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 Hours	Total Credits	Marks
Level-1	Foundation Courses	09	09 Compulsory	16	01	18	35	26	950
Level-2	Basic Technology Courses	08	08 Compulsory	20	--	18	38	29	1100
Level-3	Allied courses	06	04 (03 Compulsory +01 Electives)	06	--	06	12	09	250
Level-4	Applied Technology Courses	11	11 Compulsory	24	--	63	87	52	1575
Level-5	Diversified Courses	04	01 Electives	03	--	02	05	04	125
TOTAL		**38**	**31 compulsory +02 Elective ---- 33**	**69**	**01**	**107**	**177**	**120**	**4000**
Audit Courses		**06**	**04**	**06**	**--**	**02**	**08**	**--**	**--**
Grand Total		**44**	**37**	**75**	**01**	**109**	**185**	**120**	**4000**

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						
				Hours per week				Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
01	21101	Communication Skills	CMS	02	--	02	04	03	03	80	20	--	--	50	150
02	21102	Engineering Mathematics	EMT	02	01	--	03	03	03	80	20	--	--	--	100
03	21103	Applied Mathematics	AMT	03	--	--	03	03	03	80	20	--	--	--	100
04	21104	Applied Physics	PHY	03	--	02	05	04	02	80#	20#	--	--	50	150
05	21105	Applied Chemistry	CHY	03	--	02	05	04	02	80#	20#	--	--	50	150
06	21107	Engineering Graphics	EGR	--	--	04	04	02	--	--	--	--	--	50	50
07	21108	Engineering Mechanics	EMH	03	--	02	05	04	03	80	20	--	--	50	150
08	21109	Workshop Practice	WSP	--	--	04	04	02	--	--	--	--	--	50	50
09	21110	Introduction to IT System	ITS	--	--	02	02	01	--	--	--	--	--	50	50
TOTAL			**--**	**16**	**01**	**18**	**35**	**26**	**--**	**480**	**120**	**--**	**--**	**350**	**950**

Level: 1

Total Courses : 09
Total Credits : 26
Total Marks : 950

Abbreviations:

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

Course code Indication:

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

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) All TW are to be assessed by internal examiners only.
3) #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						
				Hours per week				Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
01	21201	Building Drawing	BDG	01	--	04	05	03	04	80	20	--	25	25	150
02	21202	Concrete Technology	COT	02	--	02	04	03	03	80	20	--	25	25	150
03	21203	Hydraulics	HYD	03	--	02	05	04	03	80	20	--	25	25	150
04	21204	Mechanics of Structures	MOS	03	--	02	05	04	03	80	20	--	--	25	125
05	21205	Geotechnical Engineering	GTE	02	--	02	04	03	03	80	20	--	--	25	125
06	21206	Transportation Engineering	TEN	03	--	--	03	03	03	80	20	--	--	--	100
07	21207	Building Construction	BCN	03	--	02	05	04	03	80	20	--	25	25	150
08	21208	Basic Surveying	BSY	03	--	04	07	05	03	80	20	25	--	25	150
TOTAL			--	**20**	**--**	**18**	**38**	**29**	--	**640**	**160**	**25**	**100**	**175**	**1100**

Level: 2

Total Courses : 08
Total Credits : 29
Total Marks : 1100

Abbreviations:

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

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) All TW are to be assessed by internal examiners only.

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

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME					EXAMINATION SCHEME						
				Hours Per Week				Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
01	21301	Entrepreneurship and Start-ups	EPS	01	--	02	03	02	--	--	--	--	--	50	50
02	21302	Construction Management	CNM	03	--	--	03	03	03	80	20	--	--	--	100
03	21303	Programming and Problem Solving	PPS	01	--	02	03	02	--	--	--	--	--	50	50
Elective I: Any **ONE** of the following															
04	21304	Computer Applications for Project Management	CAP	01	--	02	03	02	--	--	--	--	--	50	50
	21305	Artificial Intelligence	ARI	01	--	02	03	02	--	--	--	--	--	50	50
	21306	Internet of Things	IOT	01	--	02	03	02	--	--	--	--	--	50	50
TOTAL			--	**06**	--	**06**	**12**	**09**	--	**80**	**20**	--	**--**	**150**	**250**

Level: 3

Total Courses : 04
Total Credits : 09
Total Marks : 250

Abbreviations:

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

Assessment of PR / OR / TW:

1) All orals & practicals are to be assessed by external & internal examiners.
2) All TW are to be assessed by internal examiners only.

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

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME					EXAMINATION SCHEME						
				Hours Per Week				Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
01	21401	Advanced Surveying	ASY	03	--	04	07	05	03	80	20	50	--	25	175
02	21402	Computer Aided Drawing	CAD	--	--	04	04	02	--	--	--	25	--	50	75
03	21403	Estimating and Costing	ESC	03	--	04	07	05	04	80	20	--	25	50	175
04	21404	Contracts Accounts and Valuation	CAV	03	--	02	05	04	03	80	20	--	25	25	150
05	21405	Theory of Structures	TOS	03	--	--	03	03	03	80	20	--	--	--	100
06	21406	Design of R.C.C. Structures	RCC	03	--	04	07	05	04	80	20	--	25	50	175
07	21407	Design of Steel Structures	DSS	03	--	02	05	04	04	80	20	--	25	25	150
08	21408	Environmental Engineering	ENE	03	--	02	05	04	03	80	20	--	25	25	150
09	21409	Irrigation Engineering	IRG	03	--	02	05	04	03	80	20	--	--	25	125
10	21410	Industrial Training	ITR	--	--	35	35	14	--	--	--	--	100	100	200
11	21411	Project	PRO	--	--	04	04	02	--	--	--	--	50	50	100
TOTAL			--	**24**	--	**63**	**87**	**52**	**--**	**640**	**160**	**75**	**275**	**425**	**1575**

Level: 4

Total Courses : 11
Total Credits : 52
Total Marks : 1575

Abbreviations :

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Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
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PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
LEVEL – 5
DIVERSIFIED COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME					EXAMINATION SCHEME						
				Hours per Week				Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
Elective II: Any **ONE** of the following															
01	21501	Advanced Construction Technology	ACN	03	--	02	05	04	03	80	20	--	--	25	125
	21502	Building Services and Maintenance	BSM	03	--	02	05	04	03	80	20	--	--	25	125
	21503	Solid Waste Management	SWM	03	--	02	05	04	03	80	20	--	--	25	125
	21504	Earthquake Resistant Structures	ERS	03	--	02	05	04	03	80	20	--	--	25	125
TOTAL			--	**03**	**--**	**02**	**05**	**04**	**--**	**80**	**20**	**--**	**--**	**25**	**125**

Level: 5

Total Courses : 01
Total Credits : 04
Total Marks : 125

Abbreviations :

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

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) All TW are to be assessed by internal examiners only.

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
PROGRAMME STRUCTURE
AUDIT COURSES

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME				
				Hours per Week				Total Credits
				TH	TU	PR	Total Hours	
Any **Four** of the following								
01	21001	Environmental Science	EVS	02	--	--	02	**--**
02	21002	Sports and Yoga	SPY	--	--	02	02	**--**
03	21003	Essence of Indian Knowledge and Tradition	IKT	02	--	--	02	**--**
04	21004	Indian Constitution	ICN	02	--	--	02	**--**
05	21005	Integrated Personality Development Course-1	IPDC-1	02	--	--	02	**--**
06	21006	Integrated Personality Development Course-2	IPDC-2	02	--	--	02	**--**

Audit Courses :

Total Courses : 04
Total Credits : Nil
Total Marks : --

PROGRAMME - DIPLOMA IN CIVIL ENGINEERING
Courses for Award of Class

Sr. No.	Course Code	Course Title	Course Abbr.	TEACHING SCHEME					EXAMINATION SCHEME						
				Hours per Week				Total Credits	Theory Paper		Test	PR	OR	TW	Total
				TH	TU	PR	Total Hours		Hrs	Mark					
01	21203	Hydraulics	HYD	03	--	02	05	04	03	80	20	--	25	25	150
02	21302	Construction Management	CNM	03	--	--	03	03	03	80	20	--	--	--	100
03	21403	Estimating and Costing	ESC	03	--	04	07	05	04	80	20	--	25	50	175
04	21404	Contracts Accounts and Valuation	CAV	03	--	02	05	04	03	80	20	--	25	25	150
05	21405	Theory of Structures	TOS	03	--	--	03	03	03	80	20	--	--	--	100
06	21406	Design of R.C.C. Structures	RCC	03	--	04	07	05	04	80	20	--	25	50	175
07	21407	Design of Steel Structures	DSS	03	--	02	05	04	04	80	20	--	25	25	150
08	21408	Environmental Engineering	ENE	03	--	02	05	04	03	80	20	--	25	25	150
09	21409	Irrigation Engineering	IRG	03	--	02	05	04	03	80	20	--	--	25	125
10	21410	Industrial Training	ITR	--	--	35	35	14	--	--	--	--	100	100	200
11	21411	Project	PRO	--	--	04	04	02	--	--	--	--	50	50	100
	Elective II : Any **ONE** of the following														
12	21501	Advanced Construction Technology	ACN	03	--	02	05	04	03	80	20	--	--	25	125
	21502	Building Services and Maintenance	BSM	03	--	02	05	04	03	80	20	--	--	25	125
	21503	Solid Waste Management	SWM	03	--	02	05	04	03	80	20	--	--	25	125
	21504	Earthquake Resistant Structures	ERS	03	--	02	05	04	03	80	20	--	--	25	125
TOTAL			**--**	**30**	**--**	**59**	**89**	**56**	**--**	**800**	**200**	**--**	**300**	**400**	**1700**

Total Courses : 12 Total Credits : 55 Total Marks : 1700

Assessment of PR / OR / TW :

1) All orals & practicals are to be assessed by external & internal examiners.
2) All TW are to be assessed by internal examiners only.

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	21102 (03) EMT	21101 (03) CMS	21201 (03) BDG	21205 (03) GTE	21404 (04) CAV	21410 (14) ITR	**--**
	21105 (04) CHY	21103 (03) AMT	21202 (03) COT	21301 (02) EPS	21407 (04) DSS	--	
	21107 (02) EGR	21104 (04) PHY	21203 (04) HYD	21302 (03) CNM	21408 (04) ENE	--	
	21108 (04) EMH	21109 (02) WSP	21204 (04) MOS	21402 (02) CAD	21409 (04) IRG	--	
	21110 (01) ITS	21207 (04) BCN	21206 (03) TRE	21403 (05) ESC	21411 (02) PRO	--	
	--	21208 (05) BSY	21401 (05) ASY	21405 (03) TOS	--	--	
	--	21303 (02) PPS	--	21406 (05) RCC	--	--	
Total credits (Compulsory)	**14**	**23**	**22**	**23**	**18**	**14**	**114**
Elective	--	--	--	--	**I)** Any **ONE** from **Elective: I** 21304 CAP, 21305 ARI, 21306 IOT : (**02**)	--	**--**
	--	--	--	--	**II)** Any **ONE** from **Elective : II** 21501 ACN, 21502 BMS, 21503 SWM, 21504 ERS : (**04**)	--	**--**
Total Courses (Elective)	--	--	--	**--**	**02**	**--**	**02**
Total Credits (Elective)	Nil	Nil	Nil	Nil	**06**	Nil	**06**
Total Courses	**05**	**07**	**06**	**07**	**07**	**01**	**33**
Audit Courses	21002 (00) SPY	21001 (00) EVS	21003 (00) IKT **OR** 21005 (00) IPDC-1	21004 (00) ICN **OR** 21006 (00) IPDC-2	--	--	**04**
Total Credits (Compulsory + Elective)	**14**	**23**	**22**	**23**	**24**	**14**	**120**
Grand Total of Credits	--	--	--	--	--	--	**120**

Note: Figures in () bracket indicates total credits.

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / DD / ID / MK
COURSE : Communication Skills (CMS) **COURSECODE :** 21101

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Proficiency in communication skills is one of the prime needs of diploma engineers / technicians who have to communicate all the time with peers, superiors, sub-ordinates and clients in their professional life. As the world is shrinking into a global village with the new technologies, technically sound diploma holders may be a quality human resource, if their communicative abilities are shaped properly. Therefore, this course is designed to develop the ability of students to stand as a skilled and effective communicator with employability skills.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop confidence in speaking English with correct pronunciation.
2. Acquire and develop personality traits for handling personal and career challenges.
3. Understand and apply basic concepts of communication in an organization and social context.
4. Utilize four basic skills to be a competent communicator.

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. Communicate skillfully using non-verbal methods by avoiding barriers in various formal and informal situations.
2. Formulate grammatically correct sentence with the use of relevant words.
3. Acquire professional writing skills for formal written correspondence.
4. Enhance listening, speaking, reading and writing skills for improving competencies in communication.
5. Give presentations with apt body language by using audio visual aids.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Communication: Theory and Practice**	1a. Define communication. 1b. Describe the process of Communication. 1c. Differentiate between types of communication. 1d. Identify the type of Barriers and suggest Remedies. 1e. Describe and apply 7 C's of effective Communication. 1f. Describe the non-verbal communication and codes on given situation.	1.1 Introduction, meaning and definition and importance of communication. 1.2 Elements/process of communication. 1.3 Types of communication: formal informal, verbal (oral and written), non-verbal (visual and auditory), vertical, horizontal and Diagonal communication. 1.4 Barriers of Communication and ways to overcome a) Mechanical Barrier	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		b) Physical Barrier c) Psychological Barrier d) Linguistic Barrier 1.5 7 C's of effective communication (Considerate, concrete, concise, clear, complete, correct, courteous) 1.6 Introduction to Non-verbal communication and codes: a) Proxemics b) Chronemics c) Artefacts	
Unit-II Vocabulary and Grammar	2a. Remove the spelling errors in the sentences. 2b. Use relevant words, idioms, phrases and collocations correctly to express given situation. 2c. Select suitable words from glossary to explain administrative terms. 2d. Formulate grammatically correct sentences in day to day oral and written communication.	2.1 Rules of spelling 2.2 words often confused, one word substitution, idioms collocations and phrases 2.3 Glossary of administrative Terms. 2.4 Grammar Tenses Articles: Definite and Indefinite Prepositions: usage Conjunctions: Active and Passive voice Punctuation	06
Unit-III **Professional Writing**	3a. Draft business letters and compose emails in the given situation. 3b. Respond to given job advertisement by writing application letter with resume. 3c. Differentiate between C.V, resume and bio-data. 3d. Draft office correspondence in given format. 3e. Prepare reports of the given types of events.	3.1 Business Correspondence: Enquiry, order, Complaint, Adjustment Letter, emails-netiquette, itinerary writing. 3.2 Job-Application with Resume 3.3 Difference- Bio-data, resume, curriculum vitae 3.4 Office Drafting-notices, memorandum, minutes of meeting etc. 3.5 Report Writing: Accident progress and, maintenance	08
Unit-IV **Basic Skills**	4a. Differentiate between listening and hearing. 4b. Explain types of listening and its techniques. 4c. Compose different types of speeches on given situations/themes. 4d. Identify reading competencies and styles. 4e. Formulate paragraph sin words synchronised sentences structure on the given topic	4.1 Listening skill: Listening Vs Hearing. 4.2 Types of Listening-active, passive, focused, biased and techniques of effective Listening. 4.3 Speaking skill: Speeches-welcome, farewell, Vote of thanks. 4.4 Reading skill: Reading comprehension, Reading Style-skimming, scanning, sub vocalised, speed reading. 4.5 Writing skills Paragraph writing-types of paragraphs-technical,	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		descriptive, expository.	
Unit-V Presentation skills	5a. Prepare seminar /technical paper presentation on given situation. 5b. Explain use and importance of body language in oral communication and presentations.	5.1 Tips for effective seminar- Guidelines for developing Power point presentation and technical paper presentation. 5.2 Effective use of body language, Aspect of body language (kinesics)-gestures, postures, eye contact, facial expressions, personal appearance (dressing and grooming) vocalics, haptics	04
		TOTAL	**32**

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 Theory Practice	08	04	08	20
II	Vocabulary and Grammar	04	04	12	20
III	Professional Writing	--	08	16	24
IV	Basic skills	02	02	04	08
V	Presentation Skills	02	02	04	08
	TOTAL	**16**	**20**	**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/TUTORIALS/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
01	I	Present different types of barriers using examples with remedies to overcome	02*
02	I	Explain types of communication used in any organization using case study	02*
03	I	Explain 7C's of effective communication using examples	02
04	II	Repeat and write words in Language Lab software after listening to them	02
05	II	Deliver oral presentation on given topic using correct grammar.	02*
06	II	Make sentences using correct articles, prepositions and conjunctions	02*
07	II	Make list of words often confuse/collocations/idioms	02
08	III	Draft a job application letter with resume and each type of business letters	02*

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
09	III	Draft a notice, memo, minutes of meeting and itinerary planning on given topic	02*
10	III	Draft a detail progress report, accident and maintenance report on given topic	02*
11	IV	Deliver and write speeches on given topic	02*
12	IV	Repeat dialogues on language lab software after listening to them	02*
13	IV	Write short paragraphs emphasizing on syntax	02
14	V	Design and deliver power point presentation on any technical topic	02*
15	V	Mention examples of body language use at work place with suitable pictures and images	02
16	V	Explain importance of soft skills for personality development	02
		TOTAL	**32**

Minimum 12 or more practical's need to be performed out of which the practical's marked as '*' are compulsory.

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect good articles from magazines and newspaper and read them with correct intonations.
2. Watch videos of effective presentations on television and open learning sources for presentation skills and body language.
3. Undertake micro-projects.
4. Practice correct pronunciation of words and use it while speaking.
5. Read the following books in English and summarize its central idea: Malgudi Days-R. K. Narayan, The Room On Roof-Ruskin Bond, The gift of Magi-O Henry, Uncle Podger Hangs a Picture-Jerome Jerome.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Use audios of correct pronunciations.
2. Show videos /animation films to develop listening skills and enhance vocabulary.
3. Massive open online course (MOOCs) may be used to teach various topics/sub topics.
4. Arrange various communication activities of real life situation.
5. Guide micro-projects in group as well as individually.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Effective English Communication	M Ashraf Rizvi	Tata McGraw Hill Publishing Co. Ltd.
02	Communication Skills	Sanjay Kumar and Pushplata	Oxford University Press
03	Essential English Grammar	Murphy, Raymond	Cambridge University Press.
04	Living English Structure	Allen W.S.	Pearson Education
05	Better English Pronunciation	J. D. O'Connor	Cambridge University Press
06	Effective Technical Communication	M. Ashraf Rizvi	McGraw Hill
07	Personality Development and Soft Skills	Barun K. Mitra	Oxford University Press

B) Software/Learning Websites:

1. http: //www.communicationskills.co.in
2. http: //www.mindtools.com
3. http: //www.communication.skills4confidence
4. http: //www.talkenglish.com/
5. www.wordsworthelt.com
6. https: /www.britishcouncil.org/en/content

C) Major Equipment/ Instrument with Broad Specifications:

1. Digital English Language Laboratory.
2. Computers for language laboratory software
3. Headphones with microphone.
4. LCD projector.
5. Smart Board with internet.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	L	M	L	H	H	M	M	M	--
CO2	L	--	--	M	H	H	L	M	M	--
CO3	M	--	--	L	H	M	M	M	M	--
CO4	L	M	--	--	H	M	M	M	M	--
CO5	M	M	M	M	H	H	M	M	M	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	20	28	12	04	--	04	08	--	28
II	CO.2	20	28	04	08	--	04	08	04	28
III	CO.3	24	32	04	04	16	08	--	--	32
IV	CO.4	08	10	04	--	--	--	--	08	12
V	CO.5	08	10	04	--	--	--	--	04	08
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	20							20							24							08							08							80
1.35 Times marks	28							28							32							10							10							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	28
Q2	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	4	-	-	-	16
Sub Total	**28**							**28**							**32**							**12**							**08**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / MK
COURSE : Engineering Mathematics (EMT) **COURSECODE :** 21102

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

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

2.0 COURSE OBJECTIVES:

This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential Calculus and Basic elements of algebra.

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. Utilize basic concept of Trigonometry to solve engineering related problem.
2. Apply knowledge of derivative to solve engineering problems.
3. Apply the concept partial fraction solve engineering related problem.
4. Evaluate power of binomials using Binomial theorem.
5. Use basic concept of statistics to solve engineering related problem.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Trigonometry**	1a. Apply the concept compound angle to solve the problem. 1b. Apply the concept of Allied angle to solve engineering related problem. 1c. Apply the concept of multiple and submultiples angle to solve problems 1d. Apply the concept of inverse trigonometric function.	1.1 Trigonometric ratio of compound, allied, multiple and sub-multiple angles (without proof) 1.2 Factorization and De-factorization formulae (without proof) 1.3 Inverse trigonometric ratio, principal value and relation between Trigonometric and Inverse Trigonometric ratios	10
Unit-II **Differential Calculus**	2a. Apply limits to solve various type of function 2b. Solve problems of derivatives with the help of rules & formulae 2c. Obtain the derivative of various functions.	2.1 Definition of function, types of functions and Basic problems. 2.2 Derivative a) Differentiation by definition of functions($x^n, \sin x, \cos x, \tan x, e^x, \log_a x$) b) Rules of Derivatives (Sum, Product & Quotient) c) Differentiation of function of function (composite function) d) Derivative of Trigonometric, Parametric function, Logarithmic Differentiation,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Implicit function	
Unit-III **Partial Fraction**	3a. Obtain Proper & Improper Partial Fraction for given simple rational function 3b. Resolve partial fraction method of case I, II, &III	3.1 Definition of Proper and Improper Fraction 3.2 Definition of Partial Fraction. 3.3 To resolve Proper fraction in to partial fraction by Case I) Denominator containing non repeated linear factor Case II) Denominator containing repeated linear factor Case III) Denominator containing irreducible non-repeated quadratic factor	04
Unit-IV **Binomial Theorem**	4a. Illustrate Binomial for positive integral index. 4b. Illustrate Binomial for any index.	4.1 Binomial theorem for positive integral index with example 4.2 Binomial theorem for any index(without Proof) with example 4.3 First and second binomial approximation with application to engineering problem	04
Unit-V **Statistics**	5a. Obtain the range and coefficient of range of given group and ungroup data 5b. Calculate Mean and Standard Deviation of given group and ungroup data 5c. Determine the variance and coefficient of variance of given group and ungroup data.	5.1 Range and coefficient of range of given group and ungroup data 5.2 Mean and Standard Deviation of given group and ungroup data 5.3 Variance and coefficient of variance of given group and ungroup data	04
		TOTAL	**32**

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	Trigonometry	04	08	10	22
II	Differential Calculus	04	08	08	20
III	Partial Fraction	04	04	04	12
IV	Binomial Theorem	04	04	04	12
V	Statistics	02	04	08	14
	TOTAL	**18**	**28**	**34**	**80**

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

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

6.0 ASSIGNMENTS/TUTORIALS/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
01	I	Trigonometric function	01
02	I	Trigonometric function	01
03	I	Trigonometric function	01
04	II	Differential Calculus	01
05	II	Differential Calculus	01
06	II	Differential Calculus	01
07	III	Partial Fraction	01
08	III	Partial Fraction	01
09	IV	Binomial Theorem	01
10	IV	Binomial Theorem	01
11	V	Statistics	01
12	V	Statistics	01
		TOTAL	**12**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Identify engineering problems based on real world problem and solve with the use of free tutorials available on the internet.
2. Use graphical software's: EXCWL, DPLOT and GRAPH for related topics.
3. Use MathCAD as Mathematical Tools and solve the problems of calculus.
4. Prepare models to explain different concepts.
5. Prepare a seminar on any relevant topic.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any): Not Applicable

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Higher Engineering Mathematics	Grewal, B. S.	Khanna publication, New Delhi, 2013 ISBN: 8174091955
02	A Text book of Engineering Mathematics	Dutta, D.	New Age Publications, New Delhi, 2006 ISBN: 978-81-224-1689-3
03	Advanced Engineering Mathematics	Krezig, Ervin	Wiley publication, New Delhi, 2016ISBN: 978-81-265-5423-2
04	Advanced Engineering Mathematics	Das, H. K.	S. Chand publication, New Delhi, 2008ISBN: 978-81-219-0345-5
05	Trigonometry	Loney, S. L.	S. Chand publication, New Delhi, 2008ISBN: 978-81-219-0345-5

B) Software/Learning Websites:

1. www.scilab.org/- SCI Lab
2. www.dplot.com/-DPlot
3. www.allmathcad.com/-MathCAD

4. www.woifram.com/mathematica/-Mathematica
5. http: fossee.in/
6. https: //www.khanaacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig
7. www.easycalculation.com
8. www.math-magic.com

C) Major Equipments/ Instrument with Broad Specification:

1. Scientific Calculator (fx-991MS)
2. Computer system with Printer and Internet System.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	L	--	L	--	L	M	M	--
CO2	H	M	L	--	L	--	L	L	M	--
CO3	H	M	L	--	L	--	L	M	M	--
CO4	H	M	L	--	L	--	L	M	M	--
CO5	H	M	L	--	L	--	L	M	M	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE: (a)

Unit No.	CO	Marks per Unit	1.35 Times Marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	22	29.7	08	08	08	04	--	--	28
II	CO.2	20	27	08	04	04	08	04	--	28
III	CO.3	12	16.2	04	04	--	04	--	04	16
IV	CO.4	12	16.2	04	--	04	--	08	--	16
V	CO.5	14	19.9	04	--	--	--	04	12	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	22							20							12							12							14							80
1.35 Times marks	29							27							16							16							20							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	16
Q4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	32							24							16							16							20							108
TOTAL																																				108

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / MK
COURSE : Applied Mathematics (AMT) **COURSE CODE :** 21103

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Subject of applied mathematics is being introduced in diploma course to provide mathematical background to the student. This course follows in developing theory competency needed for a wide range of engineering application. In particular the technique of algebra, integration, differential equation, geometry for modeling and analysis in a wide range of applications. This course further develop the skill and understanding of mathematical concept which underpin the investigation tools used in engineering

2.0 COURSE OBJECTIVES:

This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, integral calculus, coordinate geometry, basic element of vector algebra and first order differential equation.

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 concept of algebra to solve engineering related problem.
2. Solve the given problems of integration using suitable method.
3. Apply Concept of integration to find area of curve.
4. Solve Differential Equation of first order and first degree using suitable method.
5. Solve basic engineering problem under given condition of straight lines.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I (Algebra) **Determinants and Matrices**	1a. Calculate the area of given triangle by determinant method. 1b. Solve simultaneous equation in three unknown by crammer's rule. 1c. Solve Inverse of matrix.	1.1 Value of determinant of order 2×2, 3×3, & area of triangle. 1.2 Solution of simultaneous equation in three unknown by crammer's rule. 1.3 Matrices, algebra of matrices. 1.4 Inverse of matrix (Adjoint Method).	12
Unit-II **Integral Calculus**	2a. Solve the given simple problems based on rule of integration 2b. Obtain the given integral using the substitution method. 2c. Integrate given simple function using the integration by parts and by partial fractions.	2.1 Simple Integration: Rules of Integration and Integration of standard functions. 2.2 Methods of Integration. a) Integration by substitution. b) Integration by parts. c) Integration by partial fraction.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-III **Definite Integration and It's Application**	3a. Solve the given problem based on properties of definite integration. 3b. Apply the concept of definite integration to find the area under the given curves. 3c. Invoke the concept of definite integration to find volume of revolution of given surface.	3.1. Definite Integration: a) Simple problems. b) Properties of definite integration c) (Without proof) and simple example. 3.2. Application of integration: a) Area under the Single curves. b) Area bounded by two curves.	10
Unit-IV **Differential Equations**	4a. Find the order and degree of given differential equations. 4b. Form simple differential equation. 4c. Solve the given differential equation using method of variable separable form.	4.1 Concept of Differential Equations. 4.2 Order, Degree and Formation of 4.3 Differential Equations. 4.4 Solution of first order and first degree. 4.5 Differential Equations. a) Variable Separable Form (simple problem) b) Homogeneous Differential Equation c) Linear Differential Equation d) Exact Differential Equation of	08
Unit-V **Straight Line (Co-Ordinate Geometry)**	5a. Calculate angle between two straight lines. 5b. Formulate equation of straight lines related to given engineering problem. 5c. Identify perpendicular distance from given point to the line.	5.1 Straight line and slope of straight lines. a) Angle between two lines. b) Condition of parallel and perpendicular lines. 5.2 Various form of straight lines. a) Slope point form, two point form. b) Two points intercept form. c) General form. 5.3 Perpendicular Distance from point to the line. 5.4 Perpendicular Distance between two parallel lines.	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	Determinants and Matrices	04	08	10	22
II	Integral Calculus	04	08	08	20
III	Definite Integration and It's Application	04	04	04	12
IV	Differential Equations	04	04	04	12
V	Straight Line (Co-Ordinate Geometry)	02	04	08	14
	TOTAL	**18**	**28**	**34**	**80**

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

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

6.0 ASSIGNMENTS/TUTORIALS/PRACTICALS/TASKS: Not Applicable

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Identify engineering problems based on real world problem and solve with the use of free tutorials available on the internet.
2. Use graphical software's: EXCWL, DPLOT and GRAPH for related topics.
3. Use MathCAD as Mathematical Tools and solve the problems of calculus.
4. Prepare models to explain different concepts.
5. Prepare a seminar on any relevant topic.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any): Not Applicable

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Higher Engineering Mathematics	Grewal, B. S.	Khanna Publication, New Delhi, 2013 ISBN: 8174091955
02	A Text book of Engineering Mathematics	Dutta, D.	New Age Publications, New Delhi, 2006 ISBN: 978-81-224-1689-3
03	Advanced Engineering Mathematics	Krezig, Ervin	Wiley publication, New Delhi, 2016ISBN: 978-81-265-5423-2
04	Advanced Engineering Mathematics	Das, H. K.	Chand publication, New Delhi, 2008ISBN: 978-81-219-0345-5
05	Matrices	Ayer, F.	S. Chand series. Metric Edition Book, Place of India.

B) Software/Learning Websites:

1. www.scilab.org/- SCI Lab
2. www.dplot.com/-DPlot
3. www.allmathcad.com/-MathCAD
4. www.woifram.com/mathematica/-Mathematica
5. http: fossee.in/
6. https: //www.khanaacademy.org/math?gclid=CNqHuabCys4CFdOJaAoddHoPig
7. www.easycalculation.com
8. www.math-magic.com
9. http: //www.mathsisfun.com/calculus/integration-definite.html
10. http: //www.intmath.com/applications-integration/applications-integral-intro.php
11. http: //www.mathportal.org/linear-algebra/determinants/deteninant-of-a-matrix.php
12. http: //www.math.hmc.edu/calculus/tutorials/matrixalgebra/
13. http: //aieee.examcrazy.com/maths/formula-tips/Co-ordinate-Geometry-circle.asp

C) Major Equipments/ Instrument with Broad Specification:

1. Scientific Calculator (fx-991MS)
2. Computer system with Printer and Internet System.
3. LCD Projector.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	L	--	L	--	L	M	M	--
CO2	H	M	L	--	L	--	L	M	M	--
CO3	H	M	L	--	L	--	L	M	M	--
CO4	H	M	L	--	L	--	L	L	M	--
CO5	H	M	L	--	L	--	L	L	M	--

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

This course curriculum is prepared taking into consideration the basic requirements in Engineering Mathematics for CE / ME / PO / EE / IF / CM / EL / AE / MK and mapped with PSO's of CE / ME / PO / EE / IF / CM / EL / AE / MK.

11.0 SUGGESTED QUESTION PAPER PROFILE:
For Term End Examination:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03I	03II	05	06	
I	CO.1	22	29.7	08	08	08	04	--	--	28
II	CO.2	20	27	08	04	04	08	04	--	28
III	CO.3	12	16.2	04	04	--	04	--	04	16
IV	CO.4	12	16.2	04	--	04	--	08	--	16
V	CO.5	14	19.9	04	--	--	--	04	12	20
	TOTAL	**80**	**108**	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	22							20							12							12							14							80
1.35 Times marks	29							27							16							16							20							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	16
Q6	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	**32**							**32**							**12**							**12**							**20**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / MK
COURSE : Applied Physics (PHY) **COURSE CODE :** 21104

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	Online TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	02	Max.	80#	20#	100	--	--	50	150
						Min.	32	--	40	--	--	20	--

# Indicates Online multiple choice question test/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 principles and 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 Physics to solve simple 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 data for interpretation and its analysis.
4. Develop the 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. Identify different physical quantities, units and estimate errors in measurement.
2. Apply the basic principles associated with light and electricity in related engineering applications.
3. Identify types of heat conductors and analyse relation between thermodynamic variables.
4. Identify properties such as elasticity, surface tension & viscosity with their engineering applications
5. Gain broad ideas about capacitors and classify semiconductors on the basis of band theory

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Units & Measurements**	1a. Differentiate between physical quantities and determine the dimensions of these quantities 1b. Recognize different types of errors in measurements 1c. Estimate errors in measurement 1d. Illustrate use of measuring instrument	1.1 Need of measurements, units of measurements, systems of units, S.I prefixes, fundamental & derived quantities and their units, dimension of physical quantity, numerical. 1.2 Accuracy & precision of measurement, errors, types of error-instrumental, systematic and random error, estimation of error-average value, absolute	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		error, relative error & percentage error, numerical. 1.3 Measuring instruments-vernier caliper and micrometer screw gauge.	
Unit-II **Light**	2a. Estimate refractive index of material of prism. 2b. Illustrate advantages of optical fiber over conducting wire. 2c. Distinguish between types of optical fibre. 2d. Describe the principle of laser & types of laser. 2e. Recognise engineering application of optical fibre & laser.	2.1 Refraction of light, refractive index and its significance, prism formula (eq^n only), Total internal reflection of light (T.I.R), 2.2 Optical fiber, advantages and disadvantages, construction of optical fiber, propagation through optical fibre 2.3 Transmission characteristics of optical fiber, types of optical-fiber-step& graded index fibre, application of optical fiber, numerical 2.4 Laser, Properties of laser, spontaneous absorption, spontaneous emission and stimulated emission, population inversion, pumping, life time, meta-stable state, Helium-Neon Laser and applications of laser.	10
Unit-III **Transfer of Heat & Gas Laws**	3a. Classify the materials on the basis of thermal conductivity. 3b. Calculate coefficient of expansion of different solids. 3c. State relation between three thermodynamic variables. 3d. Determine the relation between specific heats for a given materials. 3e. Distinguish between isothermal, adiabatic, isobaric & isochoric process.	3.1 Conduction of heat, variable state, steady state and temperature gradient, law of thermal conductivity, coefficient of thermal conductivity, applications of thermal conductivity, numerical. 3.2 Expansion of solids, coefficient of linear, areal and cubical expansion and relation between them (only eq^n.), numerical. 3.3 Statement of Boyle's law, Charles law, Gay Lussac's law, concept of absolute zero, general gas equation, numerical. 3.4 Work done in expanding a gas at constant pressure, specific heats of a gases and relation between them (only eq^n) 3.5 Isothermal, isobaric and isochoric and adiabatic process, difference between these thermodynamic processes.	08
Unit-IV **Properties of Matter**	4a. Calculate elastic constants and state their significance 4b. Distinguish between elasticity, surface tension & viscosity	4.1 Deforming force, restoring force, elasticity, plasticity & rigidity, factors affecting elasticity, stress & strain with their types, elastic limit, Hooke's law & elastic	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	4c. Determine surface tension & viscosity of fluid 4d. Explain applications of Pascal's law 4e. Classify types of flow of fluid 4f. Identify applications of elasticity, surface tension and viscosity	constants, factor of safety, application of elasticity, numerical. 4.2 Cohesive & adhesive force, molecular range, sphere of influence, surface tension of liquid, factors affecting S.T., molecular theory of S.T., angle of contact, capillary action, relation between capillary action & S.T., applications of S.T., numerical. 4.3 Pressure, pressure due to a fluid column, hydrostatic paradox, Pascal's law, viscosity, factors affecting viscosity, Newton's law of viscosity, coefficient of viscosity, Stoke's law of viscosity, equation for terminal velocity of sphere falling through fluid, types of flow- streamline & turbulent, Reynolds number, application of viscosity, numerical.	
Unit- V **Current Electricity & Capacitance**	5a. Use of Meter Bridge to find unknown resistance. 5b. Calculate force between two charges using Coulombs law 5c. Illustrate different properties of lines of force 5d. Determine potential due a charge 5e. Explain charging & discharging of capacitor 5f. Determine effective capacitance for combination of capacitors	5.1 Ohm's law, specific resistance, conductance, effect of temperature on resistance of conductors, insulators and semiconductors. 5.2 Wheatstone's network and its application (Meter Bridge), potentiometer-principle & applications, numerical. 5.3 Coulomb's law, electric field, intensity of electric field, electric lines of force and their properties, electric flux, flux density, numerical. 5.4 Electric potential, potential difference, potential gradient, dielectric strength, breakdown potential, pd due a point charge (eq^n only), potential of earth and numerical. 5.5 Capacitance, capacitor, principle of capacitor, charging and discharging of capacitor, capacitors in series and parallel combination, types of capacitor, parallel plate capacitor(eq. only), energy stored by a capacitor and numerical.	08
Unit-VI **Photo Electricity**	6a. Explain characteristics of photoelectric effect 6b. Calculate KE of	6.1 Planck's hypothesis, properties of photon, photoelectric effect and its characteristics, work function,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
& Semiconductors	photoelectrons using Einstein's equation 6c. Classify solids on the basis of energy band. 6d. Differentiate between p & n type semiconductors 6e. Explain biasing of p-n junction diode	Einstein's photoelectric equation, photoelectric cell- construction, working and applications, numerical. 6.2 Formation of energy bands, energy band diagram in conductors, semiconductors & insulators, properties of semiconductors, structure of silicon & germanium, types of semiconductors- intrinsic & extrinsic, p type & n type semiconductors, p-n junction diode, forward & reverse bias characteristics of p-n junction diode.	
		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	Units & Measurements	02	02	04	08
II	Light	04	04	08	16
III	Transfer of Heat & Gas Laws	04	04	06	14
IV	Properties of Matter	04	04	06	14
V	Current Electricity & Capacitance	04	04	06	14
VI	Photo Electricity & Semiconductors	04	04	06	14
	TOTAL	**22**	**22**	**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/TUTORIALS/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	I	Measure the dimensions of different objects using Vernier caliper	02
02	I	Measure the dimensions of different objects using micrometer screw gauge	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
03	II	Determine the refractive index of material of prism using spectrometer	02
04	II	Determine the numerical aperture of given optical fiber	02
05	III	Verify ohm's law and determine resistivity of material of given wire.	02
06	III	Verify law of resistance in series & parallel using Meter Bridge.	02
07	III	To verify the principle of potentiometer.	02
08	III	Determine temperature coefficient resistance of material of wire on the basis of variation of resistance with temperature.	04
09	IV	Determine coefficient of thermal conductivity using Searle's apparatus.	02
10	IV	Determine coefficient of linear expansion using Pullinger's apparatus.	02
11	IV	Verify Boyle's law	04
12	V	Verify Hooke's law of elasticity and determine Young's modulus of material of wire using Searle's apparatus.	04
13	V	Determine surface tension of water using capillary rise method.	02
14	V	Verify Stoke's law of viscosity and determine coefficient of viscosity of given fluid.	04
15	V	Charging& discharging of capacitor and determine its time constant.	02
16	V	Verify law of capacitance in series / parallel.	02
17	VI	To study IV characteristic of photoelectric cell.	02
		10 to 12 experiments should be performed in a term for completion of TW	
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Prepare chart on comparison of systems of units for different physical quantities.
2. Prepare charts of Vernier caliper, screw gauge, travelling microscope, spherometer &spectrometer for lab demonstration.
3. Make a paper scale of least count e.g. 0.01 cm, 0.2cm, 0.5cm.
4. Prepare models by using water and diode laser to demonstrate T.I.R and working of optical fiber.
5. Note the change in level of liquid in a container on heating and interpret the observations.
6. Prepare models to demonstrate gas laws using house hold materials.
7. Study the effect of detergent powder on surface tension of water by observing capillary rise.
8. Prepare charts regarding sub topics in curriculum for display in lab as well as classroom teaching-learning process.
9. Use various virtual labs/simulation techniques for lab experiments.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Apart from regular teaching learning strategies show videos based on topics in the curriculum (total internal reflection, population inversion, different laws of physics etc...) for better understanding of the concepts.
2. Show videos of practical demonstration before performance of practical for better understanding of practical.
3. Use of virtual labs/ simulation technique for better understanding of laboratory experiments.

