like strength of materials, Mechanics of structures, Theory of structures and Reinforced concrete structures.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the basic concepts of Forces, Equilibrium, Friction, Centre of gravity, Kinetics, Kinematics and simple Machines
2. Understand the basic concepts related to resolution and composition of forces, equilibrium condition and frictional force, centre of gravity, momentum, impulse energy and mechanism of machines.
3. Understand the basic principles of Lami's Theorem, Newton's law of motion, law of conservation of energy, law of machines and laws of friction.

3.0 COURSE OUTCOMES:

Students shall be able to acquire specified learning outcomes in cognitive, psychomotor and affective domain to demonstrate the following course outcomes:

1. Describe working of different machines and calculate Velocity Ratio & Efficiency of different Machines.
2. Draw free body diagram of forces acting on a body.
3. Apply laws and principles of mechanics to different practical situations.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamental concepts**	1a. Differentiate Scalar and Vector quantities 1b. Define basic terms relevant to mechanics. 1c. Describe different coordinate systems.	1.1 Mechanics and its relevance to Engineering, Fundamental concepts – scalar quantities, vector quantities. 1.2 Concept of rigid body, Definitions of deformable body, Particle, mass and weight Statics, Dynamics (Kinematics and Kinetics). 1.3 Reference frames of Axes a) Rectangular co – ordinate system b) Polar co-ordinate system. 1.4 Fundamental units, derived units and different systems of units. 1.5 Newton's laws.	04
Unit-II **Simple Lifting Machines**	2a. Compute M.A, V.R., Efficiency, Law of Machines for given Machines	2.1 Basic concepts – load, effort, input, output, mechanical advantage, velocity ratio, efficiency of machine, Law of machine, friction in the machine, ideal machine, reversibility of machine 2.2 Study of machines- simple wheel and axle, differential axle and Wheel, pulley blocks, simple screw jack, worm and worm wheel, winch crab (single & double purchase). 2.3 Numerical examples on above mentioned machines	08
Unit-III **Force**	3a. Identify and differentiate different force system 3b. Apply the laws to compute the resultant of given force system	3.1 Concept of force, Coplanar and Non coplanar force system Classification of co planer force system such as collinear, Concurrent, Non concurrent, Parallel, Like Parallel, Unlike Parallel and General force System. 3.2 Law of transmissibility of a force, parallelogram law of forces, resolution and composition of forces, resultant, triangle law of forces, polygon law of forces. 3.3 Resultant of a coplanar concurrent force system (Analytical method) 3.4 Turning effect of force – Moment, Couple, nature of moment, characteristics of couple. 3.5 Varignon's theorem of moments and its application to coplanar parallel and non-concurrent force systems. Resultant of coplanar non concurrent force system (Analytical method)	16
Unit-IV **Equilibrium**	4a. Draw Free Body Diagram 4b. Apply Lami's Theorem 4c. Compute support reactions for given beam	4.1 Concept of Equilibrium, Analytical Conditions of equilibrium, equilibrant. 4.2 Free body diagrams (FBD) 4.3 Lami's theorem and its applications 4.4 Reactions at supports of beams - types of supports, types of loads types of beam 4.5 Determination of beam reactions- cantilever beams, simply supported beam and	13

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		overhanging beam subjected to concentrated loads, uniformly distributed loads and applied moments or couples (Analytical method only)	
Unit-V **Friction**	5a. Appreciate Friction and its engineering application 5b. Calculate friction forces and coefficient of friction	5.1 Introduction, frictional force 5.2 Laws of friction (static friction only), coefficient of friction, angle of friction, angle of repose. 5.3 Body resting on Horizontal plane, inclined plane and forces acting on the body in any direction	07
Unit-VI **Centroid and Centre of Gravity**	6a. Distinguish between Centroid and Centre of Gravity 6b. Compute Centroid and Centre of Gravity of different plane laminas and solids	6.1 Definition and Concept of centre of gravity and Centroid. 6.2 Centroid of line segment, centroid of regular areas such as rectangle, square, triangle, circle, semicircle, quarter circle. Problems on location of centroid of composite area consisting of above mentioned regular areas. 6.3 Centre of gravity of regular solids such as cube, rectangular prism, sphere, hemisphere, cylinder, solid cone. Problems on location of centre of gravity of composite solids consisting of above mentioned regular solids.	08
Unit-VII **Dynamics**	7a. State equations of motion. 7b. State Newton's Laws, Impulse Momentum equation and Work Energy Principle 7c. To compute work, Power and Energy	7.1 Introduction to dynamics, definition of Kinematics and, types of motion of particle, equations of motion, (No numerical problems on Kinematics) 7.2 Introduction to kinetics, Newton's laws, 7.3 definition of Impulse, momentum, Impulse momentum equation, law of conservation of momentum (No numerical Problems on above) 7.4 Work-power Energy, definitions, units, graphical representation of work, law of conservation of energy, work energy principle, Numerical examples.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Fundamental concepts	02	02	--	04
II	Simple Lifting Machines	02	--	06	08
III	Force	02	04	12	18
IV	Equilibrium	02	04	12	18
V	Friction	--	02	08	10
VI	Centroid and Centre of Gravity	--	04	08	12
VII	Dynamics	02	04	04	10
	TOTAL	**10**	**20**	**50**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
	A	Any **Four** of following Exercises	
1	I	Differential axle and wheel	02
2		Simple screw jack	02
3		Worm and worm wheel	02
4		Single gear crab	02
5		Double gear crab	02
6		Two sheaves & three sheaves pulley block	02
7		Differential pulley block	02
8		Geared pulley block	02
	B	Any **Two** of following Exercises	
9	III	Verification of law of polygon of forces	04
10		Verification of law of moments	04
11		Study of forces in the members of jib crane	04
	C	All of the following Exercises	
12	IV	Verification of Lami's theorem	04
13	IV	Beam Reactions	04
14	V	Determination of coefficient of friction	04
15	VI	Centroid of Regular and Irregular Lamina	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Observe and list different activities at home, on Roads and common places where simple machines are used.
2. Observe and list different activities at home, on Roads and common places where principals of Mechanics are involved.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show different simple lifting machines used in workshops and other work places.
2. Show Videos and slides involving application of different Principals of Mechanics.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Theory and problems of Engineering Mechanics- Schaum's outline series Statics and Dynamics SI Edition	E. Nelson, Charles Best & Willian McLean.	McGraw Hill
2	Engineering Mechanics statics and dynamics	Singer	Harper Collins Publisher, India.
3	Vector mechanics for Engineers (statics and Dynamics)	Ferdinand P. Beer, E Russell Johnson	McGraw Hill
4	Applied Mechanics for polytechnics	P. S. Sawhney & Manikpure	S. Chand & Co. Ltd
5	A text book of Applied Mechanics	Ramamrutham	Dhanpat Rai Pub. Co. (P) Ltd, New Delhi
6	Text Book in Applied Mechanics	M. M. Malhotra, R. Subramanion, P. S. Gahlot	New Age International (P) Ltd. Publishers, New Delhi

B) Software/Learning Websites

www.nptel.com, www.youtube.com, www.howstuffworks.com, www.sciencedirect.com, www.wikipedia.org

C) Major Equipment/ Instrument with Broad Specifications

Force Table, Differential Axle & Wheel, Single and Double Purchase crab, Worm & Worm Wheel, Simple Screw Jack, Pulley Blocks and Reaction of Beam Apparatus.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H						M			M
CO2	H	H						M			
CO3		H									M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / AE
COURSE : Workshop Practice (WSP) **COURSE CODE** : 6109

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	06	06	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Engineering diploma technician is expected to know conventional workshop practices like welding, Fitting, Drilling, Tapping, Plumbing and hot working processes. The students are required to identify, operate and control various power tools and machines. They should be able to select and use various tools and equipments for various operations and processes like welding, fitting, taping, Plumbing and forging.

The students are advised to undergo each skill experience with remembrance, understanding and application with special emphasis on attitude of enquiry to know why and how for the various instructions and practices imparted to them in each shop.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Develop basic engineering workshop skills in the students.
2. Impart basic know how of various hand tools and their uses in different sections of workshop.
3. Enhance hands on experiences to learn manufacturing, production and advanced manufacturing processes.
4. Develop a skill in dignity of labour, precision at work place, team working and development of right attitude.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Know basic workshop processes.
2. Read and interpret job drawing.
3. Identify, select and use various marking, measuring, holding, striking and Cutting tools & equipments.
4. Operate, control different machines and equipments.
5. Inspect the job for specified dimensions
6. Produce jobs as per specified dimensions.
7. Adopt safety practices while working on the shop floor

4.0 COURSE DETAILS:

There are no separate classes for theory. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Introduction of workshop**	1a. Sketch general workshop layout. 1b. Follow preliminary safety rules in workshop.	1.1 Workshop layout. 1.2 Importance of various shops/ sections of workshop. 1.3 Types of jobs to be done in different sections of workshop. 1.4 General safety rules and work procedures in the workshop.
Unit-II **Fitting Section**	2a. Select appropriate Fitting tools for required application. 2b. Prepare the simple Job as per drawing and specifications by using fitting tools.	2.1 Sketches, specifications and applications of different work holding fitting tools. 2.2 Fitter's bench vice, V-block, Clamps. Sketches, specifications, material, applications and methods of using fitting marking and measuring tools-marking table, surface plate, angle plate, universal scribing block, try-square, scriber, divider, centre punch, letter punch, callipers, digital vernier callipers, height gauge etc. 2.3 Types, sketches, specifications, material, applications and methods of using of fitting cutting tools hacksaw, chisels, twist drill, taps, files, dies. 2.4 Types, sketches, specifications, material, applications and methods of using of fitting finishing tools-files, reamers. 2.5 Sketches, specifications and applications of miscellaneous tools, hammers, spanners, screwdrivers sliding screw wrench. 2.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping.etc. 2.7 Preparation of simple and male- female joints. 2.8 Safety precautions at work place in fitting section.
Unit-III **Carpentry Section**	3a. Select appropriate Fitting tools for required application. 3b. Prepare the simple Job as per drawing and specifications by using carpentry tools.	3.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule etc. 3.2 Types of woods and their applications. 3.3 Types of carpentry hardware's and their uses. 3.4 Demonstration of carpentry operations such as marking, sawing, planning,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		chiselling, grooving, boring, joining etc. 3.5 Preparation of wooden joints. 3.6 Safety precautions.
Unit-IV **Plumbing Section**	4a. Select appropriate pipe fitting tool for the required application. 4b. Prepare the simple job as per specification using pipe fitting tools.	4.1 Types, specification, material and applications of pipes. 4.2 Types, specification, material and applications of pipe fittings. 4.3 Types, specifications, material, applications and demonstration of pipe fitting tools. 4.4 Demonstration of pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling etc. 4.5 Types and application of various spanners such as flat, fix, ring, box, adjustable etc. 4.6 Preparation of pipe fitting jobs. 4.7 Safety precautions.
Unit-V **Welding Section**	5a. Select appropriate equipment and consumables for required application. 5b. Prepare the simple jobs as per specification using proper metal joining and cutting method.	5.1 Types, specification, material and applications of arc welding transformers. 5.2 Types, specification, material and applications of arc welding accessories and consumables. 5.3 Demonstration of metal joining operations- arc welding, soldering and brazing. Show effect of current and speed. Also demonstrate various welding positions. 5.4 Demonstrate gas cutting operation. 5.5 Preparation of metal joints. 5.6 Safety precautions.
Unit-VI **Smithy Section**	6a. Select appropriate Smithy tools for the required application. 6b. Prepare the simple jobs as per specification using Smithy tools.	6.1 Introduction to tools and equipments. 6.2 Smithy and Forging operations 6.3 One job of J Hook or I Hook 6.4 (Using round or square bar)
Unit-VII **Tin Smithy**	7a. Select appropriate tin smithy tool for the required application. 7b. Prepare the simple job as per specification using tin smithy tools.	7.1 Concept and conversions of SWG and other gauges in use. 7.2 Use of wire gauge. 7.3 Types of sheet metal joints and applications. 7.4 Types, sketch, specification, material, applications and methods of using tin smithy tools-hammers, stakes, scissors / snips etc. 7.5 Demonstration of various tin smithy tools and sheet metal operations such as shearing, bending and joining. 7.6 Preparation of tin smithy job. 7.7 Safety precautions.

5.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills leading to the achievement of the competency. **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Prepare carpentry and fitting shop layout.	02
2	II	Demonstrate use of different fitting tools –like work holding, marking, measuring, cutting, finishing and miscellaneous. Student will also prepare the report with sketch, specifications and applications of fitting tools demonstrated.	04
3	II	**Two jobs :** Prepare one simple and another male-female type fitting jobs as per given drawings and specifications.	10
4	III	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.	04
5	III	Prepare one Job From the following allotted to a group of 4 to 6 student depending of volume work. involving different joints, Turning and paining operation, surface finishing by emery paper, varnishing and polishing e. g. Electric switch board, pat, Chaurang, Table, Racks etc. OR One simple job involving any one joint like mortise and tendon dovetail bridle half lap etc. One Job per student	12
6	IV	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.	04
7	IV	**Two jobs. :** Prepare pipe fitting jobs as per drawings and specifications.	12
8	V	Demonstrate use of different welding transformers and consumables. Also demonstrate arc welding, gas cutting, soldering and brazing operations. Student will also prepare the report with sketch, specifications and applications of welding tools demonstrated.	04
9	V	Prepare jobs using arc welding, gas cutting, spot welding, brazing and soldering process-. One simple job involving "Butt", "lap" and "T" joint. And utility article as per drawing and specifications.	12
10	VI	Demonstrate use of different smithy tools, operations. Student will also prepare the report with sketch, specifications and applications of smithy tools demonstrated.	04
11	VI	**One job :** Prepare one smithy job as per drawing having Job of J Hook or I Hook (Using round or square bar)	12
12	VII	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.	04
13	VII	**One job :** Prepare one tin smithy job as per drawing having shearing, bending, joining and riveting.	12
		TOTAL	**96**

6.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

Sr. No	Student Activity
1	Prepare student reports as asked in the workshop practical assignment.
2	Visit the nearer timber merchant. Collect the information on types and appearance of wood being sold by them.
3	Visit the nearer plywood merchant. Collect the information on type and thickness being sold by them.
4	Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
5	Down load movies showing correct practices for fitting, carpentry, Smithy and welding.
6	Assignments on workshop technology tools equipments & processes used in above shops.

NOTES:

1. It is compulsory to follow safety norms while working in the workshop.
2. Preparation Workshop book is compulsory. Record of activities performed by
3. Student in each period is also compulsory and must be duly certified by concerned technical staff and teacher in routine workshop book.
4. Keep your all tools duly resharpened/ready.
5. It is compulsory to submit reports of student activities and workshop book.
6. Students activities are compulsory to perform.
7. Students are to be continuously assessed for competencies achieved.
8. Each student is required to submit the specified term work

7.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to workshop technology.
2. CBT Packages.

8.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1.	Mechanical workshop practice.	K.C. John	PHI
2	Workshop Technology-I.	Hazra and Chaudhary Media	promoters & Publisher private limited
3	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
4	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi publications.
5	Workshop practice manual.	K. Venkata Reddy	B.S. Publications.
6	Workshop familiarization.	E. Wilkinson	Pitman engineering craft series.
7	Workshop Technology	B. S. Raghuwanshi	Dhanpat Rai and Sons, New Delhi
8	Workshop Technology	H. S. Bawa	Tata McGraw Hill Publishers, New Delhi
9	I.T.B. Handbook.	-	Engineering industry Training Board.
10	Production Technology Hand Book HMT	-	Tata-McGraw Hill Publisher, New Delhi.

B) Software/Learning Websites

1. http://www.nptel.ac.in
2. http://www.howstuffworks.com
3. http://www.abmtools.com/downloads/Woodworking%20Carpentry%20Tools.pdf
4. http://www.weldingtechnology.org
5. http://www.newagepublishers.com/samplechapter/001469.pdf
6. http://www.youtube.com/watch?v=TeBX6cKKHWY
7. http://www.youtube.com/watch?v=QHF0sNHnttw&feature=related
8. http://www.youtube.com/watch?v=Kv1zo9CAxt4&feature=relmfu
9. http://www.piehtoolco.com
10. http://sourcing.indiamart.com/engineering/articles/materials-used-hand-tools/

C) Major Equipment/ Instrument with Broad Specifications

Sr.No.	Name Of Equipment/ Instrument	Qty
	Carpentry Section	
1	Circular saw	1
2	Jig - saw	1
3	Wood Planer	1
4	Drilling Machine Bench Type	1
5	Universal wood working Machine	1
6	Bench Grinder	1
7	Hand Tools Kit	20 Sets
8	Carpentry Bench Vice	20
9	Wood Turning Lathe	5
10	Measuring Tools & Gauges	20 Sets
11	Electrician Tool Kit	2
12	Carpentry Work Bench	20
13	Band Saw	1
14	Band saw and Circular Saw Sharpener	1
15	Chain And Chisel Mortising Machine	1
16	Vertical Sander	1
17	Heavy Duty Circular Saw	1
18	Heavy Duty Variable Speed Reciprocating Saw Kit	1
19	Single Speed Impact Drill.	1
20	Angle Grinder.	1
21	Cordless drill (Keyed Chuck)	1
22	Heavy Duty palm grip sander	1
23	Heavy Duty Router	1
	Fitting Shop	
1	Marking Table with scribers	2
2	Surface plate	2
3	Measuring Instruments, Marking Instruments, Fitting Hand Tools	2 Each
4	Tap & die set.	5 Sets
5	Bench Drilling Machine	1
6	Bench Grinder	1
7	Fitting Shop Vice Size- 100/150 mm.	20
8	Electrically operated Hand Drilling Machine (pistol Type)	2
9	Power Hack Saw Machine	1
10	Pedestal Grinder	1
11	Hand Grinder	1
12	Fitter's Work Bench	10
13	Hand Press Double (Pillar Type)	1
14	Arbor Press	1
	Smithy Shop	

Sr.No.	Name Of Equipment/ Instrument	Qty
1	Hearth with blower	5
2	Anvil	5
3	Leg Vice Size-150mm.	5
4	Swage Black	2
5	Tools and Gauges	20
6	Power Hammer	1
7	Bench Grinder	1
8	Work Bench With vice	2
9	Induction Hardening equipment	1
	Welding Shop	
1	Oil Cooled Arc Welding Transformer Three Phase With Standard Accessories	2
2	Single Phase air cooled arc Welding Transformer with Accessories	2
3	Light Duty Spot Welding Machine	1
4	Oxy-Acetylene Gas Welding Set	1
5	Soldering Irons	2
6	Double Ended Pedestal Type Grinder	1
7	Welding accessories	1
8	Electrician Tool Kit	2 Set
9	MIG / Welding Equipment	1
10	TIG Welding set.	1
11	Work Bench With Vice Size- 1800 x 1200 x 750 mm	2
12	Welding Table Size-1200 x 1200 x 750 mm With sliding tray	2
13	DC Arc Welding Transformer Rectifier type 3 Phase	1
14	Brazing Equipment and Accessories	1
15	Heavy Duty Angle Grinder.	1
16	Heavy Duty 10 mm. VSR Cordless Drill / Driver Kit.	1
	Sheet Metal & Plumbing Shop	
1	Shearing Machine	1
2	Sheet Bending Machine	1
3	Pipe Bending Devices	1
4	Hand Tools and other Equipment	1
5	Pipe Threading Dies	5
6	Portable Drilling Machine	1
7	Plumber Pipe Vice Size- 50 mm., 12 mm. to 24 mm.	1 & 20
8	Plumber's Tool Kit	1
9	Stoving Oven	1
10	Plumber's Work Bench Size-1800 x 1200 x 750 mm	2
11	Swaging Machine	1
12	Universal sheet Folding Machine	1
13	Double Column Power Press	1
14	Hydraulic Press	1
15	Circle Cutting Machines	1

Note: - Latest Technology & specifications are to consider at the time procurement.

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H							M	L	M
CO2		M							M		
CO3	H										
CO4			H	M							M
CO5		M	H	L				H			
CO6			H		M		H	H			
CO7			H			L	H				

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / PS / EE
COURSE : Computer Aided Graphics (CAG) **COURSE CODE** : 6201

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

This course provides the basic knowledge of the Computer Aided Drafting for Civil / Plastic / Electrical Engineering.

This course gives basic foundation knowledge for advance computer based software. Today the manufacturing industries needs the computer oriented man power for their global needs and to cope up the fast changing technology. Moreover, the conventional method of drafting of the objects has been replaced by computer-based drafting. Therefore this course is introduced in the present curriculum.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the importance of Computer Aided Drafting (CAD).
2. Use basic CAD command to develop 2D drawings.
3. Use CAD commands for edit/modification of existing drawings as per needs and suggestions.
4. Print the drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. State the applications, advantages and features of CAD.
2. Execute CAD commands.
3. Prepare a simple drawing file using basic draw commands.
4. Apply basic CAD command to develop 2D drawings related to discipline.
5. Apply CAD commands for edit/modification of existing drawings.

4.0 COURSE DETAILS:

There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Introduction to Computer Aided Drawing**	1a. State the applications and advantages of CAD 1b. State the features of CAD as drafting package 1c. State the hardware requirements to run CAD	1.1 Advantages of CAD 1.2 Applications of CAD, Components of CAD system
Unit-II **Basic menus in CAG**	2a. Identify component of the drawing screen. 2b. Apply the methods of selecting/entering commands to start new drawing	2.1 Opening of Drawing, commanding CAG, Command windows, text window, AutoCAD Command, 2.2 Entering commands at command prompt, Pull down Menus, Screen menus, Entering command from dialog

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	2c. Execute CAD commands by selecting from menus, tool bars and entering Commands on command line. 2d. Set the limits of the drawing to get the needed working area. 2e. Apply the 'setting commands' Grid, Snap, & Ortho Commands.	box. 2.3 Using transparent command, Repeating command and, System variables, 2.4 Co-ordinates system: WCS, UCS, UCSICON. UNITS, Setting of drawing screen using limits and zoom all command, Display of co-ordinates on screen, 2.5 Entering the Co-ordinates: Cartesian coordinate, polar coordinate, scale factor, limits setting, Grid setting, snap setting, Creating, saving and exiting / end drawing files.
Unit-III **Display Commands**	3a. Apply display commands and commands to view drawing. 3b. Apply 'view commands'	3.1 Zoom in and zoom out command & dynamic zoom, Size of windows, View command, PAN command, Redraw – Regen command, Blipmode & Redraw command, Viewers' command, Hide command, View ports command, Plan command, fill command, Drag Mode command
Unit-IV **Drawing Commands**	4a. Prepare a simple drawing file using basic commands 4b. Apply 'Draw commands'.	4.1 Point, Line, Circle, Arc, Ellipse, polygon, Pline, Donut, Trace. 4.2 Osnap Modes, Aperture command, Text and dtext command, style command, Shape command.
Unit-V **Edit Commands**	5a. Explain the applications of Edit commands 5b. Modify existing drawing. 5c. Apply 'modify commands.	5.1 Select, Erase, oops, move, copy, Array, Explode, List, Rotate, Break, trim, extend, Fillet, Chamfer, Divide, Offset, Change, Chprop, Pedit, Area, Measure, Mirror, Dlst, Stretch, U, Undo.
Unit-VI **Dimensioning Commands**	6a. Dimension the given figures.	6.1 Linear dimensioning concept. 6.2 Dim: Continue, Baseline, Angular, Diameter 6.3 Dimension editing commands - New text, Tedit, Trotate, Hometext, Update, Dimension Utility Commands.
(Only For PS) Unit-VII **3-D Commands**	7a. Apply 3D commands to given drawing.	7.1 Extrude, Change properties, Region Hide, Union, Pan, Hidden, 3-D mesh, Subtract, Revolve, Shade, 3D view (SW, SE, NE, NW, TOP, Bottom, left, right, front, back) View ports (1, 2, 3, 4 view ports), 3D Orbit.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Laboratory Work:

A) For Civil Engineering Programme only

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I, II, III	Study and use of basic 2D commands for display, drawing, editing, modifying and dimensioning.	08
2	IV	Draw 2mm, 4 mm and 6mm text used for civil engineering drawing	04
3	IV, V	Draw five symbols each of following a) Civil Engineering Materials b) Doors and Windows c) Water supply and Sanitary Fittings d) Electrification	08
4	I to VI	Draw Plan, Elevation and Side view for steps or any civil engineering object	04
5	I to VI	Draw Line plan for a small residential / public building	08
6	I to VI	Draw Section of load bearing wall up to parapet for a single storeyed building.	08
7	I to VI	Draw Plan and section of an isolated RCC column footing.	04
8	I to VI	Draw Plans for any four types of stairs used in residential building	04
9	I to VI	Draw Detailed Plan and Elevation of single storeyed flat roofed small residential building	16
		TOTAL	**64**

B) For Electrical Engineering Programme only

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I, II, III	Study and use of basic 2D commands for display, drawing, editing, modifying and dimensioning.	08
2	IV	Draw 2mm, 4 mm and 6mm text used for Electrical engineering drawing	04
3	IV, V	Draw electrical symbols for various electrical devices	08
4	I to VI	Draw circuit diagram for godown and staircase wiring	04
5	I to VI	Draw control and power circuit diagram for DOL starter	08
6	I to VI	Draw front panel of an electronic digital multimeter	08
7	I to VI	Draw transmission tower of single circuit or double circuit	04
8	I to VI	Draw electrical installation plan for small residential unit	04
9	I to VI	Draw single line diagram and wiring diagram of three phase induction motor connected to supply with star delta starter.	16
		TOTAL	**64**

For Plastic Engineering Programme only

Sr. No.	Unit No.	Name of Laboratory work	Hours
1	I to VI	Use of basic 2D commands for display, drawing, editing, modifying and dimensioning.	08
2	VII	Use of 3D commands such as Extrude, Change properties, Region Hide, Union, Pan, Hidden, 3-D mesh, Subtract, Revolve, Shade, 3D views etc.	12
3	I to VII	Draw standard plates for injection mould.	04
4	I to VII	Draw sprue bush, guide pin, ejector pin, stopper pin and ejector rod for injection mould.	04
5	I to VII	Draw different types of gate in injection mould with section.	04
6	I to VII	Draw locating ring and guide pillar with dimensions and section.	08
7	I to VII	Draw different plastic products with dimensions by using 3D commands.	08
6	I to VII	Draw balanced runner layout for 8, 16, 32 and 64 cavities with dimensions.	08
7	I to VII	Draw single cavity two plate injection mould with section and dimensions.	08
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

A) FOR CIVIL ENGINEERING STUDENTS

1. Visit to architect/civil engineering firm for understating the CAD and its applications and study of typical drawings prepared by AutoCAD
2. Collect different types of civil drawings in hard copy from architects, builders and practicing engineers prepared using CAD software

B) FOR ELECTRICAL ENGINEERING STUDENTS

1. Contact a design engineer, understand the use of computer aided drawings in profession
2. Visit to an industrial workshop collect various electrical drawings.

C) FOR PLASTIC ENGINEERING STUDENTS

1. Visit to TECHNOCAD/ACCESSCAD/MG DESIGNERS AND ENGINEERS or any other CAD institutes or CAD/CAM centre.
2. Collect and practice mould / die drawings from industries.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Lecture Method, Use of teaching aids, Industrial Visits, Demonstrations and Expert Lectures.

9.0 LEARNING RESOURCES

A) Books

Sr.No.	Title of Book	Author	Publication
1	Auto Cad 2005	George, Omura B. Robert Callori	BPB Publisher
2	Auto Cad 2005 Instant Reference	George Omura B. Robert Callori	BPB Publications
3	Auto Cad 2007 Bible	Famkline	Wiley
4	Auto Cad 2007 L T	Fred·Bery	Wiley
5	Working With AutoCAD	Ajit Singh	Tata McGraw Hills

B) Software/Learning Websites

AutoCAD

1. http://www.ferris.edu/htmls/academics/course.offerings/hillm/MYWEB7/index.html
2. http://mould-technology.blogspot.in/search/label/Mold%20Construction
3. http://webhotel2.tut.fi/projects/caeds/tekstit/mould/mould_structure.pdf
4. http://mould-technology.blogspot.in/2008/02/basic-functions-of-mold-base-parts.html

C) Major Equipment/ Instrument with Broad Specifications

1. Computers
2. LCD Projectors
3. Printers

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	M									
CO2	H	M	H	H	M						M
CO3	H	H	H	H	M	L	M	M	M		M
CO4	H	M	H	H	M						M
CO5	H	M	H	H	M						M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Drawing (BDG) **COURSE CODE :** 6202

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	04	06	04	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Drawing is basically the language of an engineer. It is a means of communication between owner, architect, engineer and contractor. Civil Engineering Diploma holder has to supervise various construction processes and execute civil engineering structures such as buildings, roads, railways, dams, bridges. Civil Engineer has to convert design parameters, process details into pictorial views. Therefore he is required to understand and prepare the drawings. He has to interpret the drawings, so that, he can execute the works. Civil engineer should be competent to convert his ideas into the drawing. This helps him to transfer his ideas, thoughts to his subordinates on the site. Drawing makes his job simple and effective. Drawing helps in detailing the structures processes with quality parameters. Drawings are essential for drafting specifications and tender documents.

The knowledge of this course is useful for building construction, estimating and costing, design of structure, surveying and projects.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Know various types of lines & symbol of civil engineering materials.
2. Study principles, byelaws & dimensions required for planning of buildings.
3. Prepare submission & working drawings.
4. Know the concept of perspective drawing.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw various lines & symbol used for preparing drawings of civil engineering structures.
2. State byelaws & dimensions required for planning of building.
3. Prepare submission & working drawings as per the norms.
4. Draw perspective drawing.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Conventions**	1a. Describe use of lines & convention. 1b. Differentiate between various symbols used in preparing drawings. 1c. Explain readily available ammonia prints.	1.1 Conventions as per IS: 962-1989 and other Refined as 2009 code practices. 1.2 Types of Lines – Visible line, Centreline, Hidden line, Section line, Dimension line, Extension line, Pointers, Arrow heads or dots. 1.3 Symbols – Materials used in construction, building components 1.4 Reading of available ammonia prints of residential buildings.	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Planning of Building**	2a. Describe the principles of planning. 2b. Explain byelaws & norms for planning buildings.	2.1 Principles of planning of Residential and Public building. 2.2 Space requirements and norms for various units of Residential and Public building. 2.3 Rules and byelaws of local governing authorities for construction. 2.4 Drawing of line plans for Residential and Public building.	06
Unit-III **Types of Drawing**	3a. Draw submission drawing & working drawing. 3b. Differentiate between submission drawing & working drawing.	3.1 Development of line plan, Elevation, Section, Site plan, Location Plan, Foundation plan, Area statement and other details. 3.2 Measured Drawing and its significance 3.3 Submission Drawing and Working Drawing	06
Unit-IV **Perspective Drawing**	4a. Concept of perspective views. 4b. Draw two point perspective views.	4.1 Definition, Necessity, Principles of Perspective Drawing, Terms used in perspective drawing 4.2 Two point perspective view of a small object like pedestal, step block, small single storied building with flat roof.	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Conventions	04	--	--	04
II	Planning of Building	06	10	--	16
III	Types of Drawing	10	10	30	50
IV	Perspective Drawing	--	--	10	10
	TOTAL	**20**	**20**	**40**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr.No.	List of practical's	Hours
1	Drawing various types of lines, lettering and symbols of materials, doors and windows, used in construction on Full Imperial size drawing sheet.	04
2	Drawing the line plans of following buildings on Full Imperial size graph paper. • Residential Building (Min. three rooms) • Public Building – School building, Primary health center / Hospital building, Bank, Post Office, Hostel building. (At least four)	04
3	Measured Drawing of an existing residential Building (Load bearing/ Framed structure Type), showing Plan, Elevation, Sections, Construction notes, Schedule of openings, Site Plan.	12
4	Submission Drawing of two storied residential building (Framed structure type) showing Plans, Elevation, Sections, Foundation Plan, construction notes, Schedule of openings, Site Plan, Area statement, Rain water harvesting.	16
5	Working drawing of above drawing sheet preferably section through stair case, layout of house drainage, foundation plan & section of column footing.	16
6	Two point perspective view of a small object/building drawn in submission drawing.	04
7	Tracing of a submission drawing prepared at Sr.No. 4 above.	04
8	Ammonia print of submission drawing prepared at Sr.No. 4 above.	04
	TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Measurement dimensions of various units of a building.
2. Draw various plans, elevation, sections of existing buildings.
3. Prepare schedule of opening & area statement as per norms & byelaws.
4. Prepare foundation plan, rainwater harvesting unit.
5. Preparation of two point perspective.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show readily available ammonia prints.
2. Observing building & building components.
3. Experts lectures of plan sanctioning authority.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Text Book of Building Drawing	Shah, Kale, Patki	Tata McGraw Hill
2	Elements of Building Drawing	D. M. Mahajan	Pune Vidyarthi Grih
3	Planning and Design of Building.	Y. S. Sane	Tata McGraw Hill
4	Civil Engineering Drawing	Malik & Mayo	New Asian Publisher New Delhi

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

1. Drawing board
2. Prismatic compass
3. Tee square, set square
4. Ammonia printing machine.

1.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H									
CO2		H	H	M	H	M					H
CO3	M	H	H	M						M	
CO4		H	H						M		

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Concrete Technology (COT) **COURSE CODE** : 6203

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Various buildings like residential, commercial and industrial are constructed in cement concrete. So a civil engineer is supposed to be acquainted with the core knowledge of concrete. This course is intended to teach the students facts, concepts, principles of concrete. Students will also learn quality control of materials used for concrete before, during and after construction in Building Construction, Environmental Engineering, Irrigation Engineering and Transportation Engineering.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Develop an overall understanding of concreting operations in civil engineering constructions.
2. Know the properties of concrete and properties of the ingredients of concrete and their importance in concrete manufacturing.
3. Apply the basic principles and procedures to know how to control the quality before, during and after the construction and the importance of quality control.
4. Develop supervisory skills in all concreting operations prior to, during and after concreting by making use of the knowledge acquired and practical tools developed by IS and I.R.C.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Evaluate physical properties of cement, sand and aggregates.
2. Describe proper method for making and curing of concrete.
3. Measure important properties of fresh and hardened cement concrete including NDT.
4. Explain properties of various types of Admixtures and their utility
5. Design Concrete Mix as per IS method
6. Explain various types of special concrete and their use.
7. Explain methods to prevent and repair different types of the crack

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Concrete**	1a. Explain process diagram of concrete. 1b. Explain properties of concrete in plastic and hardened state.	1.1 Definition of concrete and its ingredients. Importance of concrete. 1.2 Process diagram of concrete, Grades of concrete- ordinary concrete, Standard concrete, high strength concrete, minimum grades for different exposure conditions.	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.3 Properties of concrete in plastic stage - workability, segregation, bleeding, honey combing & harshness. 1.4 Properties of concrete in hardened state- strength, durability, impermeability, fire resistance.	
Unit-II **Cement**	2a. Evaluate physical properties of cement 2b. Determine fineness, soundness, setting time and strength of cement 2c. Carryout field testing of cement	2.1 Chemical ingredients of ordinary Portland cement Bogue's compounds 2.2 Physical properties of ordinary Portland cement (OPC). Grades of OPC 2.3 Various types of cement and their uses- ordinary Portland cement, low heat cement, rapid hardening cement, sulphate resistant cement, blast furnace slag cement, pozzolana Portland cement, white cement. 2.4 Standard specification for ordinary Portland cement 2.5 Effect of various properties of cement on concreting operations. 2.6 Laboratory tests on cement Fineness, soundness, setting time and compressive strength. 2.7 Adulteration of cement, Field tests on cement, selection of good cement.	05
Unit-III **Aggregates**	3a. Evaluate Physical Properties of sand and aggregates used in concrete 3b. Select proper aggregate	3.1 Fine Aggregates and coarse Aggregates 3.2 Properties of aggregates, size, shape, texture, strength, specific gravity, bulk density, water absorption, soundness, durability. 3.3 Determination of aggregate grading, sieve analysis, fineness modulus, flakiness index, elongation index, bulking of sand, silt in sand. 3.4 Minimum void grading 3.5 Effect of aggregates properties on strength of concrete and durability of concrete 3.6 Selection of good aggregate.	05
Unit-IV **Water Cement Ratio and Strength**	4a. Select proper water cement ratio	4.1 Definition, Importance of water in concrete 4.2 Hydration of cement, water cement ratio law, conditions under which the law is valid, effect of water cement ratio on concrete strength 4.3 Strength of concrete and selection of water cement ratio 4.4 Quality of water	04
Unit-V **Workability**	5a. Evaluate workability, harshness, segregation and bleeding	5.1 Definition of workability and factors affecting workability 5.2 Measurement of workability by slump test and compaction factor test. 5.3 Requirement of Workability for different	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	properties of fresh concrete 5b. List the factors affecting workability 5c. Describe methods of measurement of workability, slump test & compaction factor test 5d. Describe methods of mixing of concrete 5e. Describe methods of compaction of concrete 5f. Describe methods of Curing 5g. List Effect of curing on development of strength of concrete	conditions. 5.4 Factors causing segregation, honey combing & their remedies 5.5 Factors causing bleeding, harshness & their remedies.	
Unit-VI **Mix Design**	6a. Calculate yield of concrete	6.1 Objectives of mix design and various methods 6.2 Principle of Mix design, IS method to design a Concrete Mix As per IS-10262-2009. (no problems) 6.3 Nominal mix. 6.4 Estimating yield of concrete by bulk density method	04
Unit-VII **Non-Destructive Testing of Concrete**	7a. Describe NDT methods and its limitations.	7.1 Importance of NDT, limitations of NDT, Methods of NDT 7.2 Rebound hammer test, Ultrasonic pulse velocity test.	02
Unit-VIII **Quality Control During Concreting**	8a. Explain quality control measures to be adopted in the field.	8.1 Storing of cement and aggregate 8.2 Effect of storing of cement on its strength 8.3 Batching of cement and aggregates 8.4 Mixing of concrete ingredients, types of mixers and their comparison. 8.5 Transportation of concrete 8.6 Placing of concrete 8.7 Compaction - methods of compaction, care to be taken during compaction 8.8 Important factors to be checked during concreting	08
Unit-IX **Quality**	9a. Explain finishing, curing and construction	9.1 Finishing of concrete slabs- Screeding, Floating, trowelling 9.2 Purpose and importance of curing.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Control After Concreting	joints. 9b. Describe total quality control in concreting work.	9.3 Methods of curing. 9.4 Types of construction joints. Method of joining -wrong practice followed on site, correct methods. 9.5 Importance of construction joints. 9.6 Care to be taken for constructions joints 9.7 Total quality control at all stages	
Unit-X **Admixtures and special concrete**	10a. Explain properties of various types of Admixtures and their utility 10b. Explain special concrete and their use.	10.1 Admixtures and its benefits Types of Admixtures and trade names - Accelerators and Retarders Plasticizers and Super Plasticizers Water roofing and Air entraining admixtures 10.2 Types of special concretes such Ready mix concrete, Fibre reinforced concrete, High Performance concrete self compacting concrete, Light Weight Concrete, Pre-stressed concrete, Roller Compacted Concrete,, Air-entrained concrete and Shotcrete	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to Concrete	06	--	--	06
II	Cement	02	04	04	10
III	Aggregates	02	04	04	10
IV	Water Cement Ratio and Strength	02	04	--	06
V	Workability	--	06	--	06
VI	Mix Design	02	--	04	06
VII	Non-Destructive Testing of Concrete	--	04	--	04
VIII	Quality Control during Concreting		04	08	12
IX	Quality Control after Concreting	02	04	06	12
X	Admixtures and special concrete	--	04	04	08
	TOTAL	**16**	**34**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that*

common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises* (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	**Any THREE** of the following	
		Determination of fineness of cement	02
		Determination of water for cement paste of normal consistency	02
		Determination of initial & final setting time	02
		Determination of soundness of cement	02
		Determination of compressive strength of cement	02
2	III	**Any FIVE** of the following	
		Determination of silt in aggregate	02
		Determination of bulking of sand	02
		Determination of specific gravity, Flakiness and elongation Index	02
		Determination of fineness modulus of fine aggregate and coarse aggregate	02
		Determination of aggregate crushing value	02
		Determination of aggregate impact value	02
3	V	**Any TWO** of the following	
		Slump Test	06
		Compaction factor Test	06
		Compressive strength of concrete using different W.C. ratio.	06
4	VII	Conduct non destructive test by Rebound hammer and UPV on concrete member.	04
		TOTAL	**32**

*These tests may be conducted on the samples collected during field visits.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Undertake visit to construction site and collect few Samples from nearby site to find out different Properties of concrete
2. Visit to concrete Testing Laboratory for awareness related to other concrete Testing Equipment, concrete Testing Report

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Video Clips of Concrete Testing, interact with students by asking questions
2. Show Picture Clips through Power Point regarding Testing of Concrete

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Concrete Technology	M. S. Shetty	S. Chand & Co. Ltd.
2	Concrete Technology	M. L. Gambhir	Tata McGraw Hill Ltd.
3	Properties of Concrete	A. M. Neville	Pitman
4	Concrete Technology	Dr. K. T. Krishna swami	Dhanpatrai & Sons
5	Concrete Technology	R. S. Vashney	Oxford & IBH Publishing co, Bombay
6	Concrete Technology	Dr. D. K. Gupta	Nirali Publication

B) Standards

I.S. 269	Specifications for O.P.C.
IS. 12269	Specifications for O.P.C. 53 Grade
I.S. 383	Specifications for coarse and fine aggregates
I.S. 516	Methods of tests for strength of concrete
I.S. 2386 Part I to VIII	Methods of tests for aggregate for concrete
I.S. 456	Code of practice for plain and R.ee.
I.S. 2340	Methods for sampling of aggregates for concrete
Sp 23	Handbook for concrete Mix Design
I.S. 4031	Methods of physical tests on Hydraulic cement
I.S. 13311	Methods of non destructive testing of concrete
I.S. 1199	Methods of sampling and analysis of concrete
I.S. 10262- 2009	Recommended guidelines for concrete mix design

C) Software/Learning Websites

1. www.issnge.org
2. www.britannica.com
3. www.nptel.ac.In
4. www.springer.com
5. www.trb.org

D) Major Equipment/ Instrument with Broad Specifications

(i) Ennore sand of 3 grades (ii) Cube Moulds of size 7.07cm (iii) Mortar Mixer (iv) Compression Testing m/c (v) Le-chatlier mould (vi) Water bath (vii) I.S sieve sets (viii) Moulds for Aggregate Crushing and Impact Test (ix) Impact test Apparatus (x) Thickness and Length gauge (xi)Cube Moulds of size 15cms (xii) Slump cone (xiii) Compaction factor Apparatus (xiv) Schmidt Rebound Hammer (xv) UPV testing machine (XVI)Table Vibrator.