9.0 LEARNING RESOURCES:

A) Books:

Sr. No.	Title of Books	Author	Publication
01	Engineering Physics	R K Gaur & S L Gupta	Dhanpat Rai Pub.
02	Applied Physics	Prof. Arthur Beiser	Tata McGraw hill Pub.
03	Engineering Physics	D K Bhattacharya	Oxford University press
04	Physics 1 & 2	NCERT / MSBSHSE	NCERT/MSBSHSE
05	Physics Vol 1 &2	Halliday & Resnick	Wiley India
06	Principle of physics	Brijlal & Subrahmanyam	S. CHAND & COMPANY

B) Software/Learning Websites:

1. www.physicsclassroom.com
2. www.physics.org
3. www.physics.brown.edu
4. www.amazon.com/Basic-Physics
5. http: //scienceworld.wolfram.com/physics/
6. http: //en.wikipedia.org/wiki
7. http: //hyperphysics.phy-astr.gsu.edu/hbase
8. www.msu.edu/~brechtjo/physics
9. www.answers.com/topic/list-of-basic-physics-topics
10. www.answers.com/topic
11. www.vlab.amrita.edu
12. www.olabs.edu.in
13. https: //praxilabs.com/en/
14. www.phet.colorado.edu

C) Major Equipment/ Instrument with Broad Specifications:

1. Vernier Caliper (LC = 0.02mm)
2. Micrometer screw gauge (LC = 0.01mm)
3. Aneroid barometer (LC =1mm of Hg)
4. Digital stop watch (LC = 0.01 sec)
5. Travelling Microscope (LC = 0.001 cm)
6. Regulated power supply (o/p 0 to 15 V)
7. Apparatus to verify Boyles law
8. Stokes App to measure viscosity
9. Meter bridge (length of wire = 1m)
10. Searle's apparatus for Young's modulus (LC = 0.001cm)
11. Pullinger's apparatus (length of rod 50cm, three metal rods)
12. Gas burner with regulator, LPG gas cylinder and lighter
13. Spectrometer (LC = 1 min)
14. Ammeter, voltmeter, galvanometer, rheostat, resistance box

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	L	M	L	L	L	M	--	M
CO2	H	M	L	M	L	L	L	M	--	M
CO3	H	M	L	M	L	L	L	M	--	M
CO4	H	M	L	M	L	L	L	M	--	M
CO5	H	M	L	M	L	L	L	M	--	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks		Actual Distribution of Marks
				Q 1 to 40: 1 mark each	Q 41 to 60: 2 marks each	
I	CO.1	08	NA	06 x 1 = 06	01 X 02 =02	08
II	CO.2	16	NA	08 x 1 = 08	04 X 02 =08	16
III	CO.2	14	NA	08 x 1 = 08	03 X 02 =06	14
IV	CO.3	14	NA	06 x 1 = 06	04 X 02 =08	14
V	CO.4	14	NA	06 x 1 = 06	04 X 02 =08	14
VI	CO.5	14	NA	06 x 1 = 06	04 X 02 =08	14
	TOTAL	**80**	**--**	**40** x 1 = **40**	**20 X 02 = 40**	**80**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**VI**							**Total**
CO	**1**							**2**							**2**							**3**							**4**							**5**							
Marks per Unit	08							16							14							14							14							14							80
1. 35 Times marks	--							--							--							--							--							--							--
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**a**	**b**	**c**	**d**	**e**	**f**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q 1-40	1	1	1	1	1	1	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	1	1	1	1	1	1	1	1	1	1	1	1	40
Q 41-60	2	-	-	-	-	-	-	-	2	2	2	2	-	-	-	-	2	2	2	-	-	-	-	-	2	2	2	2	-	-	-	2	2	2	2	-	-	2	2	2	2	-	-	40
Sub Total	**08**							**16**							**14**							**14**							**14**							**14**							**80**
TOTAL																																												**80**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / MK
COURSE : Applied Chemistry (CHY) **COURSE CODE :** 21105

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	Online TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	02	Max.	80#	20#	100	--	--	50	150
						Min.	32	--	40	--	--	20	--

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1.0 RATIONALE:

Applied chemistry for diploma students in various engineering and technology courses forms the part of foundation course and includes the study of basic concepts of chemistry like chemical bonding, corrosion, water treatment, and different engineering materials like metals, alloys, insulators, cement, etc. This course will help the students in understanding engineering subjects where the emphasis is laid on the application of these concepts of Chemistry concerned with the changes in structure and properties of matter which are used in their professional career.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop knowledge of applied chemistry in interdisciplinary branches of engineering.
2. Apply knowledge of chemistry in engineering situations.
3. Develop technician possessing ability of exercising application skills underlying deep knowledge related to principles of chemistry.

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 and basic concepts of chemistry to engineering situations.
2. Apply knowledge to correlate the properties of materials, their engineering uses and protection.
3. Use relevant water treatment method to solve domestic and industrial problems.
4. Use relevant fuel and lubricants for domestic and industrial applications.
5. Solve the engineering problems using concept of Electrochemistry and corrosion.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Atomic Structure, Catalysis And Nano-Chemistry.**	1a. Describe Bohr's structure of an atom and electronic configuration of given elements 1b. Select the suitable catalyst for a given application. 1c. Explain characteristics, applications, advantages and disadvantages of nanoparticles.	1.1 Structure of atom: Bohr's theory, orbit, orbital, shapes of orbital, energy level, sub energy level, Hund's rule, Aufbau principle, Pauli's exclusion principle, Rules for distribution of electrons in shell and sub shells, Electronic configuration of elements from atomic no. 1 to 30. 1.2 Types of catalysis, Types and industrial application of catalyst.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.3 Nano chemistry-Introduction, nanotechnology, nanomaterial, characteristics, applications, advantages and disadvantages.	
Unit-II **Metals, Alloys, Insulators, Cement**	2a. Describe the properties of metals and metallurgy process. 2b. Select suitable thermocouple alloy for given application. 2c. Select suitable insulator for given system. 2d. Enlist constituents and uses of cement.	2.1 Metals: Mineral, ore, slag, flux, metallurgy, Properties of metals – Hardness, toughness, tensile strength, cast ability. Brittleness, tensile strength, machinability, weldability. Flow sheet of metallurgy, Extraction of iron from hematite ore using blast furnace. 2.2 Alloys: Definition, purposes of making alloys, Effect of alloying elements – carbon, silicon, chromium, nickel, manganese, Sulphur, Thermocouple alloy – Composition and characteristics of nickel alloy, platinum/rhodium, tungsten/rhenium, chromel – gold/iron. 2.3 Electrical Insulators: Classification. Solid-ceramic, mica, asbestos, urea formaldehyde, resin and glass. 2.4 Cement: Constituents, types, setting and uses of cement.	08
Unit-III **Water**	3a. Differentiate between hard and soft water 3b. Calculate the hardness of water from given data. 3c. Describe effect of hard water in boilers. 3d. Explain the given methods for removal of hardness of water. 3e. Describe the different treatments of drinking water.	3.1 Classification of soft and hard water based on soap test, Causes and types of hardness of water. 3.2 Units of hardness of water and simple numerical on water hardness. 3.3 Cause of poor lathering of soap in hard water, disadvantages of hard water in boiler (scales and sludges, priming and foaming, corrosion etc.) and quantitative measurement of water hardness by EDTA method. 3.4 Water softening techniques – Soda lime process, Permutit's method, ion exchange method 3.5 Municipal water treatment (in brief only) - Sedimentation, coagulation, filtration and Sterilization of water.	08
Unit-IV **Fuels &Lubricant**	4a. Describe fuels, characteristics of good fuel, types of fuel	4.1 Fuels, Calorific value and ignition temperature, Characteristics of good fuel,	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	4b. Describe solid fuel-e.g. coal in detail 4c. Describe liquid fuel an e.g.-petroleum 4d. Describe composition, properties, calorific values of given gaseous fuels with their applications. 4e. Describe lubricants, its function and classification of lubricants. 4f. Explain lubrication and it's types 4g. Describe physical and chemical properties of lubricants.	classification of fuel. 4.2 Solid fuel-e.g. coal, its types and composition, selection of coal, Proximate and ultimate analysis of coal. 4.3 Liquid fuel-Fractional distillation of crude petroleum, boiling range, composition. Properties-Knocking, cracking, octane number and cetane number. 4.4 Gaseous fuels-Biogas, LPG and CNG. 4.5 Lubricant, function of lubricants, classification with examples. 4.6 Lubrication mechanism-Hydrodynamic and boundary lubrication. 4.7 Physical properties- viscosity, viscosity index, oiliness, flash and fire point, volatility, cloud and pour point. 4.8 Chemical properties- acid value, saponification value, emulsification.	
Unit-V **Electrochemistry and Corrosion**	5a. Explain basic concept of electrochemistry. 5b. Explain Faraday's law of electrolysis. 5c. Explain industrial applications of Electrolysis. 5d. Describe construction, working and applications of given type of battery. 5e. Describe types of corrosion. 5f. Identify the different factors affecting rate of corrosion for the given type of material. 5g. Explain mechanism of given electrochemical corrosion. 5h. Select the protective measure to prevent the corrosion in the given corrosive medium.	5.1 Basic concepts of electrochemistry-Oxidation, reduction, redox reaction, electrolytes, non-electrolytes with suitable examples. 5.2 Faraday's law of electrolysis and simple numerical problems. 5.3 Industrial application of Electrolysis-Electro-plating and electro-refining. Etching process of printed circuit board by using $FeCl_3$. 5.4 Batteries-Primary cell(Dry cell), Secondary cell (Lithium ion battery) 5.5 Definition, Types of corrosion – chemical and electro chemical corrosion. Types of oxide film. 5.6 Factors affecting rate of corrosion control-Modification of environment, Use of protective coating(less active-Tinning and more active-Galvanising) Anodic and cathodic protection, Use of pure metal and metal alloy. 5.7 Mechanism of electrochemical corrosion (Hydrogen liberation and oxygen absorption) 5.8 Preventive measures –	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		a) Internal corrosion- Purification, alloying and heat treatment, b) External corrosion - Metal (anodic and cathodic) coating, organic coating.	
		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	Atomic Structure, Catalysis and Nano chemistry.	06	06	02	14
II	Metals, Alloys, Insulators, Cement.	06	06	02	14
III	Water.	06	06	02	14
IV	Fuels and Lubricants.	06	06	02	14
V	Electrochemistry and Corrosion.	10	10	04	24
	TOTAL	**34**	**34**	**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/TUTORIALS/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
01	I	Identify cation and anion in given ionic solutions.	02
02	I	Identify cation and anion in given ionic solutions.	02
03	I	Identify cation and anion in given ionic solutions.	02
04	I	Identify cation and anion in given ionic solutions.	02
05	I	Identify cation and anion in given ionic solutions.	02
06	II	Standardization of KMnO4 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO4 solution.	02
07	II	Standardization of KMnO4 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO4 solution.	02
08	III	Determine total hardness of water sample by EDTA method.	04
09	III	Determine chlorine content in the given water sample.	02
10	III	Determine the PH value of given solution using PH meter and universal indicator.	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
11	III	Determine the PH value of given solution using PH meter and universal indicator.	02
12	IV	Determine moisture and ash content in given coal sample.	02
13	IV	Determine the effect of temperature on viscosity for given lubricating oil using Redwood viscometer-I.	02
14	IV	Determine acid value of given lubricant.	02
15	V	Determine electrochemical equivalent of Cu metal using Faraday's first law.	02
16	V	Determine the rate of corrosion in acidic medium.	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect information about application of Nano chemistry in construction and different industries.
2. Internet based assignments –e.g. Find out different nano structured materials in day to day used products.
3. Seminar: Any relevant topic.
4. Power point presentation or animation on any relevant topic.
5. Prepare chart of showing percentage composition, properties, and industrial applications of different alloys.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show videos
2. Power point presentations.

9.0 LEARNING RESOURCES:

A) Books:

Sr. No.	Title of Book	Author	Publication
01	Engineering Chemistry	Agarwal, & Shikha	Cambridge University Press; New Delhi, 2015.
02	Understanding Chemistry	C.N. R. Rao	Universities Press (India) Pvt. Ltd., 2011
03	Engineering Chemistry	Dara, S. S. & Dr. S. S. Umare	S. Chand. Publication, New Delhi.2015
04	Engineering Chemistry	Jain & Jain,	Dhanpat Rai and Sons; New Delhi, 2015.
05	Engineering Chemistry	Dr. Vairam, S	Wiley India Pvt. Ltd. New Delhi, 2013.
06	Applied Chemistry Laboratory Practices, Vol. I and Vol. II,	Dr. G. H. Hugar & Prof A. N. Pathak	NITTTR, Chandigarh, Publications, 2013-14.
07	The chemistry of Nano materials.	Dr. C. N. R. Rao, A. K. Cheetam	Wiley India Pvt. Ltd., New Delhi, 2013.

B) Software/Learning Websites:

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https: //www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)

6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7. www.chemcollective.org (Metals, Alloys)
8. www.wqa.org (Water Treatment)
9. https: //www.niehs.nih.gov/health/topics/agents/sya-nano

C) Major Equipment/ Instrument with Broad Specifications:

1. Electronic balance with the scale range of 0.001gm to 500 gm.
2. Digital PH meter (P^H =0 to 14)
3. Electronic Oven inner size18"X18"X18", (Temperature range 100 to 250^{0}c)
4. Redwood viscometer-I
5. Muffle furnace temperature 400^{0}C to 1150^{0}C, 30"X15"X15"cm)

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	L	--	M	M	--	L	--	L	--
CO2	H	--	L	--	--	--	--	--	--	L
CO3	H	M	--	M	--	--	M	M	M	--
CO4	H	--	--	--	L	L	--	--	--	L
CO5	H	--	M	--	--	L	L	L	--	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks		Actual Distribution of Marks
				Q 1 to 40: 1 mark each	Q 41 to 60: 2 marks each	
I	CO.1	14	NA	08x1=08	03X02=06	14
II	CO.2	14	NA	06x1=06	04X02=08	14
III	CO.3	14	NA	08x1=08	03X02=06	14
IV	CO.4	14	NA	06x1=06	04X02=08	14
V	CO.5	24	NA	12x1=12	06X02=12	24
	TOTAL	**80**	**NA**	**40X1=40**	**20X02=40**	**80**

a) Suggested Bitwise Distribution:

Unit No.	I								II							III							IV							V											Total
CO	1								2							3							4							5											
Marks per Unit	14								14							14							14							24											80
1. 35 Times Marks	--								--							--							--							--											
Bits	a	b	c	d	e	f	g	h	a	b	c	d	e	f	g	a	b	c	d	e	f	g	h	a	b	c	d	e	f	g	a	b	c	d	e	f	g	h	i	j	k	l	Total
CO	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	
Q1(1-40)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	x	1	1	1	1	1	1	1	1	1	1	1	40
Q2(41-60)	2	2	2	-	-	-	-	-	2	2	2	2	-	-	-	2	2	2	-	-	-	-	-	2	2	2	2	-	-	-	2	2	2	2	2	2	-	-	-	-	-	-	40
Sub Total	14								14							14							14							24											80
TOTAL																																										80

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / MK
COURSE : Engineering Graphics (EGR) **COURSE CODE :** 21107

TEACHING & EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	02	--	Max.	--	--	--	--	--	50	50
						Min.	--	--	--	--	--	20	--

1.0 RATIONALE:

Engineering Graphics is the language of engineers. The concept of Engineering Graphics are used to develop, express the ideas, and convey the instructions which are useful to carry out job in the field of engineering. The course aims to develop the ability to draw and read various engineering projections. The course mainly focuses on developing imagination and translating ideas in to sketches. This course is useful in developing, drafting and sketching skills of students. This preliminary course aims at building a foundation for the further course related to engineering drawing and other allied courses.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the basic concepts of engineering drawing.
2. Understand the use of drawing tools and equipments.
3. Draw different engineering curves and know their applications.
4. Interpret the pictorial view and understand orthographic projection of the simple object.
5. Visualize three dimensional objects and draw isometric projections.
6. Draw the free hand sketches of the machine elements.

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 geometrical figures and engineering curves.
2. Draw the views of given object using principles of orthographic projection.
3. Draw isometric views of given component or from orthographic projection.
4. Use drawing codes, conventions and symbols as per IS SP-46 in engineering drawing.
5. Draw free hand sketches of given engineering elements.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basic elements of Drawing**	1a. Prepare drawing using drawing instruments 1b. Use IS SP – 46 for dimensioning. 1c. Use different types of lines. 1d. Draw regular geometrical figures. 1e. Draw figure having tangency constructions.	1.1 Drawing Instruments and supporting material: methods to use them with applications. 1.2 Standard sizes of drawing sheets (ISO-A series) 1.3 I.S. codes for planning and layout. 1.4 Letters and numbers (single stroke vertical) 1.5 Convention of lines and their applications. 1.6 Scale - reduced, enlarged & full size. 1.7 Dimensioning technique as per SP-	06@

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		46 (Latest edition) – types and applications of chain, parallel and coordinate dimensioning. 1.8 Geometrical constructions	
Unit-II **Engineering curves and Loci of a point.**	2a. Explain different engineering curves with areas of application. 2b. Draw different conic sections based on given situation. 2c. Draw involute and cycloidal curves base on given data. 2d. Draw helix and spiral curves from given data. 2e. Plot loci of a points from given data.	2.1 Concept of focus, directrix, vertex and eccentricity. Conic Section 2.2 Methods to draw an ellipse by Arcs of circle method & Concentric circles method. 2.3 Methods to draw a parabola by Directrix and focus method & Rectangle method. 2.4 Method to draw a hyperbola by Directrix focus method. 2.5 Methods to draw involutes of circle & pentagon. 2.6 Methods to draw a cycloidal curve: cycloid, epicycloids, hypocycloid. 2.7 Loci of appoints on single slider crank mechanism with given specification.	10@
Unit-III **Orthographic projections.**	3a. Explain method of orthographic projections 3b. Draw orthographic views of given simple 2D entities containing lines, circles and arcs only. 3c. Draw the orthographic views from given pictorial view.	3.1 Projections-orthographic, perspective, isometric and oblique; concept and applications. (No question to be asked in exam.) 3.2 Orthographic projections, First angle and Third angle method, their symbols. 3.3 Conversion of pictorial view into Orthographic Views– object containing plain surface, slanting surfaces slots, ribs, cylindrical surfaces. (Use First Angle Projection Method only.)	16@
Unit-IV **Isometric projections.**	4a. Prepare isometric scale. 4b. Draw isometric views of given simple 2D entities containing lines, circles and arcs only. 4c. Interpret the given orthographic views 4d. Draw isometric views from given orthographic views.	4.1 Isometric Projection 4.2 Isometric scale and natural scale. 4.3 Isometric view and projection. 4.4 Illustrative Problems related to simple objects having plain, slanting, cylindrical surfaces and slots on slanting surfaces. 4.5 Conversion of orthographic views in to isometric view/projection.	22@
Unit-V **Free Hand Sketches of engineering elements.**	5a. Sketch proportionate free hand sketches given machine elements. 5b. Select proper fasteners and locking arrangement for given situation	5.1. Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, washers, locking arrangements.	10@
		TOTAL	**64**

@: Indicates hours covered during practicals

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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	I	Draw one figure showing dimensioning technique	02
		Draw one problem on redraw the figure	02
		Draw one problems on loci of a point- Slider crank mechanism	02
02	II	Draw any four engineering curves.	10
03	III	Draw Two problems on orthographic projections using first angle method of projections having plain and slanting surfaces.	08
04	III	Draw Two problems on orthographic projections using first angle method of projections having cylindrical surfaces and ribs.	08
05	IV	Draw Two problems on Isometric view of simple object having plain and slanting surface, ribs	10
06	IV	Draw Two problems on Isometric projections of object having cylindrical surface, slanting surface by using isometric scale.	12
07	V	Draw free hand sketches of any ten machine elements.	10
		TOTAL	**64**

Unit No	Unit title	Distribution of Practical (TW) Marks			
		R Level	U Level	A and above Levels	Total Marks
I	Principles of Drawing	--	02	04	06
II	Engineering Curves and Loci of a Point	--	02	04	06
III	Orthographic Projections	--	02	08	10
IV	Isometric Projections	02	07	07	16
V	Free Hand Sketches of Engineering Elements	02	02	08	12
	TOTAL	**04**	**15**	**31**	**50**

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 Practical (TW) may vary slightly from above table.

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

a. Student should maintain a separate A3 size sketchbook which will be the part of term work and submit it along with drawing sheets. Following assignments should be drawn in the sketch book.
   1. Single stroke vertical Letters and Numbers.
   2. Types of lines

3. Redraw the figures any one
4. Engineering curves. One problem on each type of curve
5. Orthographic projections. Minimum 02 problems.
6. Isometric views /projections. Minimum 02 problems.
7. Free hand sketches. All types of machine elements mentioned in unit no. 5
   (Note: Problems in the sheet and sketchbook should be different.)

b. **Student should collect Maps, production drawings, Building drawings. Layout from** nearby workshops/industries/builders / contractors and try to list-
   1. Types of lines used
   2. Lettering style used
   3. Dimension style used
   4. IS codes referred.

c. List the shapes and curves you are observing around you in a real life with name of place and item. (For example ellipse parabola, hyperbola, cycloid, epicycloid, hypocycloid, involute, spiral, and helix.)

d. Take one circular shape. Assume one point on circumference and mark it. Roll that shape on flat and circular surface. Observe the path of the point and try to correlate with the theory taught in the class.

e. Take circular and pentagonal shape and wrap thread over the periphery, now unwrap this thread and observe the locus of the end of the thread and try to correlate with the theory taught in the class.

f. Each student should explain at least one problem for construction and method of drawing in sheet to all batch colleagues. Teacher will assign the problem of particular sheet to be explained to each student batch.

g. Each student will assess at least one sheet of other student (may be a group of 5-6 students identified by teacher can be taken) and will note down the mistakes committed by them. Students will also guide the students for correcting the mistakes, if any.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

Following are the sample strategies which a teacher can follow to teach the course more effectively to achieve the course outcomes,

1. Massive open online courses (MOOC'S) may be used to teach various topics/subtopics.
2. Use of various teaching and learning methods and proper use of media as per the need of topic.
3. Give the simple topics (10 to 15%) to students for self directed learning and ask them to present it in classroom.
4. Guide and demonstrate the students in fixing sheet and mini-drafter on board.
5. Show the video animation films, charts, models to understand the topic.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Books	Author	Publication
01	Engineering Drawing	Bhatt N.D.	Charoter Publishing House, Anand, Gujarat 2010, ISBN: 978-93-80358-17-8
02	Machine Drawing	Bhatt N.D., Panchal V.M.	Charoter Publishing House, Anand, Gujarat 2010, ISBN: 978-93-80358-11-6
03	Engineering Drawing	Jolhe D.A.	Tata McGraw Hill Edu. New Delhi, 2010 ISBN978-0-07-064837-1
04	Engineering Drawing	Dhawan R.K.	S. Chand and company, New Delhi. ISBN: 81-219-1431-0
05	Engineering Drawing	Shah P.J.	S. Chand and company, New Delhi. ISBN: 81-219-2964-4
06	Engineering Drawing Practice for schools and	Bureau of Indian Standards	BIS Government of India, Third Reprint, October 1998, ISBN: 81-7061-091-2

Sr.No.	Title of Books	Author	Publication
	colleges.IS: SP: 46		

B) Software/Learning Websites:

1. http: //www.youtube.com/watch?v=TJ4jGyD-WCw
2. http: //www.youtube.com/watch?v=dmt6_n7Sgeg
3. http: //www.youtube.com/watch?v=MQScnLXL0M
4. http: //www.youtube.com/watch?v=3WXPanCq9LI
5. http: //www.youtube.com/watch?v=fvjk7PlxAuo
6. http: //www.me.umn.edu/me2011/handouts/engg%
7. http: //www.machinedesignonline.com

C) Major Equipment/Instrument with Broad Specifications:

Sr.No.	Equipment Name with Broad specifications	Experiment No.
01	Drawing table with Drawing Board of full imperial / A1 size	All
02	Modes of objects for orthographic / isometric projections.-	4, 5, 6, 7.
03	Models / Chart of objects mentioned in unit-5	All
04	Set of various industrial drawings being used by industries	All
05	Drawing equipment's and instruments for class room teaching-large size. a. T- square or drafter (Drafting machine) b. Set square (45^0 and 30^0-60^0) c. Protractor d. Drawing instrument box (containing sets of compass and divider)	All
06	Interactive board with LCD overhead projector.	

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	--	--	M	M	L	L	L	L	L
CO2	L	H	H	L	M	--	L	M	--	M
CO3	L	H	H	L	M	--	L	--	--	--
CO4	--	H	H	L	L	L	L	L	--	L
CO5	--	--	--	M	M	L	M	H	H	H

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in CE / ME / PO / EE / AE / MK
COURSE : Engineering Mechanics (EMH) **COURSE CODE :** 21108

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	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 solution to problems related to forces acting on body. It also helps in understanding concepts and applications of Equilibrium, friction, centroid.

It helps in understanding concepts 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, Reinforced concrete structures and Design of steel 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 conditions and frictional force, centre of gravity and mechanism of machines.
3. Understand the basic principles of Lami's Theorem, law of machine and laws of friction.

3.0 COURSE OUTCOMES:

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

1. Describe fundamental concepts related to engineering mechanics, working of different machines and calculate Velocity Ratio, Efficiency of different Machines, calculate work, power, and energy.
2. Apply laws and principles of mechanics to solve problems related to resolution and composition of forces.
3. Apply condition of equilibrium to different practical situations.
4. Apply laws and principles of friction to different practical situations.
5. Locate centroid and centre of gravity.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamental Concepts and Simple Lifting Machinesand Work**	1a. Differentiate Scalar and Vector quantities 1b. Define basic terms relevant to mechanics. 1c. Compute M.A, V.R., Efficiency, Law of Machine for given Machines 1d. Compute work, Power and Energy	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 Fundamental units, derived units and different systems of units. 1.4 Basic concepts of simple lifting machines – load, effort, input, output, mechanical advantage, velocity ratio, efficiency of machine, Law of machine, friction in the machine, ideal machine, reversibility of machine. 1.5 Work-power Energy, definitions, units, graphical representation of work, law of conservation of energy, work energy principle.	10
Unit-II **Force**	2a. Identify and differentiate different force system 2b. Apply the laws to compute the resultant of given force system	2.1 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. 2.2 Law of transmissibility of a force, parallelogram law of forces, resolution and composition of forces, resultant, triangle law of forces, polygon law of forces. 2.3 Resultant of a coplanar concurrent force system (Analytical method) 2.4 Turning effect of force – Moment, Couple, nature of moment, characteristics of couple. 2.5 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)	12
Unit-III **Equilibrium**	3a. Draw Free Body Diagram 3b. Apply Lami's Theorem 3c. Compute support reactions for given beam	3.1 Concept of Equilibrium, Analytical Conditions of equilibrium, equilibrant. 3.2 Free body diagram (FBD) 3.3 Lami's theorem and its applications	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		3.4 Reactions at supports of beams - types of supports, types of loads types of beam 3.5 Determination of beam reactions- cantilever beam, simply supported beam and overhanging beam subjected to concentrated loads, uniformly distributed loads and applied moments or couples (Analytical method only)	
Unit-IV **Friction**	4a. Appreciate Friction and its engineering application 4b. Calculate friction forces and coefficient of friction	4.1 Introduction, frictional force 4.2 Laws of friction (static friction only), coefficient of friction, angle of friction, angle of repose. 4.3 Body resting on Horizontal plane, inclined plane and forces acting on the body in any direction	08
Unit-V **Centroid and Centre of Gravity**	5a. Distinguish between Centroid and Centre of Gravity 5b. Compute Centroid and Centre of Gravity of different plane laminas and solids	5.1 Definition and Concept of centre of gravity and Centroid. 5.2 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. 5.3 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
		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	Fundamental Concepts and Simple Lifting Machinesand Work	02	04	12	18
II	Force	--	04	12	16
III	Equilibrium	--	04	12	16
IV	Friction	04	--	12	16
V	Centroid and Centre of Gravity	02	--	12	14
	TOTAL	**08**	**12**	**60**	**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/TUTORIALS/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
	A	Any **Three** of following Exercises	
01	I	Differential axle and wheel	04
02		Simple screw jack	04
03		Worm and worm wheel	04
04		Single gear crab	04
05		Double gear crab	04
06		Two sheaves & three sheaves pulley block	04
07		Differential pulley block	04
08		Geared pulley block	04
	B	Any **Two** of following Exercises	
09	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	Any **Three** 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 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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 principles of Mechanics are involved.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Theory and problems of Engineering Mechanics- Schaum's outline series	E. Nelson, Charles Best & Willian	McGraw Hill

Sr.No.	Title of Book	Author	Publication
	Statics and Dynamics SI Edition	McLean.	
02	Engineering Mechanics statics and dynamics	Singer	Harper Collins Publisher, India.
03	Vector mechanics for Engineers (statics and Dynamics)	Ferdinand P. Beer, E Russell Johnson	McGraw Hill
04	Applied Mechanics for polytechnics	P. S. Sawhney & Manikpure	S. Chand & Co. Ltd
05	A text book of Applied Mechanics	Ramamrutham	Dhanpat Rai Pub. Co. (P) Ltd, New Delhi
06	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:

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

C) Major Equipments/ Instruments with Broad Specifications:

1. Differential Axle & Wheel, Single and Double Purchase crab, Worm & Worm Wheel, Simple Screw Jack, Pulley Blocks
2. Force Table
3. Law of Moments Apparatus
4. Reaction of Beam Apparatus.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	--	L	--	--	--	--	--	L
CO2	H	M	--	L	--	--	--	--	--	L
CO3	H	M	--	L	--	--	--	--	--	L
CO4	H	M	--	L	--	--	--	--	--	L
CO5	H	M	--	L	--	--	--	--	--	L

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	18	24	08	16	--	--	--	--	24
II	CO.2	16	22	04	--	16	--	--	--	20
III	CO.3	16	22	08	--	--	16	--	--	24
IV	CO.4	16	22	04	--	--	--	16	--	20
V	CO.5	14	18	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	18							16							16							16							14							80
1.35 Times marks	24							22							22							22							18							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**24**							**20**							**24**							**20**							**20**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / EL / AE / MK
COURSE : Workshop Practice (WSP) **COURSE CODE :** 21109

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	02	--	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 hand tools, 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 and power tools and their uses in different sections of workshop.
3. Enhance hands on experiences to learn manufacturing processes.
4. Develop a skills in dignity of technician, precision at work place, team working and development of life-long learning 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 with safety practices while working on the shop floor
5. Produce jobs as per specified dimensions and inspect the job for specified dimensions

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Fitting Section**	1a. Select appropriate Fitting tools for required application. 1b. Prepare the simple Job as per drawing and specifications by using fitting tools.	1.1 Sketches, specifications and applications of different work holding fitting tools. Fitter's bench vice, V-block, Clamps. 1.2 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,

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		height gauge etc. 1.3 Types, sketches, specifications, material, applications and methods of using of fitting cutting tools hacksaw, chisels, twist drill, taps, files, dies. 1.4 Types, sketches, specifications, material, applications and methods of using of fitting finishing tools-files, reamers. 1.5 Sketches, specification s and applications of miscellaneous tools, hammers, spanners, screwdrivers sliding screw wrench. 1.6 Demonstration of various fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping. etc. 1.7 Preparation of simple and male- female joints. 1.8 Safety precautions at work place in fitting section.
Unit-II **Carpentry Section**	2a. Select appropriate fitting tools for required application. 2b. Prepare the simple Job as per drawing and specifications by using carpentry tools.	2.1 Types, sketch, specification, material, applications and methods of using of carpentry tools-saws, planner, chisels, hammers, pallet, marking gauge, vice, try square, rule, etc. 2.2 Types of woods and their applications. 2.3 Types of carpentry hardware's and their uses. 2.4 Demonstration of carpentry operations such as marking, sawing, planning, chiselling, grooving, boring, joining, etc. 2.5 Preparation of wooden joints. 2.6 Safety precautions.
Unit- III **Plumbing Section**	3a. Select appropriate pipefitting tool for the required application. 3b. Prepare the simple job as per specification using pipe fitting tools.	3.1 Types, specifications, materials and applications of pipes. 3.2 Types, specifications, materials and applications of pipe fittings. 3.3 Types, specifications, materials, applications and demonstration of pipe fitting tools. 3.4 Demonstration of sample of different metal and PVC pipe fitting operations such as marking, cutting, bending, threading, assembling, dismantling, etc. 3.5 Types and application of various spanners such as flat, fix, ring, box, adjustable, etc. 3.6 Preparation of pipe fitting jobs. 3.7 Safety precautions.
Unit-IV **Welding Section**	4a. Select appropriate equipment and consumables for required application. 4b. Prepare the simple jobs as per	4.1 Types, specification, material and applications of arc welding transformers. 4.2 Types, specification, material and applications of arc welding accessories

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	specification using proper metal joining and cutting method.	and consumables. 4.3 Demonstration of metal joining operations- arc welding, soldering and brazing. Show effect of current and speed. Also demonstrate various welding positions. 4.4 Demonstrate gas cutting operation. 4.5 Preparation of metal joints. 4.6 Safety precautions.
Unit-V **a) Smithy Section** **b) Tin Smithy (Sheet Metal working)**	5a. Select appropriate Smithy tools for the required application. 5b. Prepare the simple jobs as per specification using Smithy tools. 5c. Select appropriate tin smithy tool for the required application. 5d. Prepare the simple job as per specification using tin smithy tools	5.1 Introduction to tools and equipments. 5.2 Demonstration of Smithy and Forging operations and safety precautions 5.3 Preparation of smithy job. 5.4 Concept and conversions of SWG and other gauges in use. Use of wire gauge. 5.5 Types of sheet metal joints and applications. 5.6 Types, sketch, specification, material, applications and methods of using tin smithy tools-hammers, stakes, scissors/ snips, etc. 5.7 Demonstration of various tin smithy tools and sheet metal operations such as shearing, bending and joining. 5.8 Preparation of tin smithy job. 5.9 Safety precautions.