Note: Machines/equipments of latest technical specifications at the time of procurement shall be provided.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M		L								
CO2			H	M							
CO3	M	H	M			M		M	M		L
CO4			H	M	M						
CO5			H	H			M			M	
CO6			H	M		M				M	
CO7			H	H		M	M		H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Hydraulics (HYD) **COURSE CODE :** 6204

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	01	02	06	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

It is necessary for civil, environmental and transportation engineers to understand the behavior of fluid flow in different conditions in pipes, channels, canals, notches, weirs etc. In the field these conditions are very common and diploma passouts have to solve problems related to water seepage and discharge.

The basic knowledge about hydraulics and fluid mechanics will be useful in fields like Irrigation, Water Resources Management and Public Health Engineering. In this course, basics of hydraulics and its application oriented content have been kept with a focus such that students should be able to solve practical problems. Competencies developed by this course would therefore be useful for students while performing his/her job in the field of Water resources / Irrigation and Environment Engineering/PHE.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the Physical properties of fluid.
2. Understand the concept of pressure.
4. Use pressure measuring device
5. Know the concept of total hydrostatic pressure and centre of pressure.
6. Identify the types of fluid.
7. Calculate the Flow through pipes.
8. Design the open channels.
9. Calculate the discharge using orifice, notch, venturimeter and weir.
10. Know pumps, their working, types of pumps and their selection criteria.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the properties of fluid.
2. Use the pressure measuring devices.
3. Compute the total hydrostatic pressure and center of pressure.
4. Identify the types of fluid flow.
5. Find the major and minor head losses for flow through pipes.
6. Measure flow through orifice, notches, venturimeter, weirs.
7. Discuss the open channel flow.
8. Selection of pump and calculate the horse power of pump.
9. Explain the velocity and discharge measuring devices.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive Doman)	Topics and Sub-topics	Hours
Unit-I **Hydraulics and Physical Properties of Fluids**	1a. Define fluid mechanics and hydraulics. 1b. State the importance and uses of hydraulics in Civil Engineering. 1c. Define the fluids properties. 1d. State the units for fluid properties. 1e. Solve the numerical on properties of fluid	1.1 Definition of fluid. 1.2 Definition of fluid mechanics and hydraulics. 1.3 Importance of learning hydraulics with special reference to Irrigation Engineering and Environmental Engineering. 1.4 Definition and S.I. units- specific weight, volume, mass, density, specific gravity, viscosity, surface tension and compressibility. 1.5 Viscosity, surface tension and compressibility. 1.6 Problems on Properties of fluid.	04
Unit-II **Pressure and its Measurements.**	2a. Define pressure and pressure head. 2b. State Pascal's law. 2c. Explain atmospheric pressure, Absolute pressure and gauge pressure and relation between them. 2d. Classify the pressure measuring devices. 2e. Solve the numerical on Pressure measurement. 2f. Find the pressure with pressure measuring device. 2g. Draw the sketch for Bourdon pressure gauge. 2h. Explain the working of Bourdon pressure gauge.	2.1 Definitions – pressure, free liquid surface, pressure head. 2.2 Pressure at a point in static liquid. 2.3 Pascal's law, Variation of pressure in horizontal and vertical direction. 2.4 Atmospheric pressure, Absolute pressure, gauge pressure, relation between them, problems on calculation of gauge pressures and absolute pressures. 2.5 Measurement of pressure. • Different devices for measurement of pressure. • Manometers- Simple Manometers, Piezometers, U Tube Manometers, Differential Manometers, Inverted U Tube Manometers, problems on Manometers. 2.6 Mechanical Gauges-Bourdon pressure gauge.	06
Unit-III **Hydrostatic Pressure**	3a. Define total pressure and center of pressure. 3b. Derive an equation for total pressure and center of pressure for horizontal and vertically immersed surface. 3c. Draw Pressure diagram for horizontal and vertically immersed surface.	3.1 Definition of total pressure and center of pressure. 3.2 Expression for total pressure and depth of center of Pressure on surface immersed in static liquid, Problems. 3.3 Pressure diagram- Definition and its use. 3.4 Total pressure on vertical and inclined faces of Gravity dam.	06
Unit-IV **Fundamentals of Fluid Flow**	4a. Identify the types of flow. 4b. Define Discharge. 4c. State Continuity equation for liquids.	4.1 Types of flow – steady and unsteady, uniform and non-uniform, laminar and turbulent, compressible and incompressible flow, various combination of flow with examples.	06

Unit	Major Learning Outcomes (in cognitive Doman)	Topics and Sub-topics	Hours
	4d. State Bernoulli's theorem. 4e. Solve numerical on Bernoulli's theorem. 4f. Define Datum head, pressure head, velocity head, total head	4.2 Discharge and its units. 4.3 Continuity equation for liquids. 4.4 Datum head, pressure head, velocity head, total head, Bernoulli's theorem, loss of head, modified Bernoulli's theorem, problems on Bernoulli's theorem.	
Unit-V **Flow through pipes**	5a. Explain Energy (Head) losses (major and minor in pipes). 5b. Draw Hydraulic Gradient Line (HGL) and Total Energy Line (TEL) 5c. Design Pipeline network using formula and nomograms. 5d. Define Reynolds number and State its significance. 5e. Determine the flow through pipes in series and parallel. 5f. Derive the equation for equivalent pipe. 5g. Define Water hammer. 5h. List the Causes, effects and remedial Measures for Water hammer. 5i. Solve the numerical on flow through pipes.	5.1 Loss of head due to friction, Darcy Weish Bach equation, common range of friction factor for different types of pipe material. 5.2 Reynolds number and its significance, relative Roughness. 5.3 Determination of coefficient from Moody's diagram. 5.4 Minor head losses in pipe : loss of head due to sudden contraction, gradual expansion and gradual Contraction, loss of head at entrance, exit and loss of head in various pipe fittings such as bends, elbows. 5.5 Hydraulic gradient line and total energy line and drawing the HGL and EGL. 5.6 Flow through pipes in series and parallel, Compound pipe, equivalent pipe. 5.7 Water hammer- Causes, effects and remedial Measures, surge tank. 5.8 Use of nomograms for design of water distribution system. 5.9 Problems on flow through pipes.	06
Unit-VI **Flow Measurements**	6a. Explain the volumetric measurement of discharge in closed conduits. 6b. Classify orifice. 6c. Determine Coefficients Cc, Cv and Cd for orifice. 6d. Derive the equation for small circular orifice. 6e. Solve problems on calculation of hydraulic coefficient and discharge through small circular orifice. 6f. List the Discharge measuring devices in closed conduits. 6g. Explain venturimeter,	6.1 Volumetric measurement of discharge by measuring tank. 6.2 Orifice, jet of flow, Vena contracta, use of orifice. • Classification of orifice according to size, shapes and discharges condition. • Coefficient of contraction, Coefficient of velocity, Coefficient of discharge. Derivation of relation between them. • Determination of Cc, Cv, Cd. • Discharge through small circular orifice, • Problems on calculation of hydraulic coefficient and discharge through small circular orifice.	10

Unit	Major Learning Outcomes (in cognitive Doman)	Topics and Sub-topics	Hours
	Orifice plate meter and Water meters. 6h. List the discharge measuring devices used in open channels. 6i. List the types of notches. 6j. Derive an expression for discharge through rectangular and triangular notch. 6k. Differentiate between rectangular and triangular notch. 6l. Explain effect of end Contraction and velocity of approach on discharge computation. 6m. Explain weir and flumes. 6n. List the velocity measuring devices. 6o. Explain current meter. 6p. State the working principle of Pitot tube. 6q. Explain velocity area measurement method for channel.	6.3 Discharge measuring devices in closed conduits. • Venturimeter, principle, component parts, expression for discharge through Venturimeter, coefficient of discharge. • Orifice plate meter-Expression for discharge, situation where orifice plate meter is used. • Water meters- Principle and use. 6.4 Discharge measuring devices used in open channels. • Notches – types of notches, expression for discharge through rectangular and triangular notch. Francis formula, effect of end contractions and velocity of approach on discharge computation, cippolitte weir. • Weir- Broad crested weir, ogee shaped spillway. Expression for discharge. • Flumes- venturiflumes, standing wave flume, expression for discharge. • Situations where the above devices are used. 6.5 Velocity measuring devices. • Floats- surface floats. Pitot tube – Principle, types, Expression for velocity. Current meter –Types. 6.6 Velocity area measurement method for channel.	
Unit-VII **Flow Through Open Channels**	7a. Define wetted perimeter, wetted area, hydraulic mean depth. 7b. Write Chezy's formula and Manning's formula for calculation of discharge through an open channel. 7c. List common values of Chezy's constant and Manning's constant for different types of channel surfaces. 7d. Define most economical channel section 7e. Derive expressions for	7.1 Different shapes of artificial channels, wetted perimeter, wetted area, hydraulic mean depth. 7.2 Chezy's formula and Manning's formula for calculation of discharge through an open channel. 7.3 Common values of Chezy's constant and Manning's constant for different types of channel surfaces. 7.4 Most economical channel section, Expressions for most economical rectangular and trapezoidal Channel sections.	06

Unit	Major Learning Outcomes (in cognitive Doman)	Topics and Sub-topics	Hours
	most economical rectangular and trapezoidal Channel sections. 7f. Explain hydraulic jump.	7.5 Hydraulic jump, situations where hydraulic jump occurs, uses of hydraulic jump.	
Unit-VIII **Pumps**	8a. Define Pumps and turbines. 8b. Classify pumps. 8c. Identify turbines. 8d. List the components of centrifugal pump. 8e. Compute the power required for pumps. 8f. Explain the Principle of working of centrifugal and reciprocating pumps. 8g. Explain priming of pump. 8h. List the factors for Selection and choice of type of pump. 8i. Explain Submersible pump and turbine pumps.	8.1 Definition of Pumps, Types of Pumps. 8.2 Centrifugal pumps– Principle of working, component parts, priming of pump and calculation of power required for pumps. 8.3 Reciprocating pumps – component parts and working. 8.4 Submersible pump and turbine pumps. 8.5 Selection and choice of type of pump. 8.6 Turbines- Definition and types.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH HOURS AND MARKS (THEORY)

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Hydraulics and Physical Properties of Fluids	04	--	--	04
II	Pressure and its Measurement.	02	04	02	08
III	Total Hydrostatic Pressure	04	02	02	08
IV	Fundamentals of Fluid Flow	--	08	02	10
V	Flow Through Pipes	02	08	04	14
VI	Flow Measurement	04	10	06	20
VII	Flow Through Open Channels.	02	06	02	10
VIII	Pumps	02	02	02	06
	TOTAL	**20**	**40**	**20**	**80**

Legends: R = Remembrance; U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

A. Practical Exercises

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	VI	Measurement of discharge by volumetric method.	02
2	II	a. Measurement of pressure by piezometer, U tube differential and Inverted U tube Manometer. b. Study of Bourdons pressure gauge.	04
3	IV	Verification of Bernoulli's theorem.	02
4	VI	Determination of coefficient of venturimeter.	02
5	VI	Determination of Cc, Cv, Cd, of a sharp edged circular orifice.	02
6	VI	Determination of Cd of a triangular or rectangular notch.	04
7	V	Determination of coefficient of a friction of given pipes.	04
8	V	Determination of minor losses in a pipe line – loss due to sudden Contraction, loss due to sudden expansion, loss due to valves or bents or elbows.	04
9	V	a. Study and use of Moody's chart No 1 & 2. b. Use of nomograms for Manning's equation.	02
10	VIII	Study of centrifugal pump: care to be taken in installation, selection of pump for designed discharge, Catalogues available from pump manufacturers.	02
11	VI	Study and use of Current Meter or Water Meter.	02
12	IV	Study of significance of Reynolds's number.	02
		TOTAL	**32**

B. Tutorial Exercises

Sr. No.	Unit No.	Tutorial Exercises	Approx. Hrs. required
1	I	Hydraulics and Physical Properties of Fluids(Problems)	02
2	II	Pressure and its Measurement. (Problems)	02
3	III	Total Hydrostatic Pressure (Problems)	02
4	IV	Fundamentals of Fluid Flow. (Problems)	02
5	V	Flow Through Pipes. (Problems)	02
6	VI	Flow Measurement. (Problems)	02
7	VII	Flow Through Open Channels. (Problems)	02
8	VIII	Pumps. (Problems)	02
		TOTAL	**16**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect specifications and rates of pumps.
2. Visits for studying various types of flows.
3. Collect specifications of different types of pipes available in market, their properties and rates.
4. Search video demonstration on pressure measuring devices and prepare report on it.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Take observations and study the details of various of hydraulics instruments.
2. Calculations and graphical calibration of results.
3. Assignments for solving problems.
4. Arrange visit to study different hydraulics concepts.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Hydraulics & Fluid Mechanics	Dr. P. N. Modi Dr. S. M. Seth	Standard Book House, Delhi
2	Fluid Mechanics & Hydraulic Mechanics	Dr. R. K. Bansal	Laxmi Publication New Delhi
3	A Text Book of Hydraulics, Fluid Mechanics, Hydraulic Machines	R. S. Khurmi	S. Chand & Company Ltd. New Delhi
4	Hydraulics & Fluid Mechanics	S. Ramamurtam	Dhanpat Rai & Sons, Delhi
5	Hydraulic Laboratory Manual	S. K. Likhi	T.T.T.I. Chandigarh
6	Fluid Mechanics and Hydraulics	Dr. S. K. Ukarande	Ane Books Pvt. Ltd.

B) Software/Learning Websites

1. www.waterbouw.tudelft.nl/
2. www.learnrstv.com
3. www.shiksha.com, IIT, Roorkee
4. www.blackwellpublishing.com
5. www.hrpwa.org
6. www.creativeworld9.com vii.nptel.iitm.ac.in

C) Major Equipment/ Instrument with Broad Specifications

SN	Equipment/ Instrument with Broad Specifications
1	**Bourdon pressure gauge- and Dead Weight Pressure gauge** - 10 kgf/cm^2
2	**Experimental setup of Bernoulli's Theorem.**
3	**Venturimeter Test Rig-** Venturimeter. (Cast iron /Brass) 25mm & 50mm with accessories like collection tank & differential manometer.
4	**Orifice meter Test Rig-**with accessories like collection tank, stand and scale.
5	**Orifice Apparatus-** with collection tank, stand, scale & slide attachment.
6	**Rectangular and V notch apparatus** - with accessories like collection tank, stand, hook gauge scale & slide attachment.
7	**Hydraulic Bench Setup-** with all accessories such as collecting tank & differential manometer.
8	**Centrifugal pump Test rig-** Centrifugal Pump Test Rig At Constant SPEED- 3 HP capacity 1500 RPM – Centrifugal pump, provided with three phase motor, vacuum gauge at suction and pressure gauge on discharge pipe, gate valve at discharge, which facilitate estimation of pump performance at various discharge heads.
9	**Current meter.**
10	**Model / Charts-** of Pumps Centrifugal pump, Reciprocating Pumps and all hydraulic equipments.
11	**Reynolds Apparatus-**Tank, transparent pipe, dye attachment, collecting tanks and accessories.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H									
CO2	H										
CO3			H	M							
CO4	H										
CO5	H			L			M				
CO6		H		M							
CO7		H	M					M		L	
CO8		H		H				M			M
CO9				M							

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Mechanics of Structures (MOS) **COURSE CODE** : 6205

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR			TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Concepts and principles involved in the design of various structural components are covered in this course. It forms a core course. Analysis of structures needs the basic understanding of mechanical properties of materials and their behaviour. The approach of teaching should be to develop critical thinking in students and integrate the knowledge and develop desired skills in students.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the basic principles of behaviour of the material subjected to various loads.
2. Apply the principles to field situation.
3. Understand the procedure of testing the materials and develop the ability of interpreting results.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Calculate various structural material properties under different loading Condition.
2. Analyse Statically Determinate structures.
3. Draw shear force and bending moment diagram for different beams.
4. Calculate stresses due bending and shear in beams.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Stress and Strain**	1a. Define different properties of Material. 1b. Analyse simple, composite / compound sections and Calculate direct stress, different strains. 1c. Compute punching shear stresses.	1.1 Concepts of elastic, plastic and rigid bodies, concepts of deformation, stresses and strains different material Properties like Ductility, Brittleness, Hardness, Toughness, Malleability, Fatigue etc. 1.2 Axial tensile and compressive loads, Hooke's Law, axial stresses, axial strain, lateral strain, Poisson's ratio, volumetric strain, problems on bars of uniform cross section and different cross sections (stepped bars). 1.3 Behaviour of mild steel under tensile loading, stress-strain curve, limit of proportionality, yield stress, Ultimate stress, Breaking stress, factor of safety, safe stress, working stress.	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.4 Composite sections under axial load, modular ratio, simple problems on analysis of composite sections 1.5 Concept of bi-axial stresses, tri-axial stresses, equations of total strain in three directions, Equation for Volumetric Strain. 1.6 Definition of temperature stress, nature of stresses. Simple problems on temperature stresses in homogeneous sections only (No problems on composite sections) 1.7 Concept of shear load, shear stress and shear strain, modulus of rigidity, simple shear, complementary shear stresses, Punching Shear. 1.8 Elastic constants, relation between modulus of Elasticity, modulus of rigidity and bulk modulus. (No derivations of these relations) Numerical problems on all of the above	
Unit-II **Strain Energy**	2a. Compute Strain Energy under Different Types of Loading	2.1 Concept of strain energy, types of loading-gradually, suddenly applied and impact loading, stresses due to these three types of loading. 2.2 Strain energy stored due to these three types of loading, Resilience, proof resilience, modulus of resilience. Numericals on above	06
Unit-III **Moment of Inertia**	3a. Compute Moment of Inertia of Symmetrical & unsymmetrical sections	3.1 Concept of moment of inertia for plane areas, radius of gyration, expression for moment of inertia about centroidal axes for regular plane areas such as rectangular, triangular, circular and semicircular sections. Section modulus 3.2 Parallel axes theorem, perpendicular axes theorem and polar moment of inertia. Moment of inertia of composite sections. Numericals on above.	08
Unit-IV **Shear Force and Bending Moment**	4a. Draw Shear Force & Bending Moment Diagram for Statically Determinate Beams	4.1 Concept and definitions of shear force and bending moment, sign conventions, relation between bending moment, shear force and rate of loading. 4.2 Shear force and bending moment diagrams for simply supported, cantilever and overhanging beams subjected to concentrated loads, uniformly distributed load and couples, point of zero shear, Point of contra-flexure	14
Unit-V **Bending Stresses**	5a. Apply Bending Theory. 5b. Calculate Bending Stress 5c. Draw stress distribution	5.1 Concept of pure bending, theory simple bending, Assumption in the theory of pure bending, stress distribution diagram, Equation of moment of resistance, flexure equation (Derivation not required). 5.2 Application of theory of bending, moment	09

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	diagram	of resistance for symmetrical and unsymmetrical sections of beam. Simple numerical problems on standard sections. (No problems on built up sections)	
Unit-VI **Shear Stresses in Beams**	6a. Calculate shear Stress 6b. Draw stress distribution diagram	6.1 Shear stress equation (Derivation not required), meaning of terms in equation. 6.2 Shear stress distribution diagrams for solid and hollow rectangular section, solid and hollow circular section, I-section, T-section, channel section. Numerical problems on circular and rectangular section only. 6.3 Relations between maximum shear stress and average shear stress for solid rectangular and solid circular section.	06
Unit-VII **Columns**	7a. Calculate load carrying capacity of columns and struts	7.1 Definition, types of end conditions for columns, classification of columns 7.2 Buckling of axially loaded compression Member, effective length, radius of gyration, slenderness ratio. 7.3 Euler's theory, assumptions, buckling loads, factor of safety, safe load, Limitation of Euler's formula. 7.4 Euler's Formula and Rankin's Formula for Critical Load, analysis and design of solid/Hollow circular, solid /Hollow rectangular, I- section, T- section and Channel section only. Introduction of Built up section. (No numerical problems on Built Up section)	05
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Stress and Strain	02	06	12	20
II	Strain Energy	02	02	04	08
III	Moment of Inertia	02	04	06	12
IV	Shear Force and Bending Moment	02	04	10	16
V	Bending Stresses	--	02	08	10
VI	Shear Stresses in Beams	--	02	06	08
VII	Columns	02	--	04	06
	TOTAL	**10**	**20**	**50**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Identify and Observe Functions of different parts of Universal Testing Machine.	02
2	I	Tension test on mild steel specimen.	04
3	I	Tension test on HYSD / TMT steel specimen.	04
4	I	Compression test on aluminium, copper, brass, cast iron (any **TWO** metals)	02
5	I	Compression test on timber (Along the grains and across the grains)	02
6	IV/V/VI	Flexural behaviour of timber or steel beam.	04
7	II	Izod Impact test on Aluminium, Copper, Mild Steel, Brass, Cast Iron (any **TWO** metals)	02
8	II	Charpy Impact test on Aluminium, Copper, Mild Steel, Brass and Cast Iron. (any **TWO** metals)	02
9	IV/V	Flexural test on floor tiles./Roffing tiles (Any ONE type of tile)	02
10	I	Compression test on Bricks.	02
11	I	Abrasion test on Flooring Tiles.	02
12	I	Water absorption test on bricks or flooring tiles.	02
13	I	Shear test on Mild Steel, Aluminium, Copper, Brass, Cast Iron (any **TWO** metals)	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Observe and collect samples of different construction materials used on site.
2. Carry out field test on different construction materials on site.
3. Collect samples of construction materials from site and carry out test in laboratory.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Videos and slides involving conduct of Test on different Materials.
2. Arrange site Visit.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mechanics of Materials	Beer and Johnson	McGraw Hill
2	Strength of Materials	Singer and Pytel	Harper & Row
3	Strength of Materials	Ramamrutham	Dhanpat Rai and Sons
4	Strength of Materials	Schaum's outline Series William Nash	McGraw Hill
5	Strength of Materials	Timo Shenko and Young	CBS Publisher & distributors
6	Mechanics of structure	Buchanan	olt Rinehart & Winston Inc.
7	Introduction To solid Mechanics	Irving H. Shames & Titarress	Eastern Economy Edition
8	Strength of Materials	B. K. Sarkar	Tata McGraw Hill

B) Software/Learning Websites

1. www.nptel.com
2. www.youtube.com
3. www.howstuffworks.com
4. www.sciencedirect.com
5. www.wikipedia.org

C) Major Equipment/ Instrument with Broad Specifications

Digital Universal Testing Machine (1000kN)
Compression Testing Machine (200 tonne)
Torsion Testing Machine
Impact testing Machine
Hardness testing Machine
Tile Flexure Testing Machine
Tile Abrasion Testing Machine

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H									
CO2	H	H	M								
CO3		H									
CO4	H	H									

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Geotechnical Engineering (GTE) **COURSE CODE** : 6206

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Every structure such as building, bridges, dams, towers, monuments are supported by soil and rock. The stability of all structures depends upon behaviour of soil and capacity of soil to carry loads under different environmental conditions.

The soil & rock are also used as construction materials for embankments, roads, dams, mud walls.

Thus it becomes mandatory to learn this course which includes knowledge of physical properties, classification of soil, its behaviours and various techniques to improve soil properties.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Explain soil as three-phase system and establish relationship between properties of soil.
2. Determine properties of soil by following standard test procedure and plot particle size distribution curve.
3. Determine permeability by constant head and falling head test using Darcy's Law
4. Obtained OMC & MDD for any soil sample by performing Proctor Compaction test.
5. Calculate shearing strength of soil.
6. Explain the process of compaction, consolidation and soli stabilization.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1 Explain various engineering properties / characteristics of soil with respect to construction and engineering applications
2 Conduct different laboratory tests for determining engineering properties / parameters of a soil.
3 Evaluate engineering properties / characteristics of soil for their suitability to construction of engineering structures.
4 Explain essential features and requirements of site investigation with respect to soil.
5 Conduct field tests to determine properties of soil
6 Describe the process of soil compaction and consolidation
7 Supervise the process of soil stabilization

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Importance of Geotechnical Engineering**	1a. List structures where soil is used as Construction material, 1b. State the examples of us of soil in Civil	1.1 Necessity & importance of soil Mechanics, definition of soil, 1.2 Use of soil as a constructional material & foundation bed	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Engineering structures		
Unit-II **Physical properties of Soil**	2a. Explain phase diagram of Soil 2b. Discuss various index properties of soil for the purpose of their classification & Use 2c. Describe interrelationship between different index properties	2.1 Mass of soil, soil as a three phase system 2.2 Properties like void ratio, Porosity, degree of saturation, dry density, bulk density, water content and their determination. 2.3 Three phase diagram for dry soil, wet soil & saturated soil. 2.4 Typical values of these parameters for common type of soil 2.5 Mechanical sieve analysis, grain size distribution curves, characteristics & interpretation, effective size, uniformity coefficient, coefficient of curvature & its significance, well graded, poorly graded & uniform soil 2.6 Classification of soil based on Indian standard classification method	08
Unit-III **Atterberg's Limits**	3a. Classify Soil based on Consistency Limits	3.1 Consistency of soil, Atterberg's limits of consistency: Liquid limit, plastic limit & shrinkage limit, plasticity index, determination of Liquid limit, plastic limit & shrinkage limit, plasticity index 3.2 Plasticity chart and A- line diagram, soil classification Shown on plasticity chart	06
Unit-IV **Permeability of Soil**	4a. Explain concept of permeability & its implications with respect to use of soil. 4b. Determine Permeability of given soil. 4c. Comprehend the concept of Seepage Analysis in relation to 'quick sand condition' with examples	4.1 Definition of permeability, coefficient of permeability, Darcy's law, typical values of coefficient of permeability for various soils. 4.2 Determining coefficient of permeability by constant Head & Variable head method, Factors affecting permeability of soil, Quick sand condition.	06
Unit-V **Shearing Strength of Soil**	5a. Explain different terms used in the context of 'shear strength' of soil. 5b. Evaluate shear 5c. parameters of various types of soil, with their practical significance	5.1 Constituents of shearing resistance of soil, definition of cohesion and internal friction 5.2 Purely cohesive and non-cohesive soil, Coulomb's law & failure envelope 5.3 Determination of shear strength of soil by direct shear test, unconfined compression test and Vane shear test (no numerical problems)	06
Unit-VI **Bearing**	6a. Explain concept of bearing capacity of soil.	6.1 Concept of bearing capacity, ultimate bearing capacity, net ultimate capacity. Safe bearing capacity, Net	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Capacity of Soil	6b. Describe various methods to determine bearing capacity of soil. 6c. Explain plate load test	safe bearing capacity. 6.2 Typical values of bearing capacity for common soils from building code. 6.3 Introduction to plate load test, procedure & its limitation. (no numerical problems)	
Unit-VII **Compaction of Soil**	7a. Comprehend the principle and methods of compaction of soil 7b. Differentiate between compaction and consolidation with examples 7c. Determine MDD &OMC of soil by 7d. Conducting appropriate test	7.1 Concept of compaction, consolidation, compression & Settlement. Characteristics of compaction. 7.2 Difference between compaction & consolidation 7.3 Relation between moisture content & dry density under constant compaction effort. 7.4 Purpose of compaction in field, compaction curve, Optimum moisture content, maximum dry density. Light & heavy compaction test. 7.5 Factors affecting Compaction, Common methods of compaction in the field-rolling, ramming & vibration. Type of rollers. 7.6 Measurement of field density by core cutter method & Sand replacement method.	06
Unit-VIII **Soil Stabilization**	8a. Explain the methods of soil stabilization and suitability of each.	8.1 Concept of soil stabilization, need of soil stabilization. 8.2 Different methods of soil stabilization: mechanical stabilization, lime stabilization, cement stabilization, Bitumen stabilization, fly ash & lime stabilization in brief.	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Importance of Geotechnical Engineering	04	--	--	04
II	Physical properties of soil	04	08	04	16
III	Atterberg's limit	02	04	06	12
IV	Permeability of soil	02	04	04	10
V	Shearing strength of soil	04	04	04	12
VI	Bearing capacity of soil	02	04	--	06
VII	Compaction of soil	04	04	04	12
VIII	Soil stabilization	--	04	04	08
	TOTAL	**22**	**32**	**26**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Any eight of the following	
1	II	Determination of water content of the given soil sample by oven dry method.	04
2	II	Determination of specific gravity by pycnometer method	04
3	II	Mechanical sieve analysis & grain size distribution curve for a given soil sample	04
4	III	Determination of liquid limit of given soil sample	04
5	III	Determination of plastic limit of given soil sample	04
6	III	Determination of shrinkage limit of given soil sample	04
7	III	To carry out field identification tests on soil	04
8	VII	Determination of bulk density & dry density of soil by sand replacement method.	04
9	VII	Determination of MDD & OMC by standard proctor test for a given soil sample	04
10	VII	Determination of bulk density and dry density by core culter method	04
11	V	Determine the shear strength of soil by direct shear test	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect few samples & find out different characteristics/properties of Soil from nearby site
2. Undertake site visit related to road compaction& consolidation and prepare report
3. Visit to Soil Testing Laboratory for awareness related to other soil testing.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Video Clips of Soil Testing and interact with students by asking questions
2. Show Picture Clips through Power Point regarding Testing of soil
3. Video programs on soil engineering tests - by NITTTR - Bhopal

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Soil Mechanics & Foundation	Dr. B C Punamia	Standard Book House
2	Modern Geo Technical Engineering	Dr. Alam singh	Jodhpur University
3	Textbook of Soil Mechanics & Foundation Engineering	V N S Murthy	UBS Publisher
4	Soil Sampling & Testing Manual	Dr A K Duggal	NITTTR, Chandigarh
5	Soil Mechanics & foundation Engineering	B. J. Kasmalkar	Pune Vidhyarti Griha, Pune
6	Soil Mechanics & foundation Engineering	Dr. K. R. Arora	Standard Publishers and Distributors

B) IS codes

IS 2720, IS 1892, IS 2132, IS 2809.

C) Software/Learning Websites

1. www.issnge.org
2. www.springer.com
3. www.britannica.com
4. www.trb.org
5. www.nptel.ac.In

D) Major Equipment/ Instrument with Broad Specifications

1. Core Cutter
2. Hot Air Oven
3. Sand Pouring Cylinder
4. Pyconometer Bottle
5. Set of IS Sieves
6. Casgrande Apparatus
7. Direct Shear Apparatus
8. Electronic Weighing Balance
9. Heavy & Light Proctor Test Apparatus
10. Plastic and shrinkage limit apparatus.
11. Permeability Apparatus- constant and falling head.
12.

Note: Machines/equipments of latest technical specifications at the time of procurement shall be provided.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M		L								
CO2			H	M							
CO3	L	H	H			M		M	M		L
CO4			H	M	M						
CO5			H	H			M			M	
CO6			H	M		M				M	
CO7			H	H		M	M		H		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Highway Engineering (HEG) **COURSE CODE :** 6207

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Transportation plays an important role in the development of country. Highways are one of the most important and easy mode of transportation in our country. The prosperity of the nation is directly based on development of communication network. The roads are easy and effective mode of communication. This course gives the knowledge and skills required to carry investigations, planning, design, construction and maintenance of different works related to roads and highways.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Select suitable road type and investigations for road alignment.
2. Supervise the road construction.
3. Suggest maintenance procedure of roads.
4. Understand the basic principles of traffic engineering

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify various types of roads
2. Decide investigations required for road alignment.
3. Prepare geometric design of roads.
4. Plan, organize and supervise the road construction activities.
5. Suggest necessary highway drainage arrangement.
6. Select maintenance and repair techniques for roads.
7. Apply the knowledge of basic principles of traffic engineering.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Importance and Classification of Roads**	1a. Classify various types of roads 1b. State road development plans. 1c. State importance of highway network.	1.1 Classification of Roads according to function, traffic and tonnage. 1.2 Development plan of roads, Nagpur plan & Third Road development plan, IRC classification. 1.3 Classification of Urban Roads. 1.4 Importance of highway network.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Investigation for Road Project**	2a. Describe investigations required for road alignment. 2b. List drawings required for different roads	2.1 Reconnaissance survey, Preliminary survey and Location survey for a road project. 2.2 Fixing the alignment of road, factors affecting alignment of road. 2.3 Detailed survey for cross drainage- L-section and C/S sections. 2.4 Drawings required for road project- Key map, Index map, Preliminary survey plan and detailed location survey plan, L-section and C/S sections cross drainage work, land acquisition plan. 2.5 Survey for availability of construction material, location plan of quarries.	04
Unit-III **Geometric Design of Highways**	3a. Identify various components of roads. 3b. Define and state types of camber. 3c. Define and state types of gradient 3d. Calculate sight distances. 3e. State necessity and types of curves for road. 3f. Calculate super-elevation as per IRC recommendations. 3g. Draw cross sections of road in cutting and embankment.	3.1 Highway cross-section, right of way, carriage way, Road margin, shoulder, formation width. 3.2 Camber- definition, purpose, types, IRC Specification. 3.3 Gradient- Definition, Types, IRC Specification. 3.4 Sight distances- Definition, types. 3.5 Curves- Necessity, Types: Horizontal, vertical and transition curves, widening of road on Curves. 3.6 Super elevation- definition, object, formula for Calculating super elevation IRC Recommendations for super elevation and methods of providing super elevation. 3.7 Typical cross section of National and state Highways in cutting and embankment with dimensions. Simple problems on geometric design of roads.	12
Unit-IV **Construction of Road Pavements**	4a. Differentiate between flexible and rigid pavement. 4b. Explain soil stabilization methods. 4c. Explain road construction procedure for WBM, WMM, bituminous and concrete roads. 4d. Identify IRC recommendations for WBM road 4e. Define road terminology for bituminous roads. 4f. Identify and explain different joints for	4.1 Road pavements – objectives, classification-flexible & Rigid pavements, structure of pavements, function of pavements components 4.2 Earthwork and preparation of sub grade, borrow pits, spoil bank, lead and lift balancing of Earthwork, construction procedure of earth roads. 4.3 Soil stabilization- Necessity objective and Methods of soil stabilization. 4.4 W.B.M. Road Definition, IRC recommendation. for materials and grading of aggregate, construction procedure and precautions. Wet mix macadam (WMM) Road and its construction procedure. 4.5 Bituminous roads- Definition of asphalt, tar, Emulsion, cut back, prime coat, tack coat, seal coat, surface dressing, grouting	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	concrete roads.	and construction procedure. 4.6 Concrete pavements – Definition, construction Materials, method of construction, construction joints, joint filler, joint sealer, equipments used.	
Unit-V **Road on Hilly area**	5a. Identify components of hilly road. 5b. State causes and prevention of landslides. 5c. Describe cross drainage structures for hilly roads.	5.1 Components of roads on hilly area - curves, super Elevations, design speed, IRC permissible gradients. Hilly road formation. 5.2 Causes and prevention of landslides. 5.3 Cross drainages structures, safety structures in hilly areas. Gabions and rock bolting.	04
Unit-VI **Highway Drainage and Arboriculture**	6a. Define highway drainage terminology. 6b. State necessity of highway drainage. 6c. Explain various road drainage structures. 6d. State necessity of arboriculture. 6e. Select proper trees and plantation type for road arboriculture.	6.1 Highway drainage – Definition, necessity, surface drainage, cross drainage, sub-surface drainage Cross drainage, i.e. Side gutter, catch water drains, longitudinal drain and cross drains. 6.2 Arboriculture- Necessity, selection of trees and Plants.	04
Unit-VII **Maintenance of roads**	7a. State necessity and maintenance of roads. 7b. Describe various road maintenance procedures.	7.1 Necessity of maintenance of roads. 7.2 Maintenance operations – ordinary, routine and periodic maintenance. Maintenance of W.B.M., WMM, bituminous concrete roads, materials required and procedure. 7.3 Carpeting of Road-Bituminous / Tar Carpeting Procedure	04
Unit-VIII **Traffic Engineering**	8a. State importance of traffic volume study. 8b. Identify traffic-road signs 8c. Describe different types of road intersections 8d. Explain traffic segregation structures.	8.1 Study of traffic volumes. 8.2 Controlling of traffic-road signs, signals, road safety criterion and islands. 8.3 Road intersection- intersection of grade and Separation of grade. 8.4 Segregation of traffic- flyovers, over bridge, clover leaf. 8.5 Concept of traffic management, role of GPS in traffic management.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Importance and Classification of Roads	04	--	--	04

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
II	Investigation for Road Project	--	06	--	06
III	Geometric Design of Highways	04	04	10	18
IV	Construction of Road Pavements	08	08	08	24
V	Road on Hilly area	--	06	--	06
VI	Highway Drainage and Arboriculture	04	04	--	08
VII	Maintenance of roads	--	02	04	06
VIII	Traffic Engineering	04	04	--	08
	TOTAL	**24**	**34**	**22**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
01	III	Drawing of cross- section of National Highway, State Highway in cutting and embankment with detail dimensions to a suitable scale on full imperial drawing sheet..	04
02	II, III	Drawing work for a Road Project of minimum 0.5 km. Length having at least one small cross drainage work from the survey data available. Drawing sheet/s (full imperial) shall consist of Road plan, longitudinal section and typical cross sections of the road in cutting and embankment.	08
03	IV	Visit to a road under construction/constructed to study the construction of (a) WBM / WMM road or Bituminous pavement road (b) Cement concrete pavement road for observing the type of construction and construction equipments. Prepare Visit Report.	04
04	IV	Video demonstration for a) softening point test, b) Penetration test c) flash and fire point test. Write laboratory procedure for performance of these tests.	04
05	VII	Prepare maintenance schedule/report for WBM / WMM road, Bituminous pavement road and Cement concrete pavement road	04
06	VII	Visit to a W.B.M. / WMM or Bituminous road for observing the different types of Defects in roads. Prepare a visit report. Report should consist of (a) List of Various defects observed b) Suggestions regarding the possible remedial Measure.	04
07	VIII	Traffic volume study for an important road intersection in your city.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Watch online videos of hot-mix and cold-mix bituminous process and write report on it.
2. List various earth moving, bituminous and concreting equipments required for road construction. Collect specifications and prepare report on this activity.
3. Collect the drawings of ongoing/existing road construction.
4. Collect traffic signs from RTO office / internet.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. CAI package, video demonstration, charts, models, visits and expert seminar / lecture.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Highway Engineering	Khanna & Justo	Khanna Publisher
2	Transportation Engineering	N. L. Arora, S. P. Luthara	I. P. H. New Delhi
3	Transportation Engineering	Vazarani & Chandola	Khanna Publisher
4	Road, Railway, Bridges	Birdie & Ahuja.	S. B. H. New Delhi
5	Transportation Engineering	Kamala.	T. M. H. New Delhi
6	P.W.D. hand book	PWD Maharashtra	P.W.D. Maharashtra

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	H								
CO2		H	H					M			
CO3	H	H	H	M							
CO4		H	H					H	H	M	M
CO5		H				H					M
CO6		H	H	H		M	M			H	M
CO7		H			M	M	M				

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Railway and Bridge Engineering (RBE) **COURSE CODE** : 6208

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	--	04	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

Railway and Bridges having most important part of transportation media in our country. Due to the longer distance between metropolitans and varying train, railway are most economical mode of transportation.

In this course students are acquainted with investigation planning, execution and maintenance of railway & Bridge Engineering.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Know classification of railway and mode of transportation.
2. Understand geometrical design of railway station and yards.
3. Understand component parts and types of bridges.
4. Understand inspection and maintenance of railway and bridges.
5. Understand the basics of tunnel engineering.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Compare modes of transportation.
2. Identify gauges and component parts of railways.
3. Prepare geometrical design of part of railway.
4. Classify stations and yards.
5. Identify bridge types and components.
6. Suggest inspection and maintenance of railway and bridges.
7. Identify methods of tunnelling.

4.0 CONTENTS: THEORY:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction**	1a. Knowing the modes of transportation, comparison of each mode. 1b. Knowing the gauges & their importance. 1c. Knowing the classification of Indian Railway	1.1 Modes of transportation system- Road Railways, airways, waterways, importance of each mode. 1.2 Comparison and relative merits and demerits of each mode. 1.3 Gauges- Definition and their width, Necessity and importance of uniform gauge. 1.4 Classification of Indian Railway, Zones of Indian Railway.	02
Unit-II **Alignment**	2a. To know alignment Gauges & components	2.1 Permanent way – requirement of ideal permanent way. Different components of permanent way, Cross-section of B.G.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
gauges & permanent way (components Parts)		& M.G. line, single & double line in cutting and embankment. 2.2 Rails- Types, functions dimension weight per meter Length, Type of rail joint, ideal joint, creep and causes of creep, welding of rails and it's advantage 2.3 Sleeper & Ballast- Functions and requirement types of sleepers-wooden, metal, Concrete, prestressed, Stability and sleeper density. Quality of ballast, Functions and their properties. 2.4 Railway fixtures and fastenings – fixtures and fastenings of rails & sleepers, fishplate bearing plate, Spikes, bolts, keys, anchors elastic fastening & Bearing.	
Unit-III **Geometric design of track, Branching of tracks, Station and Yards**	3a. To know coning, canting of rails, cant deficiency 3b. To know Creep of rails. 3c. To know point & crossing 3d. To know track junction & station yards	3.1 Coning of wheels, canting of rails, super elevation of curves, cant deficiency, negative cant and grade compensation of curves. 3.2 Creep of rails- Definition, causes, effect and prevention of creep. 3.3 Definition of point and crossings, simple split, switch turn-out of points and crossing lines, Sketches of different components and their functions and working. 3.4 Line sketches of track joints, diamond crossing, cross over, triangle & their salient features. 3.5 Station-types, purpose, location, layout facilities required at stations. 3.6 Yards- types of station yards, passenger yard, Good yards, locomotive yard & its requirements, marshalling yard.	10
Unit-IV **Track Maintenance**	4a. Maintenance tools & necessity	4.1 Introduction, Necessity, importance of maintenance. 4.2 Types of maintenance, Tools required, daily maintenance, periodical maintenance, organisation required for maintenance.	04
Unit-V **Bridge - Site selection and investigation, Types of Bridges,**	5a. Site section bridge alignment. 5b. Classification of bridges. 5c. Selection criteria for suitable types of bridge.	5.1 Factors affecting site selection of bridge. Bridge alignment, collection of design data. 5.2 Classification of bridges according to function, material, span, Size alignment, position of HFL, I.R.C. loading. 5.3 Permanent Bridge- Sketches and description of culverts, causeway, masonry, arch, steel, marbles steel, RCC, girder bridge, pre-stressed steel bridge, cantilever, suspension bridge and flyover.	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		5.4 Temporary Bridge- timber, flying, floating bridge. 5.5 Selection criteria for suitable types of bridge.	
Unit-VI **Terminology Bridges & types bridges**	6a. Terminology effective span, clear span, economical span, waterway cutwater, afflux, scour, HFL, free board.	6.1 Substructure- foundation, pier, abutments, wing wall, bearing, approaches in cutting and embankment-function of each components. 6.2 Different Terminology- such as effective span, clear span, economical span, waterway cutwater, afflux, scour, HFL, free board. 6.3 Plan and sectional elevation of bridge	08
Unit-VII **Inspection and maintenance of Bridge**	7a. To know modes of inspection & maintenance	7.1 Inspection of bridges. 7.2 Check list of Bridge inspection 7.3 Maintenance of Bridge- Routine and special purpose maintenance.	04
Unit-VIII **Tunnel engineering**	8a. To know various definition of tunnel engineering 8b. Transferring of centre line from ground to inside. 8c. Methods of construction 8d. Explosives and its types. 8e. Tunnel lining and ventilation.	8.1 Definition, necessity, advantages, disadvantages, Classification of tunnels, Shape and Size of tunnels, Tunnel Cross sections for highway and railways. Tunnel investigations and surveying – Tunnel surveying locating centre line on ground, transferring centre line inside the tunnel. Shaft - its purpose and construction. 8.2 Methods of tunnelling in Soft rock-needle beam method, fore-poling method. Line plate method, shield method. Methods of tunnelling in Hard rock-Full-face heading method, Heading and bench method, drift Method Precautions in construction of tunnels Tunnel lining and ventilation-Purpose and methods	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction	02	02	--	04
II	Alignment gauges & permanent way (components Parts) :	02	06	02	10
III	Geometric design of track, Branching of tracks, Station and Yards	02	08	02	12
IV	Track Maintenance	--	04	--	04
V	Bridge - Site selection and investigation, Types of Bridges	02	08	02	12
VI	Terminology Bridges & types bridges	04	08	04	16
VII	Inspection and maintenance of Bridge	02	02	--	04
VIII	Tunnel engineering	04	10	04	18
	TOTAL	**18**	**48**	**14**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 SUGGESTED INSTRUCTIONAL STRATEGIES:

Lecture Method; Use of teaching aids, Industrial Visits, Demonstrations, Expert Lectures, Assignments.

7.0 LEARNING RESOURCES:

A) Text Books

Sr.No.	Title of Book	Author	Publication
1	Road, Railway, Bridges & Tunnel Engineering	Birdie & Ahuja.	Standard Book House, New Delhi
2	Railway Engineering	Rangwala	Charotar Publishing House
3	Bridge engineering	Rangwala	Charotar Publishing House
4	Bridge engineering	Ponnuswamy	Tata McGraw Hill, New Delhi

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

8.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M	M		L							H
CO2		M		M		M		L			
CO3	H	H	H	H	L			M	L	H	H
CO4	H	H	M	M	L			M		H	H
CO5	M	M		M	L	L	L	L	L	M	H
CO6	M	M	L	M			L		L		H
CO7		H	M	M	L					M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Basic Surveying (BSY) **COURSE CODE :** 6209

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	25	--	25	150
					Min.	32	--	40	10	--	10	--

1.0 RATIONALE:

This is basic technology course, which is intended to teach the students' basic facts, concepts, principles and procedures in surveying and levelling. With this knowledge and skill, he will be able to choose appropriate survey and levelling methods instruments and carry out survey work to prepare required plans/maps. These plan/maps will be further used for designing, estimating works. One should acquire knowledge and develop the skills in surveying.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the linear and angular measurement of surveying.
2. Select suitable instruments and appropriate method of survey
3. Measure the area of field or plots and locate details by method of surveying.
4. Understand the topography of the area by levelling
5. Prepare plans and maps by field measurement.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Classify type of survey.
2. Operate survey instruments.
3. Measure area of small plot by chain and Cross staff.
4. Locate details by method of angular measurement
5. Calculate the reduced levels by method of levelling
6. Prepare contour map of a small area.
7. Locating details with Plane table Survey.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Surveying and its classification**	1a. Understand the concept of surveying 1b. understand the principal of surveying 1c. Know the classification of surveying	1.1 Definition of surveying 1.2 Objects of surveying 1.3 Principles of surveying 1.4 Uses of surveying 1.5 Classification of surveying 1.6 Primary-plane, Geodetic Secondary-Based on instruments, Methods, Object, Nature of field	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Chain Surveying**	2a. Understand handling and use of different survey instruments. 2b. Describe the method of ranging 2c. understand the method of chaining 2d. find area of field by chain and cross staff survey 2e. Know the error in chain survey apply correction. 2f. understand conventional symbol	2.1 Study and use of instruments for linear Measurements-Chain, Tape, Ranging rod, Arrows, pegs, line ranger, Cross staff, Optical Square. 2.2 Ranging – Direct and indirect ranging. 2.3 Chaining on plain and sloping ground. 2.4 Principle of chain surveying survey lines-base line, tie line check line. 2.5 Taking offsets – types of offsets Recording field Book, obstacles in chaining. 2.6 Chain and cross staff survey for finding area of Field (Numerical Problems). 2.7 Errors in chain surveying and applying correction for distance measured by chain and Tape(Numerical Problems) 2.8 Conventional signs related to survey	12
Unit-III **Compass Survey**	3a. Describe construction and use of compass 3b. Detect local attraction and apply correction 3c. Describe method of compass traversing 3d. plotting the traverse 3e. Know the sources of error.	3.1 Bearing of lines meridian-true, magnetic and arbitrary Bearing - fore bearing, back bearing, whole circle bearing and Quadrantal bearing system & reduced bearing. Finding included angles from bearings. 3.2 Prismatic compass-component, construction and use. 3.3 Local attraction-causes and detection of local attraction precautions to be taken to avoid local attraction. 3.4 Traversing by chain and compass by included angle method. Calculation of included angle and correction to them (Numerical Problems). Plotting of the traverse. Graphical adjustment of closing error. 3.5 Sources of errors in Prismatic compass. 3.6 Numerical problems on calculation of bearings, Angles and local attraction.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-IV **Levelling**	4a. State the term used in levelling 4b. Understand construction and use of dumpy level and auto level. 4c. Describe method of carrying out different types of levelling 4d. Understand temporary and permanent adjustment of level. 4e. know the sources of levelling	4.1 Definition – level surface, level line, horizontal line, vertical line, datum surface, reduced level, Benchmark and its types. (Temporary, Permanent and GTS.) 4.2 Dumpy Level – Components, Construction, Line of Sight, Line of Collimation, axis of bubble tube. Terms- fore sight, Back sight, Intermediate Sight, Change point, Height of collimation. 4.3 Recording in level book. Temporary and permanent Adjustments of dumpy level. 4.4 Levelling staff- 4m, Telescopic and folding type. 4.5 Methods of Reduction of levels- Height of instrument Method and Rise and fall method, Arithmetical Checks, Numerical problems, computation of missing readings. 4.6 Classification of levelling – simple, differential, Profile Levelling and cross- sectioning, fly levelling. 4.7 Study and use of tilting and auto levels. 4.8 Sources of errors in levelling, precautions and difficulties faced in levelling.	20
Unit-V **Contouring**	5a. Understand the characteristics of contour. 5b. Describe the methods of Contouring 5c. To know the use of contours.	5.1 Definitions- contour, contour interval, Horizontal equivalent. 5.2 Characteristics of contours. 5.3 Methods of contouring. 5.4 Establishing grade contouring. 5.5 Use of Contour maps.	08
Unit-VI **Plane Table Survey**	6a. Understand the principle of plane tabling 6b. Know the accessories and use of accessories 6c. Understand methods of orientation 6d. Describe methods of plane tabling 6e. Locate and plot the area by method of plane tabling	6.1 Principles of plane table survey. Accessories required. 6.2 Setting out of plane table, Levelling, Centering and methods of orientation. 6.3 Methods of plane table surveying: Radiation, Intersection and Traversing. 6.4 Merits and Demerits of plane table Surveying. Situations where plane table survey is used. 6.5 Use of Telescopic Alidade.	10
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Surveying and its classification	06	--	--	06
II	Chain Surveying	04	08	04	16
III	Compass Survey	04	04	08	16
IV	Levelling	04	08	12	24
V	Contouring	--	04	04	08
VI	Plane Table Survey	02	04	04	10
	TOTAL	**20**	**28**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

SN	List of Practicals	Hours
1	Measurement of distance with chain and tape on ground with direct and indirect ranging.	06
2	Setting out perpendicular and taking offsets with open cross staff and optical square.	02
3	Chain and cross staff survey for finding out area of given field.	02
4	Study and use of prismatic compass and observing fore bearing and back bearing.	02
5	Measuring fore bearings and back bearings of 5-6 sided polygon, identifying stations affected by local attractions and calculation of corrected bearings.	04
6	Measuring fore bearings and back bearings for an open traverse (5 to 6 sided) calculation of direct angles between successive lines	02
7	Use of Dumpy level, temporary adjustments and taking reading on levelling Staff. Recording readings in field book with simple levelling practice.	04
8	Differential levelling practice, reduction of levels by Height of instrument method.	02
9	Differential levelling practice reduction of levels by rise and fall method	02
10	Carrying bench marks from one point to another point about 200 m away by fly Levelling with tilting level.	02
11	Use of auto level and taking observation.	02
12	Temporary adjustments of plane table by using accessories of plane table. Locating details by method of Radiation and intersection method.	02
13	Locating details with plane table by method of Traversing. Orientation by back sighting.	02
	Projects	
1	**Chain and compass traverse survey:** A simple closed traverse of 5-6 sided enclosing a building, Calculation of included angles. Locating details and plotting them on A1 size imperial drawing sheet.	10

SN	List of Practicals	Hours
2	**Profile levelling and cross sectioning survey:** Running a longitudinal section for a length of 500 m for road alignment, taking cross Sections. 20 m on either side, with staff reading at 10 m interval. Plotting plan, L-Section and cross section on A1 size imperial drawing sheet.	10
3	Block contouring: A block of 100 m x 100 m with spot levels at 10 m x 10 m. Plotting the contours with contour interval 0.5 to 1.0 m by interpolation on A1 size imperial drawing sheet.	10
	TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect Information brochure of auto level.
2. Collect topographical / contour map of any civil Engineering Projects.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. PPT, OHP.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	N. N. Basak	Surveying and Levelling	Tata McGraw-Hill
2	T. P. Kanetkar & S. V. Kulkarni	Surveying and levelling	Pune Vidhyarthi Griha Prakashan
3	Dr. B. C. Punmiya	Surveying and levelling Vol-I & Vol-II	Laxmi Publisher
4	S. K. Husain	Surveying	S. Chand and Company
5	S. K. Duggal	Surveying and levelling Vol-I & Vol-II	Tata McGraw-Hill

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Sr.No.	Major Equipment	Remarks
1	Chains 20m /30m	Metric Chain
2	Tapes	Metallic steel Tapes
3	Cross staff	Metal cross staff
4	Prismatic compass	Metal casing box with 30' Least count
5	Dumpy level	Standard dumpy level
6	Auto level	High precision auto level.
7	Plane table	Wooden P.T. with accessories.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M	M							
CO2	M	H	M				M	H			H
CO3	M	H	H				M	H			H
CO4	M	H	H				M	H			H
CO5		H	H		M		M	H		M	H
CO6		H	H	M	M		M	H	M	M	H
CO7		H	H	M	M		M	H	M	M	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Construction Materials & Processes (CMP) **COURSE CODE :** 6210

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

The selection of materials for engineering purpose is very much crucial activity. In civil engineering any material of construction, the first and for most necessity is to know its properties, suitability, strength and durability. Based on this, one can suggest the most suitable material which may fit the exact requirement of the construction items. In this course, the technology related to some of the important and widely used construction materials has been dealt with. This course will enrich civil engineering technicians in performing their jobs with ease and confidence and will be able to select appropriate material for the given item of work on site.

Construction processes are intended for gaining useful knowledge with respect to facts. Concepts, principles and procedures related to building construction system so that student can effectively able to execute building construction work and carry out repairs and maintenance of existing building with safety and quality in construction.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Select proper materials.
2. Handle and use materials with proper way.
3. Know key resources of materials, plant & labours.
4. Know various technical term related to different components of building structure.
5. Understand various construction processes of different building components with use of equipments.
6. Select appropriate method of construction.
7. Suggest rectifications for various defects in Building.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Describe important properties of building materials used in civil engineering construction.
2. Carry out line out of a building.
3. Identify components of various types of buildings.
4. Describe various construction activities in sub structure.
5. Describe various construction activities in super structure.
6. State procedure of various allied processes in construction of a building.
7. Identify defects in construction work, analyse it and rectify the same.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Properties and Classification of Construction Material.**	1a. Classify construction materials 1b. Select appropriate material	1.1 Broad classification of materials – Natural, Artificial, Special, Finishing and Recycled construction materials etc. 1.2 Criteria for Selection of construction materials on the basis of carrying prescribed load, serviceability, aesthetically pleasing, economical, environmental friendly.	02
Unit-II **Construction Materials**	2a. Describe important properties of building materials used in civil engineering construct 2b. Identify products for use in building constructions based on its properties. 2c. Select appropriate products for different uses in building construction. 2d. Describe timber and wood products and its uses in building construction 2e. Explain different types of advanced building materials and their uses in construction. 2f. Know market rates &trade names of materials.	2.1 Stone – Physical Classification of rocks; properties of stone, Requirements of good building stone, Quarrying and dressing of stone. use of stone 2.2 Timber –, properties of good timber, seasoning of timber, defects in timber. Type & use of timber 2.3 Bituminous materials and mixtures: Terminology, different types of asphalt, bitumen, used in Civil Engineering works, their properties and uses 2.4 Lime –, classification, properties of lime, uses of lime 2.5 Bricks –Conventional bricks and Standard bricks. Characteristics of good brick, Classification of burnt clay bricks and their suitability, special bricks. Common Field tests on Bricks 2.6 Tiles –flooring and roofing tiles. Characteristic of good tiles, different types of tiles depending upon material used, sizes of tiles, uses of tiles, wall cladding. 2.7 Plywood, particle board and veneers their properties and uses. 2.8 Glass – properties, types, use in construction industry. Trade names, market rate various processes on glass such as polishing, cutting etching etc. 2.9 Special Construction Materials Contents(only properties use and trade names), Water proofing and damp proofing materials, Termite proofing materials, Thermal insulating materials, Sound insulating materials- 2.10 Finishing Materials(properties, uses and trade names), • Plastering Materials –mortar, plaster of Paris. • Paints, Distempers and Varnishes • Linoleum floors	20
Unit-III **Building**	3a. Classify various types of structure 3b. List various	3.1 Load bearing, Framed and composite structure 3.2 Sub structure: foundation, Plinth and	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Structures And Components	components of building and their function 3c. Plan construction activities	DPC its function. 3.3 Super structure: Wall, sill, lintel, doors and windows, floor, roof, parapet, slab, columns, beams and their functions.	
Unit-IV **Construction of Sub Structure**	4a. Set layout of building structure on ground 4b. State various terms related to substructure. 4c. Classify the foundations. 4d. List the precautions in construction of foundation 4e. Select appropriate type of foundations	4.1 Site Clearance, preparing job layout, layout for load bearing structure and framed structure by centre line and face line method. Precautions while marking layout on ground. 4.2 Excavation for foundation, timbering and strutting for foundation trench, dewatering of foundation, tools and plants used for excavation. 4.3 Foundations: Definition, Function, requirements of good foundation, Types a) Shallow foundation-wall footing, isolated and combined column footing, stepped foundation, raft foundation. 4.4 Deep Foundation: Pile foundation, well foundation and caisson. Precautions to be taken while constructing foundation in black cotton soil.	08
Unit-V **Construction of Super-structure**	5a. State terms used in various masonry 5b. Describe various types of masonry 5c. Understand points of supervision 5d. Supervise masonry work 5e. List types of door & windows 5f. Select proper type of doors & windows, location. 5g. Understand fixing of doors & windows	5.1 Masonry Work 5.2 Stone masonry: Terms used in stone masonry- facing, backing, hearting, through stone, corner stone, cornice etc. Type of stone masonry: Rubble masonry, Ashlar Masonry and their types. Requirements of good stone masonry, expansion joints in stone masonry their purpose, check list and supervisory points in SM. 5.3 Brick masonry: Terms used in brick masonry- bond, joints, lap, frog, line, level and plumb. Bonds in brick masonry- header bond, stretcher bond, English bond and Flemish bond. Requirements of good brick masonry, expansion joints in brick masonry, check list and supervisory points in BM. 5.4 Comparison between stone masonry and Brick Masonry, Tools and plants required for construction of stone masonry and brick masonry, Hollow concrete block masonry and composite masonry. 5.5 Scaffolding: Necessity, component parts and types of Scaffolding, Scaffolding and platforms used for multi storeyed building 5.6 Doors and windows: Door & window	18

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		frames, location of Doors and Windows, various sizes of doors and windows for residential and public buildings, check list and supervisory points in window and door frame fixing. Type of door and windows and their suitabilities. • Types of doors: Batten Ledged braced framed door, panelled, glazed, flush, collapsible, revolving doors, rolling shutters. • Types of windows: Casement, Panelled, Steel, Aluminium, Sliding, louvered window, Grills and Ventilators. • Fixture and Fastening for doors, windows Sill, lintel - types and function, Arch - types and function. Procedure for replacing the glass of existing sliding window. 5.7 Vertical Communications Means of vertical communications: Stairs, lift/ Elevators, Escalators, Ramp (sketches and suitability). Terms used in stair- Step, riser, tread, flight, Winder, Kite step, landing, soffit, pitch, Newel posts, hand rail, balustrade, head room. • Types of stairs: straight, quarter turn, half turn; open well, doglegged, spiral, bifurcated, circular, sketch and suitability, Requirements of good staircase, thumb rule for stair design check list and supervisory points in staircase construction.	
Unit-VI **Finishing works**	6a. Describe procedure of plastering, pointing and painting 6b. State terms and list tools used in plastering and pointing 6c. Identify defects in plastering and painting 6d. Suggest remedial measures for defects in plastering and painting	6.1 Plastering: Necessity, pre- construction preparation, single coat, double coat, rough finish, sponge finish, neeru finish, Special plasters, pebble finish and stucco plaster. Precautions to be taken while plastering. Defects in plastering, methods for curing. Check list and supervisory points in plastering. 6.2 Pointing : Necessity, types and procedure of pointing 6.3 Painting: Necessity, selecting suitable material. Surface preparation for painting to wall, timber, steel. Types of painting white wash, colour wash, oil bound, distemper, plastic emulsion, oil paint, cement paint. Defects in painting. Number of coats in painting. Procedure for repainting after repairs,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		check list and supervisory points in painting work.	
Unit-VII **Floors and Roofs**	7a. State types of floors and floor finishes. 7b. Understand construction of flooring 7c. Identify types of roofs.	7.1 Types of floors:- wooden floor, stone floor, concrete floor (construction and suitability). Types of floor finishes- Shahabad, Kota, marble, granite, kaddappa, ceramic, vitrified, marbonite, chequered tiles (construction procedure). • Pavement blocks, tremix floors, skirting and dado • Mezzanine Floors, location and use. • Check list and supervisory points in flooring construction. 7.2 Types of roofs:- Pitched roofs and Flat roof: Terms used, lean to roof, king post truss, queen post truss, roofing tiles, their types and their suitability • Comparison between pitched and flat roof. Check list and supervisory points in roof construction.	04
Unit-VIII **Miscellaneous works (Centring, allied process and maintenance)**	8a. Distinguish form work and centering 8b. State procedure for Water proofing for RCC slab and Sanitary block 8c. State procedure of termite proofing 8d. Do Maintenance of building	8.1 Form work and centering – Meaning of different terms, Necessity, materials used in form work and centering. Form work sketches for column, beam, chajja, stripping time of form work, shifting of formwork for high rise works, bolting, fixing, strutting etc. Centering for beam, columns and slab. Requirements of goods form work. 8.2 Water proofing – necessity and importance, water proofing procedure for RCC slab and sanitary blocks, during the construction and after construction. Check list and supervisory points in water proofing work. 8.3 Termite proofing – necessity and importance. Pre-construction termite proofing and post construction termite proofing. Check list and supervisory points in termite proofing work. 8.4 Building maintenance • Cause and types of cracks in masonry walls, plaster, concrete slabs, beams, columns, staircases, identification and repairs of cracks. • Settlement – cause and remedial measures • Plinth protection – necessity and material used	04
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Properties and classification of construction material.	04	--	--	04
II	Construction materials	02	08	10	20
III	Building structures and components	--	04	--	04
IV	Construction of sub structure	02	04	04	10
V	Construction of superstructure	02	04	12	18
VI	Finishing works	--	02	04	06
VII	Floors and roofs	02	--	04	06
VIII	Miscellaneous works (Centering, allied process and maintenance)	02	02	08	12
	TOTAL	**14**	**24**	**42**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	II	Visit to building martial supplier shop, hardware shop and paint shop.	08
2	IV	To set out Foundation Plan on ground for load bearing structure & framed structure	08
3	IV	To visit building construction site to understand construction of foundation &plinth	04
4	V	Visit to site to study the various types of stone masonry& bonds in brick masonry	04
5	V	Visit to site to observe the procedure of fixing door frames and shutters.	04
6	V	Visit to site to study the components of dog legged staircase.	04
7	VI	Visit to site to observe procedure of plastering.	04
8	VI	Visit to site to study the various types of paints and procedure of painting.	04
9	VII	Visit to site to study the procedure of construction of kitchen otta.	04
10	VII	Visit to site to observe procedure of construction of mosaic/ceramic tile flooring.	04
11	VIII	Visit to site to study the water proofing of RCC roof slab.	04
12	VIII	Visit to study Aluminium Composite panel(A.C.P.) cladding work	04
13	VIII	Visit to construction site to study scaffolding, centring and form work	04
14	VII	Visit to study fixing of AC / GI sheets in case of pitched roof	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect market rates, leaflets, trade names of building materials
2. Prepare models & charts on course.
3. Collect information regarding current techniques, materials, in construction industry.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Course videos
2. Experts guidance

9.0 LEARNING RESOURCES

C) Books

Sr.No.	Title of Book	Author	Publication
1	Civil Engineering Materials	NITTTR Chandigarh	NITTTR Chandigarh
2	Construction Materials	D. N. Ghose	Tata McGraw – Hill
3	Building Materials	S. K. Duggal	New International
4	Building Construction	S. C. Rangwala & K. S. Rangwala	Charotar Publishing House
5	Building Construction	S. K. Sharma & Kalul	S. Chand & Company LTD, Delhi.
6	Building Construction	Y. S. Sane	Pune Vidyarthi Griha Prakashan
7	Building Construction	Sushilkumar	Standard Publisher Delhi-6
8	The A to Z of practical building construction & its Management	Sandeep Mantri	Satya Prakation, New Delhi

D) Software/Learning Websites

1. http://www.mahapwd.com

E) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				
CO7			H								

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Applied Mathematics (AMT) **COURSE CODE** : 6301

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The study of mathematics is necessary to develop in the students the skills essential for new technological development. This course introduces some applications of engineering, through which the students can understand mathematics with engineering principles.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Acquire knowledge of mathematical terms, concepts, principles and different methods.
2. Develop ability to apply mathematical method to solve engineering problems.
3. Acquire sufficient mathematical technique necessary for practical problems.
4. Apply the relation between mathematics and applications in engineering.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to solve engineering and applied mathematical problems using

1. Methods of integration
2. Definite integral and its application
3. Differential equation and its application
4. Numerical methods for solving algebraic and simultaneous equations
5. Laplace's transform.
6. Probability distribution.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Integration**	1a. Solve integration problem using rules and formulae 1b. Apply method of integration for solving problem	1.1 Definition of integration, integral as anti-derivative, integration of standard functions. 1.2 Rules of integration (Integral of sum or difference of functions, scalar multiplication) 1.3 Methods of integration. a. Integration by method of substitution & by using trigonometric transformation b. Integration of rational functions & by method of partial fraction c. Integration by parts	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Definite Integration and Its Application**	2a. Apply definite integration to solve engineering problems, area Volume and R.M.S. value.	2.1 Definite Integration a. Definition of definite integral b. Properties of definite integral with simple problems c. Application of definite integration Area under curve, area bounded by two curves. Volume generated by revolution of curve, RMS value & mean value.	08
Unit-III **Differential Equations**	3a. To form and solve Differential Equation 3b. Apply various method to solve differential equations 3c. Solve engineering problems using differential equation.	3.1 Definition of differential equation, order and degree of differential equation. Formation of differential equation for function containing single or double constants. 3.2 Solution of differential equations of first order and first degree such as a. Variable separable form b. Reducible to variable separable c. Homogeneous differential equation d. Linear differential equation e. Bernoulli's differential equation. 3.3 Applications of differential equations.	08
Unit-IV **Numerical Methods**	4a. Solve algebraic equations by using Bisection method and Newton Raphson Method 4b. Solve simultaneous Equations by using Gauss-Seidel method and Jacobi's method 4c. Apply Lagrange's interpolation formula and Newton forward interpolation formula	4.1 Solution of algebraic equations using iterative method a. Bisection method b. Newton-Raphson method. 4.2 Solution of simultaneous equations containing three unknowns – iterative methods a. Gauss-Seidel method b. Jacobi's method 4.3 Interpolation a. Lagrange's interpolation formula b. Newton's forward difference 4.4 Interpolation formula	08
Unit-V **Laplace transform**	5a. Acquire knowledge of Laplace transform and Inverse Laplace transform. 5b. Apply Laplace Transform to solve Differential Equations.	5.1 Definition of Laplace transform and standard formulae of Laplace transform 5.2 Properties of Laplace transform (linearity, first & second shifting, multiplication by t^n, division by t) 5.3 Inverse Laplace transform, using partial fraction 5.4 Laplace transform of derivatives 5.5 Application of Laplace transform for solving differential equation.	06
Unit-VI **Probability Distribution**	6a. Apply Binomial Distribution 6b. Apply Poisson's Distribution 6c. Apply Normal Distribution	6.1 Binomial distribution 6.2 Poisson's distribution 6.3 Normal distribution (simple examples)	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Integration	04	08	08	20
II	Definite integration and its application	04	04	04	12
III	Differential equations	04	08	04	16
IV	Numerical methods	04	04	08	16
V	Laplace transform	02	04	02	08
VI	Probability distribution.	02	04	02	08
	TOTAL	**20**	**32**	**28**	**80**

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Unit wise home assignment, containing ten problems.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Teacher guided self learning activities.
2. Applications to solve identified Engineering problems and use of Internet.
3. Learn graphical software: Excel, DPlot, Graph etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Mathematics for polytechnic student (III)	S. P. Deshpande	Pune Vidyarthi Gruha
2	Applied Mathematics	Kumbhojkar	Phadake Prakashan
3	Numerical Methods	S. S. Sastry	Prentice Hall Of India
4	Text book of Applied Mathematics, Volume I&II	P. N. Wartikar, J. N. Wartikar	Pune Vidyarthi Gruha Pune

B) Software/Learning Websites

1. http://www.mathsisfun.com/calculus/integration-definite.html
2. http://www.intmath.com/applications-integration/applications-integrals-intro.php
3. http://www.maths.surrey.ac.uk/explore/vithyaspages/differential.html
4. http://tutorial.math.lamar.edu/Classes/DE/LaplaceIntro.aspx
5. http://library2.lincoln.ac.nz/documents/Normal-Binomial-Poisson.pdf

C) Major Equipment/ Instrument with Broad Specifications

1. Scientific Calculator
2. Computer system with Printer and Internet system.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H		M								L
CO2	H		M								L
CO3	H		M								L
CO4	H		M								L
CO5	H		M								L
CO6	H		M								L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Environmental Studies (EVS) **COURSE CODE** : 6302

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Environment essentially comprises of our living ambience, which gives us the zest and verve in all our activities. The turn of the twentieth century saw the gradual onset of its degradation by our callous deeds without any concern for the well being of our surrounding we are today facing a grave environmental crisis.

It is therefore necessary to study environmental issues to realize how human activities affect the environment and what could be possible remedies or precautions which need to be taken to protect the environment.

The curriculum covers the aspects about environment such as Environment and Ecology, Environmental impacts on human activities, Water resources and water quality, Mineral resources and mining, forests.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand and realize nature of the environment, its components and inter-relationship between man and environment.
2. Understand the relevance and importance of the natural resources in the sustainability of life on earth and living standard.
3. Comprehend the importance of ecosystem and biodiversity.
4. Identify different types of environmental pollution and control measures.
5. Correlate the exploitation and utilization of conventional and non-conventional resources.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain uses of resources, their over exploitation and importance for environment
2. Describe major ecosystem
3. Suggest measurers for conservation of biodiversity
4. Identify measures for prevention of environmental pollution
5. Describe methods of water management
6. Identify effects of Climate Change, Global warming, Acid rain and Ozone layer
7. Explain Concept of Carbon Credits
8. State important provisions of acts related to environment

4.0 COURSE DETAILS:

There are no separate classes for theory. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Importance of Environmental Studies**	1a. Define the terms related to Environmental Studies 1b. State importance of awareness about environment	1.1 Definition, Scope and Importance of the environmental studies 1.2 Need for creating public awareness about environmental issues
Unit-II **Natural Resources**	2a. Define natural resources 2b. Identify uses of natural resources, their overexploitation and importance for environment	2.1 Uses of natural resources, over exploitation of resources and importance for environment 2.2 Renewable and Non-renewable resources 2.3 Forest Resources 2.4 Water Resources 2.5 Mineral Resource 2.6 Food Resources
Unit-III **Ecosystems**	3a. Define Ecosystem 3b. List functions of ecosystem 3c. Describe major ecosystem in world	3.1 Concept of Ecosystem 3.2 Structure and functions of ecosystem 3.3 Major ecosystems in the world
Unit-IV **Biodiversity and its Conservation**	4a. Define biodiversity 4b. State levels of biodiversity 4c. Suggest measurers for conservation of biodiversity	4.1 Definition of Biodiversity 4.2 Levels of biodiversity 4.3 Threats to biodiversity 4.4 Conservation of biodiversity
Unit-V **Environmental Pollution**	5a. Classify different types of pollution 5b. Enlist sources of pollution 5c. State effect of pollution 5d. Identify measures for prevention of pollution	5.1 Definition, Classification, sources, effects and prevention of • Air pollution • Water Pollution • Soil Pollution • Noise Pollution 5.2 E- waste management
Unit-VI **Social Issues and Environment**	6a. Describe methods of water management 6b. Identify effects of Climate Change, Global warming, Acid rain and Ozone Layer 6c. Explain Concept of Carbon Credits	6.1 Concept of sustainable development 6.2 Water conservation, Watershed management. Rain water harvesting: Definition, Methods and Benefits. 6.3 Climate Change, Global warming, Acid rain, Ozone Layer Depletion, 6.4 Concept of Carbon Credits and its advantages
Unit-VII **Environmental Protection**	7a. State important provisions of acts related to environment	7.1 Importance of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act • Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights • ISO 14000

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

SR. No.	Unit No.	Practical Exercises	Approx. Hrs. required
1	I	Report on Importance and public awareness of Environmental Studies.	04
2	II	Report on Use of natural resources and overexploitation of Resources	04
3	II	Visit /Video Demonstration to Renewable / Non-renewable (wind mill, hydropower station, thermal power station)/ resources of energy.	04
4	II	Visit to polyhouse and writing report on its Effects on agriculture food production.	04
5	III	Assignment/Report on structure and functions of ecosystem.	04
6	IV	Visit to a local area to environmental assets such as river / forest / grassland / hill / mountain and writing report on it.	04
7	V	Group discussion on Environmental Pollution (Air pollution/Water pollution/Soil pollution/Noise pollution/E-waste)	04
8	V	Visit to study recycling of plastic and writing a report on it.	04
9	VI	Visit to Water conservation site / Watershed management site / Rain water harvesting site and writing a report on it.	04
10	VI	Visit to study organic farming/Vermiculture/biogas plant and writing a report on it.	04
11	VI	Video Demonstration /Expert Lecture Report on Climate Change and Global warming	04
12	VII	Write important provisions of Acts related to Environment/ Air (Prevention and Control of Pollution) Act/Water (Prevention and Control of Pollution) Act/ Wildlife Protection Act/ Forest Conservation Act	04
		TOTAL	**32**

Note: Any Four Visits/ Video Demonstration and Four Reports/Assignments from above list to be conducted.

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities.

1. Collect articles regarding Global Warming, Climate Change.
2. Collect information regarding current techniques, materials etc. in environmental system.
3. Tree plantation and maintenance of trees in the Campus.
4. Cleanliness initiative (Swachhata Abhiayan).

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Course Video
2. Expert Lectures

9.0 LEARNING RESOURCES

A) Books

Sr.No.	Title of Book	Author	Publication
1	Environmental Studies	Erach Bharucha	Universities Press (India) Private Ltd, Hyderabad
2	Environmental Studies	Dr. Suresh K Dhameja	S K Kataria & Sons New Delhi
3	Basics of Environmental Studies	U K Khare	Tata McGraw Hill

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	M			M	H					M
CO2	H	M			M	H					M
CO3	H	M	M		M	H			M		M
CO4	H	M		M	M	H		M		M	M
CO5	H	M			M	H					M
CO6	H	M			M	H	M				M
CO7	H	M			M	H					M
CO8	H	M			M	H					M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Construction Management (CNM) **COURSE CODE** : 6304

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The Civil Engineer has to plan, manage and execute Civil Engineering works. He has to manage different resources. He should have knowledge of basic management processes related to Civil engineering field.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand management techniques.
2. Plan, Monitor and execute various types of construction works.
3. Manage different resources (Men, Material, Money, Machines, Time).
4. Read, draw & update bar charts and CPM.
5. Inspect & control quality of construction.
6. Prepare safety programme to avoid accidents at construction site.
7. Understand work study.
8. Make project cost analysis.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Apply Principles and functions of management to construction industry.
2. Develop the CPM network of various construction activities.
3. Make resource smoothing and resource levelling.
4. Determine optimum duration and cost by network contracting.
5. Show leadership skills required to manage various construction resources and achieve targets.
6. Show concern for safety during various construction works.
7. Apply Supervision techniques to establish quality control in construction activities.
8. Improve productivity as a project in charge using work study techniques.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Role of Construction Industry**	1a. Interpret the importance of construction industry in National Development. 1b. List the resources required for construction industry	1.1 Importance of construction industry in National Development. 1.2 Resources of construction industry, Material, Manpower, Money, Machinery, space.	02
Unit-II **Scientific**	2a. List the objectives of construction management	2.1 Objectives of Construction Management. 2.2 Definition of Management 2.3 Necessity of Scientific management.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Management	2b. State principles and functions of management 2c. Draw organisation chart	2.4 Principles of Management 2.5 Functions of Management 2.6 Types of Organisation -Line, Line and staff, functional organisation	
Unit-III **Applications of Scientific Management and functions of management to construction industry**	3a. Apply Principles and functions of management to construction industry	Application of Principles and functions of management to Civil Engineering works in following Department 3.1 Public Works Department 3.2 Water Resource Engineering Dept. 3.3 Maharashtra Jivan Pradhikaran 3.4 Private Organisation	04
Unit-IV **Leadership and human relationship**	4a. Explain styles and functions of leadership 4b. State and interpret hierarchy of Maslow's needs in relation to motivation	4.1 Desirable qualities of leadership for effective Execution of construction work 4.2 Leadership – styles of leadership 4.3 Functions of leadership 4.4 Maslow's Human Needs. 4.5 Motivation and its importance and need, functions of Motivation. 4.6 Hygiene and motivation factors.	06
Unit-V **Planning and scheduling of construction works.**	5a. Define terminology related to planning and scheduling 5b. Prepare Construction schedule. 5c. Draw and analyze CPM network for construction work. 5d. Make resource smoothing and resource leveling 5e. Determine optimum duration and cost by network contracting	5.1 Introduction to Terminology related to scheduling. 5.2 Methods of scheduling, Advantages of Scheduling. 5.3 Bar Chart. Preparing Construction schedule. Advantages and limitations of bar chart. 5.4 Planning and scheduling by Network Analysis, Determination of various timings EST, EFT, LST, LFT, total float preparation of activity table, Example on developing Critical path, 5.5 Introduction to PERT. Terms used, Comparison between CPM and PERT. 5.6 Preparing Construction schedule comprising of items of work and duration. 5.7 Resource Allocation, Resource Smoothing, Resource Levelling for Human Resource 5.8 Project Cost Analysis-Project Cost, Cost vs Time, Optimisation of cost through network contraction (Simple problems on Bar Chart, CPM), (No mathematical problems on Project cost analysis and resource levelling in examination)	16
Unit-VI	6a. State the causes of accidents and	6.1 Importance of safety in construction works.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Safety in Civil Engineering	suggest remedial measures 6b. Describe safety programme 6c. State provisions of acts	6.2 Common Causes of accident, types of accidents, Remedial measures. 6.3 Terms used- Injury frequency rate (IFR), Injury severity rate (ISR), Injury Index (II), Accident Cost. 6.4 Effective Safety Programme. 6.5 Introduction to Workmen Compensation Act and Minimum Wages act	
Unit-VII **Supervision and quality control**	7a. Identify Supervision techniques to establish quality control in construction activities 7b. Compare sampling plans	7.1 Concept of quality. 7.2 Supervision techniques to establish quality control in construction activities. 7.3 Functions of Supervisor at construction site 7.4 Quality assurance and quality control. 7.5 Sampling Techniques.	04
Unit-VIII **Work Study and productivity**	8a. State the significance of work study 8b. Explain the steps of motion study taking case 8c. Determine standard time for the process	8.1 Concept of productivity. 8.2 Objectives of work-study & its advantages and uses. 8.3 Method study (motion study), Objectives, Symbols used, Procedure of Method study along with case study 8.4 Work Measurement- Objectives of work measurements, Determination of standard times, Simple problems	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Role of construction Industry	04	--	--	04
II	Scientific Management	02	04	--	06
III	Applications of Scientific Management and functions of management to construction industry	--	--	04	04
IV	Leadership and human relationship	02	04	02	08
V	Planning and scheduling of construction works.	08	08	20	36
VI	Safety in Civil Engineering	--	06	--	06
VII	Supervision and quality control	--	06	02	08
VIII	Work Study and productivity	04	04	--	08
	TOTAL	**20**	**32**	**28**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Prepare report on role of construction industry in National development.
2. Draw organisational chart for PWD, MJP and Water Resource Dept and explain how principles and functions are applied.
3. Prepare bar chart and CPM network for any construction project. Determine project duration.
4. Collect and interpret bar chart/CPM network from existing construction industry
5. Carry out project cost analysis for small construction project.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Site visit to construction industry like PWD / MJP to study organization
2. Expert lecture of industry person in the area of project management

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Construction planning & Management	M. L. Dhir, Gehlot	Wiley New Delhi.
2	Construction Management and Accounts	Harpal singh	Tata McGraw Hill
3	Construction management and Planning	B. Sengupta and Guha	Tata McGraw Hill
4	PERT and CPM	L.S. Shrinath	East-West Press Pvt. Ltd. New Delhi.
5	Construction Engineering and Management	S. Seetharaman	Umesh Publications

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H		M	M					H	
CO2	M	H		H							
CO3		H	M	H						H	
CO4		H		H					H		
CO5				L	H	M	M	H			M
CO6	M			H						M	
CO7			H								
CO8				H							

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE)
COURSE : Supervisory Skills (SSL) **COURSE CODE** : 6305

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

A diploma engineer working in the industry has to co-ordinate and supervises a group of workers. An engineer should have a leadership attitude. This course will help to develop requisite traits in the diploma engineer.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand importance of scientific management.
2. Understand the controlling performance of process & people.
3. Know organizing, staffing and training of worker.
4. Understand the importance of leadership.
5. Know industrial psychology and human relation.
6. Know safety awareness and health administration in the industry.
7. Understand role of supervisor in industry.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain the importance of scientific management.
2. Describe controlling performance of process & team of worker.
3. Explain the methods to train the worker.
4. State the qualities of leader.
5. Describe progressive disciplinary action to worker.
6. Enlist causes of accident and prevention of accident.
7. Explain the role of supervisor towards management and worker.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Scientific Management and Management of Job**	1a. Define the term management. 1b. Differentiate between management, administration and organisation. 1c. Explain the necessity and steps of scientific management. 1d. Describe handling complexity and its steps.	1.1 Management-definition, its job, Difference between management, administration and organization. Levels and its functions of management. 1.2 Definition, Necessity and, procedure of scientific management 1.3 Handling complexity and its steps. 1.4 Optimization and its steps.	06
Unit-II	2a. Explain objective of planning by	2.1 Planning by supervisor, necessity, steps and objectives	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Supervisory Management	supervisory 2b. Describe the different types of budget. 2c. Explain the controlling of performance of team of worker in term of quantity & cost.	2.2 Budgeting at supervisory level, objective and its advantages. Types of budget. 2.3 Deciding mental & physical activities of workers. 2.4 Controlling the performance of process & team of worker in term of quantity / quality/ time/ cost.	
Unit-III **Organising, Staffing and Training.**	3a. Define organising. 3b. State physical resources needed for production. 3c. Explain staffing with human resources. 3d. Define Merit rating. 3e. Explain methods of merit rating. 3f. Describe needs & objectives of training. 3g. List types of training. Explain any one type	3.1 Organizing effectively the department, provision of physical resources, matching human need with job need, allotment of to individual and establishing relationship among person working in a group. 3.2 Staffing with the human Resources. 3.3 Appraisal of Employee performance or merit rating and its types. 3.4 Training-definition, needs and objectives its types –induction and orientation, by skill & old worker, on job training, apprentice training, by special schools.	06
Unit-IV **Activating the work force**	4a. Define-Motivation. 4b. Explain the motivating factors. 4c. State qualities of leader. 4d. Explain democratic leadership. 4e. Explain need of effective communication.	4.1 Motivation –definition, types and motivating factors. 4.2 Leadership-definition, qualities of leader, Role of leadership, methods-authoritarian, democratic and lassez- faire or free rein. 4.3 Effective employee communication.	08
Unit-V **Managing problem performance**	5a. State symptoms of troubled employee. 5b. Explain causes of industrial dispute. 5c. Describe collective bargaining. 5d. State the causes of substandard performance. 5e. Explain progressive disciplinary action.	5.1 Counseling troubled employees-symptoms, need and guidelines for counseling. 5.2 Industrial dispute-causes, strikes, settlement of industrial dispute, collective bargaining, conciliation & mediation and arbitration. 5.3 Disciplining-definition, Substandard performance, progressive disciplinary action.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Employee Health and safety under OSHA**	6a. Define accident. 6b. List causes of accident. 6c. Explain the effect of accident to industry, worker and society. 6d. Describe role of OSHA	6.1 Accident-definition, Causes of accident, Prevention of accident, effect of accident to industry, worker and society, Preparation of accident report and investigation. 6.2 Occupational diseases, hazards, safety awareness. 6.3 Role of OSHA. (Occupational safety & health administration), industrial health.	06
Unit-VII **Supervisor's role in Labour Relation.**	7a. Explain role of supervisor towards management and work. 7b. Describe function of labour union.	7.1 Role of supervisor in management/ worker/fellow Supervisor/work. 7.2 Labour or trade union-function, right and liabilities.	04
Unit-VIII **Moving up in your organisation**	8a. Explain activities to be done at end of shift by supervisor. 8b. Describe sort of attitude and action by supervisor while moving up in organization.	8.1 Taking charge of career to know organization, Department & Worker etc. Planning the day work, activities to be done before shift start, beginning, during and end of shift. 8.2 Moving up –sort of attitude and action by supervisor	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Scientific Management and Management of Job	04	04	04	12
II	Supervisory Management	04	04	04	12
III	Organizing, staffing and Training.	04	06	--	10
IV	Activating the work force.	06	04	--	10
V	Managing problem performance.	04	04	04	12
VI	Employee Health and safety under OSHA	04	02	04	10
VII	Supervisor's role in Labour Relation.	--	06	--	06
VIII	Moving up in your organisation.	04	04	--	08
	TOTAL	**30**	**34**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Prepare safety charts and slogan.
2. Exhibition of safety charts and slogan.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video clips on management and motivation.
2. Arrange expert lecture of industry person in the area of safety awareness in industry.
3. Show video clip on safety in industry.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Industrial Engineering and management	O. P. Khanna	Dhanpat Rai & Sons
2	Industrial organization & Engineering Economics	Banga & Sharma	Khanna Publication
3	Industrial management	Shrinivasan	Dhanpat Rai & Sons