Note: The above topics and Sub topics are the part of the practical tasks. It is to be covered during imparting practical skills to achieve desired learning outcomes.

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	I	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.	02
02	I	Prepare one simple fitting job as per given drawings and specifications containing marking, cutting, filling, drilling and tapping.	08

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
03	II	Demonstrate use of different carpentry tools. Student will also prepare the report with sketch, specifications and applications of carpentry tools demonstrated.	02
04	II	Prepare one Job From the following allotted to a group of 3 to 6 students 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./any utility article **OR** One simple job involving any one joint like mortise and tendon dovetail bridle half lap etc. One Job per student.	10
05	III	Demonstrate use of different pipe fitting tools. Student will also prepare the report with sketch, specifications and applications of pipe fitting tools demonstrated.	02
06	III	**One job:** Prepare pipe threading and pipe fitting job as per drawings and specifications.	08
07	IV	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.	02
08	IV	Prepare jobs using arc welding, gas cutting, spot welding, brazing and soldering process-. **One simple job** involving "Butt", "Lap" and "T" joint. **OR** utility article as per drawing and specifications.	08
09	V	Demonstrate use of different smithy tools, operations. Student will also prepare the report with sketch, specifications and applications of smithy tools demonstrated.	02
10	V	**One job:** Prepare one smithy job as per drawing having Job of J Hook or I Hook (Using round or square bar)	09
11	V	Demonstrate use of different tin smithy tools. Student will also prepare the report with sketch, specifications and applications of tin smithy tools demonstrated.	02
12	V	**One job:** Prepare one tin smithy job as per drawing having shearing, piercing, bending, joining and riveting.	09
		TOTAL	**64**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Prepare student reports as asked in the workshop practical assignment and draw layout of any two shops in workshop.
2. Visit the nearer timber and plywood merchant. Collect the information on types and appearance of wood, type and thickness of plywood being sold by them.
3. Visit nearer fabricator. Collect the information on welding electrodes, transformers and accessories being used by them.
4. Down load movies showing correct practices for fitting, carpentry, Smithy and welding.
5. Assignments on workshop technology tools equipments & processes used in above shops.

NOTES:

a. It is compulsory to follow safety norms while working in the workshop.

b. Preparation Workshop book is compulsory. Record of activities performed by student in each period is also compulsory and must be duly certified by concerned technical staff and teacher in routine workshop book/manual.
c. Keep your all tools duly resharpened/ready.
d. It is compulsory to submit reports of student activities and workshop book/manual. Students activities are compulsory for all to complete the submission.
e. Students are to be continuously assessed for skills and competencies acquired.
f. Each student is required to submit the specified term work it is mandatory to all.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Massive open online courses (MOOCs) may be used to teach various topics/subtopics.
2. 'L' does not mean only the traditional lecture method, but different types of teaching methods and media that are to be employed to develop the outcomes.
3. About 15-20% of the topics/sub-topics which is relatively simpler or descriptive in nature is to be given to the students for self-directed learning and assess the development of the COs through classroom presentations (see implementation guideline for details).
4. Arrange visit to nearby industries and workshops for understanding various manufacturing process.
5. Show video/animation films to explain functioning of various processes like shaping, lapping, honing, turning, milling, knurling etc.
6. Prepare maintenance charts of various workshop machineries.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Mechanical workshop practice.	K.C. John	PHI
02	Workshop Technology-I.	Hazra and Chaudhary Media.	Promoters & Publisher Private Limited.
03	Workshop Technology-I.	W.A. J. Chapman	Taylor & Francis.
04	Comprehensive Workshop Technology (Manufacturing Processes).	S.K. Garg	Laxmi Publications.
06	Workshop practice manual.	K. Venkata Reddy	B. S. Publications.
07	Workshop familiarization.	E. Wilkinson	Pitman Engineering Craft Series.
08	Workshop Technology	B. S. Raghuwanshi	Dhanpat Rai and Sons, New Delhi
09	Workshop Technology	H. S. Bawa	Tata McGraw Hill Publishers, New Delhi
10	I.T.B. Handbook.	--	Engineering Industry Training Board.
11	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/001369.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=Kv1zo9CAxt3&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	
01	Circular saw	01
02	Jig- saw	01
02	Wood Planer	01
03	Drilling Machine Bench Type	01
04	Universal wood working Machine	01
06	Bench Grinder	01
07	Hand Tools Kit	20 Sets
08	Carpentry Bench Vice	20
09	Wood Turning Lathe	04
10	Measuring Tools & Gauges	20 Sets
11	Electrician Tool Kit	02
12	Carpentry Work Bench	20
12	Band Saw	01
13	Band saw and Circular Saw Sharpener	01
14	Chain And Chisel Mortising Machine	01
16	Vertical Sander	01
17	Heavy Duty Circular Saw	01
18	Heavy Duty Variable Speed Reciprocating Saw Kit	01
19	Single Speed Impact Drill.	01
20	ANGLE GRINDER.	01
21	Cordless drill (Keyed Chuck)	01
22	Heavy Duty palm grip sander	01
22	Heavy Duty Router	01
	Fitting Shop	
01	Marking Table with scribers	02
02	Surface plate	02
02	Measuring Instruments, Marking Instruments, Fitting Hand Tools	02 Each
03	Tap &die set.	04 Sets
04	Bench Drilling Machine	01
06	Bench Grinder	01
07	Fitting Shop Vice Size- 100/140 mm.	20
08	Electrically operated Hand Drilling Machine(pistol Type)	02
09	Power Hack Saw Machine	01
10	Pedestal Grinder	01
11	Hand Grinder	01
12	Fitter's Workbench	10
12	Hand Press Double (Pillar Type)	01
13	Arbor Press	01
	Smithy Shop	
01	Hearth with blower	04
02	Anvil	04
02	Leg Vice Size-140mm.	04
03	Swage Black	02
04	Tools and Gauges	20
06	Power Hammer	01
07	Bench Grinder	01
08	Work Bench With vice	02

Sr. No	Name of Equipment/ Instrument	Qty
09	Induction Hardening equipment	01
	Welding Shop	
01	Oil Cooled Arc Welding Transformer Three Phase With Standard Accessories	02
02	Single Phase Air cooled arc Welding Transformer with Accessories	02
02	Light Duty Spot Welding Machine	01
03	Oxy-Acetylene Gas Welding Set	01
04	Soldering Irons	02
06	Double Ended Pedestal Type Grinder	01
07	Welding accessories	01
08	Electrician Tool Kit	02 Set
09	MIG/ Welding Equipment	01
10	T.I. G. Welding set.	01
11	Workbench With Vice Size- 1800x1200x740mm	02
12	Welding Table Size-1200x1200x740mmWithslidingtray	02
12	D.C. Arc Welding Transformer Rectifier type 2 Phase	01
13	Brazing Equipment and Accessories	01
14	Heavy Duty Angle Grinder.	01
16	Heavy Duty 10mm. VSR Cordless Drill / Driver Kit.	01
	Sheet Metal & Plumbing Shop	
01	Shearing Machine	01
02	Sheet Bending Machine	01
02	Pipe Bending Devices	01
03	Hand Tools and other Equipment	01
04	Pipe Threading Dies	04
06	Portable Drilling Machine	01
07	Plumber Pipe Vice Size- 40 mm., 12 mm. to 23 mm.	01 & 20
08	Plumber's ToolKit	01
09	Stoving Oven	01
10	Plumber'sWorkbench Size-1800x1200x740mm	02
11	Swaging Machine	01
12	Universal sheet Folding Machine	01
12	Double Column Power Press	01
13	Hydraulic Press	01
14	Circle Cutting Machines	01

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

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
CO1	--	--	--	--	--	--	--	L	--	L
CO2	--	M	--	M	--	--	--	M	--	--
CO3	--	--	H	M	--	--	--	M	M	--
CO4	--	M	M	M	--	--	--	L	--	M
CO5	--	--	H	H	H	H	H	--	M	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in CE / ME / PO / EE / EL / AE / DD / ID / MK
COURSE : Introduction to IT System (ITS) **COURSE CODE :** 21110

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

This course is intended to make new students comfortable with computing environment – Learning basic computer skills, learning basic application software tools, Understanding Computer Hardware, Security Concepts.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Explain terminology and concepts related to hardware and software.
2. Set the parameter required for effective use of hardware combined with and application software's.
3. Use Open Office to Create documents and presentations
4. Create documents and spreadsheets using office.
5. Understand internet and Information Security Concept.

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 a computer system and hardware and software.
2. Understand concept of OS and Software Application
3. Use Open Office to create slide presentation
4. Prepare spread sheets using office tools
5. Explore internet using browsers.

4.0 COURSE DETAILS:

Note: The related theoretical contents be taught during practical

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-I **Introduction to IT Systems**	1a. Explain brief Introduction to IT System 1b. DescribeComputer hardware components	1.1 Introduction to Computer System and its working 1.2 Architecture of Computer System. 1.3 Computer hardware Components: Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices.
Unit-II **Software Applications**	2a. Explain System Software (OS, utilities) 2b. Describe Application Software	2.1 Understanding Operating System: Create, manage and search files and folders. 2.2 Application software: Introduction to office tools, word processing, spreadsheets, photo editing, database management system, device drivers, Operating Systems and utilities.
Unit-III **Presentation**	3a. Write Steps to create slide presentation. 3b. Write the steps to insert	3.1 Generating a presentation. a. Outline of an effective Presentation b. Identifying the element of user

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Tools	multimedia in the given presentation. 3c. Write steps to apply table features in the given presentation.	interface c. Creating a basic presentation. 3.2 Insertion of Media Elements. a. Adding and modifying graphical objects to a presentation. b. Edit graphical object on a slide c. Apply an animation effect to object. 3.3 Working with Tables a. Insert table in a slide. b. Format Tables.
Unit-IV **Spread Sheets**	4a. Write steps to create the given spreadsheet. 4b. Describe the specified formatting feature of a worksheet. 4c. Write steps to insert formula and functions in the given worksheet.	4.1 Working with Spreadsheets a. Overview of workbook and worksheet b. Create, Save, copy Delete worksheet 4.2 Editing worksheet 4.3 Formulas and function in worksheet
Unit-V **Basics of Internet and System Security**	5a. Describe Internet Terminology 5b. Browsers and Search Engines 5c. Explain Basics of Computer Security.	5.1 The Internet, World Wide Web, website, home page, link (or hyperlink), back arrow, web address or URL, address box 5.2 Different types of Browsers and Search Engines 5.3 Email, Chat(Textual / voice), Social networking 5.4 Overview of Information and Computer Security and privacy 5.5 Introduction to Antivirus, Firewall, and its functions

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS: Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	I	Identify Various Input/output devices, connections and peripherals of computer system	02
02	II	Manage files and folders: Create, copy, rename, delete, move files and folders	02
03	II	Introduction to Window Operating System, & its Accessories-- Paint, Explorer, WordPad, Notepad, The Calculator etc.	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
04	I, II	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.	02*
05	III	Install Open Office and Create Slide Presentation Apply Design themes to the given presentation	02
06	III	Create Slide Presentation and add new slides and insert pictures/images, shapes using office tool.	02*
07	IV	Create documents, Page formatting, Page margins Page size and orientation Page breaks, Headers and footers	02
08	IV	Insert formulas, "IF" conditions, functions and named ranges in worksheet.	02
09	IV	Apply Page setup and print options for worksheet to print the worksheet.	02
10	V	Configure Internet Connection	02*
11	V	Use Internet for different web services	02
12	V	Browsing using various search engines, writing search queries	02
13	V	Create Email-id using gmail, rediffmail, yahoo, Hotmail.	02
14	V	Sending E-mail to another user with Message and Attachment.	02
15	V	Explore Information security features and Tools, use them.	02
		TOTAL	**32**

'*': Practical with * mark are optional, remaining practical's are compulsory.

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Discuss features of different Operating Systems.
2. Collect specification of latest internal and external peripheral devices.
3. Dismantle all the connections of computer and try to connect them.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Arrange seminar of industry person in the area of hardware and maintenance
2. Case study on various office tools, latex etc.
3. Use of Online tutorials e.g. MOOCS, Swayam, Spoken tutorial, NPTEL.
4. Use any Open Office tools for laboratory Practical's.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Computer Fundamentals	R.S. Salaria	Khanna Publishing House.
02	PC Software Made Easy – The PC Course Kit	Ramesh Bangia	Khanna Publishing House.
03	IT Essentials PC Hardware and Software Companion Guide	Davis Anfinson and Ken Quamme	CISC Press, Pearson Education.
04	Computer Basics Absolute Beginner's Guide, Windows 10	Miller, Michael	QUE Publishing: 8th edition August 2015, ISBN: 978-0789754516
05	Microsoft office 2010: On Demand	Johnson, Steve	Pearson Education, New Delhi India, 2010: ISBN: 9788131766613

B) Software/Learning Websites:

1. http: //www.microsoft.com/en-in/learning/office-training.aspx
2. http: //www.introductiontocomputers.org/
3. http: //www.functionx.com/windows/index.htm
4. http: //en.wikiversity.org/wiki/Introduction_to_Computers

C) Major Equipment/ Instrument with broad specification:

Sr.No.	Equipment	Specification
01	Desktop Computer	PC Specifications to be followed: Processor: i3 or i5 RAM: 4 GB or better HDD: 1 TB SATA Monitor: TFT LCD OS: Genuine Windows 8 or 10 Professional or Home Premium or Windows 8 or 10 Ultimate or any Linux OS Antivirus: User License for three year
02	LCD Projector	Display Type: LCD Light Output: 3200 Lumens

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	--	--	M	--	--	--	H	M	--
CO2	--	--	--	--	--	--	H	H	--	--
CO3	M	--	--	--	--	--	L	--	M	L
CO4	--	M	--	M	H	--	--	--	L	--
CO5	--	--	--	--	--	L	H	M	--	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Drawing (BDG) **COURSE CODE :** 21201

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	04	05	03	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 students will be able to,

1. Learn the basic principles of building planning and drawing.
2. Make graphical representation of various components of buildings.
3. Draw complete plan, elevation and sections of a building.
4. Learn basics of perspective drawings

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. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare submission drawing, working drawing for the given requirement of Load Bearing and framed Structure.
4. Draw two-point perspective drawing for given small objects.

4.0 COURSEDETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit – I **Conventions and Symbols**	1a. Describe use of lines & convention. 1b. Differentiate between various symbols used in preparing drawings.	1.1 Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete, wood work and glass. 1.2 Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations. 1.3 Types of lines-visible lines, centre line, hidden line, section line, dimension line, extension line,	02

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions. 1.4 Types of scale-Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing. 1.5 Sizes of various standard papers / sheets. 1.6 Reading and interpreting readymade Architectural building drawing (To be procured from Architect, Planning Consultants, Planning Engineer).	
Unit– II **Planning of Building**	2a. Describe the principles of planning. 2b. Explain byelaws & norms for planning buildings.	2.1 Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. 2.2 Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS962. 2.3 Rules and bye-laws of sanctioning authorities for construction work. 2.4 Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). 2.5 Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning. 2.6 Line plans for public building-school building, primary health centre, restaurant, bank, post office, hostel, Function Hall and Library.	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 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/TUTORIALS/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
01	I	Drawing various types of lines, lettering and symbols of materials, doors and windows, used in construction on Full Imperial size drawing sheet.	04
02	II	Drawing the line plans of following buildings on Full Imperial size graph paper. • Residential Building (Minimum three rooms) • Public Building – School building, Primary health center / Hospital building, Bank, Post Office, Hostel building. (At least four)	08
03	II	Measured Drawing of an existing residential Building (Load bearing / Framed structure Type), showing Plan, Elevation, Sections, Construction notes, Schedule of openings, Site Plan.	12
04	III	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
05	III	Working drawing of above drawing sheet preferably section through stair case, layout of house drainage, foundation plan & section of column footing.	16
06	IV	Two point perspective view of a small object / building drawn in submission drawing.	08
		TOTAL	**64**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Measurement dimensions of various units of a building.
2. Draw various plans, elevation, and 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.
6. Tracing of a submission drawing prepared at practical Sr. No. 4.
7. Ammonia print of submission drawing prepared at practical Sr. No 4.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show readily available ammonia prints.
2. Observing building & building components at site visit.
3. Experts' lectures on plan sanctioning authority.

9.0 LEARNINGRESOURCES:

A) Books:

Sr. No.	Title of Book	Author	Publication
01	Text Book of Building Drawing	Shah, Kale, Patki	Tata McGraw Hill
02	Elements of Building Drawing	D. M. Mahajan	Pune Vidyarthi Grih
03	Planning and Design of Building.	Y. S. Sane	Tata McGraw Hill
04	Civil Engineering Drawing	Malik & Mayo	New Asian Publisher New Delhi
05	Building Planning and Drawing	Swamy, Kumara; Rao, N, Kameshwara	Charotar Publiction, Anand.
06	Building Construction	Bhavikatti, S. S.,	Vikas Publication House Pvt. Ltd., New Delhi.
07	Planning and design of Building	Sane, Y. S.,	Allied Publishers, New Delhi.

B) Software/Learning Websites:

1. https://www.smartdraw.com/floor-plan/building-plan-software.
2. https://www.roomsketcher.com/
3. https://www.sketchup. com/industries/construction
4. https://www.buildingplanner.in/
5. https://www.edrawmax.com/floor-plan-maker/
6. https://www.makemyhouse.com/
7. https://www.mysiteplan.com/blogs/news/best-floor-plan-software
8. https://www.autodesk.in/software
9. http://www.mahapwd.com

C) Major Equipment/ Instrument with Broad Specifications:

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

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	--	--	--	--	--	--	--	--	--
CO2	M	H	H	M	M	--	M	M	H	M
CO3	M	H	H	M	H	H	H	H	H	H
CO4	M	M	--	M	H	M	--	H	H	H

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

11.0 QUESTION PAPERPROFILE:

Unit No	CO	Marks per Unit	1. 35Times marks	Question Number Wise Marks					Actual Distribution of Marks
				01	02	03	04	05	
I	CO.1	04	05	08	--	--	--	--	08
II	CO.2	16	22	12	08	--	--	--	20
III	CO.3	50	67	--	08	36	20	--	64
IV	CO.4	10	14	--	--	--	--	16	16
	TOTAL	**80**	**108***	**20**	**16**	**36**	**20**	**16**	**108**

b) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							Total
CO	1							2							3							4							
Marks per Unit	04							16							50							10							80
1.35 Times marks	05							22							67							14							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	-	-	-	-	-	2	2	2	-	-	-	-	3	3	3	3	-	-	-	4	4	-	-	-	-	-	
Q1	4	4	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
Q2	-	-	-	-	-	-	-	4	4	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	08	10	10	-	-	-	-	-	-	-	-	-	-	38
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	18
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	8	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--
Sub Total	08							20							64							16							108
TOTAL																													108

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Concrete Technology (COT) **COURSE CODE :** 21202

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
02	--	02	04	03	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 Indian Standard 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, quality of water.
2. Describe proper method for making and curing of concrete and Measure important properties of fresh cement concrete
3. Design Concrete Mix as per IS method and Measure important properties of hardened cement concrete including NDT.
4. Explain various activities and precautions prior, during and after concreting.
5. Explain properties of various types of Admixtures, their utility and various types of special concrete, their use.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Cement, Aggregates and Water**	1a. Evaluate physical properties of cement 1b. Determine fineness, soundness, setting time and strength of cement 1c. Carryout field testing of cement 1d. Evaluate Physical Properties of sand and aggregates used in	1.1 Physical properties of ordinary Portland cement (OPC). Grades of OPC 1.2 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.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	concrete 1e. Select proper aggregate	1.3 Standard specifications for ordinary Portland cement 1.4 Effect of various properties of cement on concreting operations. 1.5 Laboratory tests on cement Fineness, soundness, setting time and compressive strength. 1.6 Adulteration of cement, Field tests on cement, selection of good cement. 1.7 Fine Aggregates and coarse Aggregates 1.8 Properties of aggregates- size, shape, texture, strength, specific gravity, bulk density, water absorption, soundness, durability. 1.9 Determination of aggregate grading, sieve analysis, fineness modulus, flakiness index, elongation index, bulking of sand, silt in sand. 1.10 Minimum void grading 1.11 Effect of aggregate properties on strength of concrete and durability of concrete 1.12 Selection of good aggregate. 1.13 Quality of water as per IS:456	
Unit-II **Concrete and Properties of Concrete**	2a. Explain process diagram of concrete. 2b. Explain properties of concrete in plastic and hardened state. 2c. Evaluate workability, harshness, segregation and bleeding properties of fresh concrete 2d. List the factors affecting workability 2e. Describe methods of measurement of workability, slump test & compaction factor test	2.1 Grades of concrete- ordinary concrete, standard concrete, high strength concrete, minimum grades for different exposure conditions. 2.2 Properties of concrete in plastic stage - workability, segregation, bleeding, honey combing & harshness. 2.3 Importance of water in concrete 2.4 Definition of workability and factors affecting workability 2.5 Measurement of workability by slump test and compaction factor test. 2.6 Requirement of Workability for different conditions. 2.7 Factors causing segregation, honey combing & their remedies 2.8 Factors causing bleeding, harshness & their remedies. 2.9 Properties of concrete in hardened state-strength, durability, permeability, fire resistance.	06
Unit-III	3a. Calculate yield of	3.1 Objectives of mix design and	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Concrete Mix Design and Testing of Concrete	concrete 3b. Describe NDT methods and its limitations.	various methods 3.2 Water cement ratio law, conditions under which the law is valid, effect of water cement ratio on strength of concrete. 3.3 Strength of concrete and selection of water cement ratio 3.4 Principle of Mix design, IS method to design a Concrete Mix As per IS-10262-2009. (no problems) 3.5 Nominal mix. 3.6 Estimating yield of concrete by bulk density method 3.7 Importance of NDT, limitations of NDT, Methods of NDT 3.8 Rebound hammer test, Ultrasonic pulse velocity test.	
Unit-IV **Quality Control of Concrete**	4a. Explain quality control measures to be adopted in the field. 4b. Explain finishing, curing and construction joints. 4c. Describe total quality control in concreting work.	4.1 Storing of cement and aggregate 4.2 Effect of storing of cement on its strength 4.3 Batching of cement and aggregates 4.4 Mixing of concrete ingredients, types of mixers and their comparison. 4.5 Transportation of concrete 4.6 Placing of concrete 4.7 Compaction - methods of compaction, care to be taken during compaction 4.8 Important factors to be checked during concreting. 4.9 Finishing of concrete slabs- Screeding, Floating, Trowelling. 4.10 Purpose and importance of curing. 4.11 Methods of curing. 4.12 Types of construction joints. Method of joining -wrong practice followed on site, correct methods. 4.13 Importance of construction joints. 4.14 Care to be taken for constructions joints 4.15 Total quality control at all stages	06
Unit-V **Admixtures and special concretes**	5a. Explain properties of various types of Admixtures and their utility 5b. Explain special concrete	5.1 Admixtures and their benefits, Types of Admixtures and trade names – Accelerators, Retarders, Plasticizers, Super Plasticizers, Water proofing and	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	and their use.	Air entraining admixtures 5.2 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.	
		TOTAL	**32**

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	Cement, Aggregates and Water	04	04	08	16
II	Concrete and Properties of Concrete	04	08	04	16
III	Concrete Mix Design and Testing of Concrete	04	04	08	16
IV	Quality Control of Concrete	08	04	04	16
V	Admixtures and Special Concretes	04	08	04	16
TOTAL		**24**	**28**	**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/TUTORIALS/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	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
02	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

Sr. No.	Unit No.	Practical Exercises* (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		Determination of aggregate crushing value	02
		Determination of aggregate impact value	02
03	V	**Any TWO** of the following	
		Slump Test	04
		Compaction factor Test	04
		Compressive strength of concrete using different W.C. ratio.	06
04	III	Conduct non-destructive test by Rebound hammer and UPV on concrete member.	06
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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
01	Concrete Technology	M. S. Shetty	S. Chand & Co. Ltd.
02	Concrete Technology	M. L. Gambhir	Tata McGraw Hill Ltd.
03	Properties of Concrete	A. M. Neville	Pitman
04	Concrete Technology	Dr. K. T. Krishna swami	Dhanpat Rai & Sons
05	Concrete Technology	R. S. Vashney	Oxford & IBH Publishing co, Bombay
06	Concrete Technology	Dr. D. K. Gupta	Nirali Publication

B) Standards:

Sr. No.	Code	Title
01	I. S. 269	Specifications for O. P. C.
02	I. S. 12269	Specifications for O. P. C. 53 Grade
03	I. S. 383	Specifications for coarse and fine aggregates
04	I. S. 516	Methods of tests for strength of concrete
05	I. S. 2386 Part I to VIII	Methods of tests for aggregate for concrete
06	I. S. 456	Code of practice for plain and R. C.
07	I. S. 2340	Methods for sampling of aggregates for concrete
08	SP 23	Handbook for concrete Mix Design
09	I. S. 4031	Methods of physical tests on Hydraulic cement
10	I. S. 13311	Methods of non-destructive testing of concrete
11	I. S. 1199	Methods of sampling and analysis of concrete
12	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, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	M	L	M	--	--	--	--	H	--
CO2	M	M	L	M	--	--	--	--	H	--
CO3	M	M	L	M	--	--	--	--	H	--
CO4	M	M	L	M	--	--	--	--	H	--
CO5	M	M	L	--	--	--	--	--	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	22	08	16	--	--	--	--	24
II	CO.2	16	22	04	--	16	--	--	--	20
III	CO.3	16	22	08	--	--	16	--	--	24
IV	CO.4	16	21	04	--	--	--	16	--	20
V	CO.5	16	21	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	CO.1							CO.2							CO.3							CO.4							CO.5							
Marks per Unit	16							16							16							16							16							80
1. 35 Times marks	22							22							22							21							21							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Total	24							20							24							20							20							108
TOTAL																																				

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Hydraulics (HYD) **COURSE CODE :** 21203

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	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 behaviour 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 parameters associated with fluid flow and hydrostatic pressure.
2. Know head loss and water hammer in fluid flowing through pipes.
3. Learn different types of pumps and their uses.

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 pressure and determine total hydrostatic pressure for different conditions.
2. Understand various parameters associated with fluid flow
3. Determine head loss of fluid flow through pipes.
4. Find the fluid flow parameters in open channels.
5. Select relevant hydraulic pumps for different applications.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Pressure Measurement and Hydrostatic Pressure**	1a. Define the fluids properties, pressure and pressure head state its units 1b. Explain types of pressure, Find the pressure with pressure measuring device. 1c. Solve the numerical on properties of fluid and Pressure measurement. 1d. Define and express total pressure and center of pressure. Numericals.	1.1 Technical terms used in Hydraulics – fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics. 1.2 Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity. 1.3 Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1e. Pressure diagram- Definition and its use.	pressure and its uses. 1.4 Measurement of differential Pressure by different methods. Manometers and Bourdon's pressure gauge 1.5 Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls. 1.6 Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side	
Unit-II **Fluid Flow Parameters**	2a. Identify the types of flow. 2b. State Continuity equation for liquids. 2c. State Bernoulli's Theorem and numerical 2d. Define Discharge, Datum head, pressure head, velocity head, total head	2.1 Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow and combination of these flow types. Reynolds number. 2.2 Discharge and its unit, continuity equation of flow. 2.3 Energy of flowing liquid: potential, kinetic and pressure energy. 2.4 Bernoulli's theorem: statement, assumptions, equation	06
Unit-III **Flow Through Pipes**	3a. Explain Energy Head and losses 3b. Draw Hydraulic Gradient Line and Total Energy Line 3c. Determine the flow through pipes in series and parallel. 3d. Derive the equation for equivalent pipe. 3e. Define Water hammer. List the Causes, effects and remedial Measures for Water hammer. 3f. Solve the numerical on flow through pipes.	3.1 Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms. 3.2 Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings. 3.3 Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. 3.4 Hydraulic gradient line and total energy line. 3.5 Water hammer in pipes: Causes and Remedial measures. 3.6 Discharge measuring device for pipe flow: Venturi meter - construction and working. Hydraulic Coefficients 3.7 Discharge measurement using Orifice, Hydraulic Coefficients	14
Unit-IV **Flow through Open Channel**	4a. Define Geometrical properties of channel 4b. Write Chezy's formula and Manning's formula 4c. Define most economical channel section 4d. Numericals.	4.1 Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section. 4.2 Determination of discharge by Chezy's equation and Manning's equation. 4.3 Conditions for most economical rectangular and trapezoidal channel	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		section. 4.4 Discharge measuring devices: Triangular and rectangular Notches. 4.5 Velocity measurement devices: current meter, floats and Pitot's tube. 4.6 Specific energy diagram, Froudes' Number	
Unit-V **Hydraulic Pumps**	5a. Define and Classify pumps. 5b. Compute the power required for pumps. 5c. Explain the Principle of working of centrifugal and reciprocating pumps. 5d. Explain priming of pump. 5e. List the factors for Selection and choice of type of pump.	5.1 Concept of pump, Types of pump - centrifugal, reciprocating, submersible. 5.2 Centrifugal pump: components and working 5.3 Reciprocating pump: single acting and double acting, components and working. 5.4 Suction head, delivery head, static head, Manometric head 5.5 Power of centrifugal pump.	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	Pressure measurement and Hydrostatic Pressure	04	08	--	12
II	Fluid Flow Parameters	04	04	04	12
III	Flow Through Pipes	04	08	08	20
IV	Flow Through Open Channel	04	04	16	24
V	Hydraulic Pumps	04	04	04	12
	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/TUTORIALS/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
01	I	Use piezometer and U tube manometer to measure pressure at a given point	02
02	I	Use U tube differential manometer to measure pressure difference between two given points	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
03	II	Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections.	04
04	III	Use Friction factor Apparatus to determine friction factor for a given pipe.	02
05	III	Determine minor losses in pipe fittings due to sudden contraction, sudden enlargement, Bend or Elbow.	04
06	III	Determine the coefficients of Venturimeter	02
07	III	Determine the coefficients of Orifice.	02
08	II	Study of Reynold's apparatus to determine type of flow.	02
09	IV	Determine the coefficient of discharge of triangular notch through open channel.	04
10	IV	Determine the coefficient of discharge of Rectangular notch through open channel	04
11	III	Study of Moody's diagram and nomograms	02
12	V	Study of centrifugal pump.	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Take observations and study the details of various 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
01	Hydraulics & Fluid Mechanics	Dr. P. N. Modi Dr. S. M. Seth	Standard Book House, Delhi
02	Fluid Mechanics & Hydraulic Mechanics	Dr. R. K. Bansal	Laxmi Publication New Delhi
03	A Text Book of Hydraulics, Fluid Mechanics, Hydraulic Machines	R. S. Khurmi	S. Chand & Company Ltd. New Delhi
04	Hydraulics & Fluid Mechanics	S. Ramamurtam	Dhanpat Rai & Sons, Delhi
05	Hydraulic Laboratory Manual	S. K. Likhi	T.T.T.I. Chandigarh

B) Software/Learning Websites:

1. www.waterbouw.tudelft.nl/
2. www.learnrstv.com
3. www.hrpwa.org/
4. nptel.iitm.ac.in

C) Major Equipment/ Instrument with Broad Specifications:

Sr. No.	Equipment/ Instrument with Broad Specifications
01	Bourdon pressure gauge- and Dead Weight Pressure gauge - 10 kgf/cm^2
02	Experimental setup of Bernoulli's Theorem.
03	Venturimeter Test Rig- Venturimeter. (Cast iron /Brass) 25mm & 50mm with accessories like collection tank & differential manometer.
04	Orifice meter Test Rig-with accessories like collection tank, stand and scale.
05	Orifice Apparatus- with collection tank, stand, scale & slide attachment.
06	Rectangular and V notch apparatus - with accessories like collection tank, stand, hook gauge scale & slide attachment.
07	Hydraulic Bench Setup- with all accessories such as collecting tank & differential manometer.
08	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.
09	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, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	M	--	--	--	H	--	--
CO3	M	--	--	--	H	--	M	--	--	M
CO4	--	M	--	--	--	L	--	--	L	--
CO5	M	--	--	--	--	--	--	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	12	16	04	12	--	--	--	--	16
II	CO.2	12	16	04	04	08	--	--	--	16
III	CO.3	20	28	08	--	08	12	--	--	28
IV	CO.4	24	32	08	--	--	04	16	04	32
V	CO.5	12	16	04	--	--	--	--	12	16
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	12							12							20							24							12							80
1.35 Times marks	16							16							28							32							16							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	**16**							**16**							**28**							**32**							**16**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Mechanics of Structures (MOS) **COURSE CODE :** 21204

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	--	25	125
						Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Concepts and principals 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. Analyse and calculate axial stress, strain.
2. Calculate shear stress, elastic constants and strain energy.
3. Calculate Shear force and Bending Moment and draw Shear Force Diagram and Bending Moment Diagram.
4. Calculate Moment of inertia of different sections, load carrying capacity of columns.
5. Calculate stresses due to bending and shear in beams and draw stress variation diagram.