B) Software/Learning Websites

1. http://www.management.com
2. www.safety.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M			H					M		M
CO2			H	M			L	M	M		
CO3		M	H	M			M		M		M
CO4	H		M			H			M		M
CO5		M			M		M		M		
CO6		M			M		M		M		M
CO7				M	M	M	M	M	M		

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE
COURSE : Marketing Management (MKM) **COURSE CODE** : 6306

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

The Marketing of product is the most important aspect of each industry. It needs to be systematically surveyed and planned as in the increasing competitive situation. An organization should have a profit for its existence. An engineer as entrepreneur, marketing set up of a company should have knowledge of marketing management. The job opportunities for an engineer in the marketing are increasing due to essentiality of person to deal the technical matter and give related feedback for improvement of product marketing function.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand various elements of market survey and design its methodology.
2. Understand the duties of marketing personal.
3. Learn the concept of pricing, branding, product mix etc.
4. Understand various marketing strategies.
5. Study various sales Forecasting methods and product diversification.
6. Acquire knowledge of various tools/techniques of Market research and product promotion.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Assess market opportunities by analyzing customers, competitors, collaborators, considering strengths and weaknesses of a company.
2. Develop effective marketing strategies to achieve organizational objectives.
3. Design a strategy implementation program to maximize its chance of success.
4. Assess scope for international marketing.
5. Use various tools/techniques of Market research and product promotion.
6. Apply various innovative ideas of advertisement for enhancing the sales.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Marketing Management Concept**	1a. Explain the needs, wants and demands of customers. 1b. Describe the concept of marketing management.	1.1 Needs, wants and Demands, Types of market demands, Products (Goods, services and Ideas), cost and satisfaction.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1c. Explain the functions of marketing management. 1d. Differentiate between selling and marketing. 1e. Explain the techniques of maximizing, consumption, customer choice and satisfaction. 1f. Distinguish between macro and micro environment. 1g. Explain techniques of maximizing consumer satisfaction, choice, product life etc.	1.2 Markets, Marketers and prospects, primary purpose of marketing management. 1.3 Simple marketing system, value exchange and transaction, functions of marketing. 1.4 The product, production and selling concept. 1.5 The marketing concept, difference between marketing and selling, the social marketing concept. 1.6 Maximize consumption, satisfaction, choice, product life, quality, customer value and consumer satisfaction, Customer – delight, life time customer. 1.7 Marketing environment – value, macro and micro environment.	
Unit-II **Marketing Management Process**	2a. Explain various types of market segmentation. 2b. Explain product life cycle. 2c. Describe 4P's of marketing. 2d. Explain the significance of different techniques in product promotion. 2e. Differentiate between Direct and Indirect marketing.	2.1 Market segmentation: Basis for segmentation- Geographic / Demographic / psychographic segmentations, benefits of Market segmentation. 2.2 Product: Concept of Product, New product development process. 2.3 Product Life cycle, Stages in PLC and Marketing Strategies. 2.4 Marketing mix: 4 P's, significance of 4P's. 2.5 Methods of marketing- Direct and Mass marketing. 2.6 Product promotion- Role of advertisement, personnel selling and internet in marketing promotion, mail marketing.	08
Unit-III **Price Decisions**	3a. Explain the significance of pricing in marketing management. 3b. Describe the different pricing methodologies.	3.1 Importance of pricing, price setting in practice 3.2 Cost oriented pricing- mark-up pricing, target pricing. 3.3 Demand oriented pricing, price discrimination. 3.4 Competition oriented pricing- going rate pricing, sealed bid pricing.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-IV **Marketing Research**	4a. Explain the concept, scope, objectives, importance and limitation of market research. 4b. Explain various methods of data collection. 4c. Describe the market research tools and techniques. 4d. Differentiate between primary data and secondary data.	4.1 Introduction, Nature, Scope, objective, importance, limitations and issue formulation. 4.2 Source and collection of marketing data- primary data, secondary data. 4.3 Methods of collection of primary data- observation, mail, personal interview, television etc. 4.4 Market Research Techniques- National Readership survey, consumer panel, test marketing.	08
Unit-V **Advertising and sales management**	5a. Explain the concepts of marketing communication. 5b. Explain the different types of sales promotions. 5c. Describe the concepts of sales management. 5d. Describe the various types of advertising media.	5.1 Concept and the process of marketing communication. 5.2 Concept of Sales promotion and its types. 5.3 Advertising media – objectives and functions, Types of media, advertising budget, functions of advertising agency. 5.4 Sales management: Concept, objectives, sales forecasting. 5.5 Personnel selling- concept, salesmanship, qualities of salesman.	08
Unit-VI **Strategic marketing**	6a. Describe the concepts of strategic marketing management. 6b. Explain the concept of Strategic marketing	6.1 Objectives and concept of strategic marketing management, 6.2 Strategic marketing Analysis-SWOT Analysis, BCG Matrix.	04
Unit-VII **International marketing - Export**	7a. Explain the concept, scope, opportunities and challenges of international marketing. 7b. Describe the Multi-National Enterprises with examples. 7c. Explain the role of Indian Trade Promotion Organization. 7d. State and explain the benefits to exporters.	7.1 Concept, scope, challenges and opportunities in international marketing. 7.2 Foreign market entry strategies. 7.3 Concept of Multi-National Enterprises (MNE) with examples. 7.4 Institutional support from government to promote export. 7.5 Role of I.T.P.O. (Indian Trade Promotion Organization) 7.6 Benefits offered to exporters by Central government.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Marketing Management concept	06	08	--	14
II	Marketing Management Process	04	08	04	16
III	Price Decisions	04	04	--	08
IV	Marketing Research	04	04	04	12
V	Advertising and sales management	04	08	04	16
VI	Strategic marketing	02	04	--	06
VII	International marketing – Export	02	02	04	08
	TOTAL	**26**	**38**	**16**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Group discussion on Brand Strategies of any one company.
2. Assignment / Report writing on:
   (a) Distribution strategy of any one company.
   (b) Promotional tools (communication mix) adopted by any one company.
   (c) Comparative advertising strategies of any two companies.
   (d) Sales promotions offered by FMCG companies/brands (Minimum two companies/brands).

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Introduction to Marketing science	Lal G. K.	Pearson edition international
2	Marketing	Dale Timge	Prentice hall
3	Marketing Engg.	Lillen Gary	Pearson edition international
4	Marketing Management	Phillip Kolter	Pearson edition international
5	Modern Marketing Management	Francis G. K.	S. Chand & Company
6	Advertising Marketing Sales Management	Thakur D.	D&D Publication
7	Marketing Management	Mr. S. A. Sherlekar	Everest Publications.
8	How to Export	NABHI	NABHI Publication

B) Software/Learning Websites

1. http://www.business-standard.com/
2. http://studymarketing.org/
3. http://salesandmarketing.com/

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1				L			M	H	M	L	
CO2					H			H	H	H	
CO3			M	M	M		M	M	L		
CO4					M		H	L	M		
CO5					L		L	M	M	M	H
CO6			L	M	M	M	L	H	H	H	L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / AE
COURSE : Material Management (MMT) **COURSE CODE** : 6307

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	03	03	Max.	80	20	100	--	--	--	100
					Min.	32	--	40	--	--	--	--

1.0 RATIONALE:

A diploma engineer has to work in different areas like Research and Design, Tool Room, Production, Production planning, Industrial Engineering, Stores, Quality Control, Marketing, Purchase.

For expressing the ideas, communicating the instructions to shop level, the knowledge of material management is essential. This course aims to avoid bottleneck due to shortage of materials and excessive inventory by quantity and number of parts, which will lead to increase in cost and ultimate loss to the industry.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the importance of raw material planning according to production requirement.
2. Identify the procedures for selecting and giving orders to the suppliers.
3. Understand the importance and procedure of inventory management.
4. Apply the various tools used for inventory management.
5. Know the procedure for purchasing material.
6. Apply the latest tools and techniques for store management.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify the types of materials and their requirements.
2. Explain the Co-ordination of material planning amongst the department.
3. Identify the different material handling equipments.
4. Enlist the duties of store officer
5. Explain the functions of production and store department.
6. Calculate the Economic Order Quantity as per requirement.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Functions of Material Management**	1a. Describe objectives of material management 1b. State functions of material management	1.1 Introduction to materials management 1.2 Objectives of material management 1.3 Functions of material management 1.4 Operating Cycle 1.5 Value analysis – Make or buy decisions.	06
Unit-II **Purchase Management**	2a. Explain functions of purchase management 2b. State the process of purchasing. 2c. Describe selection	2.1 Objective, scope & Functions of purchasing department 2.2 Responsibility of purchasing section 2.3 Purchasing procedure or purchasing cycle. 2.4 Material Requisition: Material Indent	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	procedure of material.	form, Travelling Requisition card, Bill of material 2.5 Determining Price: Price terms, Payment terms, cost comparative statement 2.6 Calling for bids or tender or quotation: Tender, Types of tenders, Invitation to BID or An Enquiry, Evaluation of bid. 2.7 Placing purchase order formats of indent/inquiry 2.8 Selection of sources of supply 2.9 Vendor development – Vendor evaluation and rating –Imports and Buyer 2.10 Supplier relationship, Negotiations - Insurance and claims managements	
Unit-III **Stores Management**	3a. Explain the function of stores department 3b. State types of stores 3c. Describe material issue system.	1.1 Functions of stores. 1.2 Location identification 1.3 Layout of store dept. 1.4 Stock taking and materials handling 1.5 Codification of materials 1.6 Duties of storekeepers 1.7 Types of stores, storage equipments/accessories 1.8 Receipt system inward good, stock items, direct purchase items. 1.9 Material issue system 1.10 Accounts of store or store records 1.11 Valuation of Material issue from store 1.12 FIFO, LIFO. 1.13 MIS for stores management	10
Unit-IV **Inventory Management**	4a. State the various inventory costs. 4b. Explain the inventory control system. 4c. State use of OR techniques in inventory management.	4.1 Concept and definition of inventory management 4.2 Classification of Inventory 4.3 Need & function of inventory 4.4 Economic order quantity: Order quantity, Lead time, Safety stock, Re-order point, numerical analysis. 4.5 Inventory Cost: Procurement cost, Inventory carrying cost 4.6 ABC analysis. 4.7 Inventory control system: Two Bin systems, periodic inventory order system, combinations of two bin & periodic system. 4.8 Use of computer in inventory control system. 4.9 Application of Operations Research Techniques in Materials Management for inventory.	10
Unit-V **Receiving and**	5a. State the procedure for inspection at receipt quality store 5b. Describe quality	5.1 Define inspection & their types, Goods receipt note 5.2 Inspection at vendor's work 5.3 Quality checking and Quantity checking	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
inspection	checking and quantity checking 5c. Importance of material handling for intricate materials	levels 5.4 Rejected goods replacement procedure. 5.5 Repair processes for rejected material 5.6 Material handling for intricate materials	
Unit-VI **Latest Trends in material management**	6a. Explain the importance of JIT 6b. Describe the need of SCM in industry 6c. State the need of E-material management	6.1 Concept of JIT (Just In Time) 6.2 Zero Inventory system 6.3 Introduction to supply chain 6.4 Developing supply chain to gain competitive advantage 6.5 Methods of transportation by air, rail, road, piping. 6.6 Value Stream Mapping (VSM) 6.7 KANBAN card system 6.8 E-Procurement	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Functions of material management	04	08	--	12
II	Purchase management	04	08	04	16
III	Stores management	04	08	04	16
IV	Inventory management	04	08	04	16
V	Receiving and inspection	02	06	--	08
VI	Latest trends in material management	02	10	--	12
	TOTAL	**20**	**48**	**12**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

Not Applicable

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect the logistics information of manufacturing, cement, pharmacy, civil, electrical industries
2. Collect and study the literature on GSCM from any industry
3. Collect and analyse the information about guidelines of material handling procedures.
4. Collect and study information of appropriate material handling devices.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show supply chain structures of different industries.
2. Arrange a visit to logistics stores or in industries from nearby areas.
3. Arrange expert seminar/lectures by a resource person from industry in the area of manufacturing, Logistics etc.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Industrial Engineering & Management	O. P. Khanna	S. Chand & Co.
2	Industrial Organisation & Management Science	Banga & Sharma	Khanna Publication
3	Materials Management	Amner Deans S.	Khanna Publication
4	Materials Management	Gopalkrishnan	Khanna Publication
5	Supply chain management. Strategy, planning & operation	Sunil Chopra	Pearson Publication

B) Software/Learning Websites

1. http://www.supplychainbrain.com/
2. http://www.legallyindia.com/
3. http://www.cipmm-icagm.ca/en/
4. http://www.iimm.org/
5. http://matmgmt.ucr.edu/

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H				M					M
CO2				M				M	H		
CO3				M		M			H		M
CO4		H		M					H		
CO5	L				M				M		M
CO6	L		H	M			M			M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Computer Applications for Project Management (CAP)**COURSE CODE** : 6308

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

The Civil Engineer has to plan, Manage and execute Civil Engineering works. He has to manage different resources. He should have knowledge of operating softwares required for civil engineering project management

2.0 COURSE OBJECTIVES:

The student will be able to

1. Study softwares required for civil engineering project management
2. Prepare bar chart using project management software.
3. Determine the time estimates and critical path for civil engineering project using project management software.
4. Study features of Building Information Modelling software

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explore capabilities of project management software.
2. Prepare bar chart using project management software.
3. Determine the project duration and critical path for civil engineering project using project management software.
4. Generate sample building information details using Building Information Modelling Software.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Project Management**	1a. Apply principles and functions of management to civil engineering projects 1b. Explain role of project manger	1.1 Definition of Project Management. 1.2 Principles and functions of Project Management 1.3 Role of project manager 1.4 Various steps involved in completion of project 1.5 Concept of task, activity and project duration. 1.6 Importance of Bar-chart, CPM, PERT in project planning.	02
Unit-II **Project Management Softwares**	2a. State the features of Project management software. 2b. State the applications of Project management	2.1 Importance of project management softwares 2.2 Types of project management softwares a. Features and uses of MS-Project software	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	software	b. Features and uses of Prima- vera software	
Unit-III **Practice on Project Management software- MS Project**	3a. Understand various menus available in MS-Project. 3b. Understand input data. 3c. Understand various commands to execute the given input data. 3d. Prepare schedules for resource allocation. 3e. Prepare networks for execution of projects.	3.1 Study various Menus available in MS-Project. 3.2 Identify various activities for a given project. 3.3 Input data required for the given project. 3.4 Prepare schedules using MS-Project for resources like men, material, machinery, money. 3.5 Calculate duration of project and Critical Path 3.6 Generate various reports for the supervision of the project.	03
Unit-IV **Practice on Project Management software- Prima-Vera**	4a. Understand various menus available in **Prima-Vera** Understand input data. 4b. Understand various commands to execute the given input data. 4c. Prepare schedules for resource allocation. 4d. Prepare networks for execution of projects.	4.1 Study various Menus available in **Prima-Vera**. 4.2 Identify various activities for a given project. 4.3 Input data required for the given project. 4.4 Prepare schedules using **Prima-Vera** for resources like men, material, machinery, money. 4.5 Calculate duration of project and Critical Path 4.6 Generate various reports for the supervision of the project.	06
Unit-V **Concept of Building Information Modeling**	5a. Use BIM software 5b. Generate resource planning and scheduling	5.1 Necessity of Building Information modelling(BIM) 5.2 Features of BIM softwares 5.3 Use of BIM software for resource planning and activity scheduling.	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping*

matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Identify the various activities and resources required for an ongoing/completed civil engineering project.	04
2	II	Study the features of MS- Project software	04
3	III	Use MS Project software for preparing bar chart and project scheduling.	04
4	II	Study the features of Prima-Vera software	04
5	IV	Use Prima-vera software for preparing project scheduling and resources planning.	08
6	V	Study the features of BIM software	04
7	V	Use BIM software for preparing resources planning and activity scheduling.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect market rates for various civil engineering materials like bricks, cement, tiles, water supply and sanitary fixtures etc
2. Collect labour rates, task work, day work for various civil engineering activities, processes and machineries and equipments etc.
3. Collect set of drawings and specifications for ongoing or completed civil engineering project.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Construction management and Planning	B. Sengupta and Guha	Tata McGraw Hill
2	CPM and PERT	L. S. Shrinath	East and West Press Pvt. Ltd.

B) Software/Learning Websites

1. Prima-vera P6,
2. Microsoft-Project,
3. Building Information Modeling(BIM).

C) Major Equipment/ Instrument with Broad Specifications

1. Desktop PC

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / ME / PS / EE / IF / CM / EL / AE / DD / ID
COURSE : Entrepreneurship Development (EDP) **COURSE CODE :** 6309

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Globalization, liberalization & privatization along with revolution in Information Technology, have thrown up new opportunities that are transforming lives of the masses. On the global scenario we have abundant physical and human resources which emphasizes the importance and need of entrepreneurship. Talented and enterprising personalities are exploring such opportunities & translating opportunities into business ventures such as- BPO, Contract Manufacturing, Trading, Service sectors etc. The student community also needs to explore the emerging opportunities. It is therefore necessary to inculcate the entrepreneurial values during their educational tenure. This will help the younger generation in changing their attitude and take the challenging growth oriented tasks instead of waiting for white- collar jobs. This course will help in developing the awareness and interest in entrepreneurship and create employment for others.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Identify entrepreneurial opportunity.
2. Develop entrepreneurial personality, skills, values and attitude.
3. Analyze business ideas- project selection.
4. Develop awareness about enterprise management.
5. Take help of support systems like banks, Government, DIC etc.
6. Prepare preliminary project report.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Develop Entrepreneurial skill by brainstorming games, SWOT analysis, Risk taking games.
2. Collect information by Visiting to DIC and Nationalised Banks.
3. Interview of successful entrepreneur.
4. Learn the success stories from successful entrepreneur.
5. Select product after market survey for product comparison, specifications and feasibility study.
6. Prepare preliminary project report.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Entrepreneurship, Creativity and Opportunities**	1a. Conduct self analysis 1b. Overview of Entrepreneurship 1c. Generating business idea	1.1 Concept, Classification & Characteristics of an Entrepreneur 1.2 Creativity and Risk taking. 1.3 Concept of Creativity, brainstorming Risk Situation, Types of risk & risk takers.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1d. Search business opportunities	1.4 Trade Related opportunities	
		1.5 Business Idea -Methods and techniques to generate business idea. 1.6 Transforming Ideas in to opportunities 1.7 SWOT Analysis 1.8 Scanning Business Environment	
Unit-II **Business Terminology, Information and Support Systems**	2a. Understand Classification of business sectors 2b. Acquiring help from support systems 2c. Planning of business activities	2.1 Types of business and industries, forms of ownership, Franchisee, Export, Network/Multilevel Marketing 2.2 Sources of Information. Information related to project, support system, procedures and formalities 2.3 Support Systems • Small Scale Business Planning, Requirements. • Statutory Requirements and Agencies. • Taxes and Acts	02
Unit-III **Market Assessment**	3a. Conducting Market survey 3b. Selection of product	3.1 Marketing - Concept and Importance 3.2 Market Identification, Survey Key components 3.3 Market Assessment	02
Unit-IV **Business Finance**	4a. Understanding terminology of finance 4b. Search and analyse sources of finance 4c. Financial ratio and profitability study	4.1 Cost of Project 4.2 Sources of Finance 4.3 Assessment of working capital 4.4 Product costing 4.5 Profitability 4.6 Break Even Analysis 4.7 Financial Ratios and Significance 4.8 Various govt. /bank schemes of finance (long term and short term)	04
Unit-V **Business Plan and Project Appraisal**	5a. Prepare a project report 5b. Conduct feasibility study	5.1 Preliminary project report preparation. 5.2 Project Appraisal & Selection Techniques • Meaning and definition • Technical, Economic feasibility • Cost benefit Analysis • Checklist	04
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Entrepreneurship Awareness- Who am I?/ EOI/ Microlab Exercise	04
2	I	Creativity Exercises/games	02
3	I	Risk taking Exercises/games	02
4	II	Brainstorming/group discussion/problem solving exercises	04
5	III	Business Games and Related Exercises	04
6	II	Interview of an entrepreneur	02
7	IV	Event/task/activity management-group of 4-6 students will work together	04
		AND/OR	
1 to 7	I-IV	3 days Achievement Motivation Training workshop /Entrepreneurship Awareness Program	22
8	V	Visit to DIC/Bank/MSSIDC/MIDC/MPCB/Industry	04
9	V	Prepare a preliminary project report and study its feasibility	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Assess yourself – are you an entrepreneur? (Self Analysis)
2. Report on
   - interview of successful entrepreneurs (minimum two)
   - interaction with the support systems
   - visit to small scale industry
3. Product survey - select one product and collect all its related information i.e. specification, price, manufacturer from at least three suppliers/ manufacturers
4. Prepare list of identified opportunities

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Conduct 3 days awareness camp for entrepreneurship by professional bodies
2. Arrange a visit to SSI/DIC
3. Arrange Interview / Expert lecture of an entrepreneur

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Entrepreneurship Development	E. Gorden K. Natrajan	Himalaya Publishing, Mumbai
2	Entrepreneurship Development	Colombo plan staff college	Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3	A Manual on How to Prepare a Project Report	J. B. Patel D. G. Allampally	EDI STUDY MATERIAL Ahmadabad
4	A Manual on Business Opportunity Identification & Selection	J. B. Patel S. S. Modi	
5	National Directory of Entrepreneur Motivator & Resource Persons.	S. B. Sareen H. Anil Kumar	

Sr.No.	Title of Book	Author	Publication
6	A Handbook of New Entrepreneurs	P. C. Jain	
7	The Seven Business Crisis & How to Beat Them.	V. G. Patel	
8	Entrepreneurship Development of Small Business Enterprises	Poornima M. Charantimath	Pearson Education, New Delhi
9	Entrepreneurship Development	Vasant Desai	Himalaya Publishing, Mumbai
10	Entrepreneurship Theory and Practice	J. S. Saini B. S. Rathore	Wheeler Publisher, New Delhi
11	Entrepreneurship Development	--	TTTI, Bhopal / Chandigarh
12	Entrepreneurship Management	Aruna Kaulgad	Vikas Publication

B) Software/Learning Websites

Websites-

1. http://www.ediindia.ac.in
2. http://www.dcmsme.gov.in/
3. http://www.udyogaadhaar.gov.in
4. www.smallindustryindia.com
5. www.sidbi.com
6. www.tifac.org.in

C) Video Cassettes /CDs

Sr.No.	SUBJECT	SOURCE
1	Five success Stories of First Generation Entrepreneurs	EDI STUDY MATERIAL Ahmedabad (Near Village Bhat, Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428, Gujarat, India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in olpe@ediindia.org Website : http://www.ediindia.org
2	Assessing Entrepreneurial Competencies	
3	Business Opportunity Selection and Guidance	
4	Planning for completion & Growth	
5	Problem solving-An Entrepreneur skill	
6	Chhoo Lenge Aasman	
7	Creativity	

D) Major Equipment/ Instrument with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1			L				L	M			M
CO2					M		M	H	M	M	H
CO3					L		M	L	H	L	M
CO4					L	M	M	M	M	H	M
CO5					H	M	M	H	H	M	M
CO6	L	M	M	M	M	M	H	H	M	H	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in CE / PS / EE / EL / AE
COURSE : Renewable Energy Sources (RES) **COURSE CODE** : 6310

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Modern society relies on stable, readily available energy supplies. Renewable energy is an increasingly important component of the new energy mix. The course covers energy conversion, utilization and storage for renewable technologies such as wind, solar, biomass, fuel cells and hybrid systems. Thermodynamics concepts (including the first and second law) form the basis for modelling the renewable energy systems. The course also touches the environmental consequences of energy conversion and how renewable energy can reduce air pollution and global climate change.

2.0 COURSE OBJECTIVES:

The student will be able to

1. List various sources of energy and their applications in India and around world.
2. Describe the challenges and problems associated with the use of various energy sources, with regard to future supply and the environment.
3. Determine potential solutions to the supply and environmental issues associated with energy sources.
4. Understand Emerging Energy Technologies.
5. Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Enlist various energy sources and state their present scenario in India
2. State the solar energy applications and functions of system components.
3. Apply the basics of wind and ocean energy for electricity generation.
4. Describe the conversion process of biomass energy.
5. State and apply the various Emerging Energy Technologies

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Energy Science** and Sources	1a. Define energy conservation law 1b. Identify various sources of energy and compare them. 1c. Understand the present energy situations and schemes for renewable energy promotion.	1.1 Concept of energy, Law of conservation of energy 1.2 Introduction to conventional energy sources and renewable energy sources 1.3 Comparison between energy sources 1.4 Present scenario in energy crises in India and world 1.5 Government schemes to promote use of renewable energy sources	02 0
Unit-II	2a. Define the basic	2.1 Introduction to solar energy	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Solar Energy	conversation principle of solar energy. 2b. Describe the solar system used in water heating. 2c. State the applications of solar energy	2.2 Physical principles of conversion of solar radiation into heat 2.3 Flat plate collectors and concentric collectors 2.4 Solar energy storage system 2.5 Applications of solar energy in Water heating, Space heating and cooling, Greenhouses and electricity generation	
Unit-III **Wind and Oceans Energy**	3a. Understand the concept of electrical wind generation. 3b. State basic components of WECS. 3c. Distinguish Wind and Oceans Energy 3d. Explain ocean thermal electric power generation 3e. Describe the principle of tidal power generation.	3.1 Basic principles of wind energy conversion 3.2 Site selection considerations 3.3 Basic components of a wind energy conversion system (WECS). 3.4 Advantages and disadvantages of WECS. 3.5 Applications of Wind energy. 3.6 Introduction of Oceans energy 3.7 Methods of ocean thermal electric power generation 3.8 Open cycle and closed cycle Ocean thermal energy conversion (OTEC) system 3.9 Basic principle of tidal power	05
Unit-IV **Bio mass Energy**	4a. State resources of Biomass energy. 4b. Describe the biomass conversion process. 4c. Know Bio Diesel and Bio Mass plant 4d. State information of Government schemes to promote use of biomass energy.	4.1 Introduction to biomass energy 4.2 Biomass energy resources 4.3 Biomass conversion process : Direct combustion, thermo chemical conversion, bio chemical conversion 4.4 Introduction to bio gas plant 4.5 Introduction to Bio Diesel, Bio Mass plant 4.6 Government schemes to promote use of biomass energy	03
Unit-V **Emerging Energy Technologies**	5a. Define the Hydrogen Energy. 5b. Describe properties of hydrogen and its sources. 5c. Know the hydrogen handling.	5.1 Hydrogen Energy 5.2 Properties of hydrogen 5.3 Hydrogen as a source of renewable energy 5.4 Sources of hydrogen 5.5 Production of hydrogen 5.6 Storage and transportation 5.7 Introduction to Carbon Capture and Storage (CCS)	02
TOTAL			**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

S. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Group discussion on benefits of renewable energy sources.	02
2	II	Visit solar water heating system demonstrate and write report on demonstration of solar water heater	04
3	II	Report on demonstration of solar light with the connection diagram.	04
4	II	Visit to the solar power plant write report and draw layout of solar power plant.	06
5	III	Visit to the wind power plant write report and draw a layout of Wind power plant	06
6	IV	Report on demonstration of bio mass gasifier	04
7	IV	Case study of Bio gas plant and tidal power plant	04
8	V	Group discussion on Emerging Energy Technologies and their future	02
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect renewable energy information from web source.
2. Collect and analyse information from web site of BEE (Bureau of Energy Efficiency) and MEDA (Maharashtra Energy Development Agency) on energy.
3. Prepare a report on Government schemes to promote use of renewable energy sources.
4. Identify and collect different manufactures of solar water heater.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show video demonstration of solar water heater system.
2. Visit to solar plant to understand the working of solar generation.
3. Arrange expert lectures on new trends in renewable energy.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Renewable energy sources and conversion technology	Bansal Keemann, Meliss,	Tata McGraw Hill
2	Renewable energy resources and emerging technologies	Kothari D. P.	Prentice Hall of India Pvt. Ltd.
3	Non-Conventional energy Sources	Rai G. D.	Prentice Hall of India Pvt. Ltd.
4	Nonconventional Energy	Ashok V. Desai	New Age International Publishers Ltd

B) Learning Websites

1. Website of bureau of energy and efficiency: www.bee-india.nic.in
2. www.betterenergy.org
3. www.mahaurja.com Maharashtra Energy Development Agency (MEDA)
4. www.worldenergy.org
5. www.renewableenergyworld.com

C) Major Equipment/ Instrument with Broad Specifications

1. Solar water heating system
2. Solar lighting system

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		M			L	H					
CO2			H								M
CO3		M				H					
CO4			H								
CO5					M	H					

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Advanced Surveying (ASY) **COURSE CODE** : 6401

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	03	Max.	80	20	100	50	--	25	175
					Min.	32	--	40	20	--	10	--

1.0 RATIONALE:

This is an applied technology course which is intended to make students to learn application of facts, concepts, principles and procedures in surveying and levelling. It is also intended to make students to study theodolite traversing and Modern Surveying instruments. With this knowledge and skill, students will be able to use appropriate survey and levelling instruments depending on requirement to carry out survey works for various Civil Engineering activities.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the principles and applications of theodolite surveying
2. Apply the knowledge of theodolite traversing to civil engineering works.
3. Get acquainted with methods of curve setting.
4. Use advanced survey instruments to carry out survey work.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Measure horizontal and vertical angle using transit theodolite
2. Determine the co-ordinates and azimuths of theodolite traverse.
3. Obtain horizontal and vertical distances using principles of tacheometry.
4. Set out a simple horizontal curve.
5. Use micro-optic and digital theodolite for angular measurements.
6. Use EDM and Total station for traversing of a small area.
7. Understand the basic principles of remote sensing and GIS.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Theodolite Surveying**	1a. Identify various components of transit theodolite. 1b. Measure horizontal and vertical angle using transit theodolite. 1c. Measure deflection angle with transit theodolite. 1d. State sources of errors in theodolite surveying. 1e. State methods of traversing with theodolite.	1.1 Types of Theodolite, Vernier, Micrometer, Digital. Components of Transit Theodolite and their functions. Technical terms used. Temporary adjustments of Transit Theodolite. 1.2 Measurement of Horizontal angle, method of Repetition, errors eliminated by method of repetition. 1.3 Measurement of Vertical angle. 1.4 Measurement of Deflection angle. 1.5 Measurement of magnetic bearing of a line by Theodolite. 1.6 Prolonging a Straight line.	16 0

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
	1f. Determine consecutive and independent co-ordinates of a theodolite traverse.	1.7 Sources of errors in Theodolite Surveying. 1.8 Permanent adjustment of transit Theodolite (only relationship of different axes of Theodolite.). 1.9 Traversing with Theodolite: Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles. 1.10 Traverse Computation - Latitude, Departure Consecutive Co-ordinates error of Closure, Distribution of angular error, balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table. Simple problems on above topic.	0 0
Unit-II **Tacheometric Surveying**	2a. State essential requirements of a tacheometer. 2b. Calculate horizontal and vertical distances using principles of tacheometry.	2.1 Principle of Tacheometry. 2.2 Essential requirements of Tacheometer. 2.3 Use of Theodolite as a Tacheometer with staff held vertical and fixed hair method (No derivation). 2.4 Determination of tacheometric constants.	08
Unit-III **Curves**	3a. State different types of curves for road alignment. 3b. Find the elements of simple circular curve. 3c. Set out a simple horizontal curve.	3.1 Types of curves used in road and railway alignments. Notations of simple circular curve. Designation of curve by radius and degree of curves. 3.2 Method of Setting out curve by offset from Long chord method and Rankin's method of deflection angles.	08
Unit-IV **Advanced Survey Instruments**	4a. State construction and uses of micro-optic theodolite. 4b. State components and principles of EDM. 4c. State components and functions of total station. 4d. Use micro-optic and digital theodolite for angular measurements.	4.1 Micro Optic theodolite: Construction and use of one second Micro Optic theodolite. 4.2 Digital Theodolite**:** Construction and use of Digital theodolite. 4.3 Electronic Distance Meter (EDM): Principle of EDM, Components of EDM. And their functions, use of EDM. 4.4 Total Station: Introduction to Total station. Components and functions of total station. 4.5 Set up of Total Station 4.6 Centering, Levelling and Recording readings with Total Station	08
Unit-V **Traversing with Total**	5a. Use Total station for measurement of distances. 5b. Measure distances, co-	5.1 Survey Station description. Entering data of occupied station for a total station. 5.2 Measurement with Total Station.	12

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Station	ordinates and elevations of points. 5c. State data storing and retrieval process for total station. 5d. Use Total station for traversing of a small area. 5e. Identify sources of errors in total station surveying.	Distances, Co-ordinates and elevations. 5.3 Total Station Traversing, back sighting and recording measurements for field points from different traverse stations. 5.4 Storing and Data Retrieval. 5.5 Field Generated Graphics 5.6 Construction layout using Total Station 5.7 Overview of Computerized Survey Data System 5.8 Equipment Maintenance 5.9 Maintaining Battery Power 5.10 Total station survey system errors, sources of errors and how to avoid errors, controlling errors.	
Unit-VI **Aerial Survey and Remote sensing**	6a. State the basic principles of remote sensing and GIS. 6b. State applications of remote sensing. 6c. State role and functions of GIS in surveying.	6.1 Aerial Survey: Introductions, definition, Aerial photograph. 6.2 Remote Sensing: meaning of remote sensing, Electro-Magnetic Energy, Remote sensing system- Passive system, Active system. Applications: mineral, land use / Land cover, Natural Hazards and Environmental engineering system. 6.3 Introduction to GIS and GPS. Concept and terminology. 6.4 Role of GIS in surveying. 6.5 Functions of GIS. Capturing, storing, querying, analysing and displaying data with GIS.	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Theodolite Surveying	04	08	08	20
II	Tacheometric Surveying	04	04	04	12
III	Curves	04	04	04	12
IV	Advanced Survey Instruments	04	08	--	12
V	Traversing with Total Station	04	04	04	12
VI	Aerial Survey and Remote sensing	04	04	04	12
	TOTAL	**24**	**32**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Understanding the components of Theodolite and their functions, reading the Vernier and temporary adjustments of theodolite.	02
2	I	Measurement of Horizontal angle by direct angle method.	02
3	I	Measurement of Horizontal angle by method of Repetition.	04
4	I	Measurement of vertical angles by transit theodolite	02
5	I	Measurement of deflection angle by transit theodolite.	02
6	I	Determine the consecutive co-ordinates of two successive lines by observing the magnetic bearings of lines.	02
7	II	Determine constants of a given tacheometer.	02
8	II	Find the horizontal distances and elevations of points using theodolite as a tacheometer	02
9	III	Design a simple circular curve for a given data using Rankin's method of deflection angle.	04
10	IV	Measurement of Horizontal and vertical angle by one second micro optic theodolite.	04
11	IV	Study and use of Electronic Distance Meter (EDM).	04
12	IV	Use of EDM for finding horizontal and vertical distances and elevations of points.	04
13	IV	Study of Total Station and its components.	04
14	V	Finding horizontal, vertical distance and elevations of points with total station.	04
15	V	Finding the co-ordinates and elevations of 8 to 10 points using total station.	04
		TOTAL	**46**
SN		**List of Projects**	
1		Theodolite traverse survey for a closed traverse of 5-6 sides for a small area. Computation by Gale's traverse table. Plotting the traverse with details on full imperial drawing sheet	06
2		Setting out simple circular curve by Rankine's method of deflection angles for a given problem and plotting the details of curve on full imperial drawing sheet	06
3		Locating details with co-ordinates and elevations of a small area by traversing with total station (3 to 4 traverse stations). Plotting the details on full imperial drawing sheet. / retrieving graphical data generated by traversing and taking a computerised printout.	06
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Study of different types of modern digital survey instruments. Collect the details from different manufacturers from internet.
2. Collect the details of GIS softwares from internet.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to Advanced surveying.
2. Use of teaching aids, power points, video demonstration, Expert lectures.
3. Use of web-based learning methods.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Surveying and Levelling	N N Basak	Tata McGraw-Hill
2	Surveying and Levelling Part I and II	T. P. Kanetkar & S. V, Kulkarni	Pune Vidhyarthi Griha Prakashan
3	Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya	Laxmi Publication
4	Text book of Surveying	S. K. Husain, M. S. Nagaraj	S. Chand and Company
5	Surveying and Levelling Vol. I and II	S. K. Duggal	Tata McGraw-Hill
6	Plane Surveying	A. M. Chandra	New Age International Publishers
7	Higher Surveying	A. M. Chandra	New Age International Publishers

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Sr.No.	Name of the Instrument	Broad Specifications
1	20" Transit Theodolite	20", 15 CM Dia. Graduated circle
2	Micro-optic Theodolite	1 second digital display and optical plummet.
3	EDM	1 second/0.001m accuracy, dual window, battery operate, with digital plummet
4	Total Station	0.001m accuracy, digital dual display, battery operated, PC interface and with high quality prism reflectors.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M	M				H			
CO2		H	M	M				H			
CO3		H	M	M				H			
CO4		H	M	M				H			M
CO5		H	M	M				H			M
CO6		H	M	M				H			M
CO7		H	M	M				H			M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Computer Aided Drawing (CAD) **COURSE CODE** : 6402

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	01	04	05	--	Max.	--	--	--	25	--	25	50
					Min.	--	--	--	10	--	10	--

1.0 RATIONALE:

It is the age of computer. Architect / Engineers prepares most accurate and descent presentation of plans to satisfy the clients. Use of computer software such as AutoCAD, Felix Cad and Auto Civil enables Civil Engineers to prepare quality drawings in shortest possible time. This helps in reduction in the laborious, tedious work of draftsmanship. Working drawings are also prepared with the help of computer. In view of this computer aided drawing has been included in the present curriculum.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the features of computer aided drawing
2. Identify various commands used for drawing, modifying and displaying drawing.
3. Prepare drawings with CAD software for various civil engineering structures.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Use different CAD commands for drawing.
2. Prepare line plans with CAD software.
3. Prepare submission drawing/working drawing for the buildings with CAD software.
4. Prepare drawings of Civil engineering structures.

4.0 COURSE DETAILS:

Note: Following theory content shall be covered in Tutorials and Practical hours.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of CAD**	1a. State various softwares for CAD. 1b. State uses of CAD	1.1 Information about CAD 1.2 Uses of CAD 1.3 Information of various software's (CAD software available in the market AutoCAD, Felix Cad, Auto Civil, 3D Max)	02
Unit-II **Creating Drawing**	2a. Identify various CAD commands. 2b. Use CAD software for creating drawing.	2.1 Starting up of CAD 2.2 CAD Window, Tool bar, Drop down menu. 2.3 Opening, Saving, Making Change and Closing CAD	02
Unit-III **Learning The CAD Commands**	3a. Use CAD commands for drawing, modifying and formatting.	3.1 Setting Up a work area, WCS and UCS, specifying units, drawing limits, grid, Osnap, polar, ortho, LWT. 3.2 Drawing commands- line, circle,	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		polyline, multiline, Ellipse, polygon, arc. 3.3 Modifying commands: Copy, move, offset, fillet, chamfer, trim, stretch, mirror, rotate, array, scale, hatch block. 3.4 Format commands: text style, dimension style, point, Line weight line type, line type scale. 3.5 Setting layers, layout& paper space.	
Unit-IV **Application of CAD**	4a. Prepare line plan and working drawings for building. 4b. Prepare drawings of various civil engineering structures using CAD.	4.1 Line plan, Detailed Plan, elevation, section, site plan and area statement. 4.2 Generation of 3D view, plotting & printing Commands.	04
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Laboratory Work:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
	A)	**Building Drawing:**	
		Following exercises shall be completed with CAD software and Print of all the drawings should be prepared on A3 / A4 size paper	
1	I/II/III	Preparation of line plan of a Public building.	04
2	III	Preparation of submission drawing of residential building framed structure type: Detailed Plan, Elevation, Section, Schedule of openings, Site Plan and Area Statement	16
3	III	Prepare Line out/foundation Plan for a framed structure	04
4	III	Prepare Layout Plan of house drainage.	04
	B)	**Civil Engineering Drawing.**	
		Preparation of Drawings with CAD software for the following exercises **(Any Six)** and Print out of the drawings should be prepared on A3 /A4 size paper.	
1	IV	Plan and Section of KT Weir.	06
2	IV	Section of an Earthen Dam.	06

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
3	IV	Plan and Section of Clarri-flocculator	06
4	IV	Plan and section of Elevated Service Reservoir.	06
5	IV	Plan and section of a septic tank.	06
6	IV	Plan, Cross Section and Longitudinal section of a Culvert (Pipe culvert/Box Culvert) or a small bridge.	06
7	IV	Cross section of a National Highway in Cutting and embankment.	06
8	IV	Prepare structural drawing for a staircase.	06
TOTAL			**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect specifications of any Two CAD softwares available in market.
2. Collect commercial presentation drawings for buildings.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show computer software related to CAD
2. Use of teaching aids, power points, video demonstration, Expert lectures.
3. Use of web-based learning methods.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	AutoCAD-2006	George Omora	BPB Publication
2	Reference Manual of AutoCAD	Autodesk	Autodesk Inc.
3	Reference Manual of Felix cad	Felix CAD	FelixCAD,
4	Reference Manual of Inteli CAD	InteliCAD	InteliCAD Inc.
5	Reference Manual of Auto Civil	Autodesk	Autodesk Inc.
6	Reference Manual of 3D-Max	Autodesk	Autodesk Inc.