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 Materials. 1b. Analyse simple, composite / compound sections and Calculate direct stress, different strains. 1c. Computing temperature 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. 1.2 Axial tensile and compressive loads, Hooke's Law, axial stresses, axial strain, lateral strain, Poisson's ratio, Young's Modulus (E), Shear Modulus (G), problems on bars of uniform cross section and different cross sections (stepped bars).	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		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. 1.4 Composite sections under axial load, modular ratio, simple problems on analysis of composite sections 1.5 Definition of temperature stress, nature of stresses. Simple problems on temperature stresses in homogeneous sections only (No problems on composite sections)	
Unit-II **Elastic Constants, Shear Stress and Strain Energy**	2a. Compute Bi-axial and Tri-axial stresses 2b. Compute punching shear stresses. 2c. Compute Strain Energy under Different Types of Loading	2.1 Bulk Modulus, volumetric strain, Elastic constants, Concept of bi-axial & tri-axial stresses, equations of total strain in three directions, Equation for Volumetric Strain. Relation between Modulus of Elasticity (E), Modulus of Rigidity (G) and Bulk Modulus (K). (No derivations of these relations) problems on all of the above 2.2 Concept of shear load, shear stress and shear strain, modulus of rigidity, simple shear, complementary shear stresses, Punching Shear. Numericals on all of the above. 2.3 Concept of strain energy, types of loading-gradually applied, suddenly applied and impact loading, stresses due to these three types of loading. 2.4 Strain energy stored due to these three types of loading, resilience, proof resilience, modulus of resilience. Numericals on all of the above.	08
Unit-III **Shear Force and Bending Moment**	3a. Draw Shear Force & Bending Moment Diagram for Statically Determinate Beams	3.1 Concept and definitions of shear force and bending moment, sign conventions, relation between bending moment, shear force and rate of loading. 3.2 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. Numericals on all of the above.	10
Unit IV **Moment of Inertia and**	4a. Compute Moment of Inertia of Symmetrical & unsymmetrical sections 4b. Calculate load carrying capacity of columns and	4.1 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	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Columns	struts	semicircular sections. Section modulus 4.2 Parallel axes theorem, perpendicular axes theorem and polar moment of inertia. Moment of inertia of composite sections. Numerical on above. 4.3 Definition, types of end conditions for columns, classification of columns 4.4 Buckling of axially loaded compression Member, effective length, radius of gyration, slenderness ratio. 4.5 Euler's theory, assumptions, buckling loads, factor of safety, safe load, Limitation of Euler's formula. 4.6 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. Numerical on all of the above. (No numerical problems on M.I. of Built Up section)	
Unit-V **Stresses in Beams (Bending and shear)**	5a. Apply Bending Theory. 5b. Calculate Bending Stress 5c. Draw stress distribution diagram 5d. Calculate shear Stress 5e. Draw stress distribution diagram	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 of resistance for symmetrical and unsymmetrical sections of beam. Simple numerical problems on standard sections. (No problems on built up sections) 5.3 Shear stress equation (Derivation not required), meaning of terms in equation. 5.4 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. 5.5 Relations between maximum shear stress and average shear stress for solid rectangular and solid circular section.	12
		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	Stress and Strain	02	04	10	16
II	Elastic Constants, Shear Stress and Strain Energy	02	04	10	16
III	Shear Force and Bending Moment	02	04	10	16
IV	Moment of Inertia and Columns	02	04	10	16
V	Stresses in Beams (Bending and shear)	02	04	10	16
	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/TUTORIALS/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 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	I	Identify and Observe Functions of different parts of Universal Testing Machine.	02
02	I	Tension test on mild steel or TMT bar specimen.	04
03	V	Flexural behaviour of timber or steel beam.	04
04	II	Izod Impact test on Aluminium, Copper, Mild Steel, Brass, Cast Iron (any **TWO** metals)	04
05	II	Charpy Impact test on Aluminium, Copper, Mild Steel, Brass and Cast Iron. (any **TWO** metals)	04
06	V	Flexural test on floor tiles./Roffing tiles (Any ONE type of tile)	04
07	I	Compression test on Bricks.	04
08	I	Abrasion test on Flooring Tiles.	02
09	I	Water absorption test on bricks or flooring tiles.	02
10	I	Shear test on Mild Steel, Aluminium, Copper, Brass, Cast Iron (any **TWO** metals)	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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
01	Mechanics of Materials	Beer and Johnson	McGraw Hill
02	Strength of Materials	Singer and Pytel	Harper & Row
03	Strength of Materials	Ramamrutham	Dhanpat Rai and Sons
04	Strength of Materials	Schaum's outline Series William Nash	McGraw Hill
05	Strength of Materials	Timo Shenko and Young	CBS Publisher & distributors
06	Mechanics of structure	Buchanan	Holt Rinehart & Winston Inc.
07	Introduction To solid Mechanics	Irving H. Shames & Titarress	Eastern Economy Edition
08	Strength of Materials	B. K. Sarkar	Tata McGraw Hill

B) Software/Learning Websites:

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

C) Major Equipment/ Instrument with Broad Specifications:

1. Digital Universal Testing Machine (1000kN)
2. Hardness testing Machine
3. Compression Testing Machine (200 tonne)
4. Tile Flexure Testing Machine
5. Impact testing Machine
6. Tile Abrasion Testing Machine

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	L	L	L	--	--	--	--	--	L
CO2	M	L	L	L	--	--	--	--	--	L
CO3	M	L	L	--	--	--	--	--	--	L
CO4	M	L	L	--	--	--	--	--	--	L
CO5	M	L	L	L	--	--	--	--	--	L

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	23	08	16	--	--	--	--	24
II	CO.2	16	21	04	--	16	--	--	--	20
III	CO.3	16	23	08	--	--	16	--	--	24
IV	CO.4	16	21	04	--	--	--	16	--	20
V	CO.5	16	20	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							1							1							2							3							
Marks per Unit	16							16							16							16							16							80
1.35 Times marks	22							21							22							21							22							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Total	**24**							**20**							**24**							**20**							**20**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Geotechnical Engineering (GTE) **COURSE CODE :** 21205

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Civil engineering structures such as buildings, bridges, dams, roads are supported by soil and rock. The stability of all structures depends upon behaviour of soil and its capacity to carry loads under different environmental conditions.

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

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

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand soil as three-phase system and establish relationship between properties of soil.
2. Utilise particle size distribution curve to determine grading of soil and Determine properties of soil by following standard test procedure and plot
3. Develop ability to Determine permeability by constant head and falling head test using Darcy's Law
4. Obtain OMC & MDD for any soil sample by performing Proctor Compaction test and Calculate shearing strength of soil.
5. Explain the process of compaction, consolidation and soil 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. Evaluate consistency limits of soil.
3. Evaluate Permeability of given soil.
4. Evaluate shear parameters of various types of soil, with their practical significance related to bearing capacity of soil.
5. Supervise the process of soil compaction and soil stabilization.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Importance of Geotechnical Engineering and Physical properties of Soil**	1a. List structures where soil is used as Construction material 1b. State the examples of use of soil in Civil Engineering structures. 1c. Explain phase diagram of Soil. 1d. Describe interrelationship	1.1 Necessity & importance of soil Mechanics, definition of soil. 1.2 Use of soil as a construction material & foundation bed. 1.3 Mass of soil, soil as a three phase system 1.4 Properties like void ratio, Porosity, degree of saturation,	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	between different index properties.	dry density, bulk density, water content and their determination. 1.5 Three phase diagram for dry soil, wet soil & saturated soil. 1.6 Typical values of these parameters for common type of soil. 1.7 Mechanical sieve analysis, grain size distribution curves, characteristics & interpretation, effective size, uniformity coefficient, coefficient of curvature & their significance, well graded, poorly graded & uniform soil. 1.8 Classification of soil based on Indian standard classification method.	
Unit-II **Atterberg's Limits**	2a. Classify Soil based on consistency Limits. 2b. Explain concept of permeability & its implications with respect to use of soil.	2.1 Consistency of soil, Atterberg's limits of consistency: Liquid limit, plastic limit & shrinkage limit, plasticity index, determination of Liquid limit, plastic limit, shrinkage limit and plasticity index 2.2 Plasticity chart and A- line diagram, soil classification Shown on plasticity chart.	05
Unit-III **Permeability of Soil**	3a. Determine Permeability of given soil. 3b. Comprehend the concept of seepage analysis in relation to 'quick sand condition' with examples.	3.1 Definition of permeability, coefficient of permeability, Darcy's law, typical values of coefficient of permeability for various soils. 3.2 Determining coefficient of permeability by constant Head & Variable head method, Factors affecting permeability of soil, Quick sand condition.	05
Unit-IV **Shearing Strength and bearing capacity of Soil**	4a. Explain different terms used in the context of 'shear strength' of soil. 4b. Evaluate shear 4c. parameters of various types of soil, with their practical significance 4d. Explain concept of bearing capacity of soil. 4e. 6b. Explain plate load test	4.1 Constituents of shearing resistance of soil, definition of cohesion and internal friction 4.2 Purely cohesive and non-cohesive soil, Coulomb's law & failure envelope 4.3 Determination of shear strength of soil by direct shear test, unconfined compression test and Vane shear test (no numerical problems) 4.4 Concept of bearing capacity, ultimate bearing capacity, net ultimate capacity. Safe bearing capacity, Net safe bearing	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		capacity. 4.5 Typical values of bearing capacity for common soils from building code. 4.6 Introduction to plate load test, procedure & its limitation. (no numerical problems)	
Unit-V **Compaction of Soil and Soil Stabilization**	5a. Comprehend the principle and methods of compaction of soil 5b. Differentiate between compaction and consolidation with examples 5c. Determine MDD &OMC of soil by conducting appropriate test 5d. Explain the methods of soil stabilization and suitability of each.	5.1 Concept of compaction, consolidation, compression & Settlement. Characteristics of compaction. 5.2 Difference between compaction & consolidation 5.3 Relation between moisture content & dry density under constant compaction effort. 5.4 Purpose of compaction in field, compaction curve, Optimum moisture content, maximum dry density. Light & heavy compaction test. 5.5 Factors affecting Compaction, Common methods of compaction in the field-rolling, ramming & vibration. Type of rollers. 5.6 Measurement of field density by core cutter method & Sand replacement method. 5.7 Concept of soil stabilization, need of soil stabilization. 5.8 Different methods of soil stabilization: mechanical stabilization, lime stabilization, cement stabilization, Bitumen stabilization, fly ash & lime stabilization in brief.	06
		TOTAL	**32**

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 and Physical properties of soil	08	08	04	20
II	Atterberg's limits	04	04	06	14
III	Permeability of soil	06	04	04	14
IV	Shearing strength and Bearing capacity of soil	04	08	04	16
V	Compaction of soil and Soil stabilization	04	08	04	16
	TOTAL	**26**	**32**	**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/TUTORIALS/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
01	I	Determination of water content of the given soil sample by oven dry method.	02
02	I	Determination of specific gravity by pycnometer method	02
03	I	Mechanical sieve analysis & grain size distribution curve for a given soil sample	02
04	II	Determination of liquid limit of given soil sample	04
05	II	Determination of plastic limit of given soil sample	02
06	I	To carry out field identification tests on soil	04
07	I	Determination of bulk density & dry density of soil by sand replacement method.	04
08	V	Determination of MDD & OMC by standard proctor test for a given soil sample	04
09	V	Determination of bulk density and dry density by core cutter method	04
10	IV	Determination of shear strength of soil by direct shear test	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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
01	Soil Mechanics & Foundation	Dr. B C Punamia	Standard Book House
02	Modern Geo Technical Engineering	Dr. Alamsingh	Jodhpur University
03	Textbook of Soil Mechanics & Foundation Engineering	V N S Murthy	UBS Publisher
04	Soil Sampling & Testing Manual	Dr. A K Duggal	NITTTR, Chandigarh
05	Soil Mechanics & foundation Engineering	B.J. Kasmalkar	Pune Vidhyarti Griha, Pune
06	Soil Mechanics & foundation Engineering	Dr. K R Arora	Standard Publishers and Distributors

B) Software/Learning Websites:

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

C) 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. Casagrande Apparatus
7. Direct Shear Test Apparatus
8. Electronic Weighing Balance
9. Heavy & Light Proctor Test Apparatus
10. Plastic and shrinkage limit apparatus.
11. Permeability Apparatus- constant and falling head.

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

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	L	L	M	L	--	--	--	H	--
CO2	M	L	L	M	L	--	--	--	H	--
CO3	M	L	L	M	L	--	--	--	H	--
CO4	M	L	L	M	L	--	--	--	H	--
CO5	M	L	L	M	L	--	--	--	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	20	28	12	16	--	--	--	--	28
II	CO.2	14	18	04	--	16	--	--	--	20
III	CO.3	14	18	04	--	--	16	--	--	20
IV	CO.4	16	22	04	--	--	--	16	--	20
V	CO.5	16	22	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	20							14							14							16							16							80
1.35 Times marks	28							18							18							22							22							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**28**							**20**							**20**							**20**							**20**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Transportation Engineering (TEN) **COURSE CODE :** 21206

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Transportation plays an important role in the development of country. Highways, Railway & Bridges are important mode of transportation in our country. The prosperity of the country is directly based on development of communication network. Due to longer distance these mode are easy, effective and economical mode of Transportation. This course gives the knowledge and skills required to carry investigations, planning, design, construction and maintenance of different works related to roads, railway & bridge.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify the types of roads as per IRC recommendations.
2. Understand the geometrical design features of different highways.
3. Perform different tests on road materials.
4. Understand the components of railway tracks.
5. Identify bridge types, corresponding inspection and maintenance of bridges.

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 roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different tests on road materials.
4. Identify the components of railway tracks and defects in railway tracks.
5. Identify bridge types, components and inspection, maintenance of bridges.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Overview of Highway Engineering**	1a. Know the modes of transportation 1b. Classification of various types of roads 1c. State importance of highway network.	1.1 Role of transportation in the development of nation, Scope and Importance of roads in India and its' Characteristics. 1.2 Different modes of transportation – land way, waterway, airway. Merits and demerits of roadway and railway; 1.3 General classification of roads. 1.4 Selection and factors affecting road alignment.	04
Unit-II **Geometric**	2a. Identify various components of roads. 2b. Define and state types of	2.1 Camber: Definition, purpose, types as per IRC – recommendations.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Design of Highway	camber. 2c. Define and state Types of gradient 2d. Know sight distances, super Elevations 2e. State necessity and types of curves for road. 2f. Draw cross sections of road in cutting and embankment.	2.2 Kerbs: Road margin, road formation, right of way. 2.3 Design speed and various factors affecting design speed as per IRC – recommendations. 2.4 Gradient: Definition, types as per IRC – Recommendations. 2.5 Sight distance (SSD): Definition, types IRC – recommendations, simple numerical. 2.6 Curves: Necessity, types: Horizontal, vertical curves. 2.7 Extra widening of roads: numerical examples. 2.8 Super elevation: Definition, formula for calculating minimum and maximum Super elevation and method of providing super-elevation. 2.9 Standards cross-sections of national highway in embankment and cutting.	
Unit-III **Construction of Road Pavements**	3a. Differentiate between flexible and rigid pavement. 3b. Explain soil stabilization methods. 3c. Explain road construction procedure for WBM, WMM, bituminous and concrete roads and their IRC recommendations 3d. Define road terms for bituminous roads. 3e. Explain joints for concrete road	3.1 Types of road materials and their Tests – Test on aggregates-Flakiness and Elongation Index tests, Angularity Number test, test on Bitumen- penetration, Ductility, Flash and Fire point test and Softening point test. 3.2 Pavement – Definition, Types, Structural Components of pavement and their functions 3.3 Construction of WBM road. Merits and demerits of WBM & WMM road. 3.4 Construction of Flexible pavement / Bituminous Road (BR), Types of Bitumen and its properties, Emulsion, Cutback, Tar, Terms used in BR (Bituminous Road)-prime coat, tack coat, seal coat, Merits and Demerits of BR(Bituminous Road)-. 3.5 Cement concrete road - methods of construction, Alternate and Continuous Bay Method, Construction joints, filler and sealers, merits and demerits of concrete roads. Types of joints.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-IV **Basics of Railway Engineering**	4a. Know the gauge & their importance. 4b. Know the Zones of Indian Railway 4c. To know permanent way, alignment and component parts. 4d. To know the creep of rails.	4.1 Classification of Indian Railways, zones of Indian Railways 4.2 Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. 4.3 Rail, Rail Joints - requirements, types. 4.4 Creep of rail: causes and prevention. 4.5 Sleepers - functions and Requirement, types - concrete sleepers and their density 4.6 Ballast - function and types, suitability. 4.7 Rail fixtures and fastenings – fish plate, spikes, bolts, keys, bearing plates, chairs-types of anchors and anti-creepers	10
Unit-V **Track Geometrics, Construction and Maintenance**	5a. To know coning, canting of rails, cant deficiency. 5b. To know point &crossing 5c. To know station And yards 5d. To know types and necessity of Track maintenance. 5e. Know organisation of track maintenance	5.1 Alignment- Factors governing rail alignment. 5.2 Track Cross sections – standard cross section of single and double line in cutting and embankment. Important terms-permanent land, formation width, side drains, 5.3 Railway Track Geometrics: Gradient, curves- types and factors affecting, grade compensation, super elevation, limits of Super elevation on curves, cant deficiency, negative cant, coning of wheel, tilting of rail. 5.4 Branching of Tracks, Points and crossings, Turn out- types, components, functions and inspection. Track junctions: crossovers, scissor cross over, diamond crossing, track triangle. 5.5 Station -Purpose, requirement of railway station, important technical terms, types of railway station, factors affecting site selection for railway station. 5.6 Station yard: Classification-Passenger, goods, locomotive and marshalling yards. Function & drawbacks of marshalling	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		yards. 5.7 Track Maintenance- Necessity, Classification, Tools required for track maintenance with their functions, Organisation of track maintenance, Duties of permanent way inspector, gang mate and key man.	
Unit-VI **Bridge Engineering**	6a. Site section bridge alignment. 6b. Classification of bridges. 6c. Selection criteria for suitable types of bridge 6d. Know component parts of bridge. 6e. Know term of bridge. 6f. Know types of bearing used for bridge. 6g. To know the inspection of bridges. 6h. To know the maintenance of Bridges.	6.1 Factors affecting site selection of bridge. 6.2 Classification of bridges according to function, material, span, Size alignment, position of HFL, I.R.C. loading. 6.3 Types of Bridges- Permanent Bridge &Temporary Bridges their importance &sketches. 6.4 Selection criteria for suitable types of bridge 6.5 Component parts of bridges- Types & their functions (foundation, pier, abutments, wing wall, approaches). 6.6 Bearing-Types & Functions. 6.7 Term- Effective span, clear span, Economical span, waterway cutwater, afflux, scour, HFL, freeboard. 6.8 Plan and sectional elevation of bridge 6.9 Inspection of bridges-Types & importance. 6.10 Maintenance of Bridge – Routine and Special purpose maintenance.	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	Overview of Highway Engineering	04	04	--	08
II	Geometric Design of Highway	04	08	04	16
III	Construction of Road Pavements	04	08	04	16
IV	Basics of Railway Engineering	02	02	08	12
V	Track geometrics, Construction and Maintenance	04	04	04	12
VI	Bridge Engineering	04	04	08	16
	TOTAL	**22**	**30**	**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/TUTORIALS/PRACTICALS/TASKS: Not Applicable

7.0 SUGGESTED STUDENT ACTIVITIES: Not Applicable

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Course Videos.
2. Expert guidance

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Highway Engineering	Khanna & Justo	Khanna Publisher
02	Transportation Engineering	N. L. Arora, S. P. Luthara	I.P.H. New Delhi
03	Transportation Engineering	Vazarani & Chandola	Khanna Publisher
04	Road, Railway, Bridges and Tunnel Engineering	Bridle and Ahuja	Standard Book House, New Delhi
05	Railway Engineering	Rangwala	Charotar Publishing House
06	Bridge Engineering	Rangwala	Charotar Publishing House

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, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	--	M	--	M	--	--	--	--	H
CO2	--	M	--	M	--	L	--	H	--	--
CO3	M	--	--	--	H	--	M	--	--	M
CO4	--	M	--	L	--	L	--	M	L	--
CO5	M	--	M	--	L	--	H	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	08	12	08	04	--	--	--	--	12
II	CO.2	16	20	08	12	--	--	--	--	20
III	CO.3	16	20	04	--	16	--	--	--	20
IV	CO.4	12	20	04	--	--	16	--	--	20
V	CO.4	12	16	--	--	--	--	16	--	16
VI	CO.5	16	20	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**VI**							**Total**
CO	**1**							**2**							**3**							**4**							**4**							**5**							
Marks per Unit	08							16							16							12							12							16							80
1.35 Times marks	12							20							20							20							16							20							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	4	-	-	-	-	-		-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	28
Q2	4	-	-	-	-	-	-		4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**12**							**20**							**20**							**20**							**16**							**20**							**108**
TOTAL																																											**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Construction (BCN) **COURSE CODE :** 21207

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	25	25	150
						Min.	32	--	40	--	10	10	--

1.0 RATIONALE:

Building construction is a core subject in Civil Engineering, which deals with the construction processes of sub structure, super structure, Building finishes and maintenance, of buildings. This course essentially imparts the knowledge of construction technology along with the processes involved. This knowledge shall be used for effective and efficient up keeping of building after construction. This will enable the students to undertake the activities in comparatively shorter period of time.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Identify different components of building.
2. Understand different types of foundation and their significance.
3. Know different types of masonry and their construction.
4. Highlight the importance of communications in building planning

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 components of building structures.
2. Propose suitable type of foundation for building structures.
3. Select suitable type of masonry for building structures.
4. Propose relevant means of communications for different types of buildings.
5. Select relevant material for finishing works.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Overview of Building Components**	1a. Classify the given building based on occupancy and type of construction 1b. Categorize the component parts of the given type of building 1c. Compare the parameters of load bearing and framed structure.	1.1 Classification of Buildings as per National Building Code Group A to I, As per Types of Constructions- Load Bearing Structure, Framed Structure, Composite Structure. 1.2 Building Components - Functions of Building Components, Substructure – Foundation, Plinth. 1.3 Superstructure – Walls, Partition wall, Cavity wall, Sill, Lintel, Doors and Windows, Floor, Mezzanine floor, Roof, Columns, Beams, Parapet.	06
Unit-II **Construction of**	2a. Set layout of building structure on ground 2b. State various terms	2.1 Job Layout: Site Clearance, Layout for Load Bearing Structure and Framed Structure by Center Line	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Substructure	related to substructure. 2c. Classify the foundations. 2d. List the precautions in construction of foundation 2e. Select appropriate type of foundations	and Face Line Method, Precautions. 2.2 Earthwork: Excavation for Foundation, Timbering and Strutting, Earthwork for embankment, Tools and plants used for earthwork. 2.3 Foundation: Functions of foundation, Types of foundation – Shallow Foundation, Stepped Footing, Wall Footing, Column Footing, Isolated and Combined Column Footing, Raft Foundation, Grillage Foundation. Deep Foundation - Pile Foundation, Well foundation and Caissons, Pumping Methods of Dewatering, Deep wells, well points, Cofferdams (Introduction only).	
Unit-III **Construction of Superstructure**	3a. State terms used in various masonry 3b. Describe various types of masonry 3c. Understand points of supervision 3d. Supervise masonry work	3.1 Stone Masonry: Terms used in stone masonry- facing, backing, hearting, through stone, corner stone, cornice. Types of stone masonry: Rubble masonry, Ashlar Masonry and their types. Joints in stone masonry and their purpose. Selection of Stone Masonry, Precautions to be taken in Stone Masonry Construction. 3.2 Brick masonry: Terms used in brick masonry- header, stretcher, closer, quoins, course, face, back, hearting, bat 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. Junctions in brick masonry and their purpose and procedure. Precautions to be observed in Brick Masonry Construction. Comparison between stone and Brick Masonry. Tools and plants required for construction of stone and brick masonry. Hollow concrete block masonry and composite masonry. 3.3 Scaffolding and Shoring: Purpose, Types of Scaffolding, Process of Erection and Dismantling. Purpose and Types of Shoring, Underpinning. Formwork: Definition of Formwork, Requirements of Formwork, Materials used in	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Formwork, Types of Formwork, Removal of formwork.	
Unit-IV **Building Communication and Ventilation**	4a. List types of door & windows 4b. Select proper type of doors &windows, location. 4c. Understand fixing of doors & windows	4.1 Horizontal Communication: Doors – Components of Doors, Full Panelled Doors, Partly Panelled and Glazed Doors, Flush Doors, Collapsible Doors, Rolling Shutters, Revolving Doors, Glazed Doors. Sizes of Door recommended by BIS. 4.2 Windows: Component of windows, Types of Windows - Full Panelled, Partly Panelled and Glazed, wooden, Steel, Aluminium windows, Sliding Windows, Louvered Window, Bay window, Corner window, clear-storey window, Gable and Dormer window, Skylight. Sizes of Windows recommended by BIS. Ventilators. 4.3 Fixtures and fastenings for doors and windows, Window Sill and Lintels, Shed / Chajja. 4.4 Vertical Communication: Means of Vertical Communication- Stair Case, Ramps, Lift, Elevators and Escalators. Terms used in staircase-steps, tread, riser, nosing, soffit, waist slab, baluster, balustrade, scotia, hand rails, newel post, landing, headroom, winder. Types of staircase (On the basis of shape): Straight, dog-legged, open well, Spiral, quarter turn, bifurcated, Three quarter turn and Half turn, (On the basis of Material): Stone, Brick, R.C.C., wooden and Metal.	14
Unit-V **Building Finishes**	5a. State types of floors and floor finishes 5b. Understand construction of flooring 5c. Identify types of roofs 5d. Describe procedure of plastering, pointing and painting 5e. State terms and list tools used in plastering and pointing 5f. Identify defects in plastering and painting 5g. Suggest remedial measures for defects in plastering and painting	5.1 Floors and Roofs: Types of Floor Finishes and its suitability- Kota, Marble, Granite, Ceramic Tiles, Vitrified, Chequered Tiles, Paver Blocks, Concrete Floors, wooden Flooring, Skirting and Dado. Process of Laying and Construction, Finishing and Polishing of Floors, Roofing Materials- RCC, Mangalore Tiles, AC Sheets, G.I. sheets, Corrugated G.I. Sheets, Plastic and Fibre Sheets. Types of Roof: Flat roof, Pitched Roof-King Post truss, Queen Post Truss, terms used in roofs. 5.2 Wall Finishes: Plastering –	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Necessity of Plastering, Procedure of Plastering, Single Coat Plaster, Double Coat Plaster, Rough finish, Neeru Finishing and Plaster of Paris (POP). Special Plasters- Stucco plaster, sponge finish, pebble finish. Plaster Board and Wall Claddings. Precautions to be taken in plastering, defects in plastering. Pointing – Necessity, Types of pointing and procedure of Pointing. Painting –Necessity, Surface Preparation for painting, Methods of Application.	
		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	Overview of Building Components	04	04	--	08
II	Construction of Substructure	04	04	--	08
III	Construction of Superstructure	04	08	08	20
IV	Building Communication and Ventilation	04	04	16	24
V	Building Finishes	04	08	08	20
	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/TUTORIALS/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
01	II	To set out Foundation Plan on ground for load bearing structure.	04
02	II	To set out Foundation Plan on ground for framed structure.	04
03	II	To visit building construction site to understand construction of foundation & plinth.	02
04	III	To visit building construction site to understand construction of walls with blocks.	02

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
05	III	Visit to construction site to study scaffolding, centring and form work.	04
06	IV	Visit to site to observe the procedure of fixing of door frames, shutters and windows.	04
07	IV	Visit to site to observe the components of staircases.	
08	V	Visit to site to observe procedure of plastering, various types of paints and procedure of painting.	02
09	V	Visit to site to study the procedure of construction of kitchen otta.	02
10	V	Visit to site to study the procedure of construction of tiled flooring.	02
11	V	Visit to site to study the water proofing of RCC roof slab.	02
12	V	Visit to study Aluminium Composite panel (A.C.P.) cladding work	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Prepare models & charts on course.
2. Collect information regarding current techniques in construction industry.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Course Videos.
2. Expert guidance

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Building Construction	Sharma S. K	S. Chand and Co. Pvt. Ltd., New Delhi.
02	Building Construction	Rangawala, S. C.	Charotar Publication, Anand
03	A to Z Building construction	Sandeep Mantri	Satya Prakashan, New Delhi
04	Building Construction	Sushil Kumar	Standard Publication
05	Building Construction	Punmia B. C., and Jain A. K.	Firewall Media
06	Building Construction	S. P. Arora and Bindra	Dhanpat Rai Publication, Delhi

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, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	M	--	--	--	H	--	--
CO3	M	--	--	--	H	--	M	--	--	M
CO4		M	--	--	--	L	--	--	L	--
CO5	M	--	--	--	--	--	--	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	08	10	04	04	--	--	--	--	08
II	CO.2	08	10	04	08	--	--	--	--	12
III	CO.3	20	26	04	04	16	--	--	--	24
IV	CO.4	24	34	08	--	--	16	12	--	36
V	CO.5	20	28	08	--	--	--	04	16	28
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	08							08							20							24							20							80
1.35 Times marks	08							12							24							36							28							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	-	-	-	-	-	-	-	4		-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	28
Q2	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	4	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**08**							**12**							**24**							**36**							**28**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Basic Surveying (BSY) **COURSE CODE :** 21208

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	05	03	Max.	80	20	100	50	--	25	175
						Min.	32	--	40	20	--	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 types of surveying works required.
2. Know the types of method and equipments to be used for different surveys.
3. Know the use and operational details of various surveying 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. Select the type of survey required for given situation.
2. Compute area of open field using chain, tape and cross staff.
3. Conduct traversing in the field using chain and compass.
4. Use levelling instruments to determine reduced level for preparation of contour maps
5. Locating details with Plane table Survey.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Overview and Classification of Survey**	1a. Understand the concept of surveying 1b. understand the principal of surveying 1c. Know the classification of surveying	1.1 Survey- Purpose and Use. 1.2 Types of surveying- Primary and Secondary, Classification: Plane, Geodetic, Cadastral, Hydrographic, Photogrammetric and Aerial. 1.3 Principles of Surveying. 1.4 Scales: Engineer's scale, Representative Fraction (RF) and diagonal scale	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 Instruments used in chain survey: Metric Chain, Tapes, Arrow, Ranging rod, Line ranger, Offset rod, Open cross staff, Optical square. 2.2 Chain survey Station, Base line, Check line, Tie line, Offset, Tie station. 2.3 Types of offsets: Perpendicular and Oblique. 2.4 Ranging: Direct and Indirect Ranging. 2.5 Methods of Chaining, obstacles in chaining. 2.6 Errors in length: Instrumental error, personal error, error due to natural cause, random error. 2.7 Conventional Signs, Recording of measurements in a field book.	08
Unit-III **Compass Traverse 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 Compass Traversing- open, closed. 3.2 Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples on conversion of given bearing to another bearing (from one form to another), Fore Bearing and Back Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination. 3.3 Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings. 3.4 Local attraction, Methods of correction of observed bearings - Correction at station and correction to included angles. 3.5 Methods of plotting a traverse and closing error, Graphical adjustment of closing error.	10
Unit-IV **Levelling and Contouring**	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 4f. Understand the characteristics of contour.	4.1 Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Back sight, Fore sight, Intermediate sight, Change point, Height of instruments. 4.2 Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level. 4.3 Types of Levelling Staff 4.4 Reduction of level by Line of collimation and Rise and Fall Method. 4.5 Levelling Types: Simple, Differential, Fly,	20

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	4g. Describe the methods of Contouring 4h. To know the use of contours.	Profile and Reciprocal Levelling. 4.6 Contour, contour intervals, horizontal equivalent. 4.7 Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.	
Unit-V **Plane Table Survey**	5a. Understand the principle of plane tabling 5b. Know the accessories and use of accessories 5c. Understand methods of orientation 5d. Describe methods of plane tabling 5e. Locate and plot the area by method of plane tabling	5.1 Principles of plane table survey. Accessories required. 5.2 Setting out of plane table, Levelling, Centering and methods of orientation. 5.3 Methods of plane table surveying: Radiation, Intersection and Traversing. 5.4 Merits and Demerits of plane table Surveying. Situations where plane table survey is used. 5.5 Use of Telescopic Alidade.	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	Overview and Classification of Survey	08	--	--	08
II	Chain Surveying	04	08	04	16
III	Compass Traverse Survey	04	04	08	16
IV	Levelling and Contouring	04	12	16	32
V	Plane Table Survey	--	04	04	08
	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/TUTORIALS/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	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
01	Measurement of distance with chain and tape on ground with direct and indirect ranging.	06
02	Setting out perpendicular and taking offsets with open cross staff and optical square.	02
03	Chain and cross staff survey for finding out area of given field.	02

SN	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
04	Study and use of prismatic compass and observing fore bearing and back bearing.	02
05	Measuring fore bearings and back bearings of 5-6 sided polygon, identifying stations affected by local attractions and calculation of corrected bearings.	04
06	Measuring fore bearings and back bearings for an open traverse (5 to 6 sided) calculation of direct angles between successive lines	02
07	Use of Dumpy level, temporary adjustments and taking reading on levelling Staff. Recording readings in field book with simple levelling practice.	04
08	Differential levelling practice, reduction of levels by Height of instrument method.	02
09	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	
01	**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
02	**Profile levelling and cross sectioning survey:** Running a longitudinal section for a length of 300 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
03	Block contouring: A block of 60 m x 80 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 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. PPT, OHP.

9.0 LEARNING RESOURCES:

A) Books:

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

B) Software/Learning Websites: Not Applicable

C) Major Equipment/ Instrument with Broad Specifications:

Sr.No.	Major Equipment	Remarks
01	Chains 20m /30m	Metric Chain
02	Tapes	Metallic steel Tapes
03	Cross staff/ Optical Square	Metal cross staff
04	Prismatic compass	Metal casing box with 30' Least count
05	Dumpy level	Standard dumpy level
06	Auto level	High precision auto level.
07	Plane table	Wooden P.T. with accessories.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	--	--	--	--	--	--	--	--	--
CO2	--	--	--	M	--	--	--	H	--	--
CO3	M	--	--	--	H	--	M	--	--	M
CO4	--	M	--	--	--	L	--	--	L	--
CO5	M	--	--	--	--	--	--	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	08	11	04	08	--	--	--	--	12
II	CO.2	16	21	04	08	08	--	--	--	20
III	CO.3	16	21	08	--	04	08	--	--	20
IV	CO.4	32	44	08	--	04	08	16	08	44
V	CO.5	08	11	04	--	--	--	--	08	12
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	08							16							16							32							08							80
1.35 Times marks	11							21							21							44							11							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	28
Q2	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	16
Sub Total	12							20							20							44							12							108
TOTAL																																				108

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / DD / ID / MK
COURSE : Entrepreneurship and Start-ups (EPS) **COURSE CODE :** 21301

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

To enhance employability and Entrepreneurship amongst youth Govt. of India is taking initiative through Start-up India, Make in India and Skill Development Program. Young engineers are required to train to support this mission. 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. 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.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Acquire Entrepreneurial spirit and resourcefulness.
2. Familiarize with various uses of human resource for earning dignified means of living.
3. Understand the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
4. Acquire entrepreneurial quality, competency, and motivation.
5. Learn the process and skills of creation and management of entrepreneurial venture.

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 business opportunity and finalize product/service.
2. Collect information by Visiting to DIC and Nationalized Banks.
3. Familiar with Legal, ethical and environmental aspects of business.
4. Conduct various feasibility study.
5. Prepare preliminary project report and detailed project report (Case Study).

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Entrepreneurship**	1a. Describe the procedure to evaluate your entrepreneurial traits as a career 1b. Explain the given terms related to Entrepreneurship 1c. Describe the salient features of the resources required for starting the specified enterprise.	1.1 Definitions: entrepreneur, Intrapreneur, Businessman, Managers Entrepreneurship as a career, Traits of an entrepreneur 1.2 Intrapreneur / entrepreneur: Consistency, creativity, initiative, independent decision making, assertiveness, persistence, calculated risk taking. 1.3 Intrapreneurship. 1.4 Types of enterprises and their	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		features: Manufacturing, service, and trading 1.5 Steps in setting up of a business. 1.6 Similarities / differences between entrepreneurs and managers. 1.7 Types of Business Structures**.**	
Unit-II **Entrepreneurial Opportunities and selection process**	2a. Justify the importance of the business plan for the given product/service. 2b. 2b. Explain the key elements for the given business plan with respect to their purpose/size 2c. Prepare the budget for the given venture. 2d. Prepare the details of the given component	2.1 Product/service selection: Process, core competence, product/service life cycle new product/service development process, mortality curve, creativity and innovation in product/service modification/development. 2.2 Process selection: Technology life cycle, Forms and cost of transformation, factors affecting process selection, location for an industry, material handling. 2.3 Market study procedures: questionnaire design, sampling, market survey, data analysis. 2.4 Discovering ideas and visualizing the business, Activity map, Business Plan.	04
Unit-III **Support Systems &Idea to Start-up**	3a. Explain various courses for entrepreneur. 3b. Identify various start-ups schemes. 3c. Describe support system. 3d. Explain market analysis.	3.1 Categorisation of MSME, ancillary industries. 3.2 Support system- government agencies: MCED, NI-MSME, PMEGP, DI, KVIC. 3.3 Support agencies for entrepreneurship guidance, training, registration, technical consultation, technology transfer and quality control, marketing and finance. 3.4 Identifying the target market. 3.5 Development, Marketing and accounting, Risk analysis. 3.6 Various ideas to start-ups.	03
Unit-IV **Management**	4a. Justify the USP of the given product/ service from marketing point of view. 4b. Formulate a business policy for the given product/service. 4c. Choose the relevant negotiation techniques for the given product/ service with justification. 4d. Identify the risks. 4e. Describe the role of the incubation	4.1 Sources of product for Business: Feasibility study. 4.2 Ownership, capital, Budgeting, Matching entrepreneur with the project, feasibility report. preparation and evaluation criteria. 4.3 Business plan preparation. 4.4 Company's Organization Structure, 4.5 Recruitment and management of talent. 4.6 Financial organization and management.	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-V **Financing and Protection of Ideas**	5a. Describe various financing methods. 5b. Explain how to apply for patent and Licence. 5c. Explain strategies for entrepreneur.	5.1 Union selling proposition (USP): identifications developing a marketing plan. 5.2 Preparing strategies of handling Business: Policy making, negotiation and bargaining techniques. 5.3 Risk Management: Planning for calculated risk taking, initiation with low cost projects. 5.4 Incubation centres: role and Procedure 5.5 Definition, Objectives & Functions of Financial management, Types of Capitals, Types of Taxes, Types of Budgets & Depreciation (Straight line and Reducing balance method) 5.6 Financing methods available for start- ups in India. 5.7 Patenting and Licenses.	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)	Hours
01	I	Submit a profile summary of a successful entrepreneur	02
02	I	Undertake SWOT analysis to arrive at your business idea of an product/service	02
03	V	Collect loan application forms of nationalise banks/other financial institutions and prepare report	02
04	V	Compile the information from financial agencies that will help you to set up your business enterprise.	02
05	III	Compile the information from the government agencies that will help you set up your business enterprise and prepare report	02
06	II	Prepare Technological feasibility report of a chosen product/service.	02
07	II	Prepare financial feasibility report of a chosen product/service.	02
08	I	Prepare a report on various types of taxes.	02
		Any four of the following exercises	
09	IV	Prepare a set of short term, medium and long term goals for starting a	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		chosen small scale enterprise	
10	IV	Prepare marketing strategy for your chosen product/service.	04
11	IV	Compile information about various insurance schemes covering different risk factors.	04
12	I	Prepare income tax statement of your business.	04
13	II	Prepare a business plan for your chosen small scale enterprise	04
14	III	Prepare a report on start-ups	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Assess yourself-are you an entrepreneur?
2. Report on · interview of successful entrepreneurs (minimum two)
3. Taxation systems and govt. Concessions · visit to small scale industry
4. Product survey-select one product and collect all its related information i.e. specification, price, manufacturer.
5. List of identified opportunities with risk factors

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	The Start-up Owner's Manual: The Step by	Step Guide for Building a Great Company Steve Blank and Bob Dorf K & S Ranch ISBN – 978	0984999392
02	The Lean Start-up: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN – 978-0670921607
03	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN-978-0755388974
04	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Christensen	Harvard business ISBN: 978-142219602
05	Entrepreneurship Development	K. Natrajan, E. Gorden	Himalaya Publishing, Mumbai
06	Entrepreneurship Development	Preferred by Colombo plan Staff College	Tata McGraw Hill Publishing
07	A Manual on How to Prepare a	Project Report	J. B. Patel
08	A Manual on Business Opportunity	J. B. Patel	EDII Ahmadabad

Sr.No.	Title of Book	Author	Publication
09	Entrepreneurship Development and Management	Dr. R.K. Singha	S. K. Kataria and Sons New
10	Entrepreneurship Development of Small Business Enterprises	Poornima M. Charantimath	Pearson Education, New Delhi
11	Entrepreneurship Theory and Practice	J. S. Saini, B. S. Rathore	Wheeler Publisher, New Delhi
12	The Seven Business Crisis & How to Beat Them.	V. G. Patel	http://www.ediindia.org

B) Software/Learning Websites:

1. https://www.fundable.com/learn/resources/guides/startup
2. https://corporatefinanceinstitute.com/resources/knowledge/finance/corporatestructure/
3. https://www.finder.com/small-business-finance-tips
4. https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/

C) Major Equipment/ Instrument with Broad Specifications: Not Applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
CO1	H	--	L	--	--	--	M	L	--	H
CO2	--	M	--	L	--	H	--	--	M	L
CO3	--	H	--	L	--	H	--	H	L	M
CO4	M	--	L	--	H	--	L	--	M	L
CO5	--	M	--	H	--	L	--	--	M	H

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in Civil Engineering (CE) / Interior Design (ID)
COURSE : Construction Management (CNM) **COURSE CODE :** 21302

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	--	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 COURSEOBJECTIVES:

The student will be able to,

1. Understand management techniques.
2. Plan, Monitor and execute various types of construction works and different resources. (Men, Material, Money, Machines, Time).
3. Read, draw & update bar charts and CPM.
4. Prepare safety programme to avoid accidents at construction site.
5. Understand importance of material management and Inspection & quality control of construction.