B) Software/Learning Websites

www.autodesk.com/solutions/cad-software

C) Major Equipment/ Instrument with Broad Specifications

Sr.No.	Name of the Instrument	Broad Specifications
1	AutoCAD Software	20 user AutoDesk certified

Computer Specification

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M					M			
CO2		H	M		M			M			
CO3		H	M		M			M			M
CO4		H	M		M			M			M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Estimating and Costing (ESC). **COURSE CODE :** 6403

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	04	Max.	80	20	100	--	25	50*	175
					Min.	32	--	40	--	10	20	--

* Indicates TW to be assessed by external & internal examiners

1.0 RATIONALE:

Estimating and costing is widely required in all civil engineering works. This course is useful for preparing estimates and find costs of civil works. In field, students will be able to prepare material and manpower requirement, schedule of rates, draft specifications, prepare estimates and bill of quantities for buildings, irrigation projects, transportation projects and environmental projects.

Estimating and costing is an important applied technology course and is an important course for civil engineering programme. After learning this course diploma civil engineer will be able to prepare estimates and decide the cost for various administrative and financial approvals from financial and government authorities.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand methods of estimates of civil engineering structures.
2. Know the use of Specification in construction.
3. Prepare Rate Analysis of civil construction items.
4. Understand methods of valuation of buildings.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Identify units and modes of measurement
2. Prepare approximate estimates for budget proposals.
3. Prepare detailed estimates of civil engineering structures.
4. Prepare material and labour requirement for various civil engineering activities.
5. Draft specifications for civil engineering items and processes.
6. Prepare analysis of rates.
7. Determine the value of any property.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Purpose and Types of Estimates**	1a. Describe purposes of estimating and costing 1b. Differentiate between different types of estimates.	1.1 Meaning of the terms: Estimating, Costing. 1.2 Purpose of Estimating and Costing 1.3 Types of Estimates: Approximate, Detailed, revised, Supplementary, annual repairs and maintenance estimate.	02
Unit-II **Modes of Measurement**	2a. Use units of measurement for different items of works.	2.1 Fixing units of measurement for items Works. 2.2 Modes of measurement of items of work as per PWD and IS-1200	04

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
	2b. Apply mode of measurement as per PWD procedure.	2.3 Desired accuracy in taking measurements.	
Unit-III **Approximate estimate**	3a. Identify methods of approximate estimate. 3b. Calculate approximate estimate of a building. 3c. Prepare approximate estimate of structures for transportation, irrigation and environmental works.	3.1 Use of approximate estimate. 3.2 Methods of approximate estimate for building: plinth area Method, cubical content method, service unit Method, Typical bay method, approximate Quantity method. 3.3 Methods of approximate estimate for roads, railways, bridges, irrigation works, water supply and sanitary work.	04
Unit-IV **Detailed estimates**	4a. Identify methods of detailed estimate. 4b. Collect data required for preparing detailed estimate. 4c. Describe steps for preparing detailed estimate. 4d. Prepare list of items of works for detailed estimate.	4.1 Uses of detailed estimate 4.2 Types of detailed estimates. Units quantity method, Total quantity method. 4.3 Data required for preparing detailed estimates:- drawing, specifications, rates, mode of Measurements. 4.4 Steps in Preparation of detailed estimates-taking out quantities, squaring-out, abstracting. 4.5 Main items of work for detailed estimates and their Units.	04
Unit-V **Procedure for preparing detailed estimate**	5a. Take out the quantities of various building items using long wall short wall and centre line method. 5b. Select suitable method for estimation of earthwork quantity of different civil engineering works. 5c. Calculate earthwork quantity for roads, dams, canal and similar works. 5d. Work out steel reinforcement quantity by preparing bar bending schedule. 5e. Provide various provisions in detailed estimate to work out the cost of structure. 5f. Prepare bill of quantities 5g. Prepare check lists for estimates.	5.1 Procedure for taking out quantities for various items of works. • Long wall & short wall method. • Center line method. • IS method of taking out quantities (Introduction Only) 5.2 Quantities for earthwork in roads, dams, canal & railway embankments: mid sectional area method, mean sectional area method, trapezoidal method and prismoidal formula method. 5.3 Taking out quantities for R.C.C. structural members such as column footing, column, beam & slab. 5.4 Preparing bar bending schedule for R.C.C. work. 5.5 Entering the quantities of items of work in standard measurement sheet. Abstracting in standard abstract sheet. 5.6 Provisions in detailed estimates for contingencies, work charged establishment, water charges, water Supply and sanitary works, electrification, tools & plants, quality control. 5.7 Preparing bill of materials for various items of work. 5.8 Check list for estimates.	24

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Specifications**	6a. State importance of specifications. 6b. List types of specifications 6c. Frame specifications for different civil engineering items.	6.1 Necessity and importance of specifications. 6.2 Points to be observed in framing specification of an item. 6.3 Types of specification: general, detailed, Standard and manufacturer's. 6.4 Preparing detailed specifications of items in Civil Engineering works. 6.5 Standard specifications book.	04
Unit-VII **Rate Analysis**	7a. Write necessity and factors affecting rate analysis. 7b. Collect market/DSR rates for materials and labour. 7c. Identify the task work for various items. 7d. Calculate the quantities of material required for different items of work. 7e. Prepare rate analysis.	7.1 Meaning of the rate analysis. 7.2 Necessity of rate analysis. 7.3 Factors affecting rate analysis. 7.4 Market rates for material and labour. 7.5 District schedule of rates. (DSR). 7.6 Definitions of task work, task work for items, Factors affecting task work. 7.7 Vehicles for transporting construction materials and their capacities. Transportation charges. 7.8 Quantity of materials required for different items of works. 7.9 Preparing rate analysis for items in Civil Engineering works.	10
Unit-VIII **Valuation**	8a. Differentiate between cost, price and value. 8b. State different methods of depreciation. 8c. Describe different methods of valuation. 8d. Evaluate capitalized value of building. 8e. Calculate rent of building. 8f. State free hold property and lease hold property.	8.1 Definition and necessity of valuation. Terms used in valuation: cost, price, value, book value, scrap value, salvage value, speculation value, distress value, sinking fund, depreciation, obsolescence. 8.2 Methods of calculating depreciation - straight line Method, sinking fund method, constant Percentage method, quantity survey method. 8.3 Computation of capitalized value, gross income, Outgoing, Net-Income, Year's purchase. Types of outgoings and their percentage. 8.4 Valuation of lands and buildings, factors affecting their valuation, Differed value of land. 8.5 Fixation of rent as per P.W.D. Practice 8.6 Lease hold property, free hold property, types of Lease Mortgage, Mortgage deed	12
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Purpose and Types of Estimates	04	--	--	04
II	Modes of Measurement	04	--	--	04
III	Approximate estimate	00	--	04	04

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
IV	Detailed estimates	--	04	--	04
V	Procedure for preparing detailed estimate	02	08	24	34
VI	Specifications	--	02	04	06
VII	Rate Analysis	--	06	06	12
VIII	Valuation	02	04	06	12
	TOTAL	**12**	**24**	**44**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I, II	Identify Units and modes of measurements for at least 25 civil engineering construction items	04
2	V	Taking out the quantities of load bearing residential building, for following items of work (two room & sanitary block with flat roof) a) Earthwork in excavation for foundation b) Bed concerting for foundation c) UCR masonry in foundation & plinth d) D.P.C. at plinth level. e) Brick masonry in super structure. f) R.C.C. for lintel, chhaja & slab. g) Plastering. h) Flooring.	10
3	V	Detailed estimate of a residential R.C.C. building.	20
4	V	Calculation of quantities of RCC (steel reinforcement) for small hall and preparing bar bending schedule.	08
5	V	Preparing detailed estimate of W.B.M. Road.	08
6	V	Preparing detailed estimate of septic tank.	04
7	VI	Study of detailed specification for one important item of work from each of the following engineering system & writing a report on it. a) Building construction system. b) Irrigation engineering c) Transportation engineering d) Environmental engineering	04
8	VII	Preparing rate analysis for following items of building work, (any five) a) Earthwork in excavation for building- b) U.C.R. Masonry in foundation plinth c) Brick masonry in supper structure	06

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		d) 12 mm thick cement plastering e) R.C.C. Work for slab & beams. f) Flooring. g) Doors & window frames	
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect market rates for various civil engineering materials like bricks, cement, tiles, water supply and sanitary fixtures etc
2. Collect labour rates for unskilled, semiskilled and skilled civil engineering activities in construction processes
3. Collect valuation report of an existing building.
4. Prepare abstract sheet using a excel sheet or suitable estimation software .

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to estimation.
2. Arrange a visit to PWD for PWD procedure of preparing estimates of civil works.
3. Arrange expert seminar of industry person in the area of estimation and costing.
4. Arrange expert seminar on valuation of properties.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Estimating & costing in Civil Engineering.	B. N. Dutta	UBS Publishers & Distributors Pvt. Ltd. New Delhi.
2	Estimating & Costing	G. S. Birdie	Dhanpat Rai & sons Delhi
3	Elements of Estimating & Costing	S. C. Rangawala	Charotar Publishers House Anand
4	Contracts and Estimates	B. S. Patil	Orient Longman Ltd. Delhi
5	Estimating, costing Specification & Valuation in Civil Engineering	M. Chakraborty	M. Chakraborty Kolkata.
6	District Schedule of rates	PWD, Govt of Mah.	PWD, Nashik

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H	M								
CO2		H								H	M
CO3	H	H	M				H	M		H	M
CO4		H	M		M						M
CO5		H			H	M	H				
CO6	M	H			M		M	M			H
CO7		H	M		M		H	M	M	H	M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Contracts and Accounts (CAA) **COURSE CODE** : 6404

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	25	25	150
					Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

This course is intended to learn concepts, principles and procedures of contracts and accounts. By this course the student will learn P.W.D. procedure of execution and accounting of Civil Engineering works, administrative procedure to be followed for preparing tender documents, allotment of works to contractors and supervision at time of construction.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the methods of execution of work.
2. Know the tendering procedure.
3. Know the types of contract.
4. Understand accounting procedure.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Execute the civil engineering work as per PWD procedure.
2. Prepare tender document.
3. Apply the conditions of contracts for execution of work.
4. Prepare bills of contractors.
5. Prepare accounts of civil work.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Methods of execution of works**	1a. Draw organisation structure of PWD. 1b. State the meaning and purpose of administrative approval technical sanction & budget provision. 1c. Describe methods of executing of work in PWD and private sector.	1.1 PWD organisation: Organisation structure, function of their personnel's, PWD procedure of initiating the work. 1.2 Administrative approval, Technical sanction, Expenditure sanction, Budgets provision. 1.3 Methods of execution: Departmental method, Daily wage labour method, piece work method, rate list method, day work method, Contract method. 1.4 Procedure of execution of works by appointing contractors in private sector. 1.5 Various no-objection certificates required from local bodies such as corporation and Zilla Parishad in connection with construction.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Tender and Tender Documents**	2a. Give classification of tenders. 2b. Draft tender Notice. 2c. State various types of tender documents. 2d. Procedure of preparation submission and security of tenders.	2.1 Definition of tender, classification of tenders, Tender form, types of tender forms. 2.2 Tender documents: - Tender notice, information to be given in tender notice, Drafting-tender notice. Preparation of tender documents for building, road and Irrigation works. 2.3 Invitation of tenders, Method of preparing and submitting tenders, Comparative-Statement, scrutiny of tenders, Rejection of tenders, Acceptance of tenders, work order. 2.4 Corrigendum to tender notice and its necessity, unbalance tender, Ring formation. 2.5 E-tendering system.	10
Unit-III **Contracts**	3a. State requirement of valid contract. 3b. State and explain various types of contracts with their advantages & disadvantages. 3c. State procedure of registration as contract in PWD.	3.1 Definition, object and requirement of valid contract Documents. 3.2 Types of contracts: - Lump sum, Item rate, percentage, cost plus percentage rate contract, labour contract, target contract, demolition contract, negotiated contract, sub contract and BOT type contract. 3.3 Class of contractor. Procedure of registration of Contractor in PWD	10
Unit-IV **Conditions of contracts**	4a. State & explain the conditions of contract 4b. Explain Indian contract act	4.1 Earnest money, security deposit, time limit and its Importance. 4.2 Conditions of contract- Defect liability period, liquidated damages, Escalation price and extra items. 4.3 Arbitration, Termination of contract, Subletting of Contract. 4.4 Indian contract act	08
Unit-V **Payments of works**	5a. Rule of the Format of M.B.S. State the muster roll of writing M.B.S. 5b. State different modes of M.R. payments and their use 5c. State various advances given to contractor	5.1 Procedure of measurement of works and recording in measurement book, Measurements book. Inspection and checking the measurements. 5.2 Interim payment, secured advance, advance payment, petty advances. 5.3 Running Bill and final bill, Mobilization advance, bill form.	06
Unit-VI **Accounts**	6a. State the heads of Accounts 6b. State importance of maintain accounts of works & store and its computerisation	6.1 Importance of maintaining accounts of works and stores, Daily diary, Imprest, Indent, bin card, Work Abstract 6.2 Classification of accounts, Heads of Accounts 6.3 Daily diary, imprest, indent, bin card, cashbook, work abstract. 6.4 Computerization of accounts in office and store.	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Methods of execution of works	04	08	06	18
II	Tender and Tender Documents	02	08	08	18
III	Contracts	04	04	06	14
IV	Conditions of contracts	04	04	04	12
V	Payments of works	02	04	04	10
VI	Accounts	--	04	04	08
	TOTAL	**16**	**32**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	II	Collect tender notices published in news paper regarding various civil engineering works (at least five). Write salient features of tender notice	04
2	II	Drafting a tender notice for a) Building construction b) Highway engineering c) Irrigation engineering d) Environmental engineering	04
3	II	Collection of tender document set from PWD and writing a report on it.	04
4	II	Preparation of following tender documents as per PWD norm for building works. i) Tender notice ii) Tender agreement iii) Schedule A & Schedule B	04
5	III	Assignment on contract	02
6	IV	Write a report on condition of contract by referring tender document.	06
7	V	Assignment on payments of works and supplies.	02
8	VI	Collection of various account forms used in PWD.	02
9	I & VI	Visit to PWD organisation to study procedure of execution of work and writing report on it.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Prepare organisation structure of PWD region, Nashik
2. Collect sample recorded forms of measurement book, nominal muster roll from PWD.
3. Collect sample recorded form of R.A. Bill and first & final bill.
4. Collect information and writing report on E-tendering system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Case study of tender document set collected from PWD.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Estimating & Costing	B. N. Dutta	UBS Publishers and distribution Ltd, Ansari, Road Delhi.
2	Estimating & Costing	G. B. Birdie	Dhanpat Rai & Sons.
3	Elements of Estimating and Costing	S. C. Rangwala	Charotar publishers house Anand
4	Contracts & Estimates	B. S. Patil	Orient Longman Ltd Delhi.
5	Schedule of Rates (D.S.R.)	P.W.D. Nashik Circle, Nashik	Govt. of Maharashtra
6	Standard specification book	P.W.D. Nashik Circle, Nashik	Govt. of Maharashtra

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	H		M	M	H	M	M	M	
CO2		M			L		M	M	L		
CO3		M				M	H				
CO4		H				L	H	M		H	M
CO5	M	M	M	L			H	M		H	M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Theory of Structures (TOS) **COURSE CODE :** 6405

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Concepts and principles involved in the design of various structures are covered in this course. The application of theoretical principles to practical field situations would help the students in understanding the concepts.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Know various elements of structures.
2. Understand basic principles.
3. Analyse the given problem
4. Apply the basic principle in solving the problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Calculate stresses on given plane for the element with given state of stress.
2. Analyse Statically Determinate structures.
3. Draw shear force and bending moment diagram for different beams.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Principal planes & principal stresses**	1a. Calculate Normal and shear stress on a inclined plane in a element subjected to plane stress condition 1b. Calculate Principal Stresses, Principal Planes, maximum shear stress and their Planes.	1.1 Concepts of simple shear, Complementary shear, Element subjected to general state of stress (Plane stress condition i.e. Normal stresses in x, y direction and shear stress all in same plane). 1.2 Equations for Normal stress, shear stress on any plane, Principal planes and Principal stresses, maximum shearing stresses and their planes. (No Derivations of these equations) Resultant stress, angle of obliquity, Numerical problems on above. 1.3 Graphical method: -Use of Mohr's circle method for an element subjected to complex State of stresses. (No problems on Mohr's circle in theory examination.)	12 00
Unit-II **Direct and**	2a. Calculate Direct & Bending Stresses of various structural	2.1 Concept of direct and eccentric loads 2.2 Tension and compression members subjected to load with eccentricity about	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Bending Stresses	components 2b. Draw stress distribution diagram for the given section	one principal axis only, stress distribution, nature of stresses. 2.3 Condition for no tension, limits of eccentricity, maximum and minimum stresses, core of section for rectangular & Circular sections, middle third rule and middle quarter rule. 2.4 Columns, walls, pillars and chimney of uniform section subjected to lateral wind pressure. Coefficient of wind resistance. Stress distribution at base (No problems on non uniform sections and Dam sections)	
Unit-III **Slope and deflection**	3a. Compute deflection & slope induced in Statically determinate Beams	3.1 Concept of slope and deflection. 3.2 Slope and deflection of determinate beam subjected to bending. 3.3 Relation between slope, deflection and Radius of curvature, differential equation (no derivation) 3.4 Double integration method (Macaulay's Method) for slope and deflection, derivation of standard formulae for maximum slope and deflection for simply supported and Cantilever beams (derivations not to be asked in theory examination.) 3.5 Application of Macaulay's method to simply supported, cantilever and overhanging beam subjected to Concentrated, uniformly distributed load. (Calculations involving solutions of cubical Expressions for maximum deflection are not expected) 3.6 Propped cantilevers, Reaction of prop, simple numerical Problems on cantilever & propped cantilever-involving point Load, uniformly distributed load.	10
Unit-IV **Fixed Beams**	4a. Distinguish between determinate and indeterminate structures 4b. Draw Shear Force & Bending Moment Diagram for Fixed Beams	4.1 Introduction to Determinate and Indeterminate structures 4.2 Concept of fixity, effect of fixity, Advantages and disadvantages of fixed beams, fixed end moments, Principle of superposition. 4.3 Derivation of formula for fixed beams for calculating fixed end moments from first principle for fixed beam subjected to concentrated load at mid span, other than mid span and uniformly distributed load over entire span. 4.4 Application of standard Formulae and differential equation for finding end moments and drawing Shear force and bending moment diagrams for fixed beams subjected to concentrated and uniformly	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		distributed loads over entire span, drawing S.F. and B.M. Diagrams. (No Problems involving application of applied Moment or couple & partial UDL)	
Unit-V **Continuous Beams**	5a. Calculate Shear Force & Bending Moment Values for Continuous Beam using Theorem of Three Moments 5b. Draw Shear Force & Bending Moment Diagram	5.1 Definition, effect of continuity, practical examples and nature of moments induced due to continuity, concept of deflected shape. 5.2 Clapeyron's theorem of three moments (no derivation) application of the theorem up to three spans only. Support at same level, spans equal or unequal, moment of inertia same or different, span subjected to concentrated and uniformly distributed loads over entire span. (No problems involving application of applied moment) Drawing shear force and bending moment diagrams. The cases of fixed ends and Overhangs and Propped cantilever are included in application.	10
Unit-VI **Moment Distribution Method**	6a. Calculate Shear Force & Bending Moment Values for Beam using Moment Distribution Method 6b. Draw Shear Force & Bending Moment Diagram	6.1 Introduction, sign convention, carry over factor, Stiffness factor, relative stiffness, distribution factor, Moment Distribution theorem. Application of moment distribution method to various types of continuous beams with supports at same levels and subjected to concentrated load and uniformly distributed loads over entire span (problems up to three spans and three unknown support moments only), shear force and bending moment diagrams (supports rigid and at same level) (No problems involving application of applied moment or couple) 6.2 Application of Moment distribution method to single bay, single storey symmetrical Portal frames, S.F. and B.M. diagrams (without sway action) 6.3 Application of moment distribution method to propped cantilever with or without overhang	10
Unit-VII **Simple Frames**	7a. Analyse Statically 7b. Determinate Trusses and frames	7.1 Definition of frame, classification of frames-perfect, imperfect, redundant, relation between members and number of joints. Assumptions in analysis of frames. 7.2 Method of joints, method of sections and graphical method of analysing simply supported or cantilever perfect frame, nature of forces in members. (No problems on graphical method in theory examination.)	06
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Principal planes & principal stresses	02	02	06	10
II	Direct and Bending Stresses	02	02	06	10
III	Slope and deflection	02	04	06	12
IV	Fixed Beams	--	04	08	12
V	Continuous Beams	--	04	08	12
VI	Moment Distribution Method	02	02	12	16
VII	Simple Frames	02	02	04	08
	TOTAL	**10**	**20**	**50**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Graphical solution of six problems on principal planes and principal Stresses	10
2	II	Solving four problems on direct and bending stresses and drawing resultant stress distribution diagrams	06
3	IV, V, VI	Solving six problems on Fixed beam, continuous beam, moment distribution (two each) and drawing shear force and bending moment diagrams for these problems	08
4	VII	Four problems on solution of frames by graphical method.	08
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Visit construction site to see the effect of continuity of beam.
2. Visit and prepare a list of structures or their component involving different actions of load i.e. Direct and Bending, Flexure, Compression Member.
3. Visit the site to observe the relevance between the reinforcement placement and bending Moment diagram.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Videos and slides involving Application of Fixed, Continuous and Propped cantilever Beam.
2. Arrange site Visit.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Strength of Materials	Singer and Pytel	Harper & Row
2	Theory of Structures	Ramamrutham	Dhanpat Rai publishing Co. (P) Ltd
3	Strength of Materials	Schaum's outline Series, William Nash	McGraw Hill
4	Strength of Materials	Timo Shenko and Young	CBS Publishers & distributers
5	Theory of Structures	R. S. Biyani	Vrinda Publications
6	Theory of Structures	Sunil S. Deo	Nirali Publications
7	Basic Structural Analysis	C. S. Reddy	Tata McGraw Hill

B) Software/Learning Websites

www.nptel.com, www.youtube.com, www.howstuffworks.com, www.sciencedirect.com, www.wikipedia.org

C) Major Equipment/ Instrument with Broad Specifications

Exercises to be carried out in Drawing Hall or Class Room.

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H	H		M							
CO2	H	H		M							
CO3	H	H		M							

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Design of R.C.C. Structures (DRCC) **COURSE CODE** : 6406

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	04	08	04	Max.	80	20	100	--	25	50*	175
					Min.	32	--	40	--	10	20	--

* Indicates TW to be assessed by external & internal examiners

1.0 RATIONALE:

Reinforced Cement Concrete is used for almost all types of structures, e.g. residential buildings, public buildings, bridges etc. It is essential for Civil engineer to study the properties & behavior of RCC.

The diploma students should be aware of the basic concepts of RCC design & should be able to prepare, read & interpret structural drawings. The students should be familiar with the relevant IS codes & be aware of the standard requirements, while executing the construction work. He should also be capable of designing structural components or simple structures.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Estimate various loads coming on the structures.
2. Refer the I.S. codes for RCC design.
3. Design the components of RCC structure.
4. Prepare the detailed RCC drawings of the designed structure.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Use relevant IS codes for analyzing, designing and detailing of RCC structural elements.
2. Reproduce the basic knowledge in the areas of limit state method and the concept of RCC members.
3. Practice the culture of professional and ethical responsibilities by following IS code provisions in the analysis, design of RC structures.
4. Identify the causes of failure in structural elements and suggest remedial measures for the benefit of community at large.
5. Demonstrate the procedural knowledge to design a system, component or process as per needs and specifications of RCC structures
6. Apply the knowledge of design of RCC structural elements using existing software and communicate the procedure adopted.
7. Understand methods of pre-stressing, losses in pre-stress and its applications.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Limit State Method**	1a. Explain Limit State Method and its types. 1b. Explain design compressive and tensile strength of concrete and steel for Limit	1.1 Necessity of steel in concrete, location of tension steel in beams, slabs and footing. 1.2 Definition of Limit State, Types of Limit States. (Limit State of Collapse – Flexure, Shear, Compression, Torsion, Limit State of Serviceability- Deflection, Cracking.) 1.3 Characteristic strength of concrete and steel, partial safety factor for concrete and steel	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	State Method.	strength. 1.4 Characteristic load, partial safety factor for load, design or factored load. 1.5 Loadings on structure as per IS 875-1987. 1.6 IS 456-2 specifications regarding spacing of reinforcement, cover, minimum & maximum reinforcement in RC members and effective span of beam or slab.	
Unit-II **Limit State of Collapse: Flexure**	2a. Analysis & Design of Singly Reinforced Rectangular beam Section in Flexure. 2b. Analysis & Design of Doubly Reinforced Rectangular Section. 2c. Analysis of flanged beam for Flexure.	2.1 Assumptions for Limit State of collapse due to flexure. 2.2 Stress and strain diagram of singly reinforced rectangular beam section. 2.3 Equations (No derivation) for balanced sections related to maximum depth of N.A- ($X_{u,\ max}$), Actual depth of N.A- (X_u), Limiting moment of resistance- ($M_{u,\ lim}$), Actual moment of resistance- (M_u), 2.4 Concept of balanced section, under reinforced section, over reinforced section. 2.5 Simple numerical problems on determining design constants, moment of resistance, type of section- under and over reinforced, ultimate load carrying capacity of beam. 2.6 Design of SS and cantilever beam for given load or moment. (i.e. to find size of beam and steel area.) 2.7 Meaning and Condition for Doubly Reinforced beam Section, Stress- Strain diagrams for doubly reinforced beam Section, analysis & design of doubly reinforced beam Section. 2.8 Conditions for formation of flanged (T and L) beams, Width of Flange as per IS 456-2000, Introduction to cases of neutral axis in i) flange and ii) web, Numerical on Moment of Resistance for neutral axis in the flange only.	14
Unit-III **Limit State Of Collapse: Shear And Bond**	3a. Design Stirrups for R.C Rectangular Beam 3b. Apply shear checks as per requirements of IS. 3c. Apply checks for development length.	3.1 Necessity of shear reinforcement, Nominal shear stress, design shear strength of concrete, maximum shear stress in concrete. 3.2 Minimum shear reinforcement, forms of shear reinforcement, maximum spacing of stirrups. 3.3 Design of shear reinforcement, 3.4 Concept of bond, types of bond, Check for bond stress and development length, Anchoring reinforcing bars in Tension and in Compression (Clause 26.2.2) Lap Length as per Is 456-2000 (Clause 26.2.5.1) 3.5 Reinforcement details for shear and bond in SS, Cantilever beams and slabs.	08
Unit-IV **Design of Slab**	4a. Identify type of Slab form drawing. 4b. Design & Draw detail drawings of	4.1 Definition and classification of slabs as one-way and two-way slabs, support conditions, main and distribution steel, Limit state of serviceability for slabs: Check for deflection. 4.2 Procedure and numerical problems on design of	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	Cantilever Slab, One Way Simply Supported Slab & Two Way Simply Supported Slab. 4c. Apply checks for shear & deflections.	one way simply supported slab with corners free to lift, check for shear & deflection. 4.3 Design of two-way simply supported slab with corners free to lift, check for shear & deflection. 4.4 Design of cantilever slab/chajja with uniform thickness, check for shear, deflection & development length. 4.5 Design of dog-legged stair: General information- rise, tread, live load etc., effective span, design of waist slab of dog-legged stair. (No problem in the theory exam on design of dog legged staircase)	
Unit-V **Limit State of Collapse: Compression**	5a. Analysis and Design of axially Loaded Short square, rectangular or circular columns	5.1 Assumption, Minimum Eccentricity, Short Column, Long Column, Reduction Factor, Effective Length of Column. 5.2 Reinforcement Requirements as per IS provisions, draw reinforcement details. 5.3 Design of axially loaded short square, rectangular or circular columns with lateral ties.	08
Unit-VI **Design of Footing**	6a. Design isolated square footing and provide reinforcement details of footing	6.1 Types of Footings, 6.2 Design of axially loaded isolated square footing with uniform depth for square, rectangular and circular columns. 6.3 Depth of footing, Check for shear and bending moment.	10
Unit-VII **Introduction of Prestressed Concrete**	7a. Compare pre-stressed concrete with RCC. 7b. Distinguish between pre-tensioning and post-tensioning	7.1 Meaning of pre-stressed concrete, comparison with RCC. 7.2 Advantages and disadvantages of pre-stressed concrete. 7.3 Basic concept, Pre-Tensioning and Post-Tensioning. 7.4 Stress Distribution Diagrams for PSC beams. (No Numerical Problems)	04
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Limit State Method	04	06	--	10
II	Limit State of Collapse: Flexure	04	04	08	16
III	Limit State Of Collapse: Shear And Bond	02	04	04	10
IV	Design of Slab	04	04	08	16
V	Limit State Of Collapse: Compression	02	04	04	10
VI	Design of Footing	02	04	06	12
VII	Introduction of Pre-stressed concrete	04	02	--	06
	TOTAL	**22**	**28**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II, III, IV, V, VI	Prepare following sketches in sketch book: 1. Longitudinal and cross section elevation along Length of Singly Reinforced Simply Supported Beam 2. Longitudinal and cross section elevation along Length of Cantilever Beam 3. Longitudinal and cross section elevation along Length of Simply Supported Tee Beam 4. Plan & c/s elevation along shorter span of One Way Simply Supported Slab 5. Plan & c/s elevation along shorter span& Longer span of Two Way Simply Supported Slab without torsion steel 6. Plan of Circular Slab with reinforcement. 7. Column reinforcement details. 8. Column and Beam ductile connection 9. Column to Column Connection when size of Upper column is reduced 10. Cantilever Retaining Wall 11. Dog Legged Stair Case	32
2	II, III, IV, V, VI	**Mini-project on structural design of a G + 1 framed residential building:** Design of slabs, beams, columns and footings for a simple plan of a G + 1 residential building based on the contents taught in the theory. Students should be encouraged to prepare their own architectural plan otherwise teacher will provide separate data of plan, dimensions and material grades separate for separate groups or batches of students; maximum batch size not exceeding 20. The students shall submit the design details in the following form: a) Design Report & calculations. b) Two or three full imperial size drawing sheets finished in pencils containing i) key-plan ii)reinforcement detailing for sample slabs and beams, column, column footing of each type and staircase iii) schedules of slabs, beams, columns and footings iv) design notes etc…	32
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

Study and Interpretation of Professional Structural Drawings:

Professional structural drawings including reinforcement detailing of the components slabs, beams, columns, footings and stair-case shall be collected from nearby consultants. Teacher shall set at least 10 objective questions on each of the five components based on the drawing sheets obtained.

1. Visit a typical building/construction site and collect details of design.
2. Collect typical photographs of building elements under different stage of construction.
3. Collect the Photographs /drawing sheets of typical staircases under construction having reinforcement details

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Site Visit must be arranged for Residential & Commercial Buildings to show reinforcement, cutting and laying of reinforcement, professional structure detail drawings
2. Show video of concrete work being carried out in slab, beam, column and in footings of different type and size.
3. Arrange lecture of practicing structural engineers on complex issues related to design.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	IS-456 – 2000	-----	Bureau of Indian Standard
2	Design Aid – SP - 16	-----	Bureau of Indian Standard
3	R.C.C. Detailing – SP - 34	-----	Bureau of Indian Standard
4	Reinforced Concrete	Dr. H. J. shah	Charotar Publication
5	RCC Theory and Design	Dr. V. L. Shah & S R Karve	Structures Publications
6	Illustrated RCC Design	V. L. Shah & S. R. Karve	Structures Publishers.
7	Design of R.C.C. Structures	B. C. Punmia, Ashok Kumar Jain, & Arun Kumar Jain	Laxmi Publications (P) Ltd
8	R.C. Structure. Elements, Behaviour, analysis & Design	Purushothaman P.	TMH Pub. Co. Ltd.,
9	Limit State Theory & Design of R.C.	V. L. Shah & S. R. Karve	Structures Publication

B) Software/Learning Websites

1. http://www.sefindia.org/
2. www.slideshare.net/asif108/
3. www.youtube.com/watch?v=2L1DTLV8bQk
4. www.nptel.ac.in
5. www.civilengineersforum.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M	H	M								
CO2	H	H									
CO3		H			H	M	H				
CO4		M	H								
CO5		H	M	M							
CO6				H							H
CO7		M									

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Design of Steel Structures (DSS) **COURSE CODE** : 6407

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	04	Max.	80	20	100	--	25	50*	175
					Min.	32	--	40	--	10	20	--

* Indicates TW to be assessed by external and internal examiners.

1.0 RATIONALE:

Steel is extensively used as a construction material for Civil engineering works such as high-rise buildings, industrial buildings, transmission towers, railway bridges, chimney, bunkers, silos etc.

The design of steel structures involves the planning of structure for specific purpose, proportioning and selection of members to carry loads in most economic manner and erection of structure at site. This can be achieved by proper functional planning and providing adequate strength to withstand direct and induced forces, which may act on the structure during its lifetime. The knowledge of material properties and behaviours of structural member, methods of structural analysis, determining design loads and method of design by using latest IS codes, hand books and design aids is essential.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Analyse the steel structure and its members for determining the forces acting on the member.
2. Select proper material and sections from steel table.
3. Calculate design force for members.
4. Use IS 875 Part 1, 2 & 3 provisions for dead load, live load and wind load.
5. Design the tension member, compression member, beam, purlin and column bases and their connections.
6. Use of IS 800: 2007 for designing the member.
7. Read and interpret the structural drawings.
8. Prepare the detailed working drawing of steel roof truss, showing sections and connections.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Draw common steel structures & know the function of each structure.
2. Use steel table and IS code to know properties of structural steel sections.
3. Design bolted and welded joints for tensile and compressive forces.
4. Design of Tension & Compression members using single or double angle sections or built up section with welded and bolt Connections as per IS 800-2007.
5. Design simple beam section.
6. Design column bases.
7. Identify the various types steel roof trusses and design industrial roof truss with detailing of designed steel structure components

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to structural Steel**	1a. State various grades of steel and their strength parameters 1b. List various properties of steel sections used for steel structures. 1c. Use steel table and IS code for finding different properties of steel sections.	1.1 Various types of rolled steel sections used, types of structural steel, I.S. code specifications, strength characteristics, ultimate and yield stresses for different types of steel. Typical stress strain graph for mild steel and salient points in it 1.2 Advantages and disadvantages of steel as construction material. 1.3 Use of steel table and relevant I.S. Code. 1.4 Types of loads on steel structure as per IS 875-1987 part I to IV specifications. 1.5 Overview of common steel structures: - Functions and components of common steel structures like steel towers, roof trusses, steel water tanks, steel bridges, gantry and crane girders, steel columns, steel chimney, building frames. 1.6 Methods of Design: Working stress method, Limit State Method. 1.7 Introduction to Limit State Method of design: Meaning and types of limit state, loads, design criteria, limit state of strength, limit state of serviceability. Partial safety Factors for material strength and loads.	04
Unit-II **Joints in Steel Structures Bolted connections (Limit State Method)**	2a. State types of steel joints and their modes of failure. 2b. Design bolted steel joints.	2.1 Type of bolts: Black bolt and High strength bolt and their use, Types of connections: - Hinged, Rigid & Semi rigid, Types of joints and failure modes. Force transfer mechanism for bolted connection, Specifications for cross-sectional area, pitch, spacing, gauge, end distance, edge distance, bolt holes for bolted connections. 2.2 Design strength of bolt in 02shear, tension and bearing. Tension capacity of plate. Efficiency of joint. 2.3 Analysis and design of bolted joints for axially loaded lap and butt joint connection. 2.4 Diagrams of beam-to-beam and beam-to-column bolted connections (No numerical problems)	06
Unit-III **Joints in Steel Structures:- Welded connections (Limit State Method)**	3a. Design welded steel joints	3.1 Introduction and types of welds, Advantages and disadvantages of welded joints, Types- butt and fillet welds and their symbols, size of weld, throat thickness 3.2 Analysis and design of welded joint (fillet weld, single & double V-butt weld) for lap and butt joint connections subjected to axial load.	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-IV **Design of Tension Members (Limit State Method)**	4a. State different types of tension members. 4b. List types of steel sections used for tension members. 4c. Analyze and design tension member connected by bolted and welded joints	4.1 Design of Tension Members: Types of sections used. Design Strength of member: - a) Design strength due to yielding of gross section, b) Design strength due to rupture at net cross-section (shear lag) and c) Design strength due to block shear. Slenderness Ratio. 4.2 Analysis and design of axially loaded single angle and double angle tension members with bolted and welded connections.	08
Unit-V **Design of Compression Members (Limit State Method)**	5a. State different types of steel sections used for compression members 5b. Analyze and design compression member connected by bolted or welded joints	5.1 Types of steel sections used for compression members, effective length, radius of gyration, slenderness ratio and its limits, design compressive stress. 5.2 Analysis and design of axially loaded simple compression members connected by bolted or welded connections with gusset plate at ends. Limits of width to thickness ratios to prevent local buckling. 5.3 Stanchions and columns – Meaning and diagrams of simple and built up sections (two angles, two I-sections, two channels placed back to back and toe to toe). No numerical problems. 5.4 Introduction to lacing and battening: Meaning and purpose. Diagrams of single and double lacing and battening system. IS code requirements only. (No design)	08
Unit-VI **Beams (Limit State Method)**	6a. List different sections used for beams. 6b. Draw loading, shear force and bending moment diagram developed in beam due to udl 6c. Analyze and design of simple beam sections subjected to udl	6.1 Different steel sections used for beams, simple and built-up sections. 6.2 Meaning of Plastic (Class-1), Compact (Class -2), Semi-compact (Class-3) and Slender (Class-4 sections). 6.3 Flexural analysis and design of simple beams (only for Class-4 sections) which are laterally supported and subjected to uniformly distributed load. Check for shear and deflections. Concept of plastic moment carrying capacity of the section. 6.4 Plate girder:-Meaning and purpose. Diagrams of typical cross sections of bolted and welded plate girder. Diagram showing components of plate girder. Function of each component.	07
Unit-VII **Column Bases (Limit State Method)**	7a. Draw components parts of steel foundations. 7b. Draw the sketch of slab base and gusseted base	7.1 Types of steel foundations- Slab Base foundation, Gusseted base foundation 7.2 Design of Slab base foundation. 7.3 Introduction to Gusseted base Foundations: Meaning and purpose. No numerical problems on analysis and	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	foundations 7c. Analysis and design slab base foundation.	design of gusseted base foundation.	
Unit-VIII **Steel Roof Truss (Limit State Method)**	8a. List types of Steel Roof trusses used in Industries. 8b. Analyze and design components of Steel Roof truss. 8c. Calculate dead load, live load and wind load acting on steel roof truss. 8d. Draw the joint connection details of different members at nodal points and connections at column supports.	8.1 Types of Steel Roof trusses for different spans (Simple and Compound Fink, Pratt, Howe, Fan, North Light roof truss) 8.2 Calculation of panel point loads for dead load, live load and wind load as per IS 875-1987. (Reaffirmed 2003) 8.3 Graphical method of finding forces in different members of truss due to dead load, live load and wind load. 8.4 Force combination table, design of members and joints of truss. 8.5 Design of angle purlin for shear and deflection only. 8.6 Arrangement of members at column supports. (No numerical on design of members, joints in theory exam.)	07
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction to structural Steel	06	--	--	06
II	Joints in Steel Structures (Limit State Method):- Bolted connections.	02	02	06	10
III	Joints in Steel Structures (Limit State Method):- Welded connections.	02	02	04	08
IV	Design of Tension Members (Limit State Method)	02	04	06	12
V	Design of Compression Members (Limit State Method)	02	02	08	12
VI	Beams (Limit State Method)	02	04	06	12
VII	Column Bases (Limit State Method)	02	02	06	10
VIII	Steel Roof Truss (Limit State Method)	02	04	04	10
	TOTAL	**20**	**20**	**40**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list*

at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	VIII	Find Forces in given Truss Members using Graphical Method due to D.L., L.L. and W.L. and Design Forces in the Members – Drawing Sheet – No: 01, A1 Size	10
2	VIII	Draw Plan & c/s Elevation of Eaves Level Joint, Ridge Joint and Two Other Joints of a Truss Selected in Sheet No:01 with design details like Size of Angle Section, Gusset Plate, Connection Details, Purlin, Roofing Material – Drawing Sheet – No: 02, A1 Size	08
3	V & VII	Draw Plan and c/s Elevation of Built up column made up of Double Channel provided back to back with Single or Double Lacing Draw Plan and c/s Elevation of Slab Base Foundation under column made up of H section	08
4	I, II, III, IV, V, VI, VII, VIII	Prepare following Neat sketches in Sketch Book 1. Different Types of Truss 2. Truss Details – Spacing of Truss, Principal Rafter, Main Tie, Members, Ridge, span, Roof Covering, Purlin etc… 3. Bolted or welded connections of roof truss. 4. Force transfer mechanism of bolted connection- heavy & friction connection. 5. Beam to Beam Connection at Same Level 6. Beam to Beam Connection at Different Level 7. Column to Beam Seated Connection (Weld & Bolt Connection) 8. Column to Beam framed Connection (Weld & Bolt Connection) 9. Gusseted Base and Slab Base Foundation.	06
5	I, II, III, IV, V, VII	Prepare a Report File related to Calculation work of Drawing Sheet No: 1, 2.	04
6	--	Site Visit of Industry Truss, Steel Structure Railway Platform – Report, Photographs	04
		1. Typical sketches of sections of tension member, determination of net effective cross sectional area of tension member. 2. Typical sketches of sections of compression member, determination of effective length for different end conditions. 3. Type of trusses for different spans. 4. Riveted and welded connections for axially loaded member. 5. Column section and slab base. 6. Important information of clauses of IS-800-2007 and IS-875 (Part-I to IV)	08
		TOTAL	**48**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect the Photographs of nearby Typical Roof Trusses and from Internet
2. Collect the Photographs of Elevated Steel Structure Water Tank
3. Collect the Photographs of Steel Columns with Lacing and / or Batten

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Site Visit must be arranged for Industrial Truss to explain Truss terminology and Connection Details
2. Show video of Fabrication work using Bolt and Weld

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	IS-800 – 2007, Indian Standard code of practice for use of structural steel in general building construction,	Bureau of Indian Standard	BIS, New Delhi.
2	Handbook on Steel – SP-6	Bureau of Indian Standard	BIS, New Delhi.
3	IS – 875, 1987, Part-1 to 5: Indian Standard Code for Loading Standards	Bureau of Indian Standard	BIS, New Delhi.
4	Limit State Design of Steel Structures	Dr. V. L. Shah and Mrs. Veena Gore	Structures Publications, Pune
5	Design of Steel Structures (By Limit State Method As Per Is: 800-2007)	Prof. S. S. Bhavikatti	I. K. International Publishing house Pvt. Ltd., New Delhi and Banglore.
6	IS hand book No. 1- Properties of structural steel rolled section.		
7	Design of Steel Structures	P. Dayarathnam	S. Chand and Company
8	Analysis and Design Practices of Steel Structures	Ghose	PHI Learning
9	Design of Steel Structures: Theory And Practice	N. Subramanian	Oxford University Press (2010)
10	Limit State Design of Steel Structures	Prof. S. K. Duggal	McGraw Hill Education (India) Pvt. Ltd.