3.0 COURSEOUTCOMES:

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. Show leadership skills required to manage various construction resources.
3. Develop the CPM network of various construction projects.
4. Maintain safety in various construction works.
5. Apply Principles and functions of Material management and quality control to construction industry.

4.0 COURSEDETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Scientific Management**	1a. Interpret the importance of construction industry in National Development. 1b. List resources required for Construction industry 1c. List the objectives of Construction management 1d. State principles and functions of management 1e. Draw organisation chart 1f. Apply Principles and functions of management to construction industry	1.1 Importance of construction industry in National Development. 1.2 Resources of construction industry, Material, Manpower, Money, Machinery, space. 1.3 Objectives of Construction Management. Definition of Management 1.4 Necessity of Scientific management. Principles of Management, Functions of Management. 1.5 Types of Organisation -Line, Line and staff, functional organization 1.6 Application of Principles and functions of management to Civil	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Engineering works in following Department a. Public Works Department b. Water Resource Engineering Dept. c. Maharashtra Jivan Pradhikaran d. Private Organisation	
Unit-II **Leadership and Human Relationship**	2a. Explain styles and functions of leadership 2b. State and interpret hierarchy of Maslow's needs in relation to motivation 2c. Identify supervision techniques in construction activities.	2.1 Desirable qualities of leadership for effective Execution of construction work 2.2 Leadership – styles of leadership Functions of leadership Maslow's Human Needs. 2.3 Motivation and its importance and need, functions of Motivation. Hygiene and motivation factors. 2.4 Functions of supervisor at construction site.	06
Unit-III **Planning and Scheduling of Construction Works.**	3a. Define terminology related to planning and scheduling 3b. Prepare Construction schedule. 3c. Draw and analyze CPM network for construction work. 3d. Make resource smoothing and resource leveling 3e. Determine optimum duration and cost by network contracting	3.1 Introduction to Terminology related to scheduling. 3.2 Methods of scheduling, Advantages of Scheduling. 3.3 Bar Chart. Preparing Construction schedule. Advantages and limitations of bar chart. 3.4 Planning and scheduling by Network Analysis, terms used. 3.5 Determination of various timings EST, EFT, LST, LFT, total float 3.6 Preparation of activity table, Example on developing Network and Critical path, 3.7 Introduction to PERT. Terms used Comparison between CPM and PERT. 3.8 Introduction to Resource Allocation, Resource Smoothing and Resource Leveling for Human Resource 3.9 Introduction to Project Cost Analysis-Project Cost, Cost vs Time (Simple problems on Bar Chart, CPM), (No mathematical problems on Project cost analysis and resource leveling in examination)	16
Unit-IV **Safety in Civil Engineering**	4a. State the causes of accidents and suggest remedial measures 4b. Describe safety programme 4c. State provisions of acts	4.1 Importance works of safety in construction 4.2 Common Causes of accident, types of accidents, Remedial measures. 4.3 Terms used- Injury frequency rate (IFR), Injury severity rate (ISR), Injury Index (II), Accident Cost. 4.4 Effective Safety Programme. 4.5 Introduction to Workmen	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Compensation Act and Minimum Wages act.	
Unit-V **Material Management and Quality Control**	5a. Describe objectives of Material management. 5b. State functions of Material management. 5c. State various inventory costs. 5d. Explain the inventory control system.	5.1 Introduction to Materials management. 5.2 Objectives of Material management 5.3 Functions of Material management. 5.4 Classification of Inventory. 5.5 Economic Order Quantity – Order quantity, Lead time, Safety stock, Re-order point, Numerical analysis 5.6 Inventory Cost –Procurement cost, Inventory carrying cost. 5.7 ABC analysis. 5.8 Concept of JIT, Zero Inventory system and Supply chain management. 5.9 Concept of quality. Quality checking, Quantity checking. Quality assurance and quality control.	10
		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	06	04	04	14
II	Leadership and Human Relationship	02	04	02	08
III	Planning and Scheduling of Construction Works.	08	06	20	34
IV	Safety in Civil Engineering	--	08	--	08
V	Material Management and Quality control	04	10	02	16
	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/TUTORIALS/PRACTICALS/TASKS: Not Applicable

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Prepare report on role of construction industry in National development.
2. Draw organizational 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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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 LEARNINGRESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Construction planning & Management.	M. L. Dhir, Gehlot	Wiley New Delhi.
02	Construction Management and Accounts.	Harpalsingh	Tata McGraw Hill
03	Construction management and Planning.	B. Sengupta and Guha	Tata McGraw Hill
04	PERT and CPM.	L.S. Shrinath	East-West Press Pvt. Ltd. New Delhi.
05	Construction Engineering and Management	S. Seetharaman	Umesh Publications
06	Materials Management.	Gopalkrishnan	Khanna Publication
07	Industrial Engineering and Management.	O. P. Khanna	S. Chand and Co.
08	Industrial Organisation and Management Science.	Banga & Sharma	Khanna Publication

B) Software/Learning Web sites: Not Applicable

C) Major Equipment/ Instrument with Broad Specifications: Not Applicable

10.0 MAPPING MATRIX OF PO'S, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	--	--	H	H	M	H	H	--
CO2	H	H	--	--	M	H	M	H	M	--
CO3	M	H	M	M	H	H	H	H	H	--
CO4	M	M	--	--	H	H	M	H	H	--
CO5	H	H	M	--	M	H	M	H	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	14	20	04	16	--	--	--	--	20
II	CO.2	08	12	04	--	08	--	--	--	12
III	CO.3	34	46	16	--	08	16	04	--	44
IV	CO.4	08	10	04	--	--	--	08	--	12
V	CO.5	16	20	--	--	--	--	04	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108***

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	14							08							34							08							16							80
1.35 Times marks	20							12							46							10							20							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**				**2**	**2**						**3**	**3**	**3**	**3**	**3**			4				**4**			**5**	**5**	**5**	**5**			**5**	
Q1	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**20**							**12**							**44**							**12**							**20**							**108**
															TOTAL																					**108**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / AE / DD / ID / MK
COURSE : Programming and Problem Solving (PPS) **COURSE CODE :** 21303

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Computers are a vital part of the engineering industry. Although programming is not a central part of some of the engineering programs, it is an important skill to have in modern life. The rapid advances occurring in computer science have provided the engineer with a powerful means of processing, storing, retrieving, and displaying data thereby increasing the role of computer programming in nearly every engineering discipline. Solving problems is the core of engineers' job. Programmers must first understand how a human solves a problem, and then understand how to translate this "algorithm" into something a computer can do, and finally how to "write" the specific syntax to get the job done. Programming can enable students to work faster and to come up with more creative solutions.

2.0 COURSE OBJECTIVES:

Prime objective is to give student a basic introduction to programming and problem solving with computer language Python and to introduce student not merely to the coding of computer programs, but to computational thinking, the methodology of computer programming, and the principles of good program design including modularity and encapsulation to,

1. Understand problem-solving, problem-solving aspects, programming and to know about various program design tools.
2. Learn problem solving with computers
3. Learn basics, features and future of Python programming.
4. Acquaint with data types, input output statements, decision making, looping and functions in Python.
5. Learn features of Object-Oriented Programming using Python.
6. Acquaint with the use and benefits of files handling in Python.

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 simple algorithms for arithmetic and logical problems.
2. Translate the algorithms to programs & execution.
3. Implement conditional branching, iteration and recursion.
4. Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. Demonstrate significant experience with the Python program development environment.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit -I **Introduction to programming**	1a. State various types of programming languages. 1b. Write simple algorithm for given problem 1c. Describe the problem	1.1 **General Problem Solving Concepts:** Problem solving in everyday life, types of problems, problem solving with computers, difficulties with problem solving,	**02**

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
and Problem Solving	solving concept.	problem solving aspects, top down design. Problem Solving Strategies. 1.2 **Programming Basics:** How to develop a program, Algorithms, Flow-charts, Types of Programming Languages, Compiler and Linker, Testing and Debugging a program. 1.3 **Program Design Tools:** Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms.	
Unit- II **Python Programming**	2a. State various features of Python 2b. State various terms related to python programming. 2c. Identify the different data types.	2.1 **Basics of Python Programming:** Features of Python, History and Future of Python, Writing and executing Python program, Literal constants, variables and identifiers, Data Types, Strings, Working With Strings, Numbers Input operation, Comments, Reserved words, Indentation, Operators and expressions in Python.	04
Unit- III **Decision Control Statements**	3a. List decision control statements and loops. 3b. Write a program using decision control statements and loops. 3c. Write pseudo code for given logic.	3.1 **Decision Control Statements:** Decision control statements, **conditional** branching Statements: if, if-else, nested if, if-elseif-else statements. 3.2 **Basic loop** Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, The break, continue, pass, else statement used with loops.	04
Unit- IV **Functions and Modules**	4a. Identify the need of function in program. 4b. Write a program using function. 4c. Describe the use of modules in program.	4.1 **Function:** Need of functions, Function: definition, call, variable scope and lifetime, the return statement. Defining functions, good programming practices. 4.2 **Modules:** Introduction to modules, Introduction to packages in Python, Introduction to standard library modules.	04
Unit- V **Advanced Features of Python Programming**	5a. Describe the use of Tuples, Lists, and Dictionaries 5b. Describe the features of Object oriented Programming: Programming 5c. Describe the use and benefits of files handling in Python.	5.1 Introduction to Tuples, Lists, and Dictionaries. 5.2 **Object oriented Programming:** Programming Paradigms-monolithic, procedural, structured and object oriented, Features of Object oriented programming-classes, objects, methods and message passing. 5.3 File Input and Output	02
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	II	To calculate salary of an employee given his basic pay (take as input from user). Calculate gross salary of employee. Let HRA be 10 % of basic pay and TA be 5% of basic pay. Let employee pay professional tax as 2% of total salary. Calculate net salary payable after deductions.	04
02	III	To accept N numbers from user. Compute and display maximum in list, minimum in list, sum and average of numbers.	02
03	III	To accept student's five courses marks and compute his/her result. Student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the grade if first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.	04
04	III	To check whether input number is Armstrong number or not. An Armstrong number is an integer with three digits such that the sum of the cubes of its digits is equal to the number itself.	02
05	III, IV	To determine the roots of quadratic equation. Display if equation having imaginary roots.	02
06	II, III	To accept the number from user and Compute a) square root of number, b) Square of number, c) Cube of number d) check for prime, d) factorial of number	04
07	II	Write a program that accepts a string from user and perform following string operations- a) Calculate length of string, b) String reversal, c) Equality check of two strings	04
08	III	Write a program that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.	02
09	III	Write a program that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.	02
10	IV	Write a program to print sum of even and odd numbers from 1 to N numbers and validate the input.	02
11	III	Write a program to print the sum of all numbers up to a given number and validate the input.	02
12	III	Write a program to find sine and cosine of angles given by user.	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Write a Python function to sum all the numbers in a list.
2. Write a program to print multiplication table of a given number
3. Count the total number of digits in a number
4. Use else block to display a message "Done" after successful execution of for loop
5. Write a program to display all prime numbers within a range

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Course Videos.
2. Expert guidance

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	How to Solve it by Computer	R. G. Dromey	Pearson Education India
02	Problem Solving and Programming Concepts	Maureen Spankle	Pearson Education India
03	Learning Python	Romano Fabrizio	Packt Publishing Pvt Ltd
04	Introduction to Computing & Problem Solving with Python	Jeeva Jose and P. Sojan Lal	Khanna Publishing House.

B) Software/Learning Websites:

1. https://www.python.org/
2. https://automatetheboringstuff.com/
3. https://static.realpython.com/python-basics-sample-chapters.pdf

C) Major Equipment/ Instrument with Broad Specifications: Not applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	--	H	--	--	--	M	--	--	L
CO2	M	H	--	--	--	--	M	--	--	--
CO3	--	H	M	H	--	--	--	--	--	L
CO4	--	M	--	M	--	L	M	--	--	--
CO5	--	M	--	M	L	--	--	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in Civil Engineering (CE) / Interior Design (ID)
COURSE : Computer Applications for Project Management (CAP) **COURSE CODE :** 21304

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
01	--	02	03	02	--	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 COURSEOBJECTIVES:

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 Modeling software

3.0 COURSEOUTCOMES:

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 Modeling Software.

4.0 COURSEDETAILS:

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 manager.	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 software.	2.1 Importance of project management softwares 2.2 Types of project management softwares a. Features and uses of MS-	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Project software b. Features and uses of Primavera 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. 4b. Understand input data. 4c. Understand various commands to execute the given input data. 4d. Prepare schedules for resource allocation. 4e. 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 modeling (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/TUTORIALS/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
01	I	Identify the various activities and resources required for an ongoing / completed civil engineering project.	04
02	II	Study the features of MS- Project software	04
03	III	Use MS Project software for preparing bar chart and project scheduling.	04
04	II	Study the features of Prima-Vera software	04
05	IV	Use Primavera software for preparing project scheduling and resources planning.	08
06	V	Study the features of BIM software	04
07	V	Use BIM software for preparing resources planning and activity scheduling.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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 LEARNINGRESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Construction management and Planning	B. Sengupta and Guha	Tata McGraw Hill
02	CPM and PERT	L. S. Shrinath	East and West Press Pvt. Ltd.
03	Planning and managing projects with PRIMAVERA	P. Vinayogam A. Vimla	I. K. International Publishing House Pvt. Ltd. New Delhi.

B) Software/Learning Websites:

1. Prima-veraP6,
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, CO's and PSO's: CE

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**1**	**2**	**3**
CO1	H	--	--	--	--	--	--	--	M	--
CO2	--	H	--	--	--	--	--	--	H	--
CO3	--	--	--	--	--	--	M	--	H	M
CO4	M	--	--	--	--	L	--	--	H	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGAMME : Diploma Programme in CE / ME / PO / EE / AE / DD / ID / MK
COURSE : Artificial Intelligence (ARI) **COURSE CODE :** 21305

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

Artificial Intelligence (AI) is a major step forward in how computer system adapts, evolves and learns. It has widespread application in almost every industry and is considered to be a big technological shift. This course will give an opportunity to gain knowledge in one of the most fascinating and fastest growing areas of Computer Science through classroom program that covers fascinating and compelling topics related to human intelligence and its applications. This course will give the students a rigorous, advanced and professional diploma level foundation in Artificial Intelligence (AI).

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand concepts of AI.
2. Define various types of agents and nature of environment used in AI.
3. Solve general problems by using AI.
4. Understand fuzzy logic and fuzzy system.
5. Understand basics of artificial neural network.

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 various AI approaches.
2. Select types of agents for problem solving.
3. Explain search algorithm terminology.
4. Explain fuzzy logic system.
5. Describe artificial neural network.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction To Artificial Intelligence (AI) and Machine Learning.**	1a. Concept of AI. 1b. Explain various AI approaches. 1c. Explain goals and history of AI. 1d. Define and classify machine learning. 1e. List applications of AI	1.1 Artificial Intelligence (AI): Concept of AI. 1.2 AI Approaches: The Turing Test approach. The cognitive modeling approach. The rational agent approach. 1.3 Goals of AI and History of AI. 1.4 Introduction to machine learning (ML). Types of machine learning. 1.5 Applications of AI (List only).	03
Unit-II **Agents and Environments.**	2a. Define agent and explain various types of agents. 2b. Explain nature of environment's used in AI.	2.1 Definition of agent. Types of Agents: Simple reflex agents, model based reflex agents, goal based agents, learning agents.	03

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	2c. State properties of environment.	2.2 Nature of environments used in AI. 2.3 Properties of environments.	
Unit-III **Search Algorithms.**	3a. Explain general problems solving methods. 3b. Describe control strategies and characteristics of problems. 3c. Classify search strategies. 3d. Explain uninformed and informed search strategies.	3.1 General Problems Solving: Production system (with water jug example).State space search (with example of 8 puzzle problem). 3.2 Search algorithms terminology.	03
Unit-IV **Fuzzy Logic Systems.**	4a. Describe fuzzy systems. 4b. Describe Fuzzy sets and Fuzzy sets operation. 4c. Explain properties of fuzzy sets. 4d. Classify types of membership function. 4e. Explain fuzzy logic.	4.1 Introduction to fuzzy systems, fuzzification and defuzzification (only concept). 4.2 Fuzzy sets: Fuzzy sets, membership function with formal definition, fuzzy truth values verses probabilities. 4.3 Fuzzy set operation, properties of fuzzy sets. 4.4 Types of membership functions. 4.5 Fuzzy logic: Fuzzy logic, fuzzy predicate and fuzzy truth values.	04
Unit-V **Artificial Neural Networks.**	5a. Define and explain unit in neural networks. 5b. Describe artificial neural network structure. 5c. Explain perceptrons. 5d. Explain back propagation. 5e. Illustrate one case study.	5.1 Neural networks: Basics of neural networks, artificial neural networks (ANN).Artificial neural network structure. 5.2 Perceptron: Single layer feed-forward neural networks. Back-propagation. 5.3 Case study: Handwritten digit recognition.	03
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	I	Study of various applications of AI.	02
02	II	Write a program in Python checking for prime numbers.	02
03	III	Solve any puzzle using Python.	02
04	III	Analyze an audio signal using Python.	02
05	II	Build an application that will check plagiarism or duplication using AI.	04
06	II	Build an application that can predict or identify human emotions through facial features using AI.	04
07	IV	Write a program to recognize spoken words.	02
08	V	To build a recommendation system for customers for products, videos and music streaming, and more, with the help of ANN, data mining, machine learning, and programming.	04
09	V	Prediction of Pneumonia from X-ray images.	06
10	V	Building a chatbot using Python to embed it in website or applications.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect information of real time artificial intelligence system.
2. Study different example of machine learning.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Books	Author	Publication
01	Artificial Intelligence A Modern Approach Second Edition.	Stuart Russell, Peter Norvig.	Prentice Hall ISBN 0-13-790395-2
02	Artificial Intelligence	Saroj Kaushik	CENGAGE Learning. ISBN-13: 978-81-315-1099-5 ISBN-10: 81-315-315-1099-9
03	Neuro-Fuzzy and Soft Computing A Computational Approach and machine intelligence.	Jyh-Shing Roger Jang Chuen-Tsai Sun EijiMizutani.	Prentice Hall ISBN 0-13-261066-3
04	Artificial Intelligence	Rich E. and Knight K.	Tata McGraw Hill. ISBN:13-978 0-07-008770-5

B) Software/Learning Websites:

1. http://www.ifc.unam.mx/Brain/nenet.htm
2. https://www.quantamagazine.org/artificial-neural-nets-finally-yield-clues-to-how-brains-learn-20210218/

C) Major Equipment/ Instrument with Broad Specifications:

Sr.No.	Equipment	Specification
01	Desktop Computer	PC Specifications to be followed: Processor: i3 or i5 RAM: 4 GB or better HDD: 1 TB SATA Monitor: TFT LCD OS: Genuine Windows 8 or 10 Professional or Home Premium or Windows 8 or 10 Ultimate Antivirus: User License for three year
02	LCD Projector	Display Type: LCD Light Output: 3200 Lumens
03	Software	JDK 1.8 or above, Any IDE for Java Programming such as Eclipse, JCreator or any other product

10.0 MAPPING MATRIX OF PO's, CO's and PSO's: CE

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	L	M	L	H	L	H	H	H	H
CO2	M	H	M	M	M	M	H	L	H	L
CO3	M	M	M	M	M	M	M	--	--	H
CO4	H	H	M	M	L	L	M	H	L	H
CO5	H	H	M	M	M	L	M	L	H	L

H: High Relationship, M: Medium Relationship, L: Low Relationship.

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in CE / ME / PO / EE / EL / AE / DD / ID / MK
COURSE : Internet of Things (IOT) **COURSE CODE :** 21306

TEACHING AND EXAMINATION SCHEME:

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

1.0 RATIONALE:

The aim of this course is to get broad understanding of the basic concepts of IOT. Internet of Things (IoT) is presently an important technology with wide ranging interest from Government, academia and industry. IoT cuts across different application domain verticals ranging from civilian to defense sectors which include agriculture, space, health care, manufacturing, construction, water, mining, etc. Today it is possible to build different IoT solutions such as shopping system, infrastructure management in both urban and rural areas, remote health monitoring and emergency notification systems, and transportation systems. Therefore, it is very important to learn the fundamentals of this emerging technology.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Assess the vision of IoT.
2. Classify Real World IoT applications in various Domains.
3. Understand design methodology for IoT platforms.
4. Explain devices in IoT.
5. Understand ethics in IoT.

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 different basic blocks of IoT systems.
2. Elaborate various aspect of IoT networking.
3. Demonstrate different platforms and their interfacing.
4. Design applications of IoT.
5. Apply ethics in IoT

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Introduction to Internet of Things**	1a. Introduction to Iot 1b. Explain characteristics of IoT. 1c. IoT communication model.	1.1 Definition and characteristics of IoT, Sensing, Actuation. 1.2 Physical design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT, IoT functional blocks. 1.3 IoT communication Models, IoT communication API's, IoT enabling Technologies Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, embedded systems.	05

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.4 IoT Levels and Deployment templates – IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6	
Unit-II **IoT and M2M**	2a. Basics of IoT Networking. 2b. Explain M2M	2.1 Basics of IoT Networking, Communication Protocols, Sensor networks. 2.2 Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software defined networking.	03
Unit-III **IoT Platforms Design Methodology**	3a. Explain Arduino programming. 3b. IoT Design and Methodology.	3.1 Introduction to Arduino programming, 3.2 Integration of Sensors/Actuators to Arduino. 3.3 IoT Design and Methodology- Purpose and requirements specification, Process specification, Domain model specification, Information model specification, service specification, IoT level specification, functional view specification, Operational view Specification 3.4 Device and component integration, application development	03
Unit-IV **IoT Physical Devices and Endpoints**	4a. Describe IoT devices. 4b. Implementation of IoT with Raspberry Pi. 4c. Data Handling Analytics.	4.1 IoT device: Basic Building blocks of an IoT Devices. 4.2 Physical Devices: Implementation of IoT with Raspberry Pi, Arduino, 4.3 Data Handling Analytics.	02
Unit-V **Ethics in IoT**	5a. Explain Characterizing the IoT, Privacy, and Control. 5b. Case Studies.	5.1 Characterizing the IoT, Privacy, Control – Disrupting Control, Crowd sourcing; Environment Physical thing, Electronics. 5.2 Internet service Solutions – The IoT as a part of the solution, cautious optimism, the open IoT definition. 5.3 Case Studies: Agriculture, Healthcare, Activity Monitoring	03
		TOTAL	**16**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	I	Observe operations of USB cables, Wires, Power Supply Units, Transistors, Breadboards, Relay, Multimeter, Tester, Soldering Kit, Wire cutter, Hot glue gun and other components required for designing of IoT available in your lab.	02
02	II	Identify different types of sensors and their working, input output pins available in Lab.	02
03	II	Write case study on architecture of Iot Toolkit	02
04	II	Study different building blocks of IoT devices	04
05	II	Exercise on smart object API Gateway service reference implementation in IoT Toolkit.	04
06	II	Experiment on Gateway as a service deployment in IoT Toolkit.	04
07	III	Experiment on application framework and embedded software agents for IoT Toolkit.	04
08		Compare different IoT platforms Raspberry-Pi, Arduino, Intel Galileo, Tibbo project systems available in market.	02
09	IV	Exercise on working principle of Rasberry Pi.	04
10	IV	Experiment on connectivity of Rasberry Pi with existing system components.	04
11	V	Write case studies and ethics in IoT and know some tools and have basic implementation skills.	
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Understand the different protocols and their purposes used to communicate in IoT.
2. Learn the Deployment steps of any Domain specific IoT Services.
3. Learn/Compare Different Hardware Boards for Creating IoT Services.
4. Discuss Privacy Issues in IOT.
5. Quiz.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Guide students in undertaking mini projects.
2. Demonstrate students thoroughly before they start doing the practice.

3. Encourage students to refer different website and YouTube channels to have deeper understanding of the subject.
4. Observe and monitor the performance of students in lab.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Internet of Things	Arshdeep Bahga and Vijay Madisetti	Universities Press
02	Designing the Internet of Things	Adrian McEwen & Hakim Cassimality Wiley	Wiley
03	Internet of Things	Dr. Jeeva Jose	Khanna Publishing House (Edition 2017)

B) Software/Learning Websites:

1. http://www.cisco.com/c/dam/en_us/solutions/trends/iot/introduction_to_IoT_november.pdf.
2. https://www.bbvaopenmind.com/en/iot-implementation-and-challenges/
3. https://www.ftc.gov/system/files/documents/reports/federal-trade-commission-staff-reportnovember-2013-workshop-entitled-internet-things-privacy/150127iotrpt.pdf

C) Major Equipment/ Instrument with Broad Specifications:

Sr.No.	Equipment	Specification
01	Desktop Computer	PC Specifications to be followed: Processor: i3 or i5 RAM: 4 GB or better HDD: 1 TB SATA Monitor: TFT LCD OS: Genuine Windows 8 or 10 Professional or Home Premium or Windows 8 or 10 Ultimate Antivirus: User License for three year
02	LCD Projector	Display Type: LCD Light Output: 3200 Lumens
03	Software	Apache Tomcat, java, python, virtualization software Academic version of any public cloud services.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	H	M	M	M	--	L	--	L
CO2	M	M	H	L	M	L	M	--	--	M
CO3	H	M	M	--	M	M	M	--	--	M
CO4	--	L	H	--	--	L	L	M	--	M
CO5	M	M	M	M	H	M	H	--	--	M

H: High Relationship, M: Medium Relationship, L: Low Relationship.

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Advanced Surveying (ASY) **COURSE CODE :** 21401

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	05	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 teach Students application of facts, Concepts, Principles, and procedures in surveying and Levelling. It is also intended to teach students theodolite traversing and Modern Surveying equipments. With this knowledge and skill, He will be able to choose appropriate survey and traversing methods 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
5. Understand use of remote sensing and GIS.

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. Determine the angles, distances and co-ordinates of the topographical points with transit theodolite.
2. Set out a simple circular curve.
3. Use Total station and advanced survey instruments to perform survey work.
4. 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 Traversing**	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. 1f. Determine consecutive and independent co-ordinates of a theodolite traverse.	1.1 Types of Theodolite, Vernier, Micrometer, and Digital Theodolite. Components of Transit Theodolite and their functions. Technical terms used. Temporary adjustments of Transit Theodolite. 1.2 Measurement of Horizontal angle, Direct method and method of Repetition, errors eliminated by method of repetition. 1.3 Measurement of Vertical angle, and Deflection angle with transit theodolite. 1.4 Measurement of magnetic bearing of a survey line by transit Theodolite.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.5 Permanent adjustment of transit Theodolite (only relationship of different axes of Theodolite). 1.6 Sources of errors in Theodolite Surveying. 1.7 Traversing with Theodolite: Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles. 1.8 Traverse Computation - Latitude, Departure, Consecutive Co-ordinates, Independent coordinates, error of Closure, Balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table. Simple problems on above topic.	
Unit-II **Tacheometry**	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 a 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. 2.5 Simple problems on above topic.	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. 3.3 Simple Problems on above topic.	08
Unit-IV **Advanced Survey Equipments**	4a. State use of digital planimeter. 4b. State construction and uses of micro-optic and electronic digital theodolite. 4c. State components and principles of EDM. 4d. State components and functions of total station. 4e. State Use of Total station for traversing of a small area. 4f. Identify sources of errors in total station surveying.	4.1 Digital Planimeter: Construction and use of Digital Planimeter. 4.2 Micro Optic theodolite: Construction and use of one second Micro Optic theodolite. 4.3 Electronic Digital Theodolite: Construction and use of one second Digital theodolite 4.4 Electronic Distance Meter (EDM): Principle of EDM, Components of EDM, functions and uses of EDM. 4.5 Total Station: Introduction to Total station. Components and functions of total station. 4.6 Set up of Total Station-Centering, Levelling and Recording readings with Total Station. Survey Station	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		description. Entering data of occupied station for a total station. 4.7 Use of Total station for Digital land surveying and Mapping. Measurement of Distances, Co-ordinates and elevations with Total Station. 4.8 Total Station Traversing, Backsight point setup. Recording measurements for field points from different traverse stations. 4.9 Storing and Data Retrieval. Field Generated Graphics and taking print out of field data. 4.10 Maintenance of Total station, Sources of errors in Total station surveying. 4.11 Construction layout using Total Station.	
Unit-V **Remote Sensing GIS and GPS**	5a. State the basic principles of remote sensing. 5b. State role and functions of GIS in surveying. 5c. State role of GPS in surveying.	5.1 Aerial Survey: Introduction, definition, Aerial photograph. Use of drones for surveying. 5.2 Remote Sensing: meaning of remote sensing, Remote sensing systems- Passive system, and Active system. Applications: mineral, land use / Land cover, Natural Hazards and Environmental engineering system. 5.3 Role of GIS (Geographical Information System) in surveying. Components of GIS. Functions of GIS. Capturing, storing, querying, analysing and displaying data with GIS. Commonly used softwares for GIS. 5.4 Global Positioning System (GPS): Principle, components and use of GPS in digital land surveying.	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	Theodolite Traversing	08	08	08	24
II	Tacheometry	04	04	04	12
III	Curves	04	04	04	12
IV	Advanced Survey Equipments	04	08	08	20
V	Remote Sensing GIS and GPS	04	04	04	12
	TOTAL	**24**	**28**	**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/TUTORIALS/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
01	I	Understanding the components of Theodolite and their functions, reading the vernier and temporary adjustments of theodolite.	04
02	I	Measurement of Horizontal angle by direct angle method.	02
03	I	Measurement of Horizontal angle by method of Repetition.	04
04	I	Measurement of vertical angles by transit theodolite.	04
05	I	Measurement of deflection angle by transit theodolite.	02
06	I	Measurement of magnetic bearings of two successive survey lines with Transit theodolite and Determine the consecutive co-ordinates of survey stations.	04
07	II	Determine constants of a given tacheometer.	02
08	II	Find the horizontal distances and elevations of points using transit theodolite as a tacheometer.	04
09	IV	Measurement of area of irregular figure from given contour map with a digital / polar Planimeter.	02
10	IV	Measurement of Horizontal and vertical angle by one second micro optic theodolite.	02
11	IV	Study and use of Electronic Digital Theodolite. Measurement of horizontal and vertical angles with Electronic Digital Theodolite.	02
12	IV	Study and use of Electronic Distance Meter (EDM).	04
13	IV	Study of Total Station and its components.	02
14	IV	Finding horizontal, vertical distance and elevations of points with total station.	04
15	IV	Finding the co-ordinates and elevations of 8 to 10 points using total station.	04
		TOTAL	**46**
		LIST OF PROJECTS	
P1	I	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
P2	III	Design and Setting out simple circular curve by Rankine's method of deflection angles for a given problem **with one second electronic digital / micro optic theodolite** and plotting the details of curve on full imperial drawing sheet.	06
P3	IV	Locating details with co-ordinates and elevations of a small area by traversing with total station (3 to 4 traverse stations). Plotting the details	06

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		on drawing sheet, retrieving graphical data generated by traversing and taking a computerised printout.	
		TOTAL	**64**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Study different types of digital survey instruments.
2. Collect information of various Total station
3. Collect information on GIS softwares.
4. Collect information on GPS system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show CAI computer software related to advanced survey
2. Show online video demonstration of advanced survey instruments.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Surveying and Levelling	N. N. Basak	Tata McGraw-Hill
02	Surveying and Levelling Part I and II	T. P. Kanetkar & S. V, Kulkarni	Pune Vidhyarthi Griha Prakashan
03	Surveying and Levelling Vol. I and II	Dr. B. C. Punmiya	Laxmi Publication
04	Text book of Surveying	S. K. Husain, M. S. Nagaraj	S. Chand and Company
05	Surveying and Levelling Vol. I and II	S. K. Duggal	Tata McGraw-Hill
06	Higher Surveying	A. M. Chandra	New Age International Publishers
07	Surveying for Engineers	J. Uren and W. F. Price	The Macmillan Press Ltd.
08	Elementary Surveying: An Introduction to Geomatics	Charles D Ghilani and Paul a Wolf	Pearson

B) Software/Learning Websites:

6. www.nptel.ac.in

C) Major Equipment/ Instrument with Broad Specifications:

Sr. No.	Name of Instrument	Brief Specifications
01	20" Transit Theodolite	20", 15 CM Dia. Graduated circle
02	One second Micro-optic Theodolite	One second digital display and optical plummet.
03	One second Electronic Digital Theodolite	One second digital display and digital plummet.
04	EDM	1 second/0. 001m accuracy, dual window, battery operate, with digital plummet
05	Total Station	0. 001m accuracy, digital dual display, battery operated, PC interface and with high quality prism reflectors.
06	Total Station with GPS	Total station with GPS antenna, receiver and

Sr. No.	Name of Instrument	Brief Specifications
		necessary software and accessories.

10.0 MAPPING MATRIX OF PO'S, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	H	--	H	--	--	M	H	--	--
CO2	M	H	--	H	--	--	M	H	--	--
CO3	M	H	--	H	--	--	M	H	--	--
CO4	M	H	--	H	--	--	M	H	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	24	32	08	16	08	--	--	--	32
II	CO.1	12	16	04	--	08	04	--	--	16
III	CO.2	12	16	04	--	--	12	--	--	16
IV	CO.3	20	28	08	--	--	--	16	04	28
V	CO.4	12	16	04	--	--	--	--	12	16
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							1							2							3							4							
Marks per Unit	24							12							12							20							12							80
1. 35 Times marks	32							16							16							28							16							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1				1	1	1	1					2	2	2				3	3	3	3	3	3			4	4	4			4	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	32							12							16							28							16							108
TOTAL																																				108

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Computer Aided Drawing (CAD) **COURSE CODE :** 21402

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	02	--	Max.	--	--	--	25	--	50	75
						Min.	--	--	--	10	--	20	--

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 working of CAD softwares.
2. Prepare building plans with CAD software.
3. Prepare submission and working drawing for the buildings with CAD software.
4. Prepare drawings of 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:

(To be covered in practical hours.)

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Basics of CAD**	1a. Enlist uses of CAD. 1b. State various software's for CAD.	1.1 Information about CAD 1.2 Uses of CAD 1.3 Information of various softwares (CAD software available in the market AutoCAD, Felix Cad, Auto Civil, 3D Max.)	02
Unit-II **Creating Drawing**	2a. State creating commands in CAD	2.1 Starting up of CAD 2.2 CAD Window, Tool bar, Drop down menu. 2.3 Opening, Saving, Making Change &Closing CAD.	02
Unit-III **Learning The CAD Commands**	3a. Draw various drawing entities 3b. Use modify commands 3c. Use format and setting commands.	3.1 WCS icon, UCS icon, 3.2 Setting Up a work area, specifying units, drawing limits, grid, Osnap, polar, ortho, LWT. 3.3 Drawing commands- line, circle,	04

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		polyline, multiline, Ellipse, polygon, arc. 3.4 Modifying commands: Copy, move, offset, fillet, chamfer, trim, stretch, mirror, rotate, array, scale, hatch block. 3.5 Format commands: text style, dimension style, point, Line weight line type, line type scale. 3.6 Setting layers, layout& paper space.	
Unit-IV **Application of CAD**	4a. Understand the use of CAD commands in actual applications.	4.1 Line plan, Detailed Plan, elevation, section, site plan, Area statement, Rainwater harvesting 4.2 Generation of 3D view, plotting & printing Commands.	04
		TOTAL	**12**

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS (THEORY): Not Applicable

6.0 ASSIGNMENTS/TUTORIALS/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
01	II	Draw Symbols of civil engineering materials- i) Brick masonry ii) U. C. R. masonry iii) Concrete iv) Glass v) North direction vi) Steel sections vi) Doors and windows.	04
02	II	Draw Line Plan of a small residential building	04
03	II	Preparation of line plan of a Public building.	04
04	III	Preparation of submission drawing of residential building: showing Plan, Elevation, Section, Schedule of openings, Site Plan, Rain water harvesting structures and Area Statement.	12
05	IV	Draw section of zoned embankment type Earthen Dam.	04
06	IV	Plan, Cross Section and Longitudinal section of a Culvert (Pipe culvert/Box Culvert).	04
07	IV	Cross section of a National Highway in Cutting or embankment.	04
08	IV	Cross section of a Clarriflocculator.	04
09	IV	Sectional elevation of a bridge with Deck-slab, piers, abutments, wing walls and approaches.	04
10	IV	Sectional Layout of a Lift Irrigation Scheme showing Intake well, Jack well, Pump House, Rising main, various valves, and Main Distribution Chamber etc.	04
		TOTAL	**48**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show CAI 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
01	Working With AutoCAD	Ajit Singh	Tata McGraw Hills
02	Reference Manual of AutoCAD	Autodesk	Autodesk Inc.
03	Reference Manual of InteliCAD	InteliCAD	InteliCAD Inc.
04	Reference Manual of FelixCAD	FelixCAD	FelixCAD Inc.
05	Reference Manual of AutoCivil	Autodesk	Autodesk Inc.
06	Reference Manual of 3D-Max	Autodesk	Autodesk Inc.

B) Software/Learning Websites:

1. www.autodesk.com/solutions/cad-software

C) Major Equipment/ Instrument with Broad Specifications:

1. Desktop PC with compatible CAD softwares- 20 nos.
2. A3 size printers -02 nos.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	--	--	H	--	--	M	M	--	--
CO2	M	--	--	H	--	--	M	M	--	--
CO3	M	--	--	H	--	--	M	M	M	--
CO4	M	--	--	H	--	--	M	M	M	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE: Not Applicable

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Estimating and Costing (ESC). **COURSE CODE :** 21403

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	05	04	Max.	80	20	100	--	25	50	175
						Min.	32	--	40	--	10	20	--

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 Technical 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.

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 modes of measurement and types of estimate for different items of works.
2. Prepare approximate estimate of Civil Engineering works.
3. Prepare detailed estimates of Civil engineering works.
4. Prepare the detailed specification for various items of construction.
5. Justify the rates for given items of works using rate analysis techniques.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
Unit–I **Fundamentals of Estimating and Costing**	1a. Explain the procedure of the detailed estimate for the given structure. 1b. Prepare the check list for the given type of the civil structure. 1c. Select the mode of measurements for given items of work as per IS: 1200.	1.1 Estimating and Costing– Meaning, and purposes of Estimating and costing. 1.2 Types of estimates - Approximate estimate and detailed estimate. 1.3 Detailed estimate of new work. 1.4 Types and Uses of Estimates: Revised estimate, supplementary estimate, revised and supplementary estimate, repair and maintenance estimate.	06

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
	1d. Describe the required specifications for the given item of structure. 1e. Apply the rules of deduction as per IS1200 for calculating the quantities of a structure. 1f. Explain the salient features of the administrative and technical approval for the given project. 1g. Classify the given type of estimate on the basis of the purpose and type of work.	1.5 Roles and responsibility of Estimator. 1.6 Check list of items of work in load bearing and framed structure as per Execution. 1.7 Modes of measurement and desired accuracy in measurements of different items of work as per IS: 1200. 1.8 Rules for deduction in Masonry work, Plastering and Pointing and Painting work as per IS: 1200. 1.9 Description / specification of items of building work as per PWD State Scheduled Rates (SSR). 1.10 Standard formats of Measurement sheet, Abstract sheet, Face sheet.	
Unit-II **Approximate Estimate**	2a. Identify methods of approximate estimate. 2b. Calculate approximate estimate of a building. 2c. Prepare approximate estimate of structures for transportation, irrigation and environmental works.	2.1 Use of approximate estimate. 2.2 Methods of approximate estimate for building: plinth area Method, cubical content method, service unit Method, Typical bay method, approximate Quantity method. 2.3 Methods of approximate estimate for roads, railways, bridges, irrigation works, water supply and sanitary work.	04
Unit-III **Detailed Estimates**	3a. Identify methods of detailed estimate. 3b. Collect data required for preparing detailed estimate. 3c. Describe steps for preparing detailed estimate. 3d. Prepare list of items of works for detailed estimate. 3e. Take out the quantities of various building items using long wall short wall and centre line method. 3f. Select suitable method for estimation of earthwork quantity of different civil engineering works. 3g. Calculate earthwork quantity for roads, dams, canal and similar works. 3h. Work out steel	3.1 Uses of detailed estimate 3.2 Types of detailed estimates. Units quantity method, Total quantity method. 3.3 Data required for preparing detailed estimates:- drawing, specifications, rates, mode of Measurements. 3.4 Steps in Preparation of detailed estimates-taking out quantities, squaring-out, abstracting. 3.5 Procedure for taking out quantities for various items of works. • Long wall & short wall method. • Center line method. 3.6 Quantities for earthwork in roads, dams, canal & railway embankments: mid sectional area method, mean sectional area method, trapezoidal method and prismoidal formula	24

Unit	Major Learning Outcomes (In cognitive domain)	Topics and Sub-topics	Hours
	reinforcement quantity by preparing bar bending schedule. 3i. Provide various provisions in detailed estimate to work out the cost of structure. 3j. Prepare bill of quantities 3k. Prepare check lists for estimates.	method. 3.7 Taking out quantities for R.C.C. structural members such as column footing, column, beam & slab. 3.8 Preparing bar bending schedule for R.C.C. work. 3.9 Entering the quantities of items of work in standard measurement sheet. Abstracting in standard abstract sheet. 3.10 Provisions in detailed estimates for contingencies, work charged establishment, water charges, water Supply and sanitary works, electrification, tools & plants, quality control. 3.11 Preparing bill of quantities for various items of work. 3.12 Check list for estimates.	
Unit-IV **Specifications**	4a. State importance of specifications. 4b. List types of specifications 4c. Frame specifications for different civil engineering items.	4.1 Necessity and importance of specifications. 4.2 Points to be observed in framing specification of an item. 4.3 Types of specification: general, detailed, Standard and manufacturer's. 4.4 Preparing detailed specifications of items in Civil Engineering works. 4.5 Standard specifications book.	04
Unit-V **Rate Analysis**	5a. Write necessity and factors affecting rate analysis. 5b. Collect market/DSR rates for materials and labour. 5c. Identify the task work for various items. 5d. Calculate the quantities of material required for different items of work. 5e. Prepare rate analysis.	5.1 Meaning of the rate analysis. 5.2 Necessity of rate analysis. 5.3 Factors affecting rate analysis. 5.4 Market rates for material and labour. 5.5 State Schedule of Rates (SSR). 5.6 Definitions of task work, task work for items, Factors affecting task work. 5.7 Vehicles for transporting construction materials and their capacities. Transportation charges. 5.8 Quantity of materials required for different items of works. 5.9 Preparing rate analysis for items in Civil Engineering works.	10
		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	Fundamentals of Estimating and Costing	04	04	04	12
II	Approximate Estimate	04	--	04	08
III	Detailed Estimates	04	08	28	40
IV	Specifications	02	04	--	06
V	Rate Analysis	02	04	08	14
	TOTAL	**16**	**20**	**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/TUTORIALS/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	I	Identify Units and modes of measurements for at least 25 civil engineering construction items	04
02	III	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
03	III	Detailed estimate of a residential R.C.C. building.	20
04	III	Calculation of quantities of RCC (steel reinforcement) for small hall and preparing bar bending schedule.	08
05	III	Preparing detailed estimate of W.B.M. Road.	08
06	III	Preparing detailed estimate of septic tank.	04
07	IV	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
08	V	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	06

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

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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. Prepare abstract sheet using a excel sheet or suitable estimation software .

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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.

9.0 LEARNING RESOURCES:

A) Books:

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

B) Software/Learning Websites:

1. http://www.mahapwd.com

C) Major Equipments/ Instruments with Broad Specifications: Not applicable

10.0 MAPPING MATRIX OF PO'S, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	--	--	H	H	M	H	H	--
CO2	H	H	--	--	M	H	M	H	M	--
CO3	M	H	M	M	H	H	H	H	H	--
CO4	M	M	--	--	H	H	M	H	H	--
CO5	H	H	M	--	M	H	M	H	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	12	16	08	08	--	--	--	--	16
II	CO.2	08	11	04	08	--	--	--	--	12
III	CO.3	40	54	08	--	16	18	12	--	54
IV	CO.4	06	08	04	--	--	--	04	--	08
V	CO.5	14	19	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**110**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	12							06							44							06							12							80
1.35 Times marks	16							11							54							08							19							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1								2	2				3	3	3	3	3						4		4		5	5	5	5			5	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	28
Q2	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	16							12							54							08							20							110
TOTAL																																				110

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Contracts Accounts and Valuation (CAV) **COURSE CODE :** 21404

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	Hrs				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	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, accounts and valuation. 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.
5. 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. Execute the civil engineering work as per PWD procedure.
2. Prepare tender documents for Civil engineering works.
3. Execute the contract for civil engineering works.
4. Prepare bills of contractors.
5. Determine the value of any property.

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 functions of personnel in PWD. 1c. State the meaning and purpose of administrative approval, technical sanction & budget provision. 1d. Describe methods of executing of work in PWD and private sector.	1.1 PWD organisation: Organisation structure, function of their personnel, PWD procedure of initiating the work. 1.2 Administrative approval, Technical sanction, Expenditure sanction, Budgets provision. 1.3 Methods of execution: Contract method, Departmental method- Daily wage labour method, piece work method, rate list method, day work method. 1.4 Procedure of execution of works by appointing contractors in private sector.	06

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 for given type of work. 2c. State various tender documents. 2d. State Procedure of preparation submission and opening of tenders. 2e. State procedure of scrutiny of tender. 2f. State E-tendering system of submission of tender.	2.1 Definition of tender, classification of tenders, Tender form, types of tender forms. 2.2 Tender notice:- Tender notice, pointes to be included while drafting tender notice, drafting of-tender notice. 2.3 Tender documents:-Index, tender notice, general instructions, special instructions, Schedule-A, Schedule-B Schedule-C, terms related to condition of contract-Earnest money, Security deposit, Time limit. Preparation of tender documents for building, road and Irrigation works. 2.4 Invitation of tenders, Method of preparing and submitting tenders (Two envelop system), procedure of opening of tender, comparative statement, scrutiny of tenders, Rejection of tenders, Acceptance of tenders, work order. 2.5 Corrigendum to tender notice and its necessity, unbalance tender, Ring formation. 2.6 E-tendering system:-online procedure of submission of tender in PWD.	12
Unit-III **Contracts & Conditions of Contracts**	3a. State requirement of valid contract. 3b. State and explain various types of contracts with their suitability, advantages& disadvantages 3c. State procedure of registration as contract in PWD 3d. State and explain conditions of contract. 3e. Explain Indian contract act.	3.1 Definition, object and requirement of valid contract Documents. 3.2 Types of contracts: - Lump sum, Item rate, percentage rate, cost plus percentage rate contract, labour contract, target contract, demolition contract, negotiated contract, all in one contract, sub contract and BOT type contract. 3.3 Class of contractor. Procedure of registration of Contractor in PWD 3.4 Conditions of contract- Defect liability period, liquidated damages and unliquidated damages, Escalation price and extra items. 3.5 Arbitration, Termination of contract, Subletting of Contract. 3.6 Indian contract act.	12
Unit-IV **Payments of Works & Accounts In PWD**	4a. Rule out the Format of M.B. and nominal muster roll, 4b. State the guide lines for writing M.B. 4c. State different modes of payments and their use	4.1 Procedure of measurement of works and recording items of work in measurement book, nominal muster roll (NMR). Inspection and checking the measurements. 4.2 Interim payment, secured	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	4d. State various advances given to contractor. 4e. State the heads of accounts. 4f. State importance of maintaining accounts of works &store and its computerisation.	advance, advances payment, petty advances. 4.3 Running Bill and final bill, Mobilization advance, bill form. 4.4 Importance of maintaining accounts of works and stores. 4.5 Classification of accounts, Heads of Accounts. 4.6 Daily diary, imprest, indent, bin card, cashbook, work abstract. 4.7 Computerization of accounts in office and store	
Unit-V **Valuation**	5a. Differentiate between cost, price and value. 5b. State different methods of depreciation. 5c. Describe different methods of valuation. 5d. Evaluate capitalized value of building. 5e. Calculate rent of building. 5f. State free hold property and lease hold property.	5.1 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. 5.2 Methods of calculating depreciation - straight line Method, sinking fund method, constant Percentage method, quantity survey method. 5.3 Computation of capitalized value, gross income, Outgoing, Net-Income, Year's purchase. Types of outgoings and their percentage. 5.4 Valuation of lands and buildings, factors affecting their valuation, Differed value of land. 5.5 Fixation of rent as per P.W.D. Practice 5.6 Lease hold property, free hold property, types of Lease Mortgage, Mortgage deed	10
		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	04	04	12
II	Tender and Tender Documents	04	06	10	20
III	Contracts & Conditions of Contracts	04	08	08	20
IV	Payments of Works & Accounts	04	04	04	12
V	Valuation	02	04	10	16
	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/TUTORIALS/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
01	II	Collect tender notices published in newspaper regarding various civil engineering works (at least five). Write salient features of tender notice	04
02	II	Drafting a tender notice for following domains a) Building construction b) Highway engineering c) Irrigation engineering d) Environmental engineering	04
03	II	Collection of tender document set from PWD and writing a report on it.	04
04	II	Preparation of following tender documents as per PWD norm for building works. a) Tender notice b) Tender agreement c) Schedule A & Schedule B	04
05	III	Assignment on contract	02
06	III	Write a report on condition of contract by referring tender document.	04
07	IV	Assignment on payments of works and supplies.	02
08	I & IV	Visit to PWD organisation to study procedure of execution of work and writing report on it.	04
09	V	Determine the valuation of given structure and writing valuation report.	02
10	V	Determine the monthly rent of the given building/quarter as per PWD method/norms.	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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 various account forms used in PWD.
5. Collect information and writing report on E-tendering system.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Estimating & Costing	B. N. Dutta	UBS Publishers and distribution Ltd, Ansari, Road Delhi.
02	Estimating & Costing	G. B. Birdie	Dhanpat Rai & Sons.
03	Elements of Estimating and Costing	S. C. Rangwala	Charotar publishers house Anand
04	Contracts & Estimates	B. S. Patil	Orient Longman Ltd Delhi.
05	Schedule of Rates (D.S.R.)	P.W.D. Nashik Circle, Nashik	Govt. of Maharashtra
06	Standard specification book	P.W.D. Nashik Circle, Nashik	Govt. of Maharashtra
07	Estimating, costing Specification & valuation in Civil Engineering	M. Chakraborty	M. Chakraborty Kolkata

B) Software/Learning Websites

1. http://www.mahapwd.com
2. http://www.mahtenders.gov.in
3. http://cpwd.gov.in/cpwde_tender.aspx

C) Major Equipments/ Instruments with Broad Specifications: Not Applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	--	--	H	H	M	H	H	--
CO2	H	--	--	--	M	H	M	H	M	--
CO3	M	--	--	--	H	H	M	M	H	--
CO4	M	M	--	L	--	H	M	M	H	--
CO5	H	M	M	--	--	M	M	M	M	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	12	16	04	12	--	--	--	--	16
II	CO.2	20	27	08	04	16	--	--	--	28
III	CO.3	20	27	08	--	--	16	04	--	28
IV	CO.4	12	16	04	--	--	--	12	--	16
V	CO.5	16	22	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	12							20							20							12							16							80
1.35 times marks	16							27							27							16							22							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**					**2**	**2**	**2**	**2**				**3**	**3**	**3**	**3**	**3**			**4**	**4**	**4**	**4**	**4**	**4**		**5**	**5**	**5**	**5**			**5**	
Q1	4	-	-	-	-	-	-		4	4		-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**16**							**28**							**28**							**16**							**20**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Theory of structures (TOS) **COURSE CODE :** 21405

TEACHING AND EXAMINATION SCHEME:

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

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. Analyse simple frames and calculate stresses on given plane for the element with given state of stress.
2. Calculate resultant stresses due to direct and bending action and draw stress diagram.
3. Analyse Statically Determinate structures for slope and deflection and calculate support moments in fixed beam.
4. Analyse continuous beam and propped cantilever to find support moments by three moment's theorem and draw shear force and bending moment diagram.
5. Analyse continuous beam and propped cantilever to find support moments by moment distribution method and draw shear force and bending moment diagram.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Simple Frames, Principal Planes & Principal Stresses**	1a. Analyse Statically determinate Trusses and frames 1b. Calculate Normal and shear stress on a inclined plane in an element subjected to plane stress condition 1c. Calculate Principal Stresses, Principal Planes, maximum shear stress and their Planes.	1.1 Definition of frame, classification of frames - perfect, imperfect and redundant frames, relation between number of members and number of joints. Assumptions in analysis of frames 1.2 Method of joints and method of sections for analysis of simply supported or cantilever perfect frame, nature of forces in members. 1.3 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).	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		1.4 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	
Unit-II **Direct and Bending Stresses**	2a. Calculate Direct & Bending Stresses of various structural components 2b. Draw stress distribution diagram for the given section	2.1 Concept of direct and eccentric loads 2.2 Tension and compression members subjected to load with eccentricity about 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)	08
Unit-III **Slope, Deflection and Fixed Beams**	3a. Compute deflection & slope induced in Statically determinate Beams 3b. Distinguish between determinate and indeterminate structures 3c. Draw Shear Force & Bending Moment Diagram for Fixed Beams	3.1 Concept of slope and deflection, slope and deflection of determinate beam subjected to bending. 3.2 Relation between slope, deflection and Radius of curvature, differential equation (no derivation) 3.3 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.) 3.4 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) 3.5 Introduction to Determinate and Indeterminate structures. Concept of fixity, effect of fixity, Advantages and disadvantages of fixed beams, fixed end moments, Principle of superposition. 3.6 Derivation of formula for fixed end moments of fixed beam subjected to point load at mid span, point load at point other than mid span and uniformly distributed load over entire span from	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		first principle. 3.7 Application of standard Formulae (superposition Method) or differential equation method (From first principle) for finding end moments and drawing Shear force and bending moment diagrams for fixed beams subjected to concentrated and uniformly distributed loads over entire span, drawing S.F. and B.M. Diagrams. (No Problems involving application of applied Moment or couple & partial UDL)	
Unit-IV **Continuous Beams**	4a. Calculate Shear Force & Bending Moment Values for Continuous Beam using Theorem of Three Moments 4b. Draw Shear Force & Bending Moment Diagram	4.1 Definition of continuous beam, effect of continuity, and nature of moments induced due to continuity, concept of deflected shape. 4.2 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 or couple) Drawing shear force and bending moment diagrams. The cases of fixed ends and Overhangs and Propped cantilever are included in application.	08
Unit-V **Moment Distribution Method**	5a. Calculate Shear Force & Bending Moment Values for Beam using Moment Distribution Method 5b. Draw Shear Force & Bending Moment Diagram	5.1 Sign conventions, 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) 5.2 Application of Moment distribution method to single bay, single storey symmetrical Portal frames, S.F. and B.M. diagrams (without sway action) 5.3 Application of moment distribution method to propped cantilever with or without overhang	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	Simple Frames, Principal Planes & Principal Stresses	02	04	10	16
II	Direct and Bending Stresses	02	04	10	16
III	Slope, Deflection and Fixed Beams	02	04	10	16
IV	Continuous Beams	02	04	10	16
V	Moment Distribution Method	02	04	10	16
	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/TUTORIALS/PRACTICALS/TASKS: Not Applicable

7.0 SUGGESTEDSTUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show videos and slides involving structures continuous beam reinforcement, structural component subjected to direct and bending action.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Strength of Materials	Singer and Pytel	Harper & Row
02	Theory of Structures	Ramamrutham	Dhanpat Rai publishing Co. (P) Ltd
03	Strength of Materials	Schaum's outline Series, William Nash	McGraw Hill
04	Strength of Materials	Timo Shenko and Young	CBS Publishers & distributers
05	Theory of Structures	R. S. Biyani	Vrinda Publications
06	Theory of Structures	Sunil S. Deo	Nirali Publications
07	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: Not Applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	M	--	--	--	L	--	--	M
CO2	H	M	M	--	--	--	L	--	--	M
CO3	H	M	M	--	--	--	L	--	--	M
CO4	H	M	M	--	--	--	L	--	--	M
CO5	H	M	M	--	--	--	L	--	--	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.475 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	24	08	18	--	--	--	--	26
II	CO.2	16	23	04	--	18	--	--	--	22
III	CO.3	16	23	04	--	--	18	--	--	22
IV	CO.4	16	24	04	--	--	--	18	--	22
V	CO.5	16	24	08	--	--	--	--	18	26
	TOTAL	**80**	**118***	**28**	**18**	**18**	**18**	**18**	**18**	**118**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	16							16							16							16							16							80
1.475 Times Marks	26							22							22							22							26							118
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	28
Q2	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q3	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	18
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	18
Sub Total	**26**							**22**							**22**							**22**							**26**							**118**
TOTAL																																				**118**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Design of RCC Structures (RCC) **COURSE CODE :** 21406

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	04	07	05	04	Max.	80	20	100	--	25	50	175
						Min.	32	--	40	--	10	20	--

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 & behaviour 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 of simple structures.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Understand the design procedure of singly reinforced RCC beam
2. Understand the design procedure of RCC beam for shear and development length.
3. Understand the design procedure of RCC slab.
4. Understand the design procedure of short RCC columns.
5. Understand the design procedure of RCC footing.

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. Design singly reinforced RCC beam
2. Design RCC singly reinforced beam for shear and development length.
3. Design RCC one way slab.
4. Design short RCC square columns.
5. Design RCC square footing.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit- I **Design of Singly Reinforced beam by Limit State Method**	1a. Explain Limit State Method and its types. 1b. Explain design compressive and tensile strength of concrete and steel for Limit State Method. 1c. Design of Singly Reinforced Rectangular beam Section in Flexure	1.1. Definition of Limit State, Types of Limit States. (Limit State of Collapse – Flexure, Shear, Compression, Torsion, Limit State of Serviceability- Deflection, Cracking.) 1.2. Characteristic strength of concrete and steel, partial safety factor for concrete and steel strength. 1.3. Characteristic load, partial safety factor for load, design or factored load. 1.4. Loadings on structure as per IS	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		875-1987. 1.5. IS 456-2000 specifications regarding spacing of reinforcement, cover, minimum & maximum reinforcement in RC members, and effective span of beam or slab. 1.6. Assumptions for Limit State of collapse due to flexure 1.7. Design SS singly reinforced rectangular beam for given load or moment. (i.e. to find size of beam and steel area)	
Unit-II **Design of RCC Beam for Shear And Bond**	2a. Design Stirrups for R.C Rectangular Beam 2b. Apply shear checks as per requirements of IS. 2c. Apply checks for development length.	2.1. Necessity of shear reinforcement, Nominal shear stress, design shear strength of concrete, maximum shear stress in concrete. 2.2. Minimum shear reinforcement, forms of shear reinforcement, maximum spacing of stirrups. 2.3. Design of shear reinforcement, 2.4. 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) 2.5. Reinforcement details for shear and bond in simply supported beams and one way slabs.	08
Unit- III **Design of Slab**	3a. Identify type of Slab from drawing. 3b. Design & Draw detail drawings of One Way Simply Supported Slab 3c. Apply checks for shear & deflections.	3.1. 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. 3.2. Procedure and numerical problems on design of one way simply supported slab with corners free to lift, check for shear & deflection. 3.3. Arrangement of reinforcement in cantilever slab, two way slab and dog-legged legged stair. (No design problem)	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-IV **Design of Column Limit State of Collapse: Compression**	4a. Analysis and Design of axially Loaded Short square column	4.1. Assumption, Minimum Eccentricity, Short Column, Long Column, Effective Length Of Column. 4.2. Reinforcement Requirements as per IS provisions, draw reinforcement details. 4.3. Design of axially loaded short square columns only with lateral ties.	10
Unit-V **Design of Footing**	5a. Design of isolated square footing and provide reinforcement details of footing	5.1. Types of Footings, 5.2. Design of axially loaded isolated square footing with uniform depth for square columns only. 5.3. Depth of footing for shear and bending moment.	10
		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	Design of Beam	04	04	08	16
II	Design of Beam for Shear and Bond	04	04	08	16
III	Design of Slab	02	04	10	16
IV	Design of Column	04	04	10	16
V	Design of Footing	02	04	08	16
	TOTAL	**16**	**20**	**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/TUTORIALS/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
01	I, II, III, IV, V	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	28

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		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. Column reinforcement details. 7. Footing reinforcement details 8. Dog Legged Stair Case	
02	I, II, III, IV, V	• Design project of a G + 1 reinforcement details, RCC framed structure of Samaj mandir or multipurpose hall : • Design of slabs, beams, columns and footings for a simple plan of a G + 1 RCC framed structure of Samaj mandir or multipurpose hall 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 • The students shall submit the design details in the following form: a) Design Report & calculations. b) Two full imperial size drawing sheets finished in pencils or AUTOCAD containing i) Key-plan ii) Reinforcement detailing for sample slabs and beams, column, column footing.	36
		TOTAL	**64**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

Study and Interpretation of Professional Structural Drawings:

Professional structural drawings including reinforcement detailing of the components slabs, beams, columns, footings and stair-case.

1. Visit a typical building/construction site and collect details of design and construction.
2. Collect typical photographs of building elements under different stage of construction.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Massive open online courses **(MOOCs)** may be used to teach various topics / subtopics.
2. About **15-20% of the topics/sub-topics,** which is relatively simpler or descriptive in nature, is to be given to the students for **self-directed learning** and assess the development of the Cos through classroom presentations (see implementation guide line for details).
3. Teachers need to ensure to create opportunities and provisions for co-curricular activities.
4. Guide student(s) in undertaking micro-projects.
5. Arrange visit to nearby newly started construction site for Residential & Commercial Buildings to show reinforcement, cutting and laying of reinforcement, structural drawings

9.0 LEARNING RESOURCES:

A) Books:

Sr. No.	Title of Book	Author	Publication
01	IS-456 – 2000	--	Bureau of Indian Standard
02	Design Aid – SP - 16	--	Bureau of Indian Standard
03	R.C.C. Detailing – SP - 34	--	Bureau of Indian Standard
04	Reinforced Concrete	Dr. H. J. shah	Charotar Publication
05	RCC Theory and Design	Dr. V. L. Shah & S. R. Karve	Structures Publications
06	Illustrated RCC Design	Dr. V. L. Shah & S. R. Karve	Structures Publishers.
07	Design of R.C.C. Structures	B. C. Punmia, Ashok Kumar Jain, & Arun Kumar Jain	Laxmi Publications (P) Ltd
08	R.C. Struct. Elements, Behaviour, analysis & Design	Purushothaman P.	TMH Pub. Co. Ltd.,
09	Limit State Theory & Design of R.C.	Dr. V. L. Shah & S. R. Karve	Structures Publication

B) Software/Learning Websites:

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

C) Major Equipment/ Instrument with Broad Specifications: Not applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	M	H	--	M	--	--	--	--	H
CO2	--	M	H	--	M	--	--	--	--	H
CO3	--	M	H	--	M	--	--	--	--	H
CO4	--	M	H	--	M	--	--	--	--	H
CO5	--	M	H	--	M	--	--	--	--	H

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.475 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	24	08	18	--	--	--	--	26
II	CO.2	16	23	04	--	18	--	--	--	22
III	CO.3	16	23	04	--	--	18	--	--	22
IV	CO.4	16	24	04	--	--	--	18	--	22
V	CO.5	16	24	08	--	--	--	--	18	26
	Total	**80**	**118***	**28**	**18**	**18**	**18**	**18**	**18**	**118**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	16							16							16							16							16							80
1.475 Times marks	24							23							23							24							24							118
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	28
Q2	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q3	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	18
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	18
Sub Total	**26**							**22**							**22**							**22**							**26**							**118**
TOTAL																																				**118**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Design of Steel Structures (DSS) **COURSE CODE :** 21407

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	04	Max.	80	20	100	--	25	25	150
						Min.	32	--	40	--	10	10	--

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 behaviour 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 forces for member.
4. Understand provisions of 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 IS 800: 2007 for designing the members.
7. Read and interpret the structural drawings.

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, design and analyse bolted and welded connection.
2. Design and analyse tension members in steel structures.
3. Design and analyse compression members in steel structures.
4. Study different classes of beam section, study and draw types of steel roof trusses.
5. Design and analyse slab base type column base.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Bolted & Welded Connections (Limit State Method)**	1a. State types of steel joints and their modes of failure. 1b. Find strength of bolt. 1c. Design bolted connection. 1d. Design of welded steel joints	1.1 Various types of rolled steel sections used, types of structural steel, I.S. code specifications, Advantages and disadvantages of steel as construction material. 1.2 Use of steel table and relevant I.S. Code IS800:2007. Types of loads on steel structure as per IS 875-1987 part I to III specifications. 1.3 Methods of Design: Working stress method, Limit State Method. 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. 1.4 Types of bolt: 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 1.5 Design strength of bolt in shear, tension and bearing. Tension capacity of plate. Efficiency of joint. 1.6 Analysis and design of bolted joints for axially loaded lap and butt joint connection. 1.7 Introduction and types of welds. Advantages and disadvantages of welded joints, Types- butt and fillet welds and their symbols, size of weld, throat thickness. 1.8 Analysis and design of welded joint (fillet weld, single & double V-butt weld) for lap and butt joint connections subjected to axial load. (Simple numerical problems on bolted and welded connections)	12
Unit-II **Design of Tension Members (Limit State Method)**	2a. State different types of tension members. 2b. List types of steel sections used for tension members. 2c. Analyse and design tension member connected by bolted and welded joints	2.1 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.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		2.2 Analysis and design of axially loaded single angle and double angle tension members with bolted and welded connections.(Simple Numerical Problems)	
Unit-III **Design of Compression Members (Limit State Method)**	3a. State different types of steel sections used for compression members 3b. Analyse and design compression member connected by bolted or welded joints	3.1 Types of steel sections used for compression members, effective length, radius of gyration, slenderness ratio and its limits, design compressive stress. 3.2 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. 3.3 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. 3.4 Introduction to lacing and battening: Meaning and purpose. Diagrams of single and double lacing and battening system. IS code requirements only. (No design)	10
Unit-IV **Beams, Steel Roof truss (Limit State Method)**	4a. List different sections used for beams. 4b. Study different Classes of section 4c. List Types of steel roof trusses used in industries.	4.1 Different steel sections used for beams, simple and built-up sections. 4.2 Meaning of Plastic (Class-1), Compact (Class -2), Semi-compact (Class-3) and Slender (Class-4 sections). 4.3 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. (No numerical problems on analysis and design of beams, girders and trusses) 4.4 Types of steel roof trusses for different spans (Simple and Compound Fink, Pratt, Howe, Fan, North Light roof truss)(No numerical problems on trusses)	08
Unit-V **Column Bases (Limit State Method)**	5a. Draw component parts of steel foundations. 5b. Draw the sketch of slab base and gusseted base foundations 5c. Analysis and design of slab base foundation.	5.1 Types of steel foundations- Slab Base foundation, Gusseted base foundation 5.2 Design of Slab base foundation. 5.3 Introduction to Gusseted base Foundations: Meaning and purpose. No numerical problems on analysis	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		and design of gusseted base foundation.	
		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	Bolted & Welded Connections (Limit State Method)	02	04	10	16
II	Design of Tension Members (Limit State Method)	02	04	10	16
III	Design of Compression Members (Limit State Method)	02	04	10	16
IV	Beams, Steel Roof truss (Limit State Method)	02	04	10	16
V	Column Bases (Limit State Method)	02	04	10	16
	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/TUTORIALS/PRACTICALS/TASKS:

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
01	I	Typical sketches of type of sections	02
02	I	Details of welded connections	02
03	IV	Different types of roof truss and truss details	02
04	I	Force transfer mechanism of bolted connections - Bearing and friction connection	02
05	I	Details of bolted connections and failure of bolted joints	02
06	IV	Framed connections :beam to beam and beam to column	02
07	II	Typical sketches of sections of tension members	02
08	III	Typical sketches of sections of compression members	02
09	III	Lacing and battening of columns	02
10	V	Column base – Slab base foundation	02
11	V	Gusseted base foundation	02
12	IV	Lug angle and tension splices	02
13	IV	Details of plate girder section	02
14	I,II,III,IV,V	Important information of clause of IS-800-2007 and IS 875 (part I to part II)	02
15	II,III,IV,V	Important information of clauses of IS 800-2007 and IS 875 (part III)	02
16	II,III,IV,V	Important information of clauses of IS 800-2007 and IS 875 (part IV)	02
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect the Photographs of Typical Roof Trusses from nearby steel structures 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 from nearby steel structures

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Site Visit must be arranged for Industrial Truss to explain Truss terminology and Connection Details
2. Show video of Fabrication work using Bolts and Welds

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	IS-800 – 2007, Indian Standard code of practice for use of structural steel in general building construction,	Bureau of Indian Standard	BIS, New Delhi.
02	Handbook on Steel – SP-6	Bureau of Indian Standard	BIS, New Delhi.
03	IS – 875, 1987, Part-1 to 5: Indian Standard Code for Loading Standards	Bureau of Indian Standard	BIS, New Delhi.
04	Limit State Design of Steel Structures	Dr. V. L. Shah and Mrs. Veena Gore	Structures Publications, Pune
05	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.
06	Hand book for Structural Engineers 1, Structural Steel Section (Revised)	BIS	SP:6(1)-1964 Reaffirmed 2003
07	Design of Steel Structures	P. Dayarathnam	S. Chand and Co.
08	Analysis and Design Practices of Steel Structures	Ghose	PHI Learning
09	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:

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

C) Major Equipments/ Instruments with Broad Specifications: Not Applicable

10. MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	H	H	--	--	--	L	--	M	H
CO2	H	H	H	--	--	--	L	--	M	H
CO3	H	H	H	--	--	--	L	--	M	H
CO4	H	H	H	--	--	--	L	--	M	H
CO5	H	H	H	--	--	--	L	--	M	H