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H									
CO2	M	M		H							
CO3		H		H			M				
CO4		H	M	H			M				
CO5		H	M	H			M				
CO6		H	M	H			M				
CO7		H	M	H			M				H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Environmental Engineering (ENE) **COURSE CODE** : 6408

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	25	--	--	125
					Min.	32	--	40	10	--	--	--

1.0 RATIONALE:

Environmental Engineering is the study of interdependence of natural agencies and surroundings like land, water, air, plant and animal life. For the convenience and use of mankind water and air are the basic needs of every living being. Therefore maintaining supply of these basic needs in adequate quantity and desired quality is very important. A huge quantity of waste products in solid, liquid and gaseous form are generated by living beings after the use of food, water, air If these are not disposed off in scientific and hygienic manner, the environmental balance gets disturbed which ultimately leads to health hazards, The job of Civil engineer is to conduct surveys, collect data, prepare drawing, estimate and supervise construction of water supply and drainage schemes of village/town / city for these aspects while constructing houses and buildings.

This course is intended to make students to learn the facts, concepts, principles and procedures related to water supply and sewage disposal projects for a medium size town, so that they can apply the principles of supervision of construction/ execution of new medium size environmental engineering projects.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Determine various water demands.
2. Know standards of purity of water.
3. Understand different methods of water treatment & design, construction and maintenance aspects of treatments
4. Understand methods of distribution of water.
5. Know the methods of collection and disposal of dry refuse in villages and cities,
6. Understand significance, use and maintenance of various sanitary fittings used for house drainage
7. Understand different methods of sewage treatment

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select appropriate treatment to raw water useful for domestic as well as construction purpose.
2. Maintain the pipe-network for water supply and Sewage disposal effectively.
3. Determine the impurities present in water
4. Explain function of various stages of treatment of influent water
5. Suggesting and planning suitable water supply scheme
6. Plan and implement house plumbing work effectively
7. Select appropriate sewage treatment process
8. Explain methods of sewage disposal

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Importance of Environmental Engineering**	1a. Explain Importance of water supply engineering	1.1 General importance of environmental engineering. 1.2 Need for protected water supply, water borne diseases. 1.3 Need for disposal of waste	02
Unit-II **Estimation of Demand of Water**	2a. Estimate the demand of water required for city/village 2b. Enlist factor affecting water demand	2.1 Water requirement for domestic, public and Industrial needs fire demands, losses and wastage, Rate of demand, Factors affecting rate of demand, Minimum requirements as per IS 1172. 2.2 Variation in rate of demand. 2.3 Design period for water supply scheme. 2.4 Forecasting population, methods of forecasting 2.5 Estimation of total quantity of water for a town	04
Unit-III **Sources of Water**	3a. Identify sources of water for potable use 3b. Select the source of water 3c. Determine characteristics of raw water 3d. List Standards of quality of water with their permissible limits	3.1 Classification of sources- Surface, Subsurface Adequacy of source. ▪ Intakes- Canal Intake, reservoir intake, river intake, lake intake. Factors governing location and construction of intakes. 3.2 Quality of Water ▪ Meaning of potable water, impurities present in Water and its classification. Need for analysis of water. ▪ Tests on water- Physical tests for colour, taste and odour and turbidity. Chemical tests for total solids, hardness, chlorides, dissolved gases, pH, Nitrogen and its compounds. Bacteriological tests, E Coil Index, MPN. ▪ Water sampling for tests, precautions to be taken for Collection of sample. Standards for potable water as per I.S. Specifications	08
Unit-IV **Treatment of Water**	4a. State objectives of water Treatment 4b. Describe principles used in water treatment. 4c. Explain function of various stages of treatment of influent water	4.1 Screening- Types of screens 4.2 Aeration- objects and methods of aeration, plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks. 4.3 Filtration: Objects of filtration, theory	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	4d. Suggesting and planning suitable water supply scheme	of filtration, filter media, depth and grading of sand bed, classification of filters- slow sand, rapid sand filters, construction, working and design aspects, suitability, merits and demerits, loss of head and negative head, back washing of rapid sand filters. 4.4 Disinfection: - objects of disinfection, methods of disinfection, chlorination-different forms of chlorination, points of chlorination, residual chlorine and ortho-tolodine test. 4.5 Flow diagram of water treatment plant, components of a water treatment plant.	
Unit-V **Conveyance of Water and Distribution of Water**	5a. List various materials used for pipe 5b. Explain various pipe joints in Distribution system 5c. List different valves and fittings used in pipe network 5d. Describe working principle of Laying of Pipes for Conveyance of Water 5e. Explain necessity of maintenance of water supply mains	5.1 Types of Pipes used for conveyance of water, choice of pipe material, 5.2 Types of joints & Types of valves-their use, location and function on a pipeline. 5.3 Methods of distribution of water-Gravity, pumping and combined system 5.4 Service reservoirs: functions and types, 5.5 Layouts of distribution of water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.	08
Unit-VI **Introduction to Sanitary Engineering**	6a. Explain house plumbing system 6b. Describe plumbing practice and safety precautions 6c. List sanitary fittings used in house plumbing& tools used 6d. Plan house plumbing work	6.1 Necessity of building sanitation. 6.2 Terms: sewage, sludge, refuse, garbage, rubbish, storm water sanitary sewage, domestic sewage. Building Sanitation 6.3 Terms: water pipe, rainwater pipe, antisiphonage pipe, waste pipe, drains 6.4 Building sanitary fitting, watercloset, flushing cistern, wash basin, sinks, urinals, Traps-Nhani trap, Gully trap P, Q, S Traps, their function, use and location. 6.5 systems of plumbing: Single stack system, one pipe system, two pipe system, choice of system, 6.6 Principles governing design of building drainage, layout plan for building sanitary fittings (Drainage Plan) Minimum size of drains and	07

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		their slopes, inspection and junction chambers, their necessity, location, size and shape. 6.7 Estimation of sanitary fittings for a building. 6.8 Maintenance of sanitary units. 6.9 Sanitary Plumbing, Layout, Plumbing arrangement for residential and public building. Rainwater and sewage collection systems.	
Unit-VII **Types of Sewerage System**	7a. State objectives of sewage disposal 7b. Discuss methods of sewage collection 7c. Describe Conservancy system & Water carriage system 7d. Describe sewer appurtenances 7e. Explain Testing and maintenance of sewer 7f. Explain, requirement and procedure for maintenance of sewerage system 7g. Explain functions of maintenance equipments and tools 7h. Plan house plumbing work for drainage effectively	7.1 Systems of sewerage- separate system, combined system, partially separate system, comparison and their suitability. 7.2 Types of sewers- Shapes and materials used, their suitability and selection. 7.3 Design of sewers, quantity of sewage, self-cleaning velocity, gradient of sewers, Size of sewers, use of tables in design of sewers. 7.4 Laying of sewers. 7.5 Testing of sewers. 7.6 Maintenance of sewers. Sewer Appurtenances 7.7 Man hole, component parts, location, spacing and construction of drop man holes. 7.8 Sewer inlets- street inlets. 7.9 Flushing tanks.	05
Unit-VIII **Analysis of Sewage**	8a. List characteristics of sewage 8b. Explain the testing, by different test like B.O.D. Test, C.O.D. test 8c. Explain sewage treatment process 8d. Explain methods of sewage disposal	8.1 Characteristics of sewage. 8.2 BOD and its significance, strength of sewage. 8.3 Aerobic and Anaerobic process. Sewage Treatment 8.4 Objects of sewage treatment. 8.5 General layout flow diagrams of sewage treatment plant for a small town including primary and secondary treatment. 8.6 Introduction and Function of grit chamber, skimming tank, sedimentation tank, sludge digestion tank and trickling filters, Activated sludge process. 8.7 Disposal of sewage: Digestion of sludge and its disposal (Only brief knowledge) Oxidation pond: Principle, working, design and layout.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Principles of septic tank, its design and working, soak pit	
Unit-IX **Solid Waste And Its Disposal**	9a. Explain different methods of recycling waste water 9b. Explain management and utilization of solid waste generated from society	9.1 Definitions: Refuse, Rubbish, Garbage, Ashes, 9.2 Constituents of solid wastes. Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes. Methods of treatment and disposal of solid waste. 9.3 Hazardous Wastes Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.	05
Unit-X **Industrial Waste**	10a. List types of Industrial Waste 10b. List characteristics of industrial waste 10c. Explain different methods of disposal of industrial waste	10.1 Types of industrial waste Hazardous and non-hazardous waste, 10.2 Major characteristic of waste from the following industries: textile, sugar, leather, dairy paper and pulp and food. 10.3 General idea regarding disposal of waste from above industries.	03
Unit-XI **Rural Sanitation**	11a. State necessity and importance of rural sanitation 11b. Explain methods of rural sanitation	11.1 Necessity and importance, Rural sanitation- Types of Privies: Aqua privy and Bore Hole Latrine	02
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Introduction	02	--	--	02
II	Estimation of Demand of Water	--	02	04	06
III	Sources of Water	04	06	--	10
IV	Treatment of Water	--	04	08	12
V	Conveyance of Water and Distribution of Water	02	02	06	10
VI	Introduction to Sanitary Engineering	02	02	04	08
VII	Types of Sewerage System	02	04	04	10
VIII	Analysis of Sewage.	02	04	04	10
IX	Solid Waste and Its Disposal	02	04	--	06
X	Industrial Waste	--	04	--	04
XI	Rural Sanitation	--	02	--	02
	TOTAL	**16**	**34**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	III	To determine pH of the given sample of water.	02
2	III	To determine the turbidity of the given sample of water.	02
3	III	To determine residual chlorine in a given sample of water.	02
4	III	To determine the total solids of the water sample.	02
5	III	To determine the optimum dose of coagulant in the given sample by jar test.	04
6	III	To determine the total solids of the waste water sample.	02
7	IX	Design of septic tank for a public building such as hostel or hospital	02
8	IX	Draw details of septic tank (plan & section) with location of soak pit.	02
9	VI	Visit to residential and public buildings to study the different systems of plumbing and sanitary fittings.	04
10	IV	Visit to water treatment plant / sewage treatment plant. Write report on it.	06
11	XI	Preparing layout of house drainage system.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

Collecting rates of plumbing materials

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Lecture method, Use of teaching aids, Case Studies, Group discussions & Assignments, Site visits

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Environmental Engineering	Kamala, A & Kanthrao. D. L.	Tata McGraw Hill-New York
2	Water supply Engineering	Gharpure V. L.	Engineering book publishing co. Pune
3	Water supply and sanitary Engg. Part-I	Gurucharan singh	Standard Publisher Distributors: New Delhi
4	Water supply and sanitary Engg.	Rangwala S. C.	Anand Charotar-Delhi
5	Water supply and sanitary Engg.	Santosh Garg	Khanna publisher, New Delhi
6	Water supply and sanitary Engg.	Hussain. S. K.	Oxford and IBH New Delhi
7	Water supply and sanitary Engg.	G. S. Birdie	Dhanpat Rai and Sons, New-Delhi

B) Software/Learning Websites

1. Study of software related to water supply and sanitary engineering.

C) Major Equipment/ Instrument with Broad Specifications

1. BOD Incubator
2. COD digester
3. Jar Test Apparatus
4. Turbidity Meter
5. pH Meter
6. Chloroscope
7. Water Analysis Kit

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H		M	H	H		M	M	H	
CO2		H		M	H	M		M	M	H	
CO3	M	H	H	M				M	M		M
CO4		H				L					M
CO5		H	M	M	M	M	M		M		M
CO6		H	M	M			M	M		M	
CO7		H		M	H	H		M	M	H	
CO8		H									M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Irrigation Engineering (IRG) **COURSE CODE :** 6409

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
04	--	02	06	03	Max.	80	20	100	--	--	25	125
					Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

India is an agricultural country where majority of persons live in villages. Agricultural industry is the backbone of Indian economy. India being the tropical country, rainfall is available only for three to four months and is not uniform. To increase the yield of the farmers, assured uniform supply of water throughout the year is essential. This is possible only with enhancing the irrigation facilities in the country.

Irrigation is an age-old art. The aim of the course is to present the science and practice of irrigation engineering in a concise form comprising practically all the modern development.

The input to the course is the knowledge of survey for investigation, hydrology for calculation of yield from rainfall records and hydraulics for designing the storage, conveyance and outlet structures.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Collect & analyse hydrological data.
2. Determine catchment area & yield of catchment.
3. Calculate storage capacity of reservoirs.
4. Design control levels of dam.
5. Know the various parameters of dams.
8. Prepare the layout of various minor irrigation schemes.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Calculate the yield from catchments.
2. Determine storage capacity of reservoirs.
3. Design & fix control levels of dam.
4. Decide the section of Dams, Weirs and Barrages.
5. Design the Canals.
6. Design sprinkler and drip irrigation scheme.
7. Supervise and maintain irrigation structures.
8. Assist in watershed management programme and Jalyukta shivar programmes

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Hydrology**	1a. Define irrigation 1b. Lists benefits, possible ill effects of irrigation 1c. Explains necessity of irrigation 1d. Calculates average rainfall, run off & MFD 1e. Estimates yield of catchment	1.1 Definition and necessity of Irrigation in India 1.2 Benefits of Irrigation, possible ill effects of over Irrigation. 1.3 Methods of irrigation 1.4 Types of Irrigation projects 1.5 Precipitation, measurement of rainfall, rain gauges - Non-automatic and automatic rain gauges 1.6 Average rainfall calculations - Arithmetic average method, Thiessen polygon method, Isohyetal method 1.7 Catchments - Definition, types. 1.8 Runoff - Definition, factors affecting runoff, Computation of runoff by runoff coefficient, Inglis Formula, Strange's table & curves, Binnie's Percentage. 1.9 Maximum flood discharge: Definition, uses, factors affecting MFD, Methods of estimation of MFD. 1.10 Yield, dependable yield and calculation of yield.	08
Unit-II **Water Requirement of Crops**	2a. Lists cropping seasons & respective crops 2b. Defines various terms such as crop season, crop period, base period, command area etc. 2c. Establishes relation between duty & delta	2.1 Cropping seasons and crops in Maharashtra 2.2 Definitions of terms - Crop season, crop period, base period, crop rotation, Intensity of Irrigation, command area, Gross command area, Cultivable command area, Irrigable command Area, Crop pattern. 2.3 Duty & Delta, Relation between duty & delta, factors affecting duty, Methods of improving duty. 2.4 Time factor, capacity factor. 2.5 Determination of water requirement & capacity of canal 2.6 Assessment of irrigation water.	06
Unit-III **Reservoir Planning**	3a. Selects site for reservoir 3b. Collects data for irrigation project 3c. Plots area capacity curves	3.1 Selection of site for a reservoir 3.2 Investigation for reservoir planning 3.3 Data collection for irrigation project. 3.4 Area capacity curves- Construction and uses. 3.5 Reservoir sedimentation - factors affecting silting, reservoir sediment control, necessity and methods of desilting of reservoir. Evaporation from reservoir, methods of reducing evaporation. 3.6 Absorption. 3.7 Fixing control levels of reservoir.	08
Unit-IV	4a. Classifies dams 4b. Defines gravity dam	4.1 Classification of dams according to use, hydraulic design & material	20

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Dams & Spillways	4c. Enumerates and determines the forces acting on gravity dam 4d. Decides stability of gravity dam 4e. Knows various construction details such as galleries, joints, keys & water seals 4f. Lists components of earthen dams, Enlist probable causes of failure of dam, Suggests appropriate methods to control seepage. Classifies spillways, Decides methods of energy dissipation, supervises the dams & spillways.	4.2 Gravity dams - Forces acting on gravity dam, Conditions of stability, theoretical and practical profile, high & low dams. 4.3 Construction details of gravity dam, Joints, keys and water seals in gravity dams. 4.4 Galleries- Function, Types, size and shape 4.5 Control of cracking in gravity dams. 4.6 Strengthening of gravity dam 4.7 Outlets in gravity dam. 4.8 Components of earthen dam & their functions. Typical cross-section of an earthen dam 4.9 Seepage through earthen dam, methods to reduce seepage through embankment & foundation. Phreatic line & its characteristics. 4.10 Slope protection, Downstream drainage system 4.11 Criteria for safe design of earthen dam. Causes of failure of earthen dam and condition of Stability. Construction of earthen dam. Outlets through earth dams. 4.12 Definition, purpose, component parts, types of spillways - with & without gates, ogee spillway, bar spillway Conditions favouring each type, length & flood lift required. Energy dissipation below spillways, stilling basin. Spillway crest gates - Radial and vertical lift gate	
Unit-V **Minor Irrigation Schemes**	5a. Prepares layout 5b. Decides cross section of Bandhara & Percolation Tank 5c. Enlists components & their functions 5d. Surveys the site for minor & micro irrigation system 5e. Maintains the minor & micro irrigation system	5.1 Bandhara irrigation - Layout, component parts, advantage and disadvantage of bandhara irrigation 5.2 Percolation Tank - Necessity, selection of site, component parts and construction 5.3 Lift Irrigation - Definition, Layout of lift Irrigation scheme, components of lift irrigation scheme 5.4 Micro Irrigation - types of micro irrigation: sprinkler and drip irrigation, component parts, layout, operation and maintenance of scheme, Design of drip and sprinkler irrigation system, merits & demerits, precautions to be taken for efficient working.	08
Unit-VI **Weirs & Barrages**	6a. Prepares the cross section of Weir & Barrage. 6b. Enlists situations favouring constructions	6.1 Weirs - Functions, site selection, types - sloping weir, vertical drop weir, situation favouring their construction. 6.2 Barrage - Components and their functions, layout of typical barrage, situation favouring Construction of	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	6c. Compares weir with barrage. 6d. Constructs & maintains weir or barrage.	barrage, comparison between weir & barrage.	
Unit-VII **Canals & Canal structures**	7a. Classifies canals 7b. Draws typical types of cross sections of canal 7c. Enlist canal structures 7d. Decides types of canal structures 7e. Constructs & maintains canal structures	7.1 Definition, classification - based on the function and relative importance in the network of canals 7.2 Canal alignments - ridge canal, contour canal, side slope canal 7.3 Typical cross section of canals, balancing depth of canal, canal discharge. 7.4 Canal structures – Necessity, location & function of Head regulators, cross regulators, canal falls, canal escapes, canal outlets. 7.5 Cross drainage works: definition, types. 7.6 Canal lining - Definition, materials used, advantages of providing canal lining, Types of canal lining. 7.7 Maintenance of canals.	08
		TOTAL	**64**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Hydrology	04	--	08	12
II	Water Requirement of Crops	02	04	04	10
III	Reservoir Planning	02	04	04	10
IV	Dams & Spillways	02	10	12	24
V	Minor Irrigation Schemes	04	--	04	08
VI	Weirs & Barrages	02	04	--	06
VII	Canals & Canal structures	02	04	04	10
	TOTAL	**18**	**26**	**36**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Plotting catchment area, determination of catchment area by Planimeter.	02
2	I	Collection of information and prepare list of documents and drawings required for irrigation project.	02
3	I	Calculation of yield from given Topo sheet of a catchment area,	02
4	II	Plotting of area capacity curve of a given contour map of irrigation project.	04
5	II	Fixation of control levels of reservoir from a given data.	02
6	II	Cross-section and Layout of drainage of earthen dam on A4 size plate.	04
7	IV	Neat labelled sketch of ogee spillway with gate and energy dissipation arrangement.	02
8	IV, VII	A report on visit to dam OR irrigation structures.	06
9	V	A report on water shed management & jalyukta shivar	04
10	V	A report including design on drip irrigation and sprinkler irrigation	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collects project reports/circulars/GRs of irrigation structure from the irrigation department.
2. Collects Rainfall data; toposheets.
3. Collects photographs, videos to study construction details from internet
4. Collects case studies of failures of irrigation structures from internet, literatures/magazines.
5. Visits to farm to study micro irrigation system.
6. Visits to major/medium irrigation projects.
7. Conducts interviews for collecting information regarding causes of failures of projects and remedial measures taken

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to irrigation engineering.
2. Arrange a visit to irrigation structures.
3. Arrange expert seminar of industry person in the area of irrigation engineering.
4. Visit to watershed management programme/jalyukta shivar programme

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Irrigation and water Power Engineering	Punmia, B. C, Pande B. B. Lal	Standard Publishers & Distributors, Delhi.
2	Text Book of Irrigation Engineering	Dahigaonkar J. G.	Wheeler Publishing, Allahabad
3	Irrigation and water Power Engineering	Garg S. K.	Khanna Publishers, Delhi - 6.
4	Irrigation Engineering	Priyani V. B.	Charotar Book Stall, Anand

B) Software/Learning Websites

1. http://www.maharashtrawaterpolicy.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	M	H	M				H	M	M		M
CO2	M	H	M				M		M	H	M
CO3		H				M	H	M	M		L
CO4	M	H		H		M		M	M	M	L
CO5	M	H		M			H	M	M		
CO6	M	H		M		M		M			
CO7		H		M			H	M	M	H	M
CO8		M		M		M		M	M		L

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Professional Practices (PPR) **COURSE CODE :** 6410

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Most of the diploma holders join industries. Due to globalization and completion in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, attitude and ability to communicate in addition to basic technological concepts.

The purpose of introducing professional practice is to provide opportunity to students to undergo activities which will enable them to develop confidence. Information search, Industrial visits, expert lectures and case study will increase participation of students in learning process.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand techniques of data collection.
2. Study professional techniques through industrial visits and expert lectures.
3. Understand and find solutions for technical problems.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Collect technical information from different sources.
2. Write industrial visit reports.
3. Acquire technical knowledge through expert lecture.
4. Develop problem solving techniques through case studies.

4.0 COURSE DETAILS:

Note: There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Information search and data collection**	1a. List documents for building permission and completion. 1b. Prepare proposal for sanction of plan of residential building 1c. Explain the procedure of registration as a contractor in PWD. 1d. State market rates of various items of advanced construction materials, pipes and peripherals. 1e. State various soft-wares used in Civil engineering.	1.1 Information of documents required for Building permission and completion certificates. 1.2 Proposal for sanction of plan of residential building 1.3 Procedure of registration of contractor in PWD. 1.4 Need of Market survey for advanced construction materials. 1.5 Need of Market survey for pumps, pipes and peripherals required for multi-storey building. 1.6 Importance of software's used in Civil Engineering.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-II **Industrial visit.**	2a. Develop technical report writing skills on industrial visits	2.1 Industrial visits and report writing of : **(Any Two)** a. Construction site for multi-storeyed residential / public building b. Visit to bridge / flyover site. c. Visit to water/sewage treatment plant d. Visit to Solid waste management site/plant e. Visit to Hot Mix Plant
Unit-III **Expert lectures**	3a. Write report on the expert lecture to obtain the professional knowledge.	3.1 Expert lectures from professionals/ industries on. **(Any Two)** a. Environmental Pollution control b. Software for Civil Engineering. c. Rules and building bye laws / Towns planning act/ Development & control rules d. Green technology. e. Advanced construction techniques
Unit-IV **Case Study**	4a. Solve civil engineering problems by case study technique.	4.1 Problem solving through Case Study technique. Identify, understand, state and suggest remedial measures for rectification. **(Any Two)** a. Cracks in the building. b. Leakages in structure (e.g. toilets, bathrooms, basement, water tank.) c. Plumbing layout of a multi-storeyed building. d. Case study for valuation of an old building and calculating market value of an old building e. Repair and restoration of civil engineering structure.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1		**Information search, data collection and writing a report on the topic (Any Five)** a. Collection of documents required for an apartment building such as P.R. card, 7/12, CT survey map, sale deed, N.A. order,	24

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Building permission, occupancy, and completion certificates. b. Preparing proposal for sanction of plan of residential building on a piece of land, collect documents required for plan sanctioning. Including rain water harvesting data) c. Collection of information regarding procedure of registration of contractor in PWD/facilities given to diploma holders, documents required. d. Market survey for advanced construction materials regarding quality, rate and applications. e. Market survey for pumps, pipes and peripherals required for multi-storey building. f. Collection of information regarding different software's used in Civil Engineering and detailed study of any one of them. g. Collection of market information including rates and specifications for non-conventional energy products like solar water heater. Solar lamp, wind turbine.	
2		**Industrial visits (Any two)** a. Construction site for multi-storeyed residential / public building b. Visit to irrigation structure c. Visit to water/sewage treatment plant d. Visit to Solid waste management site/plant e. Visit to RMC Plant	16
3		**Expert Lectures (Any Two)** The lectures from professionals/ industry expert to be organized (2 hrs. duration) on any 2 topics of following suggested areas or any other suitable topics. a. Environmental Pollution control b. Software for Civil Engineering. c. Rules and building bye laws / Towns planning act/ Development & control rules d. Green technology. e. Advanced construction techniques The brief report to be submitted on the expert lecture by each student as a part of term work.	08
4		**Case study (Any Two)** a. Study of different types of cracks in the building and suggested remedial measures. b. Study of leakages in structure (e.g. toilets, bathrooms, basement, water tank.) & suggestions regarding prevention of leakages. c. Study of Plumbing layout of a multi-storeyed building. d. Case study for valuation of an old building and calculating market value of an old building e. Repair and restoration of civil engineering structure.	16
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect specifications and rates for works of glass cladding, dewatering and slip form techniques.
2. Collect set of working drawings for civil engineering structures.
3. Observe a video on expert lectures from internet on civil engineering topic and draft a report on it.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software, arrange industrial visits, expert lectures, case studies related to civil engineering.

9.0 LEARNING RESOURCES:

A) National and international Journals and Magazine. New Building Construction, Inside Outside, Indian Concrete Journal, Civil Engineering and construction Review.

B) Software/Learning Websites

1. http://www.mahapwd.com
2. www.icjonline.com

C) Major Equipment/ Instrument with Broad Specifications

Not applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H			H		H	H	H		M
CO2		H						M	H		M
CO3		H			M	M	M				M
CO4	H	H	H	H	M			M			H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Seminar (SEM) **COURSE CODE** : 6411

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	02	02	--	Max.	--	--	--	--	--	50	50
					Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

An engineer or technician has to carry out variety of tasks & face problems and situations in his Professional life. He has to convey his ideas, communicate with people. Effective presentation of ideas, thoughts and information becomes a requisite skill for him.

The involvement of student in the seminar course will help him to plan and prepare the related topic by searching information from various sources, interact with others, analyze the information, document the content and present.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Develop abilities to search information
2. Suggest ideas through seminar
3. Collect data, information from various resources
4. Develop planning of seminar activities
5. Develop skill to communicate the problems and solutions
6. Develop skill to prepare reports
7. Develop presentation skills

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes as applicable to seminar:

1. Know and select seminar topic or problem statement in engineering field
2. Draft Problem statement or topic of seminar
3. Carry out literature survey from various resources
4. Write review of information search
5. Develop document preparation skills
6. Use of presentation skill for seminar delivery
7. Keep updated with latest trends in areas of engineering discipline

4.0 COURSE DETAILS:

Activity No	Activities
1	Briefing about selection for seminar topics in class: Discussion in class
2	Search seminar topics and approval of topic from guide from searched topics.
3	Collection of data and literature for seminar from: internet/ visit/Journals/Books/EBooks
4	Preparation of synopsis of seminar topic: print draft copy
5	Submission of seminar synopsis to guide (Printed copy)
6	Guidance about preparation of document by guide
7	Preparation of document by students
8	Editing document
9	Submission of Seminar and presentation document: Hard copy & Soft copy of power point
10	Submission of diary

Activity No	Activities
11	Seminar Presentation

The activities mentioned above shall be monitored and guided by the guide every week during the contact hours provided for the same.

5.0 AREAS FOR SELECTION OF SEMINAR:

SN	Areas For Selection
1	Environmental Engineering
2	Green Technology.
3	Irrigation Engineering
4	Building Construction.
5	Equipments & Machine
6	Structural Engineering
7	Housing project.
8	Computer application
9	Interior Decoration
10	Campus Development
11	Construction Management
12	Any other topic related to civil engineering

6.0 SUGGESTED INSTRUCTIONAL STRATEGIES:

Classroom Teaching, Library Assignment, Group Discussion, Case Studies

7.0 LEARNING RESOURCES:

Magazines, Journals, Papers: National & international Reference Books, Internet, previous seminars, Text Books, Codes of Practices e.g. IS Codes, Video Cassettes, Audio Cassettes, Compact Discs, Charts, Transparencies, Software, Models, Industrial visits, expert lectures/workshops

8.0 GUIDELINES FOR SEMINAR:

1. Selection of topic for seminar:

a. The student shall search from various resources and get the topic approved.
b. Topic of seminar shall be based on curriculum with new developments.
c. Topic of seminar should not be from the project taken by the group or by individual.
d. Selection of topic should be finalised in consultation with teacher guide allotted for the seminar.

2. Submission of Seminar Document:

a. The student shall get the seminar draft approved from Guide and complete final document.
b. Each student shall prepare two hard copies of final seminar document and retain one copy with student and submit one hard copy along with soft copy for department.
c. The structure of the seminar document shall be as per the following format: Certificate / Acknowledgement / Index / Introduction / Detailed content / Conclusion / References.
d. The seminar report shall be of minimum 10 pages and max. 20 pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2 cm, bottom margin 2 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified. It should be certified by seminar Guide and Head of department.

3. Evaluation of Seminar:

Evaluation of seminar will consist of Progressive Assessment, Presentation

i. Progressing Assessment:

1. Progressive assessment will be based on attendance, searching of various seminar topics, selection of title, collection of data from internet, Journals, Literatures, organization of data and preparation of document.
2. The student has to get seminar document assessed from guide regularly.
3. The attendance of the student shall carry 05 marks as follows
    a. Below 75 % : 00 marks
    b. 75 % and below 80 % : 02 marks
    c. 80 % and below 85 % : 03 marks
    d. 85 % and below 90 % : 04 marks
    e. 90 % and above : 05 marks

ii. Presentation of Seminar:

1. The time for presentation shall be 7 to 10 minutes per student
2. The question answer session time shall be 2 to 3 minutes per student
3. Evaluation of presentation of seminar will be carried out by a panel of teaching staff from institute based on the following point
    a. Confidence and courage
    b. Technical knowledge acquired
    c. Presentation skill
    d. Use of presentation medium e.g. A/V aids, animation

iii. Marking scheme for Seminar.

Progressive assessment	Confidence and courage	Technical knowledge	Presentation skill	Use of media	Total
25	05	05	10	05	50

9.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1								H			
CO2								M		H	
CO3		H						M			
CO4			H		M					L	
CO5									H	M	
CO6											
CO7											H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Project (PRO) **COURSE CODE** : 6412

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50*	100
					Min.	--	--	--	--	20	20	--

* Indicates TW to be assessed by external & internal examiners.

1.0 RATIONALE:

An Engineer or technician has to work on various projects in profession or field work. The aim of project is to develop the ability of "learning to learn' on its own, work in team. This would go a long way helping the students in keeping pace with future changes in technology and acquisition of Knowledge and skills as and when needed.

The scientific way of solving the problems and ability to apply it to find alternative solutions for the problems will help a technician in his professional life. This course will help to inculcate leadership skills, decision making, participative learning, resource management, cost considerations, documentation and report writing skills with effective communication.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Integrate the knowledge of engineering programme.
2. Develop the skill to identify the problem & define the problem statement.
3. Develop scientific attitude for stepwise solutions to the problems.
4. Develop attitude to work in team and act as leader of project.
5. Develop planning & execution skills.
6. Build multidisciplinary concept with cost considerations.
7. Understand recent developments in engineering fields and prepare report.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate some of course outcomes as applicable to project.

1. Participate effectively in group work.
2. Collect, analyse and synthesise the data.
3. Conduct a survey and investigate the activities.
4. Make appropriate decision.
5. Act as leader for group task.
6. Develop cost consideration.
7. Prepare technical reports.

4.0 COURSE DETAILS:

Activity No	Activities
1	Formation of Group.
2	Selection of Project: Individual/Group discussions.
3	Define Problem statement for project work.
4	Decide Strategies/Methodology to carry out project.
5	Literature Survey/data survey.
6	Submission of synopsis: by each group.
7	Project activity plan-Defining activities, strategy, duration.
8	Allocation of work responsibility to individual/team.
9	Visits to Industries / Institutions / Market/field work/sites.
10	Collection of Data /Survey/Analysis.

Activity No	Activities
11	Design of Components, preparation of drawing, estimates wherever required, printed circuits design, its checking.
12	Fabrication, Assembling, Model/Prototype development, Testing as per project requirements.
13	Progressive presentation of work and recording in diary.
14	Consolidation of work allotted to individual or team.
15	Presentation of initial draft: pre submission draft.
16	Final Project Report: Printed: Submission: soft & Hard copy.
17	Group presentation of project work at the time of final evaluation.

The activities mentioned above shall be monitored and guided by Project Guide every week during the contact hours provided for the same.

The Project is also included with Seminar with the aim to develop certain set communication skills (preparation of report, writing survey report writing Lab. experiment results writing conclusions of the work done and physical phenomenon observed, participating in group discussions, verbally defending the project in the form of Seminar etc.)

5.0 AREAS FOR SELECTION OF PROJECT:

These are only guidelines; any project related to Civil Engineering depending upon the availability of projects may be included. Preference should be given to practical oriented projects according to the local needs.

SN	Areas For Selection
1.	Environmental Engineering
2.	Green Technology.
3.	Irrigation Engineering
4.	Building Construction.
5.	Equipments & Machine
6.	Structural Engineering
7.	Housing project.
8.	Computer application
9.	Interior Decoration
10.	Campus Development
11.	Construction Management
12.	Renewable Energy
13.	Any other topics related to Civil Engineering

6.0 GUIDELINES FOR PROJECT:

A. Group Formation:

1. The department Head / Incharge should make sure that the project groups are formed within **one week** of the beginning of academic term and assign a faculty as project guide.
2. The students may be asked to work individually or in groups of five students. The group size may be varied in accordance with the effective compliance of project work.
3. The group can decide the leader and distribute work and prepare the group management structure.

B. Finalization of Project Title:

1. The students are expected to take up a project with the guidance of a Project Guide from the institute / Industry Expert / Sponsored by industry, Institute, society, self.
2. The project shall be as far as possible industrial project useful to society.
3. The students can seek help from TPO / HOD / Guide.
4. The group of students / Project guide / authority shall see the viability / feasibility of project over the duration available with the students and capabilities and setup available.

C. Note:

1. The group / student shall prepare Project Diary with Name of Project, Name of Students in group, their attendance and progress and get assessed from guide from time to time during project hours.
2. The title of the project should be finalized within **two weeks** after the group formation and a synopsis of the project should be submitted to the guide.
3. An abstract (synopsis) not exceeding 100 words, indicating salient features of the work shall be submitted to guide.
4. Modify format suitably as per requirement of the project.

D. Project Execution:

1. Guide shall monitor the work and help the students from time to time.
2. The progress shall be presented before the guide every week during project hours.
3. The students shall design parts, prepare their drawing showing all details and manufacture within the institute / sponsoring industry / workshop in local areas.
4. The guide should maintain a record of progressive / continuous assessment of project work and observe the progress of each group member on weekly basis.
5. The same shall be kept ready for submission to the external examiner before the final examination.

E. Evaluation of Project:

1. The continuous evaluation of individual progress shall be followed
2. External examiner and guide shall jointly evaluate the project.
3. The project can be evaluated on site if it is difficult to bring or demonstrate the trials in the institute
4. The attendance of the student shall carry 05 marks as follows
    i. Below 75 % : 00 marks
    ii. 75 % and below 80 % : 02 marks
    iii. 80 % and below 85 % : 03 marks
    iv. 85 % and below 90 % : 04 marks
    v. 90 % and above : 05 marks
5. The details of project assessment are mentioned in Annexure II

F. Project Report:

1. The student shall get the initial draft copy of the project approved from the Project Guide.

2. Structure: It shall be as follows
    - Title page, Inner title page (white), Certificate, Certificate from Industry, Synopsis, Acknowledgment, Table of Contents, List of table & figures (optional), Introduction, Objectives of the Project, Methodology used, Design, Drawing of the part and assembly, Testing, Costing, Result, Conclusions & Scope for future, Merits, Demerits, Applications, Bibliography
    - Annexure consists of various designed parts and assembly drawings, photographs, charts, statistical data
    - CD of video clips /Power Point presentation

3. Each group has to submit one copy of project report to the library and one soft and hard copy to the department apart from the individual copy.
4. The project report will be of 40 to 50, A4 Size pages with 1.5 line spacing. Font: New Times Roman, left margin 3 cm, right margin 1.5 cm, top margin 2.5 cm, bottom margin 1.5 cm, header & footer 1.5 cm, page numbers, size of font 12 pt, paragraphs left and right justified.
5. Chapters (to be numbered in Arabic) containing Introduction-which usually specifies scope of work and the present developments. Main body of the report divided appropriately into chapters, sections and subsections. The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc. and subsections as 2.2.3, 2.5.1 etc.
6. The chapter must be left or right justified (font size 16). Followed by the title of chapter centered (font size 18), section/subsection numbers along with their headings must be left justified with section number and its heading in font size 16 and subsection and its heading in font size 14. The body or the text of the report should have font size 12.
7. The figures and tables must be numbered chapter wise.
8. The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.
9. Reference OR Bibliography:
   The references should be numbered serially in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [4]. [The section on references should list them in serial order in the following format.]
   1. For textbooks – Dr. V. L. Shah & Veena Gore, Limit State Design of Steel Structures, Structures Publications, 1 Edition, 2009.
   2. For papers - David, Insulation design to combat pollution problem, Proc of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.
   3. Only SI units are to be used in the report. Important equations must be numbered in decimal form.
   4. All equation numbers should be right justified.
10. Each student from group shall have one copy with individual certificate only.
11. The project report and progressive assessment sheets are to be submitted before the end of term declared in the Academic Calendar of the institute.

7.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				
CO7			H								

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Supervision (BDS) **COURSE CODE** : 6501

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50	100
					Min.	--	--	--	--	20	20	--

1.0 RATIONALE:

Supervision is a personal art of an engineer. By studying this course a diploma engineer can supervise the different construction activities with the skills & solution. He/she can manage, dialogue and supervise the work of different types of labour. This course also intends to develop skills of handling & management of material & equipment on site.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the procedure of supervision of building work.
2. Know management of manpower, materials, equipments and finances for building project.
3. Supervise construction of multi-storeyed buildings.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Supervise all items of building works.
2. Prepare line out details of multi storeyed building.
3. Management of labour, material, equipments and finance for building project.
4. Supervise the construction of multi-storeyed building.
5. Check the construction activities of building.
6. Apply safety measures on construction site.