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

11. SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.475 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	24	08	18	--	--	--	--	26
II	CO.2	16	24	08	--	18	--	--	--	26
III	CO.3	16	24	04	--	--	18	--	--	22
IV	CO.4	16	23	04	--	--	--	18	--	22
V	CO.5	16	23	04	--	--	--	--	18	22
	Total	**80**	**118***	**28**	**18**	**18**	**18**	**18**	**18**	**118**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							Total
CO	1							2							3							4							5							
Marks per Unit	16							16							16							16							16							80
1.475 Times marks	26							26							22							22							22							118
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	5	
Q1	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	4	28
Q2	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q3	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	-	-	-	-	-	-	-	18
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	6	6	-	-	-	-	18
Sub Total	**26**							**26**							**22**							**22**							**22**							**118**
TOTAL																																				**118**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Environmental Engineering (ENE) **COURSE CODE :** 21408

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100		25	25	150
						Min.	32	--	40		10	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 of 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 quality and quantity of water for village/town/city.
2. Understand different methods of water treatment & Construction and maintenance aspects of treatments.
3. Know the methods of collection and disposal of solid waste.
4. Understand different methods of sewage treatment, construction and maintenance aspects of 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. Estimate the quantity of drinking water required for a population.
2. Select appropriate source of water.
3. Suggest appropriate treatment to raw water based on its quality.
4. Suggest appropriate plumbing system.
5. Select appropriate sewage treatment process based on quality of sewage.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Estimation of Demand of Water**	1a. Explain Importance of water supply engineering 1b. Estimate the demand of water required for city/village	1.1 General importance of environmental engineering. 1.2 Need for protected water supply, water borne diseases. 1.3 Need for disposal of waste	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	1c. Enlist factor affecting water demand	1.4 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 IS1172. 1.5 Variation in rate of demand. 1.6 Design period for water supply scheme. 1.7 Forecasting population, methods of forecasting 1.8 Estimation of total quantity of water for a town	
Unit-II **Sources and Quality of Water**	2a. Identify sources of water for potable use 2b. Select the source of water 2c. Determine characteristics of raw water 2d. List Standards of quality of water with their permissible limits	2.1 Classification of sources- Surface, Subsurface, Adequacy of source. 2.2 Intakes- Canal Intake, reservoir intake, river intake, lake intake. Factors governing location and construction of intakes. 2.3 Quality of Water- Meaning of potable water, impurities present in Water and its classification. Need for analysis of water. 2.4 Characteristics of Water 2.5 Physical Characteristics: Colour, taste and odour and turbidity. 2.6 Chemical Characteristic: Total solids, hardness, chlorides, dissolved gases, pH, Nitrogen and its compounds. Bacteriological Characteristic: E Coil Index, MPN. 2.7 Water sampling for tests, precautions to be taken for Collection of sample. Standards for potable water as per I.S. Specifications	06
Unit-III **Treatment of Water and Distribution of Water**	3a. State objectives of water Treatment 3b. Describe principles used in water treatment. 3c. Explain function of various stages of treatment of influent water 3d. Suggesting and planning suitable water supply scheme 3e. Describe working principle of Laying of Pipes for Conveyance of Water 3f. Explain necessity of	3.1 Screening- Types of screens 3.2 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. 3.3 Filtration: Objects of filtration, theory of filtration, filter media, depth and grading of sand bed, classification of filters- slow sand, rapid sand filters, construction, working and design aspects,	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	maintenance of water supply mains	suitability, merits and demerits, loss of head and negative head, back washing of rapid sand filters. 3.4 Disinfection: - objects of disinfection, methods of disinfection, chlorination- different forms of chlorination, points of chlorination, residual chlorine 3.5 Flow diagram of water treatment plant, components of a water treatment plant. 3.6 Methods of distribution of water- Gravity, pumping and combined system 3.7 Service reservoirs: functions and type. 3.8 Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.	
Unit-IV **Sanitary Engineering and Sewerage System**	4a. Explain house plumbing system 4b. Describe plumbing practice and safety precautions 4c. List sanitary fittings used in house plumbing &tools used 4d. Plan house plumbing work 4e. Discuss methods of sewage collection 4f. Describe 4g. Conservancy system & Water carriage system 4h. Explain Testing and maintenance of sewer	4.1 Necessity of building sanitation. 4.2 Terms: sewage, sludge, storm, water pipe, rainwater pipe, anti-siphonage pipe Building Sanitation 4.3 Traps- Nhani trap, Gully trap P, Q, S Traps, their function, use and location. 4.4 Systems of plumbing: Single stack system, one pipe system, two pipe system, choice of system, 4.5 Types of Pipes used for conveyance of water and sewage, choice of pipe material. 4.6 Types of joints & Types of valves- their use, location and function on a pipeline. 4.7 Principles of septic tank, its design and working, soak pit 4.8 Rural sanitation- Necessity and importance, Aqua privy and Bore Hole Latrine 4.9 Systems of sewerage- separate system, combined system, partially separate system, comparison and their suitability. 4.10 Types of sewers- Shapes and materials used, their suitability and selection.	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		4.11 Laying of sewers, testing of sewers, Maintenance of sewers. 4.12 Man hole, component parts, location, spacing	
Unit-V **Treatment of Sewage**	5a. List characteristics of sewage 5b. Explain the testing, by different test like B.O.D. Test, C.O.D. test 5c. Explain sewage treatment process 5d. Explain methods of sewage disposal	5.1 Characteristics of sewage. 5.2 BOD and its significance, strength of sewage. 5.3 Aerobic and Anaerobic process. Sewage Treatment 5.4 Objects of sewage treatment. 5.5 General layout flow diagrams of sewage treatment plant for a small town including primary and secondary treatment. 5.6 Introduction and Function of grit chamber, skimming tank, sedimentation tank, sludge digestion tank and trickling filters, Activated sludge process. 5.7 Disposal of sewage: Digestion of sludge and its disposal (Only brief knowledge) Oxidation pond: Principle, working, design and layout.	10
Unit-VI **Solid Waste And Industrial Waste**	6a. Explain different methods of recycling waste water 6b. Explain management and utilization of solid waste generated from society 6c. List types of Industrial Waste 6d. List characteristics of industrial waste 6e. Explain different methods of disposal of industrial waste	6.1 Definitions: Refuse, Rubbish, Garbage, Ashes, 6.2 Constituents of solid wastes. Sources of solid wastes, 6.3 Collection of Solid Wastes. 6.4 Methods of collection of solid wastes. 6.5 Methods of treatment and disposal of solid waste. 6.6 Types of industrial waste Hazardous and non-hazardous waste, 6.7 Hazardous Wastes Introduction, Types of hazardous wastes. 6.8 Characteristics of hazardous wastes. 6.9 Treatment and disposal of hazardous wastes. 6.10 Major characteristic of waste from the following industries: textile, sugar, leather, dairy paper and pulp and food.	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	Estimation of Demand of Water	02	02	04	08
II	Sources and Quality of Water	02	04	04	10
III	Treatment of Water and Distribution of Water	04	08	14	26
IV	Sanitary Engineering and Sewerage System	02	04	06	12
V	Treatment of Sewage.	02	04	08	14
VI	Solid Waste and Industrial Waste	02	08	--	10
	TOTAL	**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/TUTORIALS/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
01	III	To determine pH of the given sample of water.	02
02	III	To determine the turbidity of the given sample of water.	02
03	III	To determine residual chlorine in a given sample of water.	02
04	III	To determine the total solids of the water sample.	02
05	III	To determine the optimum dose of coagulant in the given sample by jar test.	04
06	VI	Design of septic tank for a public building such as hostel or hospital	02
07	VI	Draw details of septic tank (plan & section) with location of soak pit.	02
08	VI	Visit to residential and public buildings to study the different systems of plumbing and sanitary fittings.	06
09	IV	Visit to water treatment plant / sewage treatment plant. Write report on it.	06
10	VI	Preparing layout of house drainage system.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collecting rates of plumbing materials

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. 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
01	Environmental Engineering	Kamala, A & Kanthrao D. L.	Tata McGraw Hill-New York
02	Water supply Engineering	Gharpure V. L.	Engineering book publishing co. Pune
03	Water supply and sanitary Engg. Part-I	Gurucharansingh	Standard Publisher Distributors: New Delhi
04	Water supply and sanitary Engg.	Rangwala S. C.	Anand Charotar-Delhi
05	Water supply and sanitary Engg.	Santosh Garg	Khanna publisher, New Delhi
06	Water supply and sanitary Engg.	Hussain S. K.	Oxford and IBH New Delhi
07	Water supply and sanitary Engg.	G. S. Birdie	Dhanpat Rai and Sons, New-Delhi

B) Software/Learning Websites:

1. www.nptel.se.in

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, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	M	--	--	H	H	M	H	H	--
CO2	H	H	--	--	M	H	M	H	M	--
CO3	M	H	M	M	H	H	H	H	H	--
CO4	M	M	--	--	H	H	M	H	H	--
CO5	H	H	M	--	M	H	M	H	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	08	12	04	08	--	--	--	--	12
II	CO.2	10	14	02	08	04	--	--	--	14
III	CO.3	26	34	06	--	12	16	--	--	34
IV	CO.4	12	16	--	--	--	--	16	--	16
V	CO.5	14	18	06	--	--	--	--	12	18
VI	CO.5	10	14	10	--	--	--	--	04	14
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**VI**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							**5**							
Marks per Unit	08							10							26							12							14							10							80
1.35 Times marks	12							14							34							16							18							14							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	-	-	-	-	**2**	**2**	**2**	**2**	-	-	-	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	-	-	-	**5**	**5**	**5**	**5**	-	-		
Q1	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28
Q2	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**12**							**12**							**36**							**16**							**16**							**16**							**108**
TOTAL																																											**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Irrigation Engineering (IRG) **COURSE CODE :** 21409

TEACHING & EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	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. Calculate the yield from catchments.
2. Design and fix the control levels of reservoirs.
3. Decide the section of Dams.
4. Design the Canals section for irrigation requirement.
5. Identify the types of water shed management 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. Identify irrigation practices.
2. Calculate the yield from catchments.
3. Design & fix control levels of dam.
4. Suggest suitable section of dam.
5. Decide canal capacity of canals.
6. Supervise and maintain irrigation structure.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Irrigation Practices**	1a. Define irrigation. 1b. Classify irrigation schemes and projects. 1c. Identify minor irrigation schemes. 1d. Identify jalyukta and watershed management practices.	1.1 Definition of Irrigation, Irrigation Engineering, Necessity of Irrigation. Benefits and ill-effects of irrigation. 1.2 Types and methods of irrigation. 1.3 Classification of irrigation projects. 1.4 Minor irrigation schemes- Bandhara irrigation, Percolation Tanks, Well Irrigation, Lift irrigation. 1.5 Micro irrigation Schemes- Drip and	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		Sprinkler Irrigation- Advantages, Layouts, components and design considerations. 1.6 Jalyukta and Watershed management practices. 1.7 Data collection for irrigation project.	
Unit-II **Hydrology**	2a. Enlist components of hydrological cycle. 2b. Calculate the dependable yield from catchments 2c. Calculate the MFD	2.1 Definition of Hydrology, Components of hydrological cycle. 2.2 Precipitation, measurement of rainfall. Non-automatic and automatic rain-gauges. Arithmatic Average method, Thiessen polygon and Isohyetal method. 2.3 Catchments- Definition, types 2.4 Runoff - Definition, factors affecting runoff Computation of runoff by runoff coefficient, Inglis Formula, Strange's table & curves, Binnie's Percentage. 2.5 Maximum flood discharge: Definition uses, factors affecting MFD, Methods of estimation of MFD. 2.6 Yield, dependable yield and calculation of yield.	06
Unit-III **Irrigation Crop Water Requirement**	3a. Define types of command areas. 3b. Estimate the crop water requirement for given command.	3.1 Cropping seasons and crops in Maharashtra. 3.2 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. 3.3 Duty & Delta, Relation between duty & delta, factors affecting duty, Methods of improving duty. 3.4 Time factor, capacity factor. 3.5 Determination of water requirements & capacity of canal 3.6 Assessment of irrigation water.	06
Unit-IV **Reservoir Planning**	4a. Understand types of investigations for reservoir planning. 4b. Design and fix control levels of a reservoir.	4.1 Selection of site for a reservoir 4.2 Investigations for reservoir planning 4.3 Area capacity curves- Construction and uses. 4.4 Reservoir sedimentation - factors affecting silting, reservoir sediment control, necessity and methods of desilting of reservoir. Evaporation from reservoir, methods of reducing evaporation. 4.5 Zones of storage- Dead storage, Live storage, Gross storage,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		surcharge storage. 4.6 Fixing control levels of reservoir.	
Unit-V **Weirs, Dams And Spillways**	5a. Explain components of diversion head works. 5b. Classify types of dams. 5c. Select a suitable type of dam. 5d. Explain the concept of gravity and earthen dams. 5e. Know the types of spillways and energy dissipation below spillway.	5.1 Layout and components of diversion head works. 5.2 Classification of dams according to use, hydraulic design & material. 5.3 Selection of a type of dam for given site conditions. 5.4 Gravity dams - Forces acting on gravity dam, theoretical and practical profile, High & low dams. 5.5 Construction, Control of cracking, Joints, keys and water seals in gravity dams. 5.6 Galleries- Function, Types size and shape. 5.7 Earthen dams:- Types of earthen dams, materials used, components, functions and typical cross-section of a zoned embankment earthen dam. 5.8 Seepage through earthen dams, methods to reduce seepage through embankment & foundation. Phreatic line & its characteristics. 5.9 Slope protection, downstream drainage arrangements in earthen dam. L-drain, cross drain and toe drain. 5.10 Construction of earthen dam. Outlets through earth dam. 5.11 Causes of failure and conditions of stability of earthen dam. 5.12 Spillway- Definition, purpose and types of spillways, Capacity of spillway. 5.13 Necessity of Energy dissipation below spillway, Stilling Basin and Roller bucket type dissipators 5.14 Spillway gates- Radial Gate.	16
Unit-VI **Canals and Canal Structures**	6a. Identify the canal types 6b. Design the capacity of canals 6c. Explain necessity of canal lining and canal structures.	6.1 Classification of canal based on capacity and canal alignment. 6.2 Section of canals in cutting and banking. Concept of balancing depth. 6.3 Canal Structures: Head regulators, cross regulators, canal fall, canal escapes, canal outlets. 6.4 Cross drainage works- Aqueduct, syphon aqueduct, superpassage, syphon super passage, level crossings, inlets and outlets. 6.5 Canal lining- necessity, materials,	06

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		requirements and advantages of canal lining. 6.6 Maintenance of canals.	
		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	Irrigation Practices	04	04	04	12
II	Hydrology	02	04	04	10
III	Irrigation Crop Water Requirement	02	04	04	10
IV	Reservoir Planning	04	04	04	12
V	Weirs, Dams And Spillways	04	12	08	24
VI	Canals And Canal Structures	04	04	04	12
	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/TUTORIALS/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
01	I	Collection of information and prepare list of documents and drawings required for irrigation project.	04
02	I	Design and preparing layout for a drip irrigation or sprinkler irrigation system. (Drawing on full imperial drawing sheet or A3 sheet with AutoCAD)	04
03	I	A report on water shed management & jalyukta shivar practices.	02
04	II	Plotting catchment area, determination of catchment area by Planimeter. And Calculation of yield from a catchment area of given Topo sheet.	04
05	III	Calculation of Crop water requirement, reservoir capacity and canal capacity.	02
06	IV	Plotting of area capacity curve from a given contour map of reservoir basin.	04
07	IV	Fixation of control levels of reservoir from a given data.	02
08	V	Detailed drawing for designed Cross-section of Earthen Dam and downstream drainage arrangement. (Drawing on full imperial drawing sheet or A3 sheet with AutoCAD)	04
09	V	Detailed drawing of ogee spillway with gate and energy dissipation	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Hours
		arrangement. (Drawing on full imperial drawing sheet or A3 sheet with AutoCAD)	
10	V	A report on visit/video/model demonstration of dam or irrigation structures.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collects project reports/circulars/GRs of irrigation structure from the irrigation department.
2. Collects Rainfall data.
3. Collects photographs, videos to study construction details of dam 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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

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
01	Irrigation and water Power Engineering	Punmia, B. C, Pande B. B. Lal	Standard Publishers & Distributors, Delhi.
02	Text Book of Irrigation Engineering	Dahigaonkar J. G.	Wheeler Publishing, Allahabad
03	Irrigation and water Power Engineering	Garg S. K.	Khanna Publishers, Delhi - 6.
04	Irrigation Engineering	Priyani V. B.	Charotar Book Stall, Anand

B) Software/Learning Websites:

1. http://www.maharashtrawaterpolicy.com
2. http://www.wrd.maharashtra.gov.in
3. http://www.cwprs.gov.in

C) Major Equipment/ Instrument with Broad Specifications:

1. Models of dams.
2. Models of canal structures.
3. Models of spillway gates.
4. Models of dam and canal outlets.
5. Models of watersheds
6. Models of Drip and sprinkler irrigation layouts.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	H	--	M	M	H	M	M	--	--
CO2	H	H	--	M	M	--	M	M	--	--
CO3	H	H	M	M	M	--	M	M	M	M
CO4	H	H	M	M	H	H	M	H	H	H
CO5	M	M	H	H	--	--	M	M	H	H
CO6	M	M	M	H	H	--	H	M	H	H

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	12	16	04	12	--	--	--	--	16
II	CO.2	10	14	04	04	04	--	--	--	12
III	CO.3	10	14	04	--	12	--	--	--	16
IV	CO.3	12	16	04	--	--	12	--	--	16
V	CO.4, CO.6	24	32	08	--	--	04	16	04	32
VI	CO.5, CO.6	12	16	04	--	--	--	--	12	16
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	I							II							III							IV							V							VI							Total
CO	1							2							3							3							4, 6							5, 6							
Marks per Unit	12							10							10							12							24							12							80
1.35 Times marks	16							14							14							16							32							16							108
Bits	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	a	b	c	d	e	f	g	Total
CO	1	1	1	1				2	2		2					3	3	3				3	3	3	3				4	4	4	4	4	6			5	5	5			6	
Q1	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	28
Q2	-	4	4	4	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	16							12							16							16							32							16							108
TOTAL																																											108

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / DD / ID / MK
COURSE : Industrial Training (ITR) **COURSE CODE :** 21410

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	35	35	14	---	Max.	--	--	--	--	100	100	200
						Min.	--	--	--	--	40	40	--

1.0 RATIONALE:

Industrial Training is short term association with the industry for orienting the students in transforming them to be industry ready after completion of diploma programme and bridging the gap between Industry and institute. For getting real time exposure of industrial environment six- month Industrial training is incorporated in the curriculum. It is structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. The main aim of Industrial training is to increase the employability skills of the students passing out from institute. The industrial needs such as the soft skills, life skills and hands-on practices are intended to be inculcated in the students through this training.Industrial Trainingis educational and career development opportunities, providing practical experience in a field or discipline. The industrial training has to be meaningful and mutually beneficial to the trainee and the organization.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop as competent professionals by getting exposure to industrial environment which cannot be simulated in the classroom.
2. Learn problem solving & managerial skills required at the job.
3. Acquaint students with facilities, equipment and professional practices in their respective trades.
4. Understand the engineer's responsibilities and ethics.
5. Learn to use knowledge acquired in the classroom into 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. Follow industrial working practices, industrial safety practices & industrial discipline.
2. Follow administrative, operational & social functioning of industrial organization.
3. Draw & read the drawing used in industry.
4. Prepare the preventive maintenance schedule.
5. Demonstrate the Quality Assurance procedure.
6. Write Industry training report of executed work.

4.0 COURSE DETAILS:

4.1 GENERAL IMPLEMENTATION STRATEGY FOR INTERNSHIP:

The Industries/Organizations can be Government/Public limited/or Private family enterprises.

a) Duration of Industrial Training: After completion of 5th semester (in Sixth Semester), for16 weeks
b) Industrial Training Area: Students should be trained in large and medium scale Industry / Organization. However, despite the best efforts by the institute, if large and medium scale Industry / Organization are not available to all students then, students can also be placed in small scale Industry / Organization.

For **Civil engineering**, it can be public works department, irrigation department, public health engineering, municipal corporations, town and country planning, highway and roads authorities, railways, large and medium scale civil contractors, rural engineering departments, environment corporations, large and medium scale private construction companies, mining companies.

For **Mechanical /Automobile Engineering / Mechatronics**, it can be manufacturing, fabrication, tool room, foundry or processing industry which may include compressors, boilers, engines, heat exchangers, air conditioning and refrigeration plants, conveyors etc. are either manufactured or used. Power plants, Railways, process plants, ordinance factories, textile factories, automobile manufacturers, major automobile workshops, service station are the industries where the student can be placed for Internship.

For **Polymer Technology**, it can be Plastic processing plants, chemical plants, plastic moulding workshops, plastic packaging and testing units, etc.

For **Electrical Engineering**, it can be electricity transmission and distribution companies, power generating stations, sub stations, railways, industries manufacturing electrical products, electrical utilities which may include industry where large motors/transformers etc. are used, process plants, electrical contractors.

For **Computer and Information Technology,** it can be any software developing company, cyber security companies, web page developing company, hardware and networking companies, data base management companies, software testing company, service providers, cloud based service providers, telecommunication companies or IT division of any other industries/finance/retail companies or organizations where software are used and maintained for various applications.

For **Electronics & Tele Communication Engineering / Mechatronics**, it can be any industry providing design, development, manufacturing or service of electronic or telecommunication products and systems. It may be manufacturer or service provider for control equipments, CNC machines, PCB processing units, Optical fiber systems, Medical electronics, solar System, E-vehicle, computer hardware and networking etc.

It may also include industry providing support for creation of infrastructure in emerging areas of technology like Artificial Intelligence, Machine learning, Internet of Things, Robotics, Automation, cyber-space and security etc.

For **Dress Design and Garment Manufacturing**, it can be textile industry, apparel manufacturing industry, export industry, boutiques etc.

For **Interior Design**, it can be Architects, builders and developers, consultants, furniture industry, interior designing company, landscape designing industry, set designing industry, graphic designing industry etc.

4.2 WORKSCHEDULE OF PARENT DEPARTMENT OF THE INSTITUTE:

The Parent departments have to contact Industries to collect information of Industries available for Industrial Training. The departments have to send request letter to industries well in advance.

The following schedule is to be followed

Sr. No.	Activity	Schedule
01	Collecting information about Industry / Organization available for training along with capacity **(Format-1)**	Before completion of Second year even term
02	Student and mentor allocation as per the slots available for industrial training (Desirable mentor- student ratio is 1:10)	Before commencement of third year odd term
03	Communication with Industry / Organization available for training along with capacity and its confirmation	Before first Unit Test of the third year odd term
04	Obtaining consent letter from parents / guardian **(Format-2)**	Before second Unit Test of the third year odd term
05	Student enrolment for industrial training	Before commencement of third year odd term examination
06	Issue letter to the Industry / Organization for the training along with details of students and mentors. **(Format-3)**	During third year odd term examination
07	Mentors along with industry supervisor will carry out progressive assessment of the students during the industrial training **(Format-4)**	Each week of training
08	End of training assessment by mentor along with Industry / Organization expert as external examiner **(Format-5)**	Before third year even term **ESE**

Suggestions:

a) Departments can take help of alumni or present students (if they or their parents or relatives have some contact in different industries) for securing placement.
b) The students would normally be placed as per their choices, in case of more demand for a particular Industry / Organization. Students would be allocated place based on their relative merit. However, if some students have arranged training placement in some companies with the help of their parents/relatives etc. then they will be given preference for placement in those companies
c) Principal/ HOD/ Faculty should address students about industrial safety norms, rules and discipline to be maintained in the Industry/ Organization during the training before relieving students for training.
d) The faculty member during the visit to Industry / Organisation will check the progress of the student in the training, his/ her attendance, discipline and project report preparation.

4.2.1 EXPECTATIONS FROM INDUSTRY:

Industry should help institute in developing the following competencies among students

a) Soft Skills i.e. Communication, Presentation etc.
b) Life Skills i.e. Time management, Safety, Innovation, Entrepreneurship, Team building and others
c) Hands-on Practices i.e. Shop floor Implementation and Quality Assurance aspects.

4.3 SUGGESTED LEARNING STRATEGIES:

Students should visit the website of the industry where they are undergoing training to collect information about products, processes, capacity, number of employees, turnover etc. They should also refer the handbooks of the major machines and operation, testing, quality control and testing manuals used in the industry. Students may also visit websites related to other industries wherein similar products are being manufactured as their learning resource.

4.4 TENTATIVE WEEK-WISE SCHEDULE OF INTERNSHIP:

The industrial training is a common course to all programmes. The industry / Organisation selection depends upon the nature of programme and its related industry. Details of activities to be completed during Industrial training may vary according to programme. The training activity may vary according to nature and size of Industry / Organisation. The following table details suggestive schedule for industrial training for all programmes.

Table - 2 Detail week schedule and Marks distribution:

Sr. No.	**Week No.**	**Details of activities to be completed during Internship training**	**Marks distribution/ week for PA** Marks to be awarded by industry person (may be supervisor)	**Marks distribution/ week for PA** Marks to be awarded by Mentor / Institute Faculty
01	01	Course Registration, Induction (Inputs to students) regarding Industrial Training. Department staff, Mentors will guide the student about Industrial Training, activities to be done, behaviour in industry, how to take care of oneself etc.	**---**	**---**
02	02	Induction to industry, Know all departments/ sections, Observe layout & learn functional relationship between various sections, Prepare Organization structure of Industry	08	06
03		Observe & learn the operational processes employed in relevant industry. Collect information about specifications of major machines, equipment, raw materials / software used etc.	08	06
04	To	Observe the discipline & safety procedure followed in industry. Observe, Read the drawing used in industry. Observe the Quality Assurance / Quality Control Procedure used in industry.	08	06
05		Observe the Preventive & breakdown maintenance procedure in industry	08	06
06	15	Observe the material handling system, storage system in industry.	08	06
07		Finalisation of report writing.	10	20
08	16	Reporting& submission of report in institute. Preparation for presentation under guidance of Mentor etc.	---	---
		TOTAL	50	50

5.0 SUGGESTED SPECIFICATION TABLE WITH MARKS:

Unit No.	Unit Title	Distribution of Marks
		Total Marks
I	Induction to industry, Know all departments/ sections, Observe layout & learn functional relationship between various sections, Prepare Organization structure of Industry	14
II	Observe & learn the operational processes employed in relevant industry. Collect information about specifications of major machines, equipment, raw materials / software used etc.	14
III	Observe the discipline & safety procedure followed in industry. Observe, Read the drawing used in industry. Observe the Quality Assurance / Quality Control Procedure used in industry.	14
IV	Observe the Preventive & breakdown maintenance procedure in industry	14
V	Observe the material handling system, storage system in industry.	14
VI	Finalisation of Report writing	30
	TOTAL	**100**

6.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Students would interact with the mentor to suggest choices for suitable Industry / Organization. If students have any contact in Industry / Organization (through their parents, relatives or friends) then same may be utilized for securing placement for themselves and their peers.
2. Students have to fill the forms duly signed by authorities along with training letter and submit it to training officer in the industry on the first day of training. Student should also carry with him/her the Identity card issued by institute during training period.
3. He/she will have to get all the necessary information from the training officer regarding schedule of the training, rules and regulations of the Industry / Organization and safety procedures to be followed. Student is expected to observe these rules, regulations, procedures.
4. Students should know that if they break any rule of industry or do not follow the discipline then industry can terminate the training and sent back the students.
5. It is the responsibility of the student to collect information from Industry / Organization about manufacturing processes / testing and quality assurance methods/specifications of machines and raw materials/maintenance procedures/ production planning/organizational structure etc.
6. During the training period students have to keep record of all the useful information in diary
7. Maintain the weekly diary as provided and get it signed from mentor as well as Industry / Organization training in-charge.
8. In case they face any major problem in industry such as an accident or any disciplinary issue then they should immediately report the same to the institute.
9. Prepare final report about the training for submitting to the department at the time of presentation and viva and get it signed from mentor as well as Industry / Organization training in-charge.
10. Obtaining consent letter from parents is important and it is responsibility of students to maintain individual safety and industrial safety, confidentiality of information if any.
11. Students should travel to Industry at his own expenses and own responsibility every time.

7.0 FORMAT FOR INDUSTRIAL TRAINING REPORT:

Following is the suggestive format for the training report, actual format may differ slightly depending upon the nature of Industry / Organization. The training report may contain the following (Format for Industrial Training Report may vary according to Programme)

- Title Page
- Certificate
- Abstract
- Acknowledgement
- Content Page

Chapter 1. Introduction of Industry / Organization (Type of products and services, history, turn over and number of employees, competitors, customers, suppliers etc.)

Chapter 2. Organizational structure of Industry / Organization and General Lay Out

Chapter 3. Types of major equipment/instruments/ machines used in industry with their specifications, approximate cost and specific use and their routine maintenance.

Chapter 4. Safety procedures followed and safety gear used.

Chapter 5. Particulars of Practical Experiences in Industry / Organisation if any.

Chapter 6. Short report/description of the task (if any done during the training)

Chapter 7. Special/challenging experiences encountered during training if any (may include students liking & disliking of work places)

References /Bibliography

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

a. Study computer software related to Industry.
b. Arrange a quiz/ interview/ group discussion of students group in same industry

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	NIMA Book Diary	NIMA	NIMA
02	The Ultimate Guide to Internships	Eric Woodard	Allworth, Skyhorse Publishing[2015]
03	How to Land your dream Internship	Tam Pham	ISBN1537049224
04	Various standards used in Industry		
05	Product Manuals		

B) Software/Learning Websites:

1. Concerned industry websites and its network.
2. Sales and Service center websites of industry.

C) Major Equipment/ Instrument with Broad Specifications: Not Applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	--	--	--	--	--	--	H	--	--
CO2	--	--	--	M	--	--	--	L	--	--
CO3	M	--	--	--	H	--	M	--	--	H
CO4	--	M	--	--	--	L	--	--	L	--
CO5	M	--	--	--	--	--	--	--	--	--

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

FORMAT 1

COLLECTING THE INFORMATION ABOUT INDUSTRY / ORGANIZATION AVAILABLE FOR TRAINING ALONG WITH CAPACITY

1 Name of Industry / Organization :_____

2 Address for communication with email : _____
_____
_____

3 Contact person details:

a Name: _____

b Designation:_____

c E mail:_____

d Mobile number:_____

4 Type of Product: ☐ Manufacturing Industry / ☐ Service Industry /

5 Type of Industry: ☐ Large scale / ☐ Medium scale / ☐ Small scale

6 Type of Control: ☐ Government Industry / ☐ Government Undertaking / ☐ PSU / ☐ Semi Government / ☐ Pvt

7 Number of Employee in Industry / Organization:

8 Whether willing to offer industrial training to _____ number diploma students in _____ months for 16 weeks.

9 Industrial Training capacity details:

Programme	**CE**	**ME**	**PO**	**EE**	**IF**	**CM**	**EL**	**AE**	**DD**	**ID**	**MK**
Male students											
Female students											
Total											

Name & Signature of Industry Person

FORMAT 2

CONSENT LETTER OF PARENTS / GUARDIAN

To,
The Principal
Government Polytechnic Nashik.

Sub:- Consent letter for Industrial Training

Sir / Madam

1 I am aware that my ward _____, Roll Number _____ studying in _____ term in _____ branch in your college has to undergo 16 weeks of Industrial Training for partial fulfillment towards completion of Diploma in _____.
2 For this fulfillment he / she has been deputed in _____ industry located at _____ for industrial training of 16 weeks for period from _____ to _____.

With respect to above I give consent for my ward to travel to & from the mentioned Industry. Further I undertake that

a. My ward will be entirely under discipline of the organization where he / she will be placed & will abide by rules & regulations in force of the said organization
b. My ward is not entitled to any leave during training period.
c. My ward will submit regularly prescribed weekly diary duly filled & countersigned by Training Supervisor of organization to mentor faculty of institute.
d. My ward will undergo the training at his / her own cost & risk during training and/or stay.
I have explained the contents of letter to my ward who has also promised to adhere strictly to the requirements. I assure that my ward will be properly instructed to take his / her own care to avoid any accidents injuries in the industry.

Date :
Place :

Signature of Parents / Guardian
Name of Parents / Guardian
Email ID of Parents/ Guardian:
Phone number 1:
Phone Number 2:
Address of Parents / Guardian:

FORMAT 3

LETTER TO INDUSTRY / ORGANIZATION FOR INDUSTRIAL TRAINING ALONG WITH LIST OF STUDENTS & NAME OF MENTOR / FACULTY

To,
The HR Manager
_____
_____

Sub :– Placement for Industrial Training of 16 week in your organization
Ref :– Your consent letter No. _____ dated _____

Sir / Madam
With reference to above subject, following students of our institute are sent for Industrial Training in your esteemed organization as per arrangement arrived at. The period of training will be from _____ to _____.
Diploma Programme in_____

Sr.No.	Roll Number	Name of student	Name of Mentor with Phone Number

Diploma Programme in_____

Sr.No.	Roll Number	Name of student	Name of Mentor with Phone Number

Kindly do the needful & oblige
Thanking You,

Yours sincerely

Principal
Government Polytechnic Nashik

FORMAT 4

EVALUATION SHEET FOR PA (TW) OF INDUSTRIAL TRAINING

1. Name of Student: _____ Roll Number:_____
2. Programme: _____
3. Name of Industry: _____

Sr. No.	Week No.	Details of activities to be completed during Internship training	Marks awarded by Industry Supervisor per week for PA		Marks awarded by Mentor / Institute faculty per week for PA	
			Max Marks	Marks Awarded	Max Marks	Marks Awarded
01	02	Induction to industry, Know all departments/ sections, Observe layout & learn functional relationship between various sections, Prepare Organization structure of Industry	08		06	
02	To	Observe & learn the operational processes employed in relevant industry. Collect information about specifications of major machines, equipment, raw materials / software used etc.	08		06	
03		Observe the discipline & safety procedure followed in industry. Observe, Read the drawing used in industry. Observe the Quality Assurance / Quality Control Procedure used in industry.	08		06	
04	15	Observe the Preventive & breakdown maintenance procedure in industry	08		06	
05		Observe the material handling system, storage system in industry.	08		06	
06		Finalization of Report writing	10		20	
TOTAL			50		50	
Final Marks out of 50 (GRAND TOTAL)						

Signature of Mentor / Faculty
Name of Mentor / Faculty

Signature of Industry Supervisor
Name & Designation of Industry Supervisor
of Industry Supervisor

FORMAT 5

EVALUATION SHEET FOR ESE OF INDUSTRIAL TRAINING BY MENTOR & INDUSTRY SUPERVISOR

1. Name of Student: _____
2. Roll Number Student:_____
3. Programme: _____
4. Name of Industry: _____

Sr.No.	Activity	(Max Marks) Marks Distribution	Marks Awarded to Student
01	Oral Examination	50	
02	Presentation	50	

a. Oral examination of student include presentation of students
b. Student has to bring his / her Industrial Training Report

Signature of Mentor / Faculty
Name of Mentor / Faculty

Signature of Industry Supervisor
Name & Designation of Industry Supervisor
of Industry Supervisor

WEEKLY DIARY
FOR
INDUSTRIAL TRAINING

1. Name of Student: _____
2. Roll Number of Student:_____
3. Programme: _____
4. Name of Industry: _____
5. Duration of Training: From _____ to _____
6. Name of Industry Person/ supervisor:_____
7. Designation of Supervisor: _____
8. Name of Mentor / Faculty:_____

Instructions to Students:

a. Write down important daily activities on the same day
b. Write down important activities only
c. Summarize at week end
d. Take signature of Industry Supervisor & Mentor at the end of week

WEEK No. ____

Duration of Week: from _____ to _____
Expected work /task / Activities:
_____
_____
_____
_____

Day	Date	Activities Carried out
01		
02		
03		
04		
05		
06		

Summary:_____
_____
_____
_____

Signature of Student **Signature of Industry Supervisor** **Signature of Mentor**

PROGRAMME : Diploma Programme in CE / ME / PO / EE / IF / CM / EL / AE / DD / ID / MK
COURSE : Project (PRO) **COURSE CODE :** 21411

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
--	--	04	04	02	--	Max.	--	--	--	--	50	50	100
						Min.	--	--	--	--	20	20	--

1.0 RATIONALE:

Engineer has to work on various projects in profession or field work. Project course is the manifestation of technical knowledge acquired by the student during course of work. This course provides an opportunity to the students to identify and solve real life problem of the industries, research organization, and society. Students also get opportunity to provide innovative, economic and technological skills in the world of work. 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.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Develop the skill to identify the problem & define the problem statement
2. Develop scientific attitude for stepwise solution to problem
3. Develop leadership skills and decision making with participative learning
4. Develop planning and execution skills, report writing skills
5. Build multidisciplinary concept with cost reduction approach
6. Integrate and apply the knowledge and skills of engineering programme

3.0 COURSE OUTCOMES:

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

1. Identify the problem/task statement related to field of work
2. Choose logically relevant solution in steps to accomplish the task
3. Select, collect the data & information to solve problem statement
4. Prepare & execute project plan by allocation of activities as a teamwork
5. Communicate effectively as a member and leader of team
6. Prepare and present technical reports considering impacts on society

4.0 COURSE DETAILS:

Sr. No.	Specific Activity/Task/Outcomes	Hours
01	Formation of Group/Team	02
02	Select Project: Individual/Group discussions	04
03	Define Problem statement for project work	04
04	Decide Strategies/Methodology to carry out project	02
05	Conduct Literature Survey/data survey/ Market Survey	06
06	Submit synopsis: by each group	02
07	Plan Project activity-Defining activities, strategy, duration	04
08	Allocate work responsibility to individual/team	02
09	Visit Industries / Institutions / Market/field work/sites	06
10	Collect Data through various resources or Survey/Analyse data	04
11	Design Components, printed circuits, prepare drawing, estimate wherever required	04

Sr. No.	Specific Activity/Task/Outcomes	Hours
12	Fabricate, Assemble, Develop Model/Prototype, Test as per project requirements	06
13	Present work progressively and record in diary	04
14	Consolidate of work allotted to individual or team	06
15	Present initial draft: pre submission draft	02
16	Print Final Project (edited Report)&Submit: soft & Hard copy	04
17	Give Presentation of project work at the time of evaluation	02
	TOTAL	**64**

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 along-with presentation with the aim to develop certain set of 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 presentation etc.)