4.0 COURSE DETAILS:

Note: There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions**.**

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I Job Layout	Prepare job layout for building	Job layout : Procedure
Unit-II Line Out	Explain the line out procedure of multi-storeyed buildings	Line out of multi-storeyed building
Unit-III Resource Management	Manage material, labour and finance planning for building	Management of material, labour and finance for building.
Unit-IV Equipments for Building Construction	Enlist the equipments for building construction with applications	List of equipments for building construction and their applications
Unit-V **Checklist for Building Works**	Prepare checklist for different items of building works	Checklist for different items of building work a) Brick and stone block masonry work. b) RCC column, beam and Slab. c) RCC stair case

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		d) Plastering e) Flooring f) Painting
Unit-VI **Water Proofing**	Describe procedure of water proofing treatment	Water proofing : Methods of water proofing treatment
Unit-VII **Plumbing Work**	Prepare checklist for plumbing work	Checklist for plumbing work of multistoryed buildings.
Unit-VIII **Lift Erection**	Describe lift erection process for multistoryed building	Lift erection process
Unit-IX **Rain Water Harvesting**	Describe rain water harvesting process for multistoryed building Describe sewage treatment plant process for multistoryed building	1. Rain water harvesting : concept, methods 2. Sewage treatment plant for multistoryed building
Unit-X **Safety Measures**	Enlist safety measures for multi-storeyed building.	Importance of various safety measures, list of safety measures in construction of multi storeyed building.
Unit-XI **Green Building**	State green building concept	Green building concept

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	**I**	Preparation of job layout for building	04
2	**II**	Visit to study the line out work of multi-storeyed buildings	04
3	**III**	Prepare report on material management, labour requirement and finance for a building.	04
4	**IV**	Prepare list of tools, plants and equipments for building construction and their applications	04
5	**V**	Prepare checklist for different item of building work a) Brick and stone block masonry work. b) RCC column, beam and Slab. c) RCC stair case d) Plastering e) Flooring	12

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		f) Painting	
6	**VI**	Report on water proofing treatment for building	04
7	**VII**	Check list for plumbing work of multistoryed buildings.	02
8	**VIII**	Visit to multi-storeyed building to study the erection process of lift	04
9	**IX**	Visit to multistoryed building to study rain water harvesting and sewage treatment plant	04
10	**X**	List various safety measures adopted in multistoryed building.	04
11	**XI**	Visit to study green building concept applicable to building.	04
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Preparing detailed list of plumbing material with specifications for building.
2. Preparing detailed list of paints with specifications used for building.
3. Preparing detailed list of tiles with specifications used for flooring.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Lecture method, industrial visits, case study, market survey

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Practical Building Construction & its management	Mantri Constructions	Mantri Institute of development & research, Mantri house, FC Road, Pune-411004
2	Building Technology Vol-I & Vol-II	Jack Bowyer	The Butter worth group
3	Introduction to construction	Richard Patrick Maher	Operations Willey-International Publication
4	Contraction Engineering & Management	S. Seetharaman	Umesh publication, 5-B, Nath Market, Navi Sarak, Delhi-110006

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H	M	M			H	M			M
CO2		H	H					H	M		M
CO3		H	M	M			H	M			M
CO4		H	M	M			H	M			M
CO5		M	M				M	M	M	M	
CO6		M	M				M	M	M	M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Architectural Practices and Interior Design (ARP) **COURSE CODE** : 6502

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50	100
					Min.	--	--	--	--	20	20	--

1.0 RATIONALE:

Keeping in view the fact that the diploma Civil Engineers are to work under certain architectural firms and interior decorators. He/She should be able to draw working drawing and supervise the building works effectively. He/She should be able to prepare innovative and economic plans considering the functional utility as per the requirements of the customer.
He/She should be able to prepare required interior drawings for presentation to customers.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Use the basic architecture principles for working drawings.
2. Draw submission drawing and working drawings of buildings.
3. Know plan sanctioning procedure along with document required
4. Describe landscaping for an institutional / commercial campus.
5. Use the basic principles of interior design for drawing interior plans.
6. Prepare interior drawings for a commercial buildings or residential buildings.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Prepare submission drawing along with necessary document for plan sanctioning from competent authority.
2. Prepare innovative sketch plans for presentation to client as per requirements.
3. Design and implement interior design and decoration for buildings
4. Design and implement landscape for residential and pubic building

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Architectural Design**	1a. Describe principles of architecture. 1b. Explain / Describe building by laws.	1.1 Review of principles of Architecture. 1.2 Site selection, climatic conditions, sun control, orientation of building & site.
Unit-II **Building Aesthetics**	2a. Define aesthetics. 2b. Explain /Describe building aesthetics. 2c. Describe characteristics of building.	2.1 Feeling for aesthetics and utility, composition, unity, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern. 2.2 Character of Building.
Unit-III **Design of Projects**	3a. Draft plans elevation & section of given residential / commercial building.	3.1 A case study of residential building. 3.2 A case study of public / commercial building. 3.3 Aspect of working drawing – plan, elevation section

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		3.4 Building by laws & its applications.
Unit-IV **Landscaping**	4a. Define self & hard landscaping. 4b. Explain basic principles & landscaping. 4c. Present case study report of landscape for public / commercial building campus.	4.1 Soft and Hard landscaping. 4.2 Basic Principle of landscaping. 4.3 Assessment of land. 4.4 Design procedure. 4.5 A case study of land scape for public/ commercial building campus.
Unit-V **Elements and principles of design**	5a. Describe the various elements & principles of design. 5b. Describe various colour schemes. 5c. Explain importance of colour in design.	5.1 Elements such as form, texture, light, colour, effect of light on colour and texture, organization of space in design, space pattern. 5.2 Importance of colour as art element. Various colour schemes.
Unit-VI **Anthropometrics Data**	6a. Sketch human figures with dimension performing different activities. Activity such as cooking, opening doors & using overhead units, setting, using, w.c. & windows etc.	6.1 Relation of human measurement to furniture and movement and to circulation patterns.
Unit-VII **Interior Materials**	7a. Describe different finishing materials. 7b. Describe materials used for partition & panelling. 7c. Describe materials used for false ceiling, flooring and painting. 7d. List eco-friendly materials.	7.1 Different interior materials, paneling, partitions, finishing materials, furniture. 7.2 False ceiling, flooring, paints. 7.3 Eco-Friendly Material
Unit-VIII **Interior of Residential building**	8a. Design & draft furniture, interior layout, sectional elevation for given plan.	8.1 Use of space, circulation, standard size of furniture. 8.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room.
Unit-IX **Interior of small commercial building**	9a. Design & draft furniture/ interior layout for given commercial unit. 9b. Draft furniture details for given furniture object used in commercial unit.	9.1 Planning of interior for small commercial units such as offices, consulting chambers, shops etc. 9.2 Furniture details such as executive table, architectures table etc. used in commercial units.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping*

matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Prepare report on elements and principles of design.	08
2	III	Process of plan sanctioning with necessary documents.	10
3	IV	Design a landscape for any existing public premises	12
4	VII	Prepare a report of market survey for different materials required for interiors	08
5	VII	Prepare interior plan for 1 BHK residential bungalow / flat	14
6	IX	Prepare interior plan of any one commercial unit such as office, bank, restaurant, shop etc.	12
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Study of plan sanctioning document.
2. Design a landscape for any existing public building campus
3. Collect interior plan for 1 BHK residential bungalow / flat.
4. Collect interior plan of any one commercial unit such as office, bank, restaurant, shop.
5. Prepare a report of market survey for different materials required for interiors.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show CAI computer software related to estimation.
2. Arrange expert seminar of industry person in the area of interior design and decoration.
3. Arrange expert seminar of industry person in the area of architecture
4. Arrange expert seminar of plan sanctioning authority.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Building construction	M. G. Shah, C. M. Kale S. Y. Patki	Tata McGraw Hill
2	Time saver standard for interior design & space planning	Joseph De Chiara, Julins Panch, Martin Zelnik	McGraw Hill
3	The use of colours in interiors	Albert O. Halse	McGraw Hill
4	Nwtert – Architects	Bousmaha Baiche & Nicholes Walliman	Black Well Science

B) Software/Learning Websites

1. http://www.mahapwd.com
2. Auto CAD
3. 3 D Max.
4. 3 D Home
5. Google Sketch up.
6. www.interiordesign.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1	H	H	M	M			M				
CO2		H	M	M		M	M	H			
CO3		H		M	M		M	M	M	H	M
CO4			H	M	M	M	M	M	M	M	M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Maintenance (BDM) **COURSE CODE** : 6503

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	--	Max.	--	--	--	--	50	50	100
					Min.	--	--	--	--	20	20	--

1.0 RATIONALE:

Maintenance of building is an inevitable process because of deterioration of building due to natural and artificial forces. Maintenance of building is essential not only to extend life of building but for proper functioning of building through entire life of building.

2.0 OBJECTIVES:

The student will be able to

1. Understand principles of maintenance management.
2. Investigate and diagnose defects in building.
3. Carryout repair and maintenance of buildings.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Assess the health condition of structures.
2. Inspect and evaluate damaged structures.
3. Test the condition of existing structures.
4. Implement the techniques for repair of concrete structure.

4.0 COURSE DETAILS:

Note: There are no separate classes for theory as given below. The relevant theory has to be discussed before the practical during the practical sessions.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Maintenance of Buildings**	1a. Explain the requirement of maintenance in building. 1b. Explain various types of maintenance in building.	1.1 Introduction 1.2 Importance of maintenance 1.3 Types of maintenance – daily, weekly, monthly, Annually 1.4 General Maintenance. 1.5 Painting of Buildings.
Unit-II **Durability and Serviceability of Concrete**	2a. Explain concrete properties required for construction work. 2b. Explain weather effect on structure. 2c. Explain Rebound Hammer method.	2.1 Quality assurance for concrete construction based on concrete properties like (a) strength (b) Permeability (c) Thermal properties (d) cracking 2.2 Effects of cover and cracks 2.3 Rebound Hammer (NDT Technique) for checking strength of concrete.
Unit-III	3a. Identify materials for repair in building.	3.1 Materials for Repair - Special concrete and mortar

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Materials and Techniques For Repair	3b. Explain techniques for Repairs. 3c. Uses Advance techniques for repair.	- Concrete chemicals - Construction chemicals - Expansive cement - Polymer concrete - Sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete - Rust eliminators and polymers coating for rebars - Foamed concrete - Dry pack - Vacuum concrete - Asphalt sheeting 3.2 Techniques for Repairs - Gunniting, grouting and Shotcrete - Epoxy injection 3.3 Methods of repairing by Advance techniques.
Unit-IV **Repair**	4a. Explain the repair work of various component in existing masonry building 4b. Explain the repair work of various component in existing concrete structure	4.1 Repair of - stone, brick and block masonry - (Cracks, dampness, efflorescence, joint separation etc.) - Flooring - Roofs (sloping, flat, pitched etc.) - Concrete members due to (i) Steel Corrosion (ii) Lack of Bond (iii) shear, tension, torsion, compression - failure 4.2 Rainwater Leakage in Buildings 4.3 Leakage in Basement, toilet area 4.4 Control on Termites (White Ants) in Buildings 4.5 Fungus, Decay of wood works in Buildings 4.6 Estimation of Repair.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Not Applicable

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Prepare a report on (based on internet search) a. Importance of Maintenance. b. Various routine maintenance works in building	10
2	II & III	Prepare a report on (based on internet search) a. Points to be taken care of during inspection and evaluation of damaged structure b. Determine the strength of Columns by Rebound hammer.	14
3	III	Prepare sketches of equipment/tools for repair works. (Based on internet search and site visits)	14
4	I, III & IV	a. Study the maintenance of a nearby building/civil structure being carried out (or carried out recently) and prepare a case study on it including financial aspects. (this may includes study of maintenance of cracks) b. Visit to repairing flooring of building & building joints & Cracks.	16
5	IV	a. Study the guide lines of the Municipal Corporation or R & B (Roads and Building) department regarding declaring building use/life. Based on this identify buildings/structures requiring repairs if any in your locality and prepare report on it. b. Study the preservation work of a historical building being carried out by Archaeological department in nearby location and prepare a report on it.	10
		TOTAL	**64**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Preparing detailed list of types of cracks.
2. Preparing detailed list of joints in building.
3. Preparing list of method of maintenance.
4. Preparing list of waterproofing material used for R.C.C. element.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Building Repair and Maintenance Management	P. S. Gahlot, Sanjay Sharma	CBS
2	Maintenance & Repair Of Civil Structures	B. L. Gupta	Standard Publications.
3	Building Repair and Maintenance Management	P. S. Gahlot	CBS Publishers and Distributors Pvt. Ltd.
4	Repair of Concrete structures	R. T. Allen and S. C. Edwards	Blakie and Sons, UK
5	Maintenance of Buildings	A. C. Panchdhari	New Age International

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
CO1		H		M	M	M					
CO2		H	H	H		M	M			M	H
CO3		H		H	M						M
CO4		H	M		M	M					M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Advanced Construction Techniques (ACN) **COURSE CODE** : 6504

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

In the construction of various civil engineering activities construction technology plays an important role. During the last five decades, construction industry has under gone large scale mechanization with rapid changes and advancements in construction practices. In order to bring modernisation in construction the course of "Advanced Construction Technology" has been introduced. This course will enable student to understand the concepts and principles of modern day construction like, special foundations, High Rise Buildings, Prefabricated construction, use of land reclamation and green buildings.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand use and application of advanced construction techniques and materials.
2. Know drainage for Land Reclamation and structural improvement
3. Special flooring materials, sealants and adhesives, protective coatings
4. Supervise activities carried out multi-storey buildings.
5. Know and able to execute Prefabricated construction.
6. Know the technical details for deep foundation construction & safety measures.
7. Know eco friendly materials, grading points and green construction activities to achieve energy savings in green buildings.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select appropriate material/ methods for different construction activities
2. Suggest structural improvement techniques by drainage and Land Reclamation
3. Supervise special flooring with sealants.
4. Execute multi-storey construction.
5. Execute prefabricated construction.
6. Know the details of deep foundation construction & safety measures.
7. Understand energy efficiency of green buildings.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Advanced Construction Materials**	1a. To understand various fibers and plastics used in construction works/ Activity. 1b. To understand various Artificial Timber	1.1 Fibres • Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. • Properties of fibers. • Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colour plastic sheets. Use of plastic as Construction material.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1c. To understand materials like Microsilica, Wall cladding etc. 1d. To understand special flooring materials	1.2 Timber • Properties and uses of artificial timber. • Types of artificial timber available in market, strength of artificial timber. 1.3 Other materials • Properties and uses of acoustics materials, wall Claddings. • Plaster boards, Micro-silica, artificial sand, Bonding agents, adhesives. • Energy efficient materials. • Special flooring materials, sealants and adhesives, protective coatings	
Unit-II **Land Reclamation.**	2a. To know the details of Land Reclamation	2.1 Land Reclamation 2.2 Technical progress. 2.3 Drainage for Land reclamation. 2.4 Structural improvement.	04
Unit-III **High Rise Construction**	3a. To know aspects of multi-storeyed building and problems.	3.1 High rise buildings; architectural & structural aspects; 3.2 Special features of construction; tall chimneys, components,; slip form method, lift slab method; 3.3 Problems of high rise construction.	08
Unit-IV **Prefabricated Construction**	4a. To understand Prefabricated construction, its advantages and methods	4.1 Prefabricated construction, Advantages of pre fabricated construction; 4.2 Selection of structural elements; design aspects; assembly of precast elements; jointing, modular co-ordination and tolerances; 4.3 Structural systems for buildings; single and multi- storey building systems; methods and equipments. For handling and placement	08
Unit-V **Foundations for Tall Building**	5a. To know the methods of special foundations	5.1 Necessity for special foundations, Foundations for tall buildings and Foundations for underground structures. 5.2 Pile foundations in expansive soils. 5.3 Dewatering and its various methods.	08
Unit-VI **Green buildings**	6a. To understand the concept of green building made of eco friendly materials	6.1 Green building definition 6.2 Green building rating system 6.3 Eco friendly materials 6.4 Advantages of green building 6.5 Construction techniques of green building	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Advanced construction materials	04	02	08	14
II	Land reclamation	04	04	04	12

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
III	High rise construction	04	04	10	18
IV	Prefabricated construction	04	04	04	12
V	Foundations for tall building	02	08	02	12
VI	Green buildings	04	04	04	12
	TOTAL	**22**	**26**	**32**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	Collect Specifications/ properties of at least five advanced materials of Construction and write the report on the same.	04
2	V	Enumerate major design parameters and data requirements of any one type of special foundations.	04
3	II	Information and study of Land Reclamation by visit or net	04
4	I	Write a report on special flooring materials, sealants and adhesives, protective coatings	04
5	IV	Write a report on prefabricated construction.	04
6	III	Preparing a detailed account of types, numbers and drawings of steel structures Prepare formwork required for framed structured residential building.	04
7	III	Visit the construction site of multi storied building and prepare report on techniques employed and suggest further scope of improvement	04
8	VI	Visit and report of green buildings. Energy efficiency /saving units of a building and information.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collects photographs, videos to study construction details from internet
2. Collects case studies of failures of building construction from internet, literatures / magazines.
3. Visits to see the construction method for high rise building / structure and prepare report on it.
4. Visits to Energy efficient structure and prepare report on it.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Applicable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Construction Technology Vol. I to IV	R. Chudly	ELBS- Longman Group
2	Construction Planning equipment and methods	R. L. Peurifoy	McGraw-Hill Co. Ltd.
3	Modern Foundations – Introduction to Advanced Techniques	Naiman P Kurian	Tata McGraw Hill
4	Design of Foundation Systmes.	Kurian NP	Narosa Publications
5	Materials of construction	R. C. Smith	McGraw-Hill Co. Ltd.
6	Construction Technology	Sarkar & Sarswati	Oxford University Published, 2012
7	Construction Planning and Equipment	R. Satyanarayana and S. C. Saxena	Standard Publication New Delhi
8	Civil Engineering materials	TTTI Chandigarh	TTTI Chandigarh
9	Construction of structures and Management of Works	S. C. Rangawala	Charotar Publication
10	A to Z of Building Construction	Mantri	Mantri Publication

B) Hand Books

Sr.No.	Title of Book	Author	Publication
1	PWD Handbooks for –Materials Foundation & Construction equipments	Govt. Of Maharashtra	Govt. Of Maharashtra
2	Practical Civil Engineering Handbook	Khanna	Khanna Publication

C) Software/Learning Websites

1. http://www.iaarc.org/news/a_news_2012_10_24.pdf
2. http://www.smithandwallwork.com/wp-content/uploads/2012/08/Cambridge-University-Smith-and-Wallwork.pdf

D) Major Equipment/ Instrument with Broad Specifications.

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H		H								
CO2		M			H			M			M
CO3			H								L
CO4				M				M			
CO5	H									M	
CO6				M							
CO7	H										M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Construction Equipments (CEQ) **COURSE CODE** : 6505

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

This is a diversified technology course, which is intended to make the students to learn working and types of construction equipments required for different types of construction processes**.**

2.0 COURSE OBJECTIVES:

The student will be able to

1. Know different construction processes.
2. Know different types of construction equipments.
3. Understand working of various construction equipments.
4. Know application of different types of construction equipments.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Plan the equipment for construction processes.
2. Determine the utility of construction equipments.
3. Select particular types of construction equipments for required construction operation.
4. Determine merits & demerits of construction equipments.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Planning & selection of equipments**	1a. Describe necessity, advantages & disadvantage of equipments 1b. Explain the planning & selection of construction equipments.	1.1 Necessity of construction equipments 1.2 Advantages and disadvantages of construction equipment 1.3 Selection of construction equipment 1.4 Planning of construction equipment	04

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-II **Excavation and Hauling Equipment**	2a. List the types of excavation equipments. 2b. Explain working operation and output of different excavating equipments with sketches. 2c. List types of hauling equipments.	2.1 Introduction, types of excavation equipments. 2.2 Power shovels Basic parts and operation of shovel. Selecting the type and size of power shovel, Optimum depth of cut, output of power shovels, Factors affecting output 2.3 Draglines, Types of draglines, Basic parts and operation of dragline, Optimum depth of cut, Factors affecting output 2.4 Clamshells, General information, Clamshell buckets 2.5 Hoes, General Basic parts and working, working ranges of hoes. 2.6 Trenching machines – types, Selection of suitable equipment for trenching 2.7 Scrapers, Types of scrapers and working of scraper, Cycle time for a scraper. 2.8 Tractor – types and factors affecting selection, crawler & wheeled tractors. 2.9 Bulldozers – crawler mounted & wheel mounted bulldozers, Output of bulldozers. 2.10 Trucks and wagons, dumpers, their capacity	10
Unit-III **Hoisting and Conveying Equipments**	3a. Differentiate between Hoisting and Conveying Equipments 3b. Describe various hoisting equipments with sketches. 3c. Describe various conveying equipments with sketches.	3.1 Hoisting equipment – Pulleys, Jacks 3.2 Chain hoist – types, Hoist winches, fork trucks 3.3 Cranes – types, Derrick crane, mobile crane, whirler crane, tower crane, hydraulic crane, gantry crane, Safety in crane operation 3.4 Conveyer belt – types & uses. 3.5 Cable way, ropeway	12
Unit-IV **Compacting Equipments**	4a. State necessity of soil compaction. 4b. Explain different types of rollers with their applications.	4.1 Necessity of soil compaction 4.2 Equipment for soil compaction, Roller-Sheep foot rollers, vibratory rollers, pneumatic rollers, vibrating plate/shoes	04
Unit-V **Concreting Equipments**	5a. Differentiate between various concrete mixers. 5b. Describe concrete pumps, equipments for tremix concreting. 5c. Explain working of RMC plant with layout.	5.1 Concrete mixers- Types, working and selection under different conditions. 5.2 Vibration- Types, working and selection under different conditions. 5.3 Concrete pumps. 5.4 Equipments for tremix concreting, portable concrete batching plants.	06

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-VI **Stone Crusher**	6a. State necessity & types of crushers. 6b. Describe screens and washers.	6.1 Necessity of crushers 6.2 Types, capacities and working of Jaw, Gyratory, Hammer mills, Roll crushers 6.3 Necessity and types of screens. 6.4 Necessity and types of washers.	04
Unit-VII **Tunneling Equipments**	7a. State various types of drill. 7b. Write factors considered for drilling operation.	7.1 Drill bits, Drifters, Rotary percussion drill, Jumbo drill, Blast hole drill, diamond drill, Fusion, piercing. Tunnel boring machine. 7.2 Factors affecting selection of drilling methods and drilling patterns.	08
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Planning & selection of equipments	08	--	--	08
II	Excavation and Hauling Equipment	04	08	04	16
III	Hoisting and Conveying Equipments	02	06	04	12
IV	Compacting Equipments	02	04	04	10
V	Concreting Equipments	02	02	08	12
VI	Stone Crusher	02	04	04	10
VII	Tunneling Equipments	02	04	06	12
	TOTAL	**22**	**28**	**30**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	I	A report on important construction equipment used in Civil Engineering works	02
2	I	A report on necessity & selection of construction equipment	04
3	II	A report on excavation equipment	04
4	II	Study of hauling equipment and matching of equipment	02
5	III	A report on hoisting equipment	02
6	III	Study of every types of cranes	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
7	III	A report on conveying equipment	02
8	IV	Study of soil compacting equipment	02
9	V	Study of concreting equipment and concreting techniques	02
10	VII	A report on tunnelling equipment and methods	02
11	VI	A report on visit to stone crusher plant	04
12	V	A report on visit to Ready Mix Concrete plant	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect information of various construction equipments.
2. Visit to contractor's office & collect sources of equipments, availability of equipments, capital cost, hiring charges etc.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show working of construction equipments with video & internet.
2. Live demo of construction equipment in working operations.
3. Demonstration of construction equipments with laboratory models.
4. Information by experts during site visits.

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Construction planning and equipment	R. L. Peurifoy	McGraw Hill Publication
2	Construction equipment its planning and application	Dr. Mahesh Varma	Metropolitant book Company
3	Transportation Engg. Volume – I	V. N. Vazirani and S. P. Chandola	Khanna Publisher

B) Software/Learning Websites

1. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M		M					M	
CO2		H		H			M				
CO3		H		H		M		M	M	H	
CO4	L	M									M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Urban Planning (URP) **COURSE CODE** : 6506

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Urbanization and industrialization are complementary to each other and are instrumental in the socio economic growth of a nation. Systematic planning of towns will ensure a most comfortable living, otherwise it will lead to haphazard development of towns, & it may to formation of slums making town life miserable.

Diploma civil engineer who is to assist in several activities related to town planning is required to understand modern day towns & town planning. He /She is required to develop basic competencies related to town planning so as to make himself/herself competent to assist town planner.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Collect information required for development plan
2. Draw layout plan
3. Study by laws required as per competent authority.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Assist Town Planner in preparing the development plan of a town
2. Prepare Housing lay outs on the basis of Neighbourhood Planning Principles and Bye laws.
3. Assist Town Planner in preparing renewal plan of existing towns.
4. Collect data, analyze data and interpret data related with socio economic aspects of town planning.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to town planning.**	1a. State necessity and importance of town planning. 1b. Describe objective and principles of town planning. 1c. State forms of town planning. 1d. Describe types of growth of existing town.	1.1 Necessity and importance of town planning, 1.2 Historical developments in town planning, 1.3 Objectives and Principles of town planning, 1.4 Forms of town planning. System of town planning. 1.5 Growth of existing towns, types – Horizontal and vertical, satellite towns, garden city,	03
Unit-II **Elements of**	2a. Define main parts of town such as town centre, suburbs,	2.1 Main parts of town such as town centre, suburbs, industrial areas, communication networks, open	03

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Town	industrial area. 2b. Describe elements of town.	spaces. 2.2 Elements of town: Communication, built up area, open areas, public services, public amenities distribution of land, with the help of pie diagram.	
Unit-III **Surveys**	3a. State necessity and types of survey. 3b. Describe method of collection of information using survey instruments.	3.1 Necessity of surveys, objectives of surveys, 3.2 Types of survey: physical survey, social survey, economic survey, 3.3 Collection of data/ information using survey instruments or questionnaire methods of data collection suitability of survey instrument. 3.4 Tabulation of data, presentation of data, analysis and inference of data Reporting of survey work	04
Unit-IV **Zoning**	4a. Describe classification of zoning. 4b. Describe height zoning. 4c. State colour coding to indicate different types of zones.	4.1 Definition, importance of zoning 4.2 Classification of zoning- Use zoning, residential, commercial zone, civic zone, imitational zone, recreational zone, 4.3 Height zoning- 450 rule, 631/20 rule, Density zoning, gross density, net density, estimating net and gross density. 4.4 Zoning powers, colour coding to indicate different types of zones.	04
Unit-V **Housing**	5a. Explain housing policies. 5b. Describe neighbourhood planning. 5c. Prepare layout of housing.	5.1 Introduction, housing, housing policies, housing problems, housing schemes, Classification of housing. 5.2 Neighbourhood planning, principles, Typical Neighbourhood. 5.3 Layout of housing, Reilly plan, Radburn plan, Cul De sac. 5.4 Calculating area for neighbourhood amenities in neighbourhood.	04
Unit-VI **Slums**	6a. State causes of slums formation. 6b. Precaution of formation of slums. 6c. Describe methods of slum Clearance.	6.1 Concept of slum, causes of slum formation, 6.2 A layout of a typical slum, precautions against slum formation. 6.3 Slum Clearance, slum development schemes. Improvement method, complete removal method.	03
Unit-VII **Parks and Play Grounds**	7a. State criteria for selection of sites for parks and play grounds. 7b. Design of park for neighbourhood.	7.1 Necessity, types- active, passive recreation, 7.2 Selection of site for parks and play grounds. 7.3 Forms of recreation amenities, park layout, park recreation amenities. 7.4 Park layout, park design, standards of open spaces, Design of a park for a neighbourhood.	04
Unit-VIII	8a. Draw layout of public	8.1 Types, site selection, grouping, public	04

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Public Buildings & Town Center	building complex. 8b. State of market shopping center.	building complex. 8.2 Typical layout of a complex of public buildings. 8.3 Town center- elements, Markets, Shopping center, amenities.	
Unit-IX **Industries**	9a. Prepare typical layout for industrial township.	9.1 Types, classification. 9.2 Selection of site for an industrial estate. 9.3 typical layout of an industrial estate, planning for an industrial estate, industrial township.	02
Unit-X **Communication & Traffic System**	10a. State the functions of communication system. 10b. State the factors in town road design. 10c. Classify town roads & street systems. 10d. Explain traffic management, traffic congestion, traffic control, parking sites, street lighting.	10.1 Need for communication and transportation facilities. 10.2 Functions of communication system. 10.3 Requisites of city roads, factors in town road design. 10.4 Classification of town roads- arterial, sub arterial, local roads, ring roads, other roads. 10.5 Street systems, types, layout. 10.6 Traffic management, necessity, objectives traffic surveys. 10.7 Traffic congestion- causes, remedies. 10.8 Traffic control- traffic segregation, road junction, types. 10.9 Parking signs, facilities, space requirement, traffic signs, signals, marking. 10.10 Street lighting, lighting patterns.	08
Unit-XI **Master Or Development Plan**	11a. State the necessity of master plan. 11b. Describe stages in preparation of master plan. 11c. Describe renewal and re-planning of the existing town. 11d. Write procedure of sanctioning development plan.	11.1 Definition, objective, necessity of Master plan. 11.2 Data to be collected, maps to be prepared. 11.3 Stages in preparation of master plan. 11.4 Typical master plan, features of master plan. 11.5 Urban renewal and re planning the existing towns. 11.6 Objects of re planning, data to be collected. 11.7 Sanction of development plan.	06
Unit-XII **Municipal Bye Laws**	12a. Describe building bylaws, land acquisition act, compensation, Bombay town planning act, Model planning act 1957.	12.1 Building byelaws, provision of building regulation. 12.2 functioning of local authority. 12.3 Land acquisition act, payment to damage, compensation, betterment contribution. 12.4 Bombay town planning act, model town planning act 1957.	03
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
I	Introduction to town planning.	02	02	--	04
II	Elements of Town	02	02	--	04
III	Surveys	02	04	--	06
IV	Zoning	--	04	02	06
V	Housing	02	04	02	08
VI	Slums	--	04	02	06
VII	Parks and Play Grounds	--	04	02	06
VIII	Public Buildings & Town Center	02	04	02	08
IX	Industries	--	04	--	04
X	Communication & Traffic System	02	06	04	12
XI	Master Or Development Plan	02	04	04	10
XII	Municipal Bye Laws	02	02	02	06
	TOTAL	**16**	**44**	**20**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr.No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	III	Preparation of a simple questionnaire for socio economic survey	02
2	III	Data collection for socio economic survey of a slum, or a village, analysis and presentation of results	06
3	V	Identify various units of neighbourhood, percentage area of different types houses, other amenities and open areas, from a given neighbourhood / housing lay out.	06
4	II	Prepare a housing layout for a colony or a township on the basis of Neighbourhood principles for an area of 1 -1.5 Ha.	06
5	XI	Prepare project proposal for renewal plan for a small congested area or a slum in a town.	06
6	XI	Prepare a detailed report of various units/ elements/ communication system of a town on the basis of visit to a planned township/MHADA/ CIDCO/HUDCO.	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect a housing layout for a colony or a township.
2. Collect project proposal for renewal plan for a small congested area or a slum in a town.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Arrange expert lecture of industry person in the area of urban planning / smart city.
2. Information by expert during site visit.
3. Case study on neighborhood planning

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Fundamentals of Town Planning	Hiraskar	Dhanpat Rai &Sons
2	Text book of Town Planning	Rangwala	Charotar

B) Reference Books

Sr.No.	Title of Book	Author	Publication
1	Town and country planning and housing	N. V. Modak	
2	Town and country planning.	Gandhi	

C) Software/Learning Websites

Not applicable

D) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	H		M		H	M	M		M
CO2		H	H		M	M	H	M	M	M	M
CO3		H	M	M	M	H	M	M	M	M	M
CO4		M	M	M	M	M	H	H	M	M	H

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Plumbing Services. ((PBS) **COURSE CODE :** 6507

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	-	50	150
					Min.	32	--	40	--	-	20	--

1.0 RATIONALE:

A properly structured course in plumbing is not available in India. Plumbing, though crucial, has so far remained as neglected course. As a good plumbing enhances life of building, there is a great importance to the well trained plumbing professionals in the building industry.

As the buildings are becoming more complex and more and more modern plumbing materials and systems are available in India, it is necessary to include the same in the Civil Engineering curriculum.

Indian Plumbing Association (IPA) had adopted, reviewed and revised the Uniform Plumbing Code of International Association of Plumbing and Mechanical Officials to suit Indian practices, customs and laws. The code is published as 'Uniform Plumbing Code – India' (UPC-I).

Students who opt for code based education and training in plumbing will have better job opportunities and improved income. The formal education in plumbing will improve the plumbing system design and installation standards, thereby, ensuring health and safety of people and structures.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand proper coordination of plumbing work with Architects and structural engineers.
2. Interpret plumbing drawings.
3. Select proper plumbing materials & systems.
4. Supervise plumbing installation as per UPC – 2008.
5. Understand methods to conserve water and energy.
6. Follow safety measures at site.
7. Follow standards for installation as per code practice

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Select the suitable plumbing materials for particular requirements of buildings
2. Plan various plumbing services required for different types of buildings.
3. Know relevant code used in plumbing.
4. Manage plumbing services provisions in big construction sites.
5. Supervise installation and testing of plumbing services
6. Synchronize the construction activities with installation of plumbing services.
7. Ensure green building applications to the new constructions.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics &Sub topics	Hours
Unit-I **Introduction to Codes,**	1a. Use relevant Code (UPC – 2008). 1b. Maintain proper coordination amongst	1.1 Importance of plumbing, model code-roles, scope, purpose and use of codes and standards in building industry, approvals, AHJ(Authority Having	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics &Sub topics	Hours
Architectural and Structural Coordination.	different agencies. 1c. Select proper materials for plumbing. 1d. Follow local municipal laws.	Jurisdiction), code provisions regarding general regulations, minimum standards, labelling, alternative materials, sewers required, protection of pipes and structures, water proofing, rat proofing. 1.2 Architectural and structural coordination. 1.3 Architectural and Structural provisions for Plumbing systems, 1.4 coordination required during the planning stage, various agencies involved and their roles, policy decisions, 1.5 planning spaces for plumbing systems, water tanks, pump room, 1.6 Centralized hot water system, toilet locations, toilet planning, plumbing shafts, basement and terraces planning. Structural parameters, sunken toilets, 1.7 Importance of waterproofing. 1.8 Local Municipal laws.	
Unit-II **Plumbing Terminology**	2a. Define terms used in plumbing. 2b. List plumbing fixtures. 2c. List drainage system and their joints. 2d. List different valves used in water supply and drainage with their function.	2.1 Definitions, use/purpose of the following. 2.2 Plumbing Fixtures: accessible/readily accessible, aerated 2.3 Fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flush meter valve, flush tanks, lavatories, macerating toilet, plumbing appliances and plumber. 2.4 Traps, indirect waste, vent: blow off, developed length, dirty arm, FOG, indirect waste, receptors, slip joints, trap and vent. 2.5 Drainage: adapter fitting, adjusted rood area, AAV, air break, air gap, area drain, base, bell and spigot joint, building drain, branch, DFU, grease interceptor, joints, roof drain, smoke test, stack. 2.6 Water supply: angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, ferrule, gate valve, gray water, joints, PRV. Hot water line system.	10
Unit-III **Plumbing Fixtures and Fixture Fittings**	3a. State use of different plumbing fixtures. 3b. Draw plan and elevation of fixture and fitting with standard dimension. 3c. State use of different plumbing fittings required for specific situation. 3d. Know installation standard for fixtures as per code.	3.1 Difference between plumbing fixtures, fittings and appliances, water conserving fixtures, water closets, toilets urinals, flushing devices, lavatories, bath/shower, kitchen sinks, water coolers, drinking fountain, clothes washer, mop sink, overflows, strainers, prohibited fixtures, installation standards, strainers, floor drains, floor slopes, location of valves and hot water temperature, installation standard dimensions in plan and elevation.	06
Unit-IV	4a. State purpose of different	4.1 Traps required, trap arms, developed	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics &Sub topics	Hours
Traps, Interceptors, Indirect Waste and Vents.	traps and trap seals. 4b. Describe proper methods of installing indirect waste piping. 4c. State requirement and purpose of venting. 4d. State installation standard as per code	length, trap seals, venting to traps, trap primers, prohibited traps, building traps. 4.2 Two forms of discharge for indirect waste piping, nature of contents or systems, proper methods to install indirect waste piping, air gap and air break, sink traps, dish washers, drinking fountains, waste receptors, sterile equipment, appliances, condensers, point of discharge, venting. 4.3 Vent requirement, purpose of venting, trap seal protection, materials, vent connections, flood rim level, termination, vents tacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, introduction to vent sizing.	
Unit-V **Sanitary Drainage and Storm Drain.**	5a. State purpose of single and two pipe systems of plumbing. 5b. List different pipe materials and joints. 5c. Draw sketches for protection of pipes and structures. 5d. State sizing of horizontal and vertical pipes. 5e. List storm drains requirements, roof drains, sub drains and sub soil drains.	5.1 Preamble on single and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below invert level, suds relief, testing, building sewers, trenching, testing, sumps and pumps, introduction to dfu (Drainage Fixture Unit) and sizing of horizontal and vertical pipes.	08
Unit-VI **Water Supply, Gray and Reclaimed Water**	6a. State sources of water. 6b. Understand hot and cold water distribution system. 6c. Differentiate potable and non potable water. 6d. Learn gray water, reclaimed water and rain water harvesting. 6e. Understand gray water approvals, specification, drawing and safety signs used. 6f. Understand rain water harvesting.	6.1 Preamble on municipal water, sources of water, potable and non potable water, reclaimed water, water storage, hot and cold water distribution system, backflow protection, air gap, cross connection control, pipe materials and jointing method, alternative materials, hangers and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure control, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, colour codes and arrow marking, introduction to wsfu(Water Supply Fixture Units). 6.2 Definition of gray water, approvals, specification and drawing, safety, total gray water discharge, holding tanks, valves and piping, reclaimed water system, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses, Rain water harvesting in plumbing systems	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics &Sub topics	Hours
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS(THEORY):

Unit No.	Unit Title	Distribution of theory marks			
		R Level	U Level	A and Above level	Total Marks
I	Introduction to Codes, Architectural and Structural Coordination.	04	02	--	06
II	Plumbing Terminology	--	08	06	14
III	Plumbing Fixtures and Fixture Fittings	--	04	08	12
IV	Traps, Interceptors, Indirect Waste and Vents	02	08	02	12
V	Sanitary drainage and storm drain.	02	06	08	16
VI	Water Supply, Gray and Reclaimed Water	02	06	12	20
	TOTAL	**10**	**34**	**36**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

Note*: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of* ***Programme Outcomes/Course Outcomes in affective domain*** *as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr.No.	Practical exercises	Approx. Hrs required
1	Draw sketches of installation details of plumbing fixtures and fittings in plan, elevation and section; with standard dimensions (Minimum 4)	08
2	Interpretation of sample plumbing drawings for multistoryed building	04
3	Draw toilet layouts, plans, elevations and sections of selected case. Give dimensions.	04
4	Prepare layout of drain pipes & chambers for carrying sewage to septic tank & NMC sewer line for building visited in practical no 3	04
5	Visit any plumbing site and submit a report on observation on plumbing system, architectural and structural provisions, pipe materials work method, safety and recommendations based on the provisions of UPC-I and ITM	04
6	**Seminar:** Students can select any topic from contents by referring codes, text book, professional magazines, technical papers published and websites of manufacturers and make a seminar presentation in 10 minutes using power point. Weightage is assigned for contents and presentation skills. (Students can work in a group of two.)	08
	TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect market rates, leaflets, trade names of plumbing materials
2. Prepare models & charts on course.
3. Collect information regarding current techniques, materials in plumbing services

8.0 SPECIAL INSTRUCTIONAL STRATEGIES:

1. Course videos
2. Experts guidance

9.0 LEARNING RESOURCES:

A) Text Books

Sr.No.	Title of Book	Author	Publication
1	Plumbing Engineering	S. M. Patil	Seema Publication, Mumbai
2	Plumbing Design and Practice	S. G. Deolalikar	Tata McGraw – Hill
3	Plumbing Technology Design and Practice	Lee Smith	Delmar Publication
4	Practical Plumbing Design Guide	James C. Church	McGraw-Hill (T)
5	Plumbing and Illustrated Guide to the Plumbing codes.	Michal Casey, Duglas Hannes, Redwood Kardon	

B) IS, BIS and international codes:

1. 2008 Uniform plumbing code – India (UPC-I)
2. Extracts from IAPMO India
3. 20080Illustrated training manual (ITM).

C) Websites:

1. www.plumbing services.com.
2. www.cookandlees.com
3. www.mepdesignservices.com
4. www.plumbing.1800anytyme.com
5. www.dyno.com/plumbing.

D) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H										
CO2		H									
CO3							M				
CO4	M					L					
CO5				L			M				
CO6			H				H				
CO7			H								

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Watershed Management (WSM) **COURSE CODE** : 6508

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	100	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Knowing extremity of water crisis, we must appreciate water as "Nature's greatest gift". Our water requirement is rapidly increasing due to vast industrial development, population growth and changing life style. We are mostly dependent on rains as a predominant source of water. The other important source of water is the ground water which also depends to great extent on rainfall in previous years. We know that ground water table is declining rapidly due to its excessive use and misuse and also due to insufficient rainfall every year. To stress upon the concept of water management and simultaneously to create the awareness about the proper use and conservation of water, this course is specially designed for the students of Diploma in Civil Engineering. An attempt has been made to develop theoretical knowledge with emphasis on certain aspects of watershed management.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand the importance of rainwater harvesting.
2. Know implementation of water management schemes.
3. Understand the benefits of watershed management.
4. Know the techniques of soil and water conservation.
5. Create awareness about proper use and conservation of water.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain basic concepts of watershed management.
2. Implement the soil and water conservation techniques.
3. Design the rain water harvesting scheme.
4. Suggest water harvesting structures.
5. State the Maharashtra state policies for watershed management.
6. Create awareness about optimum use and reuse of water.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Aspects of watershed management**	1a. Define watershed management. 1b. State the benefits of watershed development. 1c. List the characteristics of watershed. 1d. State the objectives	1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management. 1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development 1.3 Integrated multidisciplinary approach for watershed.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	of watershed management.	1.4 Effects of urbanization on watershed management	
Unit-II **Soil and Water Conservation**	2a. List the techniques for erosion control. 2b. Explain the concept of soil erosion. 2c. Design the water conservation structure. 2d. Maintain water conservation structures. 2e. Draw the neat sketch of water conservation structures. 2f. Classify the water conservation structures.	2.1 Soil erosion- definition, problems of erosion, factors affecting soil erosion, types of soil erosion. 2.2 Land classification for watershed management 2.3 Soil conservation, need of soil conservation, soil conservation technology. 2.4 Engineering measures for erosion control such as contour cultivation, construction of grade stabilization structure, retention of detention reservoirs, agronomical measures (names only) 2.5 Contour bunds: design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund. 2.6 Graded bunding: design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding. 2.7 Bench terracing: types, design. 2.8 Grassed waterways: shape, planning, construction and maintenance, selection of suitable grasses. 2.9 Gully control measures: vegetation, Gully control structures, Gully plugging. 2.10 Farm ponds: types, components, selection of site, construction. 2.11 Check dams: classification, temporary check dam, semi permanent check dam, permanent check dam.	20
Unit-III **Water Harvesting**	3a. Define rainwater harvesting. 3b. State the advantages of rainwater harvesting. 3c. Explain the techniques of rainwater harvesting. 3d. List the necessity and importance of rainwater harvesting. 3e. List the components of roof water harvesting.	3.1 Definition, need of rainwater harvesting, advantages of rainwater harvesting, harvesting principles. 3.2 Water harvesting techniques: different types. 3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, Recharge structures pit, trench, dug well, hand pump, Recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters. 3.4 Reuse of domestic water	05
Unit-IV	4a. Classify the	4.1 Spreading method, induced recharge	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Artificial Recharge of ground water	methods of artificial recharge of ground water. 4b. Explain the methods of recharge of ground water.	method, recharge well method, subsurface dams, ponds, unlined canals. 4.2 Waste water recharge, recharge by urban storm runoff.	
Unit-V **Water Harvesting Structures**	5a. Identify the watershed structures. 5b. Draw the types of watershed structures. 5c. Explain the details of watershed structures.	5.1 Types of watershed structures- such as small weir, bandhara, underground bandhara, gabion structure, K.T. weir, percolation tank, jalbandh, farm pond and check dam. 5.2 Details of watershed structure with neat sketch.	06
Unit-VI **Socio Economic Aspects**	6a. Create awareness amongst people. 6b. Evolve strategies for people participation for optimum use and reuse of water.	6.1 People's awareness, participation and response. 6.2 Sustainable society for economical up liftment. 6.3 Economics. 6.4 Comparison of benefit cost ratio.	04
Unit-VII **Maharashtra state policies for watershed management**	7a. State the Maharashtra state policies for water-shed management.	7.1 Maharashtra state policies for watershed management.	02
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	**U Level**	**A and above Levels**	**Total Marks**
I	Aspects of watershed management.	06	04	--	10
II	Soil and Water Conservation	06	10	14	30
III	Water Harvesting	02	02	08	12
IV	Artificial Recharge of ground water:	--	04	04	08
V	Water Harvesting Structures	--	04	06	10
VI	Socio Economic Aspects	--	02	04	06
VII	Maharashtra state policies for watershed management.	--	04	--	04
		14	**30**	**36**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignment/task should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the desired programme outcome/course outcome.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in the mapping matrix for this course. Faculty should ensure that students also acquire Programme Outcomes/Course Outcomes related to affective domain.*

Sr.No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
1	II, III, V	Preparation of complete water shed management plan for small area identified from toposheet.	08
2	II, III, IV, V	Report on visit to watershed management programme.	08
3	II, III, IV, V	Literature and collection of various articles/photographs/sketches related to watershed development works.	08
4	IV	Prepare a report on rainwater harvesting of building.	08
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect toposheet, rainfall and runoff data for small area.
2. Collection of articles/photographs/sketches related to watershed development works.
3. Site visit to building with rainwater harvesting system.
4. Site visit to watershed management programme.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1 Expert lecture
2 Site visit
3 Case study

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Watershed management	V. V. Dhruvanarayana G. Sastry, U. S. Patnaik	Indian Council for Agricultural Research, Krishi Anusandhan Bhawan, Pusa, New Delhi.
2	Watershed management in India Wiley Estern Ltd.	V. S. Murty	Wiley Estern Ltd.
3	The Booklet from Directorate of water shed development- Soil & water conservation- Pune	Directorate of water shed development	Directorate of water shed development
4	Watershed planning and Management.	Raj Vir Singh	Yash publishing House
5	Field manual on watershed management	--	Central Research Institute For Dry Land Agriculture, Hydrabad- 500659
6	Watershed management	E. M. Tideman	Omega Scientific Publications, New Delhi

Sr.No.	Title of Book	Author	Publication
7	Watershed management	N. D. Mani	Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
8	Watershed management: practice, policies and coordination	Robert J. Reimold	BOSS International US ISBN0070522995

B) Software/Learning Websites

Not Applicable

C) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	H					H	M		M		
CO2	H	H	H		M		M				
CO3		H		H							
CO4				H	H	M			L		
CO5	M	H					H		H		
CO6	M	H		M	M				H	H	M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Earthquake Resistant Structures (ERS) **COURSE CODE** : 6509

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

Himalayan region, Indo-Gangetic plain, Western India, Kutch & Kathiawar regions are geologically unstable parts of the country. A major part of the peninsular India experienced strong Earthquakes. Therefore the design of earthquake resistant structures taking into account seismic data from studies of these Indian Earthquakes has become essential particularly in view of the intense construction activity all over the country. To serve this purpose, the course "Earthquake Resistant Structures" is being introduced for final year Civil Engineering Diploma students.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand causes of Earthquake and principles of seismic waves.
2. Understand the factors affecting damage to the Building.
3. Understand the design of earthquake resistant non-engineered structure.
4. Understand the Ductile detailing for structures.
5. Understand retrofitting of the damaged/old structures.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Explain various engineering aspects of occurrence of earthquake
2. Describe the direct and indirect effects of earthquake
3. Differentiate between magnitude and intensity of earthquake
4. Supervise the building in view of earthquake resistance of the structure
5. Select the proper site for construction of earthquake resistant structure
6. Evaluate the performance of the existing building for resisting the earthquake.
7. Act in disaster management during earthquake occurrence.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Phenomenon, Causes, Measurement and Effects of Earthquake**	1a. Explain various engineering aspects of occurrence of earthquake. 1b. Differentiate between magnitude and intensity of earthquake.	1.1 Definition of Earthquake 1.2 Formation of earth & its cores. Formation, types & movement of tectonic plates, Elastic rebound theory, Types of earthquakes & Faults. Focus, Epicenter, Epicentral distance, Focal depth, Shocks-foreshocks and aftershocks, Magnitude of Earthquake & Intensity of Earthquake.	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.3 Measurement of magnitude by Seismograph, Richter scale method. Measurement of intensity of earthquake. Modified Mercalli Intensity (MMI) scale and MKS scale, Isoseismals, Accelerogram & its significance 1.4 Effects of earthquake- direct and indirect	00
Unit-II **Seismic waves and zones**	2a. Explain the basic terminology about earthquake engineering. 2b. Describe earthquake zones in India.	2.1 Seismic Analysis- Static and Dynamic 2.2 Seismic waves, Body waves and surface waves, P waves, S waves. 2.3 Natural period, fundamental natural period, seismic weight, seismic mass, 2.4 Earthquake zones, seismic zoning map of India.	05
Unit-III **Planning of buildings**	3a. Explain aspects of planning of building. 3b. Describe soft story effect.	3.1 Plan aspects of Building- symmetry, regularity, separation of blocks, simplicity, adjacent buildings, enclosed area, separate building for different functions, 3.2 Soft storey and its effect 3.3 Choice of site- Stability of slopes, loose sand 3.4 Requirements of structural safety	05
Unit-IV **Damage And Collapse Of R.C.C. Building**	4a. Explain different types of damages. 4b. Describe the care to be taken during concreting.	4.1 Types of damages- Sliding of roof off support, falling of infill walls, crushing of column ends, short column effect, diagonal cracking of column beam joint, pulling out of reinforcing bars, joints failure, foundation sinking and tilting, staircase failure 4.2 Care in concrete construction- measuring materials, mixing materials, formwork, placing of reinforcement, casting and compacting concrete, curing of concrete, construction joints.	06
Unit-V **Ductile Detailing**	5a. Explain concept of ductility design. 5b. Describe the arrangement of reinforcement.	5.1 Ductility of structural element, Requirements of IS 13920 – 1993 regarding (a) Longitudinal reinforcement and web reinforcement of flexural members and (b) Longitudinal reinforcement and transverse reinforcement of columns 5.2 Special confining reinforcement in footings.	06
Unit-VI **Masonry Building- Improving earthquake resistance**	6a. Explain causes of failure of masonry building. 6b. Explain the easy of failure of stone masonry building.	6.1 Reasons for poor performance of masonry building 6.2 Causes of damage in brick masonry building 6.3 Typical damage and failure of brick masonry building- Non structural damage, failure of bearing wall and failure of ground. 6.4 General construction aspect of brick masonry w.r.t. mortar, wall enclosure, openings in walls, masonry bond,	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		horizontal reinforcement in wall, vertical reinforcement in wall. 6.5 Typical ways of damage and failure of stone masonry building. 6.6 General construction aspect of stone masonry w.r.t. overall dimensions, mortar, openings in walls, masonry bond, horizontal reinforcement in wall, dowels at corners and junctions, vertical reinforcing of walls.	
Unit-VII **Earthquake Analysis Of Simple R.C. Building**	7a. List the different methods of seismic analysis of building.	7.1 Introduction 7.2 Concept of seismic design philosophy. 7.3 Introduction of various seismic analysis Methods- Conventional design philosophy and nonconventional design philosophy. (No problems)	04
Unit-VIII **Evaluation Of Earthquake Resistance Of Buildings**	8a. Evaluate the performance of the existing building for resisting the earthquake. 8b. Describe seismic retrofitting of structure.	8.1 Evaluation steps of earthquake resistance of existing building. 8.2 Concepts of retrofitting. Need of seismic retrofitting, limitations of retrofitting 8.3 Retrofitting techniques-global and local 8.4 Seismic retrofitting for masonry buildings. Seismic retrofitting strategies for RC buildings. 8.5 Introduction of BIS codes for Earthquake resistant building IS 1893, IS 4326, IS 13827, IS 13828, IS 13920, IS 13935, IS 6922, IS 4991, IS 4967	06
Unit-IX **Disaster Management and past earthquakes**	9a. Explain the steps of disaster management during earthquake occurrence.	9.1 Guidelines for Earthquake preparedness: protection of life and protection of property. 9.2 Post earthquake operations w.r.t. buildings, Lifelines and Roads & Bridges 9.3 Prominent past earthquake in India: Koyna, Latur, Jabalpur and Bhuj.	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Phenomenon, Causes, Measurement And Effects Of Earthquake	04	06	--	10
II	Seismic waves and zones	04	04	--	08
III	Planning of buildings	02	04	04	10
IV	Damage And Collapse Of R.C.C. Building	02	04	04	10
V	Ductile Detailing	--	04	04	08
VI	Masonry Building- Improving earthquake resistance	02	04	04	10
VII	Earthquake Analysis Of Simple R.C. Building	02	04	--	06
VIII	Evaluation Of Earthquake Resistance Of	02	04	04	10

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
	Buildings				
IX	Disaster Management and past earthquakes	--	04	04	08
	TOTAL	**18**	**38**	**24**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr.No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
		Term work shall consist of following:	
1	V	Four plates on ductile detailing.	06
2	VIII	Six plates on Retrofitting of structures.	06
3	VI	Four plates on IS 13828 (1993) Indian standard guidelines for improving earthquake resistance of low- strength masonry building.	06
4	VII, VIII	Write a report about recent development and techniques of earthquake resistant structure and repairs of earthquake affected buildings	08
5	I	Write a report of visit at the seismological center	06
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Collect the data of earthquake occurrence and damage in the country prepare the report.
2. Visit Earthquake monitoring centre and prepare the visit report.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

1. Show Video Clips earthquake and rehabilitation work.
2. Show Picture Clips through Power Point regarding earthquake damages

9.0 LEARNING RESOURCES:

A) Books

SN	Title of Book	Author	Publication
1	Earthquake Resistant Design of Structures	Pankaj Agarwal & Manish Shrikhande	Prentice-Hall of India
2	Earthquake Resistant Design of Structures	S. K. Duggal	Oxford University Press
3	Elements of Earthquake Engineering	Jai Krishna, A. R. Chandrashekharan and B. Chandra	South Asian (Publisher) Pvt. Ltd
4	Earthquake Resistant Structures	Dr. S. M. Dumne	Nikita Publication
5	Guide lines for Earth quake resistant Non- Engineered construction	NICEE	NICEE
6	Guide lines for Earth quake resistant of structures	NPEEE	NPEEE

B) Codes of Practices: (BIS, BS, ASTM.):

IS 13920: 1993	IS 4326	IS 6922	IS 4967
IS 1893: 2002	IS 13828	IS 4991	IS 13827
IS 875	IS 13935		

C) Software/Learning Websites

1. www.issnge.org
2. www.springer.com
3. www.britannica.com
4. www.trb.org
5. www.nptel.ac.in

D) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1	M		L								
CO2			H	M							
CO3	M	H	M			M		M	M		L
CO4			H	M	M						
CO5			H	H			M			M	
CO6			H	M		M				M	
CO7			H	H		M	M		H		M

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Prestressed and Precast concrete (PPC) **COURSE CODE** : 6510
Prerequisite:

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme								
Hrs / week			Credits	TH Paper Hrs.	Marks							
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

As various Civil Engineering Structures are constructed using prestressed concrete technique e.g. bridges, pre-cast panels, Electric poles, Railway sleepers, a civil engineer is supposed to know the principles, techniques and design procedures of prestressed concrete. So this course is intended to learn core facts, concepts, principles & procedure of designing the simple prestressed concrete structures by using standard design methods & codes.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Understand difference between RCC & Pre-stressed concrete.
2. Understand the principles used in construction of Pre-stressed concrete structures.
3. Design the simple Pre-stressed beam.
4. Understand the design principals of other simple pre-stressed concrete structures.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Differentiate RCC & prestressed structures.
2. Describe the need of high strength concrete & high strength steel.
3. Explain pre & post tensioning systems & various methods used.
4. Determine stresses in the critical section of the PSC members.
5. Determine total losses of prestress section.
6. Explain manufacturing process of any precast prestressed section.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basic Concepts in pre-stressing**	1a. Explain Advantages and disadvantages of pre-stressed concrete.	1.1 Advantages and disadvantages of pre-stressed concrete over RCC, definition & types of pre-stressing 1.2 Terminology – Tendon, Anchorage, pre-tensioning, post-tensioning, bonded & non-bonded prestressed concrete. Full prestressing, limited or partial pre-stressing, moderate pre-stressing, axial pre-stressing, eccentric prestressing, concordant pre-stressing, non distortional pre-stressing, uni, bi & tri-axial pre-stressing, circular prestressing, transfer, supplementary or untensioned reinforcement, transmission length, Cracking load, Creep & shrinkage in concrete, relaxation in steel, cap-cable, Degree of prestressing, debonding.	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.3 Applications of prestressed concrete.	
Unit-II **Materials for prestressed concrete**	2a. Describe need of high strength concrete mixes & high strength steel. 2b. List permissible stresses in steel & concrete.	2.1 High strength concrete mixes 2.2 Strength requirements 2.3 Permissible stresses in concrete 2.4 Shrinkage & creep in concrete 2.5 Types of High tensile steel, Strength requirements & permissible stresses 2.6 Relaxation of stress in steel	04
Unit-III **Prestressing system**	3a. List & explain various pre & post tensioning methods.	3.1 Introduction 3.2 Tensioning devices. 3.3 Pretensioning system, Hoyer's method 3.4 Post tensioning system – Freyssinet, Gifford Udall, Mangel – Blaton & Lee – Mc Call. 3.5 Application of pre & post tensioning.	06
Unit-IV **Analysis of prestress & bending stresses**	4a. Estimate resultant stress in the cross section of PSC beam. 4b. Explain concept of internal resisting couple & load balancing	4.1 Basic assumptions. 4.2 Analysis of prestress (Stress diagram) 4.2.1. Concentric tendon 4.2.2. Eccentric tendon 4.3 Resultant stresses at a section. 4.4 Pressure line or thrust line & internal resisting couple, Problems. 4.5 Concept of load balancing.	12
Unit-V **Losses of Prestress**	5a. List & estimate the various losses in PSC section.	5.1 Nature of losses of prestress. 5.2 Losses due to elastic deformation of concrete. 5.3 Loss due to relaxation of stress in steel. 5.4 Loss due to shrinkage of concrete. 5.5 Loss due to creep of concrete. 5.6 Loss of stress due to friction. 5.7 Loss due to anchorage slip. 5.8 Total losses allowed for in design. 5.9 Problems on above.	12
Unit-VI **Precast concrete units**	6a. List Advantages & disadvantages of precast units. 6b. Explain manufacturing procedure of different precast units.	6.1 Advantages & disadvantages of precast members or framed structure. 6.2 Quality control, cladding materials and their sizes & grading proportions, durability of concrete. 6.3 Manufacturing procedure of different precast unit such as – Hollow and solid blocks, Hollow tile slabs, heat insulation, Precast walls, Precast slabs, Large precast slab, Pipes, Water storage tanks, Sills, Sun shades, Jallies, Shaft Slabs, I-Joist, T-Joist, Floor tiles, Paver block, Poles	05
Unit-VII **Pre-cast pre-stressed concrete units**	7a. Explain manufacturing procedure of Pre-cast pre- stressed concrete units & modular prefabrication.	7.1 Pre-cast pre- stressed concrete products such as poles, sleepers, pipes, water tanks, floors, (Theory only) 7.2 Modular coordination and prefabrication.	04
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Basic Concepts in pre-stressing	04	04	--	08
II	Materials for prestressed concrete	04	06	--	10
III	Prestressing system	02	06	04	12
IV	Analysis of prestress & bending stresses	02	06	08	16
V	Losses of Prestress	--	08	08	16
VI	Precast concrete units	02	10	--	12
VII	Pre-cast pre- stressed concrete units	02	04	--	06
	TOTAL	**16**	**44**	**20**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy).

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	I	Writing the basic concepts of prestressing and various terminologies.	02
2	II	Writing the strength requirements, permissible stresses of the prestress materials.	02
3	III	Observe and draw the sketches of various pre and post tensioning systems, Also write short notes on them.	06
4	IV	Problem on analysis of stresses and resultant stress at a section.	06
5	IV	Problem on thrust line and internal resisting couple and concept of load balancing.	04
6	V	Various losses of prestressed and total losses allowed for in design and problems.	04
7	VI	Details sketches of any five moulds of precast units.	04
8	VII	Site visit and report writing of prestressed construction work site.	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Site visits at special works such as prestressed high rise buildings & bridges.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Acceptable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Prestressed concrete design	R. S. Ramamrutham	
2	Prestressed concrete design & analysis	N. Krishana Raju	Tata McGraw Hill Pub. Co. Ltd
3	Design of Prestressed concrete structures	T. Y. Lin, Ned H. Burns	John Wiley and sons.
4	Prestressed concrete	G. S. Pandit & Gupta	CBS Publishers and Distributors, New Delhi

B) Codes of Practices: (BIS, BS, ASTM.):

Sr.No.	Code Number	Title
1	I. S. 1343: 1980	IS code of practice for prestressed concrete.
2	I. S. 456: 2000	Plain and Reinforced Concrete Code of Practice

C) Software/Learning Websites

Not Applicable

D) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H									
CO2		H									
CO3		H	M	M			M				M
CO4		H	M	M							
CO5		H	H								
CO6		H		M		M				M	

H: High Relationship, M: Moderate Relationship, L: Low Relationship

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Advanced Concrete Technology (ACT) **COURSE CODE** : 6511

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme				Examination Scheme							
Hrs / week			Credits	TH Paper Hrs.	Marks						
TH	TU	PR				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	03	Max.	80	20	100	--	--	50	150
					Min.	32	--	40	--	--	20	--

1.0 RATIONALE:

In the recent past, it is the need to study the advanced concrete as due to high rise, heavily loaded, long span structures and ground shaking due to earthquake excitation. Recent development in infrastructural facilities has become more advanced and also complexity has been reached to higher degree. Supervision of concreting work has become a modern state of art and demands at higher level in addition to higher strength along with specific requirements by the user. Repairs and rehabilitation of existing concrete building is important aspect in construction of advanced structures and increasing pressure challenge for higher speed of construction. This course aimed at giving overview of behaviour of different types of concrete mixes and also, detailing of structural elements of advanced concrete structures.

2.0 COURSE OBJECTIVES:

The student will be able to

1. Impart the importance and understanding of advanced concrete mixes and its employability in civil Engineering constructions.
2. Know the function and its importance of various admixtures and mineral additives added in the fresh concrete mix.
3. Understand the basic principle and procedure to know the control over fresh concrete before, during and after construction.
4. Develop supervisory skills in all concreting operations prior to, during and after concreting by making the use of knowledge acquired and practical tools developed by IS and I.R.C.

3.0 COURSE OUTCOMES:

The course content should be taught and learning imparted in such a manner that students are able to acquire required learning outcome in cognitive, psychomotor and affective domain to demonstrate following course outcomes:

1. Use proper admixture & mineral for improving performance of concrete.
2. Prepare mix design for high strength concrete.
3. Perform Destructive & Non-destructive test on harden concrete.
4. State concreting procedure of RMC.
5. State the various methods for repairs & rehabilitation of concrete structures.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Concept of Advance Concrete**	1a. State specification of concrete. 1b. Explain importance & necessity of advance concrete.	1.1 Components of concrete 1.2 Strength developments. 1.3 Specification of concrete, grades of concrete as per IS 456-2002 code. 1.4 Advanced concrete: concept, necessity and importance. 1.5 Challenges faced by concrete industries.	04
Unit-II **Admixtures and Mineral additives**	2a. List & explain various admixtures. 2b. Use proper admixture or mineral in the field situation.	2.1 Introduction. 2.2 Functions of admixtures. 2.3 Classification of admixtures. ▪ Accelerators: Purpose, effects, dosage used. ▪ Retarders: Purpose, effects, soluble carbohydrate derivative, inorganic retarders, brand names. ▪ Plasticizers: Purpose, basic products, action of plasticizers, types of, brand names. ▪ Super-plasticizers: Purpose, brand names, classification, Effects on fresh concrete, dosages. 2.4 Introduction of Mineral Admixtures: Fly ash, silica fume, rice husk ash, Metakaoline 2.5 Pigments: Purpose, classification, brand names.	06
Unit-III **Proportioning of Concrete mix**	3a. List & explain concrete mix design procedure. 3b. Design concrete mix for various grades. 3c. Use IS code for mix design.	3.1 Introduction: Nominal Mix and Design Mix. 3.2 Factors influencing the selection of Mix proportions. 3.3 Minimum cement content, characteristic strength, target mean strength, standard deviation as per IS 456-2002 code. 3.4 Method of proportioning of concrete. ▪ Various methods of Mix design. ▪ Detailed Mix design by IS Code. ▪ Detailed Mix design by American Concrete Institute method.	07
Unit-IV **Hardened Concrete Test**	4a. Explain quality control purpose. 4b. Conduct Destructive & Non-destructive test on harden concrete.	4.1 Purpose and Quality Control. 4.2 Classification of Tests & Non-destructive tests. 4.3 Destructive Test: Standard test procedure of Cube Compression, flexural test and split test. 4.4 Non-destructive test: concept, advantages and Limitations. ▪ Schmidt's rebound hammer test: Rebound number and Strength of concrete, schematic diagram of rebound hammer, position of	07

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		rebound hammer. ▪ Ultra Sonic Pulse Velocity method: concept, techniques of measuring Pulse velocity through concrete, factors affecting the measurements, limitations.	
Unit-V **Ready Mix Concrete**	5a. Explain RMC concept. 5b. Draw RMC plant layout. 5c. List quality control in RMC.	5.1 Introduction: Concept of Ready Mix Concrete, Historical development of RMC, Advantages and disadvantages. 5.2 RMC plant: Components, machinery used, schematic layout, processes adopted at RMC plants, work force. 5.3 Concrete specifications and Quality control. 5.4 Transportation, distribution, handling and placing.	06
Unit-VI **High Performance Concrete**	6a. State the requirements of high performance concrete. 6b. List the various methods of achieving high performance concrete.	6.1 Introduction: Concept, Definition, requirements of high performance concrete & its characteristics, 6.2 Advantages and disadvantages. 6.3 Classification, factors affecting high performance 6.4 Methods of achieving High performance concrete	06
Unit-VII **Special Concrete.**	7a. List & explain importance of special concrete.	7.1 Introduction: Importance of special concrete. 7.2 Applications, advantages. 7.3 Various special concretes: Light weight concrete, Ultra-light weight concrete, Mass concrete, Roller compacted concrete, high density concrete, Fiber reinforced concrete, Gap graded concrete, No-fines concrete.	06
Unit-VIII **Repairs and rehabilitation of Concrete**	8a. State & explain various Repairs & rehabilitation, methods for concrete structures.	8.1 Difference between Repairs & rehabilitation, Diagnosis of strength of concrete 8.2 Causes of cracks in concrete: Types of cracks, crack patterns and its causes 8.3 Methods of repairing cracks: surface preparation, crack filling, epoxy grouting, short-creating, nailing, trapping and meshing. 8.4 Methods of rehabilitation of concrete structural components: Beams, Columns, Column footing. Slabs, walls 8.5 Epoxy sheets and its uses. 8.6 Health monitoring of structures, Structural auditing.	06
		TOTAL	**48**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY):

Unit No.	Unit Title	Distribution of Theory Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Concept of Advance Concrete	02	04	--	06
II	Admixtures and Mineral additives	02	06	04	12
III	Proportioning of Concrete mix	02	06	04	12
IV	Hardened Concrete Test	02	06	04	12
V	Ready Mix Concrete	02	04	04	10
VI	High Performance Concrete	--	04	04	08
VII	Special Concrete.	--	04	04	08
VIII	Repairs and rehabilitation of Concrete	02	06	04	12
	TOTAL	**12**	**40**	**28**	**80**

Legends: R = Remembrance (Knowledge); U = Understanding; A = Application and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6.0 ASSIGNMENTS/PRACTICALS/TASKS:

The tutorial/practical/assignments/tasks should be properly designed and implemented with an attempt to develop different types of cognitive and practical skills **(Outcomes in cognitive, psychomotor and affective domain)** so that students are able to acquire the competencies.

***Note**: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. required
1	II	Comparative study of Admixtures and additives used with concrete mix	02
2	III	Proportioning the concrete mix by I.S. Code method using admixtures with cost detailing	04
3	III	Proportioning the concrete mix by I.S. Code method using mineral additives with cost detailing	04
4	III	Proportioning the concrete mix by I.S. Code method with admixture as well as mineral additives	04
5	III	Workability of fresh concrete with admixtures using V Funnel	04
6	III	Workability of fresh concrete with admixtures using L Box	04
7	V	Visit to RMC plant and writing report including various concreting operations, equipments and yielding cost of ready mix concrete and interpretation made with reference to conventional concrete.	04
8	VIII	Sketching of 04 plates showing details of (i) repaired of old concrete structures (ii) any two devices used in NDT	02
9	--	Report based on various construction sites of at least two concrete structures with advanced concrete construction	04
		TOTAL	**32**

7.0 STUDENT ACTIVITIES:

Following is the list of proposed student activities

1. Site visits at special works such as high rise buildings & dams.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Not Acceptable

9.0 LEARNING RESOURCES:

A) Books

Sr.No.	Title of Book	Author	Publication
1	Concrete Technology	M. S. Shetty	S. Chand & Company
2	Concrete Technology	M. L. Gambhir	TATA McGraw Hill
3	Concrete Technology	A. M. Neville	Oxphard & IBH Publisher co. Pvt. Ltd
4	Concrete Technology	R. S. Varshney	Oxphard & IBH Publisher co. Pvt. Ltd
5	Concrete Technology	P. D. Kulkarni	Oxphard &IBH Publisher co. Pvt. Ltd

B) Indian Standard Code:

Code No.	Name of Code
IS 269-1989	Ordinary Portland Cement 33 Grade
IS 383-1970	Coarse & Fine Aggregates From Natural Sources For Concrete
IS 2386-1963	Methods of Test For Aggregates For Concrete
IS 8112-1989	Ordinary Portland Cement 43 Grade
IS 10262-1982	Recommended Guidelines For Concrete Mix Design
IS 12269-1987	Ordinary Portland Cement 53 Grade

C) Software/Learning Websites

Not Applicable

D) Major Equipment/ Instrument with Broad Specifications

Not Applicable

10.0 MAPPING MATRIX OF PO'S AND CO'S:

Course Outcomes	Programme Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
CO1		H	M		M	M	M				
CO2		H	H	M				M			M
CO3		M	H			H		M			
CO4		H									
CO5		M	H	M	M	M					

H: High Relationship, M: Moderate Relationship, L: Low Relationship

Annexure : I

Rules for Registration and Examination

Important Rules of Registration for courses.

1. An eligible student must register to minimum three courses and maximum seven courses during each term.
2. While registering for a course at the beginning of a term, a student shouldn't have backlog of more than seven courses of any term as carried over due to failure or any other reason.
3. A student can register for a Project work only after acquiring minimum 100 credits.
4. A student will have to re - register for a course/s if he / she is detained from the course/s for any reason.

Important Rules regarding Registration for Examination

1. A student can register for examination of only those courses for which he has registered and kept term.
2. A student can register for examination for not more than 10 courses in one examination.
3. A student will have to re-register for examination of theory or Practical / oral of a course if he / she fails in examination.
4. A student will be allowed to re-register for examination in accordance with rules if he / she was eligible to appear for last Examination but he/ she failed to appear last examination for any reason.
5. A student will not be able to cancel his registration after he / she is Registered for examination

Other Important Rules

1. A candidate will be eligible for the award of diploma when he / she acquires the required number of credits for a Programme.
2. No candidate will be allowed to appear for examination of any course unless the Head of the Department certifies that
   - 2.1 Attended at least 75% of the prescribed lecture hours, tutorial hours, practical hours or any other kind of work and or assignment for the course as the case may be in conformity with the provision laid down in the course contents.
   - 2.2 Satisfactorily completed specified laboratory practical, term work prescribed in curriculum for the course.
3. No candidate will be permitted to reappear to any course of any examination in which he has once passed.

Standard of Passing

1. Theory, total of theory and periodic test, practical, oral and termwork examination shall be separate head of passing.
2. To pass examination of any course, a candidate must obtain a minimum of 40% marks in each head of passing prescribed for that course taken separately.

Periodic Test

1. Two periodic tests will be conducted during each term for the courses as per their examination scheme.
2. Average marks of the two period tests will be considered for each course separately.
3. Reappearing for the periodic test for improvement of marks is not allowed.

Term Work

1. Term work is a document submitted by the candidate consisting of report of site / field visit and / or laboratory work and / or drawing sheets / sketch books / jobs / model. Such term work shall be submitted before the end of academic term and it shall be satisfactory in the opinion of concern faculty member, Head of the Department and Principal of Institute.

Grace Marks

1. Grace marks shall be applicable if the rules of "standards of passing" are fulfilled.
2. The grace of maximum three marks will be given in either in "Theory marks", or "Periodic test" or "total of theory and periodic test marks", if it falls short by maximum three marks to pass a course.
3. The grace of maximum three marks shall not be applicable twice for the same course. i.e. for "theory" and "total of theory and periodic test" of same course.
4. The grace marks are not applicable to practical, oral, term work examination.

Award of Class

First Class with Distinction	:	70% or more
First Class	:	60% and above but less than 70%
Second Class	:	50 % and above but less than 60%
Pass Class	:	40% and above but less than 50 %

Annexure : II

Evaluation Scheme for Project

Term Work : Max. Marks : 50 Min. Marks : 20.
Oral : Max. Marks : 50 Min. Marks : 20.

Progressive Assessment

Name of the student: Enrolment No.:
Term : II / III ODD / EVEN
Programme: Civil Engineering
Course : Project **Code :** 6412 **Project Guide :**

Title of Project :

SN	Project Activities	Date / Week	Leader ship	Understanding	Observation &Accuracy	Contribution	Timely Completion	Total	Signature of Student	Signature of Guide	Signature of HOD
			5	5	5	5	5	25			
1	Formation of team & finalization of project	1									
2	Submission of synopsis : by each group	2									
3	Project activity plan	3									
4	Maintenance Project Diary	6									
5	Visits to Industries / Institutions / Market	7									
6	Collection of Data / Survey	9									
7	Analysis and Presentation of data.	10									
8	Pre submission seminar	13									
9	Presentation of Rough Work : hand written	14									
10	Final Project Report : Submission	15									
	Total by Internal : out of 250										

The Term Work : Convert the total given by internal to "out off 25".

Signature of Project Guide

Project assessment :

Term Work			**Oral**		
Internal	External	Total	Internal	External	Total
25	25	50	25	25	50

Annexure : III

Committees

1. Governing Body (GB)

Sr. No	Name & Office Address	Governing Body Designation
1	**Shri. Pramod Naik** Joint Director, Directorate of Technical Education, M.S. Mumbai	Chairman
2	**Shri. Mahendra Kothari** Chairman, Maharashtra State Pipe & Allied Industry, D-5, MIDC Satpur, Nashik.	Member
3	**Shri. Ashok Katariya** Chairman, Ashoka Group of Companies, Ashoka House, Ashoka Marg, Nashik.	Member
4	**Dr. Ramesh Unnikrishnan** Regional Officer and Director, Regional Office, (AICTE) Regional Office, Western Region, Mumbai.	Member
5	**Shri. B. S. Joshi** The Joint Director, Industries, Regional Office, Nashik	Member
6	**Shri. V. D. Patil** Coordinator, NITTR-Bhopal Extension Center, Pune.	Member
7	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist.Co.Ltd, Nashik	Member
8	**Shri. Kishor Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007	Member
9	**Shri. Harishankar Banerjee** President, NIMA, MIDC, Satpur, Nashik.	Member
10	**Shri. F. A. Khan** Principal, Govt. Polytechnic, Aurangabad.	Member
11	**Shri. Manish Kothari** Chairman, Institution of Engineers Nashik Local Centre, Nahik.	Member
12	**Prof. Dnyandeo P. Nathe** Principal, Government Polytechnic, Nashik	Member Secretary

2. Board of Studies (BOS)

Sr. No.	Name & Office address	BOS Designation
1	**Shri. S. P. Wagh** Chairman, Consumer Grievances Redressal M.S.E. Dist.Co.Ltd, Nashik	Chairman
2	**Shri. Sunil Bhor** Project Management Consultant, 659/A wing second floor market, Shopping complex Dindori Road, Nashik.	Member
3	**Shri. Bhalchandra R. Patwardhan** Plot No.24, Atharva Raw House, Bhavik Nagar, Gangapur Road, Nashik-13.	Member
4	**Shri. Kishor T. Patil** Institute Of Career & Skills, 3, Adgaonkar plaza basement, ABB circle, Mahatma Nagar, Nashik-422007	Member
5	**Shri. Kishor Vyas** Digilog System Pvt. Ltd., 15, Shriram sankul, Opp. Hotel Panchavati, Vakilwadi, Nashik.	Member
6	**Shri. Chandrashekhar. B. Dahale** F1, Computer Service, No. 2, Sukhraj, Near Parijatnagar bus stop, Nashik 422005	Member
7	**Shri. M. M. Dube** Sr. Executive, Systems, M & Q, C-1, MIDC, Ambad, Nashik-10	Member
8	**Shri. Anant Tagare** Principal Engineer, Validation, Mahindra & Mahindra Ltd., R & D Centre, 89, MIDC, Satpur, Nashik-422007	Member
9	**Shri. Aaush Potdar** Director, Poddar Clothing Industries, Nashik.	Member
10	**Shri. Vijay Sanap** Architect & Consultant, Soham Constructions, Nashik.	Member
11	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
12	**Shri. P. T. Kadve** Principal, K.K. Wagh Polytechnic, Nashik.	Member
13	**Shri. R. N. Vaidya** HOD Civil Engg., Govt. Polytechnic, Nashik.	Member
14	**Shri. S. R. Deshkukh** HOD Civil Engg (II Shift), Govt. Polytechnic, Nashik	Member
15	**Dr. C. Y. Seemikeri** HOD, Mechanical Engg., Govt. Polytechnic, Nashik.	Member
16	**Dr. Sanjay Ingole** HOD, Mechanical Engg (II Shift), Govt. Polytechnic, Nashik	Member
17	**Shri. J. B. Modak** I/C, HOD Plastic Engg., Govt. Polytechnic, Nashik.	Member
18	**Shri. L. S. Patil** I/C, HOD Elect. Engg., Govt. Polytechnic, Nashik.	Member

Sr. No.	Name & Office address	BOS Designation
19	**Shri. Yogesh Sanap** I/C, HOD Info. Tech. & Comp. Tech., Govt. Polytechnic, Nashik.	Member
20	**Shri. A. S. Laturkar** HOD, Electronics and Telecommunication Engg., Govt. Polytechnic, Nashik.	Member
21	**Dr. S. D. Pable** HOD, Electronics and Telecommunication Engg (II Shift), Govt. Polytechnic, Nashik	Member
22	**Shri. T. G. Chavan** I/C, HOD, Automobile Engg., Govt. Polytechnic, Nashik.	Member
23	**Ms. T. J. Mithari** I/C, HOD, Dress Design & Garment Manufacturing, Govt. Polytechnic, Nashik	Member
24	**Ms. N. P. Adke** I/C, HOD, Interior Design & Decoration, Govt. Polytechnic, Nashik	Member
25	**Shri. V. H. Chaudhari** I/C ,Training & Placement Officer, Govt. Polytechnic, Nashik	Member
26	**Shri. G. G. Wankhede** Controller of Examination, Govt. Polytechnic, Nashik.	Member
27	**Shri. S. P. Dikshit** Lecturer in Civil Engg., I/C CDC, Govt. Polytechnic, Nashik	Member Secretary

3. Programme wise committee(PWC)

Sr. No.	Name & Office address	PWC Designation
1	**Shri. R. N. Vaidya** HOD, Civil Engg. Govt. Polytechnic, Nashik.	Chairman
2	**Shri. S. R. Deshmukh** HOD, Civil Engg. (II nd Shift), Govt. Polytechnic, Nashik.	Member
3	**Shri. S. G. Pagare** Consultant, 10 Triymbak complex, Opp. Bytco Hospital Nashik Rd, Nashik.	Member
4	**Shri. S. G. Pandit** Consultant, Vidya Bunglow Kathe Galli, Nashik.	Member
5	**Shri. R. S. Narkhede** H.O.D. Civil Engg. MET Institute of Technology Polytechnic, Adgoan, Nashik.	Member
6	**Shri. R. G. Sonone** Co-ordinator, APM Dept., Govt. Polytechnic, Nashik.	Member
7	**Dr. N. L. Patil** Lect., Civil Engg. Dept., Govt. Polytechnic, Nashik.	Member
8	**Shri. Pramod U. Wayse** Deputy Secretary (T), MSBTE, Regional Office, Osmanpura, Aurangabad-431005.	Member
9	**Shri. S. P. Dikshit** Lect., Civil Engg. Dept., Incharge CDC, Govt. Polytechnic, Nashik.	Member secretary

4. PROGRAMME CURRICULUM DEVELOPMENT COMMITTEE

Institute Level Curriculum Development Cell

Sr. No.	Name of the Faculty	Designation
1	Prof. D. P. Nathe	Principal, Government Polytechnic, Nashik
2	Shri. R. N. Vaidya	Head of Civil Engineering Department and Academic co-ordinator, Government Polytechnic Nashik
3	Shri. S. P. Dikshit,	CDC Incharge, Lecturer in Civil Engineering, Government Polytechnic, Nashik
4	Dr. N. L. Patil,	Lecturer in Civil Engineering, Government Polytechnic, Nashik.
5	Dr. S. V. Bhangale	Lecturer in Electrical Engineering, Government Polytechnic, Nashik.
6	Dr. S. J. Gorane	Lecturer in Mechanical Engineering, Government Polytechnic, Nashik.
7	Shri. N. N. Thakare	Lecturer in Plastic Engineering, Government Polytechnic, Nashik.

Department Level Committee

Sr. No.	Name of the Faculty	Designation
1	Prof. D. P. Nathe,	Principal, Government Polytechnic, Nashik
2	Shri. R. N. Vaidya	Head of Civil Engineering Department and Academic co-ordinator, Government Polytechnic Nashik
3	Shri. S. R. Deshmukh	HOD, Civil Engg. (II nd Shift), Govt. Polytechnic, Nashik.
4	Shri. R. G. Sonone	Co-ordinator and Lecturer in Applied Mechanics Department
6	Shri. S. P. Dikshit,	CDC Incharge, Lecturer in Civil Engineering, Government Polytechnic, Nashik
5	Dr. N. L. Patil,	Lecturer in Civil Engineering, Government Polytechnic, Nashik.
7	Dr. S. S. Pathak	Lecturer in Civil Engineering, Government Polytechnic, Nashik

NITTTR Committee

Sr. No.	Name of the Faculty	Designation
1	Prof. R. G. Chouksey	Dean Student Welfare, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.
2	Dr. Nishith Dubey	Professor, Department of Vocational Education and Entrepreneurship Development, NITTTR, Bhopal.

5. Contributors to Course Curriculum Development

Sr. No.	Name of the Faculty	Designation
1	Dr. A. R. Thete	Consultant. Director Center For Development of Leadership in Education Pvt. Ltd. Aurangabad.

Sr. No.	Name of the Faculty	Designation
2	**Civil Engineering Department, Government Polytechnic Nashik**	
	Shri. R. N. Vaidya	Head of Department
	Shri. S. R. Deshmukh	HOD, Civil Engg. (II nd Shift)
	Shri. S. M. Swar	Lecturer in Civil Engineering
	Shri. S. D. Sonawane	Lecturer in Civil Engineering
	Shri. S. P. Patil	Lecturer in Civil Engineering
	Shri. R. K. Baviskar	Lecturer in Civil Engineering
	Shri. R. B. Tadge	Lecturer in Civil Engineering
	Dr. N. L. Patil	Lecturer in Civil Engineering
	Shri. S. P. Dikshit	Lecturer in Civil Engineering
	Dr. S. S. Pathak	Lecturer in Civil Engineering
	Mrs. P. R. Saraf	Lecturer in Civil Engineering
	Mrs. S. N. Nisal	Lecturer in Civil Engineering
3	**Applied Mechanics Department, Government Polytechnic Nashik**	
	Shri. R. G. Sonone	Co-ordinator and Lecturer in Applied Mechanics
	Shri. S. P. Pagare	Lecturer in Applied Mechanics
	Shri. V. R. Gaikwad	Lecturer in Applied Mechanics
4	**Mechanical Engineering Department, Government Polytechnic Nashik**	
	Shri. S. P. Muley	I/C Head of Department
	Shri. R. V. Rupavate	I/C Head of Department (second shift)
	Shri. P. S. Kulkarni	Lecturer in Mechanical Engineering
	Shri. Y. S. Kokate	Lecturer in Mechanical Engineering
	Shri. A. G. Waghulde	Lecturer in Mechanical Engineering
	Shri. K. A. Jagtap	Lecturer in Mechanical Engineering
5	**Other Departments, Government Polytechnic Nashik**	
	Shri. P. G. Kochure	Workshop Superintendent
	Dr. K. V. Nemade	Controller of Examination, Lecturer in Automobile Engineering
	Dr. D. D. Lulekar	Lecturer in Electrical Engineering
	Dr. S. V. Bhangale	Lecturer in Electrical Engineering
6	**Science and Humanities Department, Government Polytechnic Nashik**	
	Shri. S. M. Shinde	Lecturer in Mathematics
	Mrs. A. S. Salunkhe	Lecturer in Mathematics
	Shri. C. N. Pagare	Lecturer in Chemistry
	Shri. S. A. Padwal	Lecturer in Physics
	Shri. R. P. Landage	Lecturer in English
	Mrs. A. N. Patil	Lecturer in Chemistry
	Mrs. Y. S. Patil	Lecturer in Physics

Sr. No.	Name of the Faculty	Designation
	Mrs. P. S. Joshi	Lecturer in English
	Mrs. K. S. Shinde	Lecturer in Chemistry
	Dr. Mrs. K. D. Talele	Lecturer in Physics

Certificate

The curriculum of the programme has been revised in the year 2016, as per the provision made in curriculum development process of Government Polytechnic, Nashik. This is the **outcome based Curriculum of Diploma in Civil Engineering programme**, which shall be implemented from academic year 2016-17.

Verified by

Department Level CDC Representative
Government Polytechnic, Nashik

Head of Department
Civil Engineering
Government Polytechnic, Nashik

Incharge, Curriculum Development Cell
Government Polytechnic, Nashik.

Principal
Government Polytechnic, Nashik.