5.0 AREA OF SELECTION FOR 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 industry/practical work oriented projects according to the local needs. (Example of Department of Civil Engineering Programme is mentioned)

Sr.No.	Areas For Selection
01	Environmental Engineering
02	Green Technology.
03	Irrigation Engineering
04	Building Construction.
05	Equipments & Machine
06	Structural Engineering
07	Housing project.
08	Computer application
09	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 / Officer in Charge shall 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 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 work management.

B. Scope of the Project:

The student can select any one suitable area/topic of interest

1. Design Projects
2. Prototype (design, make, test and evaluate)

3. Field works (surveys, case study, using equipment, information collecting data from visual information, industry problem)
4. Fabrication work
5. Construction of structure
6. Application development using hardware and software

C. 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. Industrial project shall be encouraged.
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.

Note:

1. The group / student shall prepare **Project Diary** with Name of Project, Name of Students in group, their attendance and activity 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 and students should be made aware about **rubrics**.
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

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, Plagiarism declaration, 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: Times New 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 cantered (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.
   a. For textbooks – Dr. V.L. Shah & Veena Gore, Limit State Design of Steel Structures, Structures Publications, 1 Edition, 2009.
   b. For papers - David, Insulation design to combat pollution problem, Proceedings of IEEE, PAS, Vol 71, Aug 1981, pp 1901-1907.
   c. Only SI units are to be used in the report. Important equations must be numbered in decimal form.
   d. 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 CO's, PO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	--	--	--	--	--	--	H	--	--
CO2	--	--	--	H	--	--	--	M	--	--
CO3	--	--	--	M	--	--	--	M	--	--
CO4	--	--	--	--	--	H	--	--	M	H
CO5	--	--	--	--	--	M	--	--	--	M
CO6	--	--	--	--	M	H	--	--	--	M

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

8.0 Evaluation Scheme for Project:

Term Work	: Max. Marks: 50	Min. Marks: 20.
Oral	: Max. Marks: 50	Min. Marks: 20.

9.0 Progressive Assessment:

Name of the student: Enrolment No.:
Term : III ODD
Programme: Civil Engineering
Course : Project **Code:** 21411
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
	Marks Distribution	->	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 of 25":_____.

Signature of Project Guide

10.0 Project assessment:

Term Work			Oral		
Internal	External	Total	Internal	External	Total
25	25	50	25	25	50

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Advanced Construction Technology (ACN) **COURSE CODE :** 21501

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	--	25	125
						Min.	32	--	40	--	--	10	--

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 modernization 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 materials, equipments and techniques.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. State the advanced construction materials.
2. Explain the working of construction equipments.
3. State the procedure of advanced construction techniques.
4. Understand the principle of 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. Identify various advanced construction materials.
2. Select suitable construction equipment for a specified construction activity.
3. Identify the green building materials.
4. Select a suitable advanced construction technique based on site requirements.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Advanced Construction Materials**	1a. Define fibres 1b. State types of fibres 1c. State various types of PVC used in construction. 1d. State properties of micro-silica and fly ash.	1.1 Fibres- Types, properties and uses of steel, polypropylene, glass, carbon fibres. 1.2 Use of RPVC, HDPE, CPVC, UPVC, FRP, GRP in construction. 1.3 Properties and uses of artificial timber, wall cladding and acoustics materials and composite materials. 1.4 Properties and uses of Micro-silica, Fly-ash, additives, sealants, adhesives, protective coatings in construction.	08
Unit-II	2a. State working of excavation equipments.	2.1 Principle and working of Power shovel, draglines,	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Modern Construction Equipments	2b. State types and working of cranes. 2c. Draw layout of RMC plant 2d. State components of hot mix and cold mix bituminous plants. 2e. State procedure for production of artificial sand.	scrappers, graders. 2.2 Working of tower cranes, gantry cranes, hydraulic cranes, cable ways and rope ways. Safety consideration of cranes. 2.3 Working and Use of compaction equipments – sheep foot roller, vibratory rollers, pneumatic rollers. 2.4 Layout, Principle and Working of Automatic RMC plant, hot mix and cold mix bituminous plant. 2.5 Construction and working of Bituminous Paver and Recycled Aggregate Paver (RAP). 2.6 Working of Tremie equipment. 2.7 Equipments for production of artificial sand and aggregates. 2.8 Working of Pile Driving equipment. 2.9 Working of Tunnel Boring machine. 2.10 Underground Metro Construction- Challenges and Equipments used.	
Unit-III **Green Building**	3a. State concept of green buildings. 3b. Enlist eco-friendly construction materials. 3c. State criteria for rating of green buildings.	3.1 Concept of green building. 3.2 Eco-friendly materials and construction techniques of green building. 3.3 Use of energy efficient materials in green buildings. 3.4 Certification and Rating systems of green buildings. 3.5 Sustainable building construction.	08
Unit-IV **Advanced Construction Techniques**	4a. State methods of prefabrication. 4b. Explain working of slip form. 4c. State applications of Geo synthetics. 4d. State treatment procedure of weak foundations.	4.1 Concept of Prefabricated construction techniques. Methods of prefabrication for structural elements. Advantages and limitations. 4.2 Concept of 3D Printing. Construction process with 3D printing. Advantages and limitations. 4.3 Under water concreting – Process of Tremie concreting. Dewatering techniques. 4.4 Working with Slip form and Tunnel form in construction.	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		4.5 Geo synthetics and Soil reinforcement. 4.6 Special foundations. Treatment of weak foundations. 4.7 Guniting and jacketing of structures.	
Unit-V **High-Rise Constructions**	5a. State aspects of high rise construction. 5b. State requirements high rise lift construction. 5c. State requirements of fire safety in tall structures.	5.1 High rise buildings- architectural & structural aspects 5.2 Special features of skyscraper construction. 5.3 Plumbing and drainage of High rise buildings. 5.4 High rise Lifts- construction and safety requirements. 5.5 Requirements of fire safety in tall structures.	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	04	04	12
II	Modern Construction Equipments	06	12	06	24
III	Green Building	04	04	04	12
IV	Advanced Construction Techniques	04	12	04	20
V	High-Rise Constructions	04	04	04	12
	TOTAL	**22**	**36**	**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/TUTORIALS/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
01	I	Study of proportions and aspect ratio of fibres on strength of concrete.	02
02	I	Study of different types of artificial timber, wall claddings and acoustics materials used for construction.	02
03	I	Study of various types of fly ash, properties and effects on strength of concrete.	04
04	II	Study of various excavation and compaction equipments.	04
05	III	Visit / Video demonstration of working of RMC plant and writing a report on it.	04
06	IV	Visit / Video demonstration of working of Bituminous hot mix/cold mix plant and writing a report on it.	04
07	IV	Study of green building techniques and criteria for rating of green buildings.	04
08	V	Study of prefabricated construction techniques.	02
09	V	Study of various types of Geo synthetics applications in construction industry.	02
10	V	Visit / Video demonstration of multi-storied building to study various services like plumbing, drainage, fire fighting, lift construction etc.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect market rates, specifications, properties of various advanced construction materials.
2. Collect product specifications, working and output efficiency of various construction equipments.
3. Collect details of existing green buildings.
4. Collect information of various repair and restoration techniques of bridges and other structures.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show CAI computer software related to advanced construction equipments and techniques.
2. Arrange expert seminar of industry person in the area of advanced construction materials, equipments or techniques.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Civil Engineering materials	TTTI Chandigarh	TTTI Chandigarh
02	Construction planning and equipment	R. L. Peurifoy	Tata McGraw Hill Publication
03	Construction equipment its planning and application	Dr. Mahesh Varma	Metropolitant book Company
04	Transportation Engg. Volume - I	V. N. Vazirani and S. P. Chandola	Khanna Publisher
05	Construction Technology Vol. I to IV	R. Chudly	ELBS- Longman Group

Sr.No.	Title of Book	Author	Publication
06	Materials of construction	R. C. Smith	McGraw-Hill Co. Ltd.
07	Construction Planning and Equipment	R. Satyanarayana and S. C. Saxena	Standard Publication New Delhi
08	A to Z of Building Construction	Mantri	Mantri Publication
09	Construction Technology	Sarkar & Sarswati	Oxford University Published, 2012
10	Modern Foundations – Introduction to Advanced Techniques	Naiman P Kurian	Tata McGraw Hill

B) Software/Learning Websites:

1. http://www.nbmcw.com
2. https://theconstructor.org/construction/heavy-construction-equipment-types/
3. www.youtube.com

C) Major Equipment/ Instrument with Broad Specifications:

1. Models of construction equipments.
2. Identify various advanced construction materials.
3. Explain the working of construction equipments.
4. Understand the principle of green buildings.
5. State the procedure of advanced construction techniques.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	H	--	--	--	M	--	H	H	--	--
CO2	H	H	--	H	H	--	M	M	H	--
CO3	H	H	--	--	H	H	H	M	H	H
CO4	H	H	H	H	H	H	H	M	--	H

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	12	16	04	12	--	--	--	--	16
II	CO.2	24	32	08	04	16	04	--	--	32
III	CO.3	12	16	04	--	--	12	--	--	16
IV	CO.4	20	28	08	--	--	--	16	04	28
V	CO.4	12	16	04	--	--	--	--	12	16
	Total	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**4**							
Marks per Unit	12							24							12							20							12							80
1.35 Times marks	16							32							16							28							16							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4		-	-	-	-	-	-	4	28
Q2	4	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	4	-	-	-	16
Sub Total	**16**							**32**							**16**							**28**							**16**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Building Services and Maintenance (BSM) **COURSE CODE :** 21502

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme								
Hrs / week				Credits	TH Paper Hrs.	Marks							
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	--	25	125
						Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Buildings serve several societal needs – primarily as shelter from weather, security, living space, privacy, to store belongings, and to comfortably live and work. Building services are the systems installed in buildings to make them comfortable, functional, efficient and safe. They can include fire safety, HVAC (heating, ventilation and air conditioning), lighting, plumbing, ICT (information and communications technology), and so on. The knowledge of building services is necessary to maintain and provide the functional requirements of the building by a civil technologists. As buildings are becoming more complex and more modern, it is essential to include the services and maintenance of buildings in Civil Engineering curriculum. This course is designed to enhance the employability with the skills required for building service industries.

2.0 COURSE OBJECTIVES:

The student will be able to,

1. Know the various types of building services.
2. Understand the plumbing requirements for multi-storied buildings.
3. Understand fire safety requirements for buildings.
4. Understand the service requirements for lighting, HVAC (heating, ventilation and air conditioning) and acoustics for a building.
5. Understand the 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. Identify functional requirements of various building services.
2. Design suitable water supply and plumbing system for 5-8 storied building.
3. Design the roof top rain water harvesting system for a building.
4. Prepare proposal for fire safety requirements for multi-storeyed building.
5. Prepare repair and maintenance requirements for a given building.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Overview of Building Services**	1a. Classify the building based on the basis of the given type of occupancy with reference to the provisions of National Building Code. 1b. List the relevant type of services required for the given building with justification. 1c. Explain the salient characteristics of BMS required for the given type of building.	1.1 Introduction to building services. Classification of buildings as per National Building code. Necessity of building services. 1.2 Functional requirements of building, Different types of building services i. e. HVAC (Heat, Ventilation and Air Conditioning), Escalators and lifts, fire safety, protection and control, plumbing services, rain water harvesting, solar water heating system, lighting, acoustics, sound insulation and electric installation etc. 1.3 Role and responsibility of Building Service Engineer, Introduction to BMS (Building Management Services), Role of BMS, concept of smart building.	04
Unit-II **Plumbing Services**	2a. Explain the governing principles of laying the plumbing services (water supply / drainage / vent) in the given type of building. 2b. Select the relevant type of valves, pipe material and fittings required for laying the water supply and drainage system for the given site condition with justification. 2c. Suggest the relevant plumbing system for the given type of building with justification. and where used, Traps, Interceptors. 2d. Design rain harvesting system for a building. 2e. Suggest requirements of solar water heating system.	2.1 Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminology and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors. 2.2 System of plumbing for building water supply: storage of water, hot and cold water supply system. 2.3 System of plumbing for building drainage: Types of drainage system such as two pipe system, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water. 2.4 Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability. 2.5 Need for rain harvesting system. Components and layout of rain harvesting system. 2.6 Need of solar water heating system. Requirements of solar water heating system.	12
Unit-III **Fire Safety**	3a. Justify the provision of the fire safety system for the given type of buildings.	3.1 Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and	12

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
and Vertical Communication Services	3b. Select the relevant system of fire safety for the given structure with justification. 3c. Specify the provisions of NBC for the installation of fire extinguishing equipments in the given type of building. 3d. Suggest the civil engineering requirements for the Escalators to be installed in the given type of civil structure with justification. 3e. Compute the space requirement for the Escalators and Lifts of the given type of civil structure. 3f. Draft the specifications required for construction of ramp required for physically handicapped and elderly persons for the given type of the building structure.	various extinguishing systems, Working principles of various fire protection systems. 3.2 Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing buildings, Provisions for evacuation. 3.3 Objectives and modes of vertical communication in building. 3.4 Lifts: Different types of lifts and its uses, Component parts of Lift-Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommodate lift services, Safety measures. 3.5 Escalators: Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services, Safety measures. 3.6 Ramp: Necessity, design consideration, gradient calculation, layout and Special features required for physically handicapped and elderly.	
Unit-IV **Lighting, HVAC and Acoustics Services**	4a. Select relevant system of lighting for the given building with justification. 4b. Suggest the lumen capacity required for the given size of the room. 4c. Describe the methods used for the ventilation purposes in the given type of building. 4d. Explain the significance of providing air conditioning system in the given type of building. 4e. Justify the need of acoustic treatment in the	4.1 Concept of lighting, types of lighting (natural, and artificial), factors influencing the brightness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remote switch, timer switch and photo-electric cell switch), types of lamps (incandescent, Tungsten halogen and electric discharge), Lamps election as per room sizes. 4.2 Concept of ventilation, necessity and Types of ventilation.	08

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
	given type of building structure. 4f. Explain the relevant method of acoustic treatment for the given type of building structure.	4.3 Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavity resonator)	
Unit-V **Building Maintenance and Repair Techniques**	5a. Explain various types of maintenance in building. 5b. Identify materials for repair in building. 5c. Explain techniques for Repairs. 5d. Explain the repair work of various components in existing masonry building. 5e. Explain the repair work of various component in existing concrete structure.	5.1 Importance of maintenance 5.2 Types of maintenance – daily, weekly, monthly, Annually 5.3 General Maintenance. Painting of Buildings. 5.4 Materials for Repair • Special concrete and mortar • 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 5.5 Techniques for Repairs • Gunniting, grouting and Shotcrete • Epoxy injection • Methods of repairing by Advance techniques. 5.6 Repair of • Stone, brick and block masonry (Cracks, dampness, efflorescence, joint separation etc.) • Repair of Flooring and Roofs (sloping, flat, pitched etc.) • Concrete members due to (i) Steel Corrosion (ii) Lack of Bond (iii) shear, tension, torsion, compression failure 5.7 Rainwater Leakage in Buildings 5.8 Leakage in Basement, toilet area 5.9 Control on Termites (White Ants) in Buildings 5.10 Control of Fungus, Decay of wood works in Buildings 5.11 Estimation of Repair.	12
		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	Overview of Building Services	04	04	--	08
II	Plumbing Services	04	08	08	20
III	Fire Safety and Vertical Communication Services	04	06	06	16
IV	Lighting, HVAC and Acoustics services	04	06	06	16
V	Building Maintenance and Repair Techniques	04	08	08	20
	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/TUTORIALS/PRACTICALS/TASKS:

Note: This write up is as per our curriculum format

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
01	I	Identify components of building services required for a residential / public building and prepare a report.	02
02	I	Prepare detailed report on plumbing requirements of 7-8 storied building.	02
03	II	Compute the requirements for the rain water harvesting system for the given type of building. Prepare the drawings as per requirements of municipal corporation norms.	02
04	II	Work out detailed requirements for the escalator / lift for the given building as per guidelines of national building code.	02
05	III	Write a report on specifications and working of the fire extinguisher by viewing the relevant video / simulation / photographs.	02
06	IV	Prepare a report on lighting and ventilation system to be provided for the given dwelling unit by viewing the relevant video / simulation / photographs / drawings.	04
07	IV	Suggest a suitable acoustical treatment for the auditorium and prepare report on materials and methods.	02
08	V	Estimate the quantities of the electrical points, switches and wiring system required for the given type of dwelling unit and Prepare a budget for it with summarization of all relevant information in the form of a report.	04
09	V	Study the defects in a nearby building and Find the causes of damages in the given structure. Prepare check list of repairs necessary for this	04

Sr. No.	Unit No.	Practical Exercises (Outcomes in Psychomotor Domain)	Approx. Hrs. Required
		structure.	
10	V	Write report on of equipments and tools required for repair works.	02
11	V	Write a report on non-destructive testing of an old structure.	02
12	V	Visit a nearby damaged structure / observe video and prepare report on retrofitting and strengthening.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Collect the technical brochures of the different components of building services from the local market/internet to present in report form.
2. Visit any certified Green building to record the important features that has converted it into green building and submit a report.
3. Collect specifications and brochures of advanced waterproofing material.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
2. Arrange visit to nearby construction sites for understanding various construction activities.
3. Use of video/animation films to explain various processes of building construction.
4. Use different instructional strategies in classroom teaching.
5. Demonstration of different small activities related to building services.
6. Display of various technical brochures of modern building services.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Building Services.	Patil S. M.	Seema Publication, Mumbai.
02	The A to Z of Practical Building Construction and its Management,	Mantri and Sandeep.	Satya Prakashan, New Delhi.
03	Fire Services in India: History, Detection, Protection, Management	Bag S P	Mittal Publications, New Delhi.
04	Plumbing Design and Practice	Deolalikar S. G.	McGraw-Hill,
05	Principles of Fire Safety Engineering: Understanding Fire and Fire Protection	Akhil Kumar Das.	PHI Learning Pvt. Ltd, New Delhi.
06	Solar panel installation guide & user manual	Shraman N L	The Memory Guru of India.
07	Practical handbook on building maintenance - Civil works	Gupta M K	Nabhi Publications.
08	National Building Code Part1, 4, 8, 9.	BIS.	Bureau of Indian Standard, New Delhi
09	Code of practice for plumbing in multistoried buildings	BIS., IS 12183 (Part 1): 1987	Bureau of Indian Standard, New Delhi
10	Uniform plumbing code – India (UPC-I)	BIS., 2008	Bureau of Indian Standard

Sr.No.	Title of Book	Author	Publication
11	Maintenance & Repair Of Civil Structures	B. L. Gupta	Standard Publications.
12	Building Repair and Maintenance Management	P. S. Gahlot	CBS Publishers and Distributors Pvt. Ltd.
13	Maintenance of Buildings	A. C. Panchdhari	New Age International

B) Software/Learning Websites

1. https://www.capterra.com
2. http://www.plumbingservices.com
3. http://bis.org.in
4. http://bmsbuildingservice.com

C) Major Equipments/ Instruments with Broad Specifications

1. Model of a civil engineering structure depicting various components.
2. Chart showing detailing of lift, escalator and ramp.
3. Model of various material used in water supply and sanitary drainage system such as fixtures, fittings, pipe section, joints and valves.
4. Model of a civil engineering structure depicting various components of Rain Water Harvesting system.
5. Model of a civil engineering structure depicting various components of Solar Water Heating system.

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	M	--	--	H	H	H	M	H	--
CO2	M	M	--	--	H	H	M	M	H	--
CO3	M	M	--	--	H	H	M	--	H	--
CO4	M	M	--	--	H	H	M	--	H	--
CO5	M	M	--	--	H	H	H	--	H	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	08	10	04	08	--	--	--	--	12
II	CO.2, CO.3	20	27	08	08	08	--	--	--	24
III	CO.1, CO.4	16	22	04	--	08	08	--	--	20
IV	CO.1	16	22	04	--	--	08	12	--	24
V	CO.5	20	27	08	--	--	--	04	16	28
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2, 3**							**1, 4**							**1**							**5**							
Marks per Unit	08							20							16							16							20							80
1.35 Times marks	10							27							22							22							27							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	1	1	-	-	-	-	-	2	2	3	3	-	-	-	4	4	4	4	-	-	-	1	1	1	1	1	-	-	5	5	5	5	-	5	5	
Q1	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	28
Q2	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	4	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**12**							**24**							**20**							**24**							**28**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Solid Waste Management (SWM) **COURSE CODE :** 21503

TEACHINGANDEXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	--	25	125
						Min.	32	--	40	--	--	10	--

1.0 RATIONALE:

Industrialization and urbanization is increasing day by day. As a result of this, the generation of solid waste is a major problem all over the country within the urban as well as rural area and it is increasing day by day. In view of this, the management of solid waste produced is of prime need to keep the environment safe and clean. Information on classification and characteristics of solid waste will enable to decide appropriate technology about the collection and transportation of waste produced. Various disposal method s of solid waste will enable to recommend suitable method of disposal of solid waste with economy and acceptable environmental constraints including reuse and recycle wherever applicable. Content on other types of solid waste such as biomedical waste, construction waste, E-waste and plastic waste will be useful in deciding appropriate method for collection, transportation and disposal of these wastes. Thus, the knowledge of solid waste management with the concept like recycling, recovery and reuse will lead to proper disposal with acceptability. This will further lead to keeping the natural resources condemnation free.

2.0 COURSE OBJECTIVES:

The students will be able to,

1. Identify the different sources of solid wastes.
2. Know the method of collection and transportation of solid wastes.
3. Understand the methods for disposal of solid wastes.
4. Understand the method for disposal of Bio-medical wastes, Industrial wastes and E-waste.
5. Understand the laws related to solid waste 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 different sources of solid wastes.
2. Execute the relevant method of collection and transportation of solid wastes.
3. Execute an action plan for disposal of solid wastes.
4. Implement the relevant method for disposal of Bio-medical wastes, Industrial wastes and E- waste.
5. Implement the relevant laws related to solid waste management.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamental of Solid Waste Management**	1a. Explain the principles of waste reduction in the given condition. 1b. Classify the given solid wastes according to their sources. 1c. Describe the characteristics of the given solid wastes. 1d. Justify the need of solid waste management in the given situation. 1e. Assess the impact of solid waste management on the environment in the given situation. 1f. List the factors generating solid wastes in the given specific area with justification.	1.1 Definition of solid waste Meaning of different solid waste -Domestic waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E- waste, hazardous waste, institutional waste 1.2 Sources of solid waste, Classification of solid waste –hazardous and non-hazardous waste. 1.3 Physical and chemical characteristics of Municipal solid waste. 1.4 Impact of solid waste on environment. Solid waste management techniques-solid waste management hierarchy, waste prevention and waste reduction techniques. 1.5 Factors affecting the solid waste generation.	04
Unit-II **Storage, Collection and Transportation of Municipal Solid Waste**	2a. Suggest the relevant method of storage of solid waste for the given site conditions with justification. 2b. Explain the relevant method of collecting the solid waste in the given situation. 2c. Implement the relevant techniques for management of solid waste in the given area. 2d. Suggest the relevant Transportation system for transporting the Municipal solid waste at the given location with justification. 2e. Propose the organization chart required to manage solid waste for the given village / town / city of your locality	2.1 Storage of solid waste 2.2 Collection methods of solid waste 2.3 Tools and Equipment-Litter Bin, Broom, Shovels, H and carts, Mechanical road sweepers, Community bin-like movable and stationary bin. 2.4 Transportation of Municipal waste. 2.5 Transportation vehicles with their capacity, Transfer station-meaning, necessity, location 2.6 Role of rag pickers and their utility for society. 2.7 Organization pattern of solid waste management system, practices according to Population of the town or city.	10
Unit-III **Disposal of**	3a. Explain the principles of preparing the compost for the given site.	3.1 Concept of composting of waste, Principles of composting process.	14

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Municipal Solid Waste	3b. List the relevant factors affecting the given composting process with justification. 3c. Describe the different steps of executing the relevant method of composting for the given site. 3d. Suggest the design criteria adopted in execution of vermin composting for the given area with justification. 3e. Explain the relevant operating method of sanitary land filling for the given site condition and given type of waste. 3f. Select the site suitable for the land filling purpose in the given locality with justification. 3g. State the relevant parameters to select a site for land filling with justification. 3h. Propose the relevant method to control the liquid Leachate generated in the given land filling site. 3i. Suggest the relevant situation for disposal of given type of solid waste through incineration process with justification. 3j. Select the relevant type of incinerator for the given type of solid waste.	Factors affecting the composting process 3.2 Methods of composting-Manual Composting-Bangalore method, Indore method. 3.3 Mechanical Composting-Dano process. 3.4 Vermi composting. Land filling technique, Factors to be considered for site selection. 3.5 Land filling methods-Area method, Trench method and Ramp method. 3.6 Leachate and its control, Biogas from land fill, Advantages and disadvantages of land fill method. 3.7 Recycling of Municipal solid waste 3.8 Incineration of waste. 3.9 Introduction of incineration process. Types of incinerators Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste-Definition, methods. Products of incineration process 3.10 Advantages and disadvantages of incineration process.	
Unit-IV **Biomedical Waste Management and Health Aspects and Public Involvement In Solid Waste Management, Industrial Waste Management and E- Waste Waste**	4a. Compare the characteristics of the given type of biomedical waste with other given type of waste material. 4b. Describe the different sources of generating the given type of biomedical waste in the given locality. 4c. Classify the biomedical waste on the basis of given criteria. 4d. Explain the method of	4.1 **Biomedical waste management**: Definition of Biomedical waste. Sources and generation of Biomedical waste. Classification of Biomedical waste, management technologies. 4.2 **Health aspects and public Involvement in solid waste management:** Health aspects during handling and processing, Health problems during time of segregation,	16

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Management	executing the disposal of the given type of biomedical waste in the given area. 4e. Explain the ill effects on the health of humans handling the given type of solid waste in the given area. 4f. Justify the need of public participation in effective implementations of schemes managing the given type of solid waste in the given area. 4g. Explain the relevant method of disposal of given type of industrial waste. 4h. Classify the industrial waste based on the given criteria. 4i. Describe the process of control ling the generation of given type of industrial waste at the given site. 4j. Suggest the relevant appliance for the disposal of given type of E- waste with justification 4k. Explain the ill effects of given type of E-waste on the environment of that area. 4l. Suggest the relevant method of recycling and disposal of the given type of E-waste in the given situation	recovery, recycling and reuse of solid waste. 4.3 Public involvement and participation in solid waste management practices. 4.4 **Industrial waste management:** Variety of industrial waste Collection and disposal of industrial waste, control measures for industrial waste, recycling of industrial waste. 4.5 **E-waste management:** Definition of E-waste, Varieties of E-wastes, Dangers of E-waste, recycling of E-waste. · 4.6 Disposal of E-waste	

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-V **Legal Aspects of Solid Waste Management**	5a. Suggest the existing legal frame work to regulate the given type of solid waste with justification. 5b. Explain the relevant major provisions of Municipal solid waste management Rules, 2016 for disposal of the given type of solid waste. 5c. Explain the different major provisions of Biomedical waste management Rules, 2016 for managing the given type of bio-medical waste. 5d. Compile the major features of Construction and demolition waste management Rules, 2016 for the disposal of the given type of waste. 5e. Explain the salient features of Hazardous and other wastes management Rules, 2016 for the disposal of the given type of waste. 5f. Explain Role of CPCB (Central Pollution control Board) and MPCB (Maharashtra Pollution control Board) in managing the given type of solid waste.	5.1 Legal Aspects: Legal aspects-present scenario Municipal solid waste management Rules, 2016 5.2 Biomedical waste management Rules, 2016 5.3 E- waste management Rules, 2016 construction and demolition waste management Rules, 2016 5.4 Hazardous and other wastes management Rules, 2016 5.5 Plastic waste management Rules, 2016 5.6 Role of Central Pollution control Board and Maharashtra Pollution control Board in management of solid waste from various sources	**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	Fundamental of Solid Waste Management	02	04	---	06
II	Storage, Collection and Transportation of Municipal Solid Waste	06	08	06	20
III	Disposal of Municipal Solid Waste	06	06	08	20
IV	Biomedical Waste Management and Health Aspects and Public Involvement In Solid Waste Management, Industrial Waste Management and E-Waste Waste Management	04	08	12	24
V	Legal Aspects of Solid Waste Management	02	08	--	10
	TOTAL	**20**	**24**	**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/TUTORIALS/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
01	II	Submit your observations along with your comments on parameters of different solid waste by viewing the relevant video / simulation / photographs	04
02	II	Undertake the survey through internet to prepare a report on the methodology used in collection and transportation of solid waste including equipments, specifications used there in.	04
03	II	Design the organization chart for the agency managing solid waste for a given area. Write are port on population to be served, pattern, machineries, equipment, man power used in SWM.	02
04	III	Submit your observations along with your comments on solid waste disposal plant by viewing the relevant video / simulation / photographs.	02
05	III	Submit your observations along with your comments on solid waste management system by landfills techniques by viewing the relevant video / simulation.	04
06	IV	Submit your observations along with your comments on disposal of bio-medical waste by viewing the relevant video / simulation.	04
07	IV	Submit your observations along with your comments on the disposal of E-waste by viewing the relevant video / simulation.	02
08	IV	Submit your observations along with your comments on the disposal of Industrial waste by viewing the relevant video / simulation.	02
09	V	Compile the relevant provisions Central Pollution control Board (CPCB) and State Pollution control Board (SPCB) pertaining to solid waste management by viewing in the relevant video / simulation / search engine.	02
10	III	Submit your observations along with your comments on Biogas plant by viewing the relevant video / simulation / photographs.	02
11	III	Submit your observations along with your comments on composting plant by viewing the relevant video / simulation / photographs.	04
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

1. Preparation of charts showing solid waste management techniques.
2. Preparation of charts showing tools, equipment, vehicles and machineries used in solid waste management practices.
3. Preparation of compost using decomposable waste material at home adopting appropriate method.

8.0 SPECIAL INSTRUCTIONAL STRATEGIES (If any):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Massive open online courses **(MOOCs)** may be used to teach various topics / subtopics.
2. About **15-20% of the topics / sub-topics**, which is relatively simpler or descriptive in nature, is to be given to the students for **self-directed learning** and assess the development of the Cost through class room presentations (see implementation guide line for details).
3. With respect to item no. I0, teachers need to ensure to create opportunities and provisions for co-curricular activities.
4. Guide student(s) in undertaking micro-projects.
5. Arrange visit to nearby newly started site for Understanding various solid waste management practices.
6. Show video / animation films to explain various instruments used in solid waste management practices.

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of Book	Author	Publication
01	Solid Waste Management	Bhide A. D.	Indian National Scientific Documentation Centre, New Delhi Edition1983 ASIN: BOO18MZ0C2
02	Solid Waste	Techobanoglous George; Kreith, Frank	McGraw Hill publication, New Delhi 2002, ISBN9780071356237
03	Environmental Studies	Manjunath D. L	Pearson Education publication, New Delhi,
04	Solid Waste Management	Sasikumar K.	PHI learning, New Delhi, 2009 ISBN 8120338693
05	Prospect and Perspectives of solid waste management	Hosetti B. B	New Age International Publisher, 2006 New Delhi, ISBN-13:978-8122417777

B) Software / Learning Websites:

1. www.hsagolden.com
2. www.almitrapatel com
3. www.yousee.in
4. www.skgsangha.org
5. En.wikipedia.org/waste-management
6. www.epa.gov/epaoswer/non-hw/muncipal/index.htm

C) Major Equipment /Instrument with Broad Specifications: Not applicable

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	M	--	--	--	--	--	--	--	--	--
CO2	--	M	M	--	--	L	--	L	M	--
CO3	--	--	H	--	H	--	M	--	--	M
CO4	--	--	--	M	--	--	--	--	L	--
CO5	M	--	--	--	--	--	--	--	--	--

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No	CO	Marks per Unit	1. 35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO1	06	08	04	04	--	--	--	--	08
II	CO2	20	28	08	12	08	--	--	--	28
III	CO3	20	27	04	--	08	16	--	--	28
IV	CO4	24	32	08	--	--	--	16	08	32
V	CO5	10	13	04	--	--	--	--	08	12
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	06							20							20							24							10							80
1. 35 Times marks	08							28							27							32							13							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**Total**
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	-	-	-	-	-	-		4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	28
Q2	4	-	-	-	-	-	-		4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-		-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	4	-	-	-	16
Sub Total	**08**							**28**							**28**							**32**							**12**							**108**
TOTAL																																				**108**

PROGRAMME : Diploma Programme in Civil Engineering (CE)
COURSE : Earthquake Resistant Structures (ERS) **COURSE CODE :** 21504

TEACHING AND EXAMINATION SCHEME:

Teaching Scheme					Examination Scheme							
Hrs / week				Credits	TH Paper Hrs.	Marks						
TH	TU	PR	HRS				TH	TEST	TH+TEST	PR	OR	TW	TOTAL
03	--	02	05	04	03	Max.	80	20	100	--	--	25	125
						Min.	32	--	40	--	--	10	--

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 Earthquake resistant non-engineered structure.
4. Check Ductile detailing of structures.
5. Suggest methods of retrofitting 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 and differentiate between magnitude and intensity of earthquake
2 Describe the direct and indirect effects of earthquake & damage to buildings.
3 Explain Earthquake resistant non-engineered structure.
4 Supervise the building in view of earthquake resistance of the structure
5 Suggest methods of retrofitting the damaged/old structures select the proper site for construction of earthquake resistant structure and guide for disaster management.

4.0 COURSE DETAILS:

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
Unit-I **Fundamentals of Earthquake, Seismic Waves and Seismic Zones**	1a. Explain various engineering aspects of occurrence of earthquake 1b. Differentiate between magnitude and intensity of earthquake 1c. Explain the basic terminology about earthquake engineering 1d. Describe earthquake zones in India	1.1 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. 1.2 Measurement of magnitude by Seismograph, Richter scale method. Measurement of intensity of earthquake. Modified Mercalli Intensity (MMI) scale, MKS scale, Isoseismals. 1.3 Effects of earthquake- direct and indirect 1.4 Seismic waves, Body waves and surface waves, P waves, S waves, seismic weight, seismic mass, 1.5 Earthquake zones, seismic zoning map	10
Unit-II **Planning of Buildings**	2a. Explain aspects of planning of building 2b. Describe soft story effect	2.1 Plan aspects of Building- symmetry, regularity, separation of blocks, simplicity, adjacent buildings, enclosed area, separate building for different functions, 2.2 Soft storey and its effect 2.3 Choice of site- Stability of slopes, loose sand	08
Unit-III **Damage and collapse of RCC and Masonry Buildings**	3a. Explain different types of damages of RCC building 3b. Describe the care to be taken during concreting 3c. Explain causes of failure of brick and stone masonry building 3d. Explain the methods to improve earthquake resistance of buildings	3.1 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 3.2 Care in concrete construction- measuring materials, mixing materials, formwork, placing of reinforcement, casting and compacting concrete, curing of concrete, construction joints 3.3 Reasons for poor performance of brick masonry building 3.4 Causes of damage in brick masonry building 3.5 Typical damage and failure of brick masonry building- Non-structural damage, failure of bearing wall and failure of ground.	10

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics	Hours
		3.6 General construction aspect of brick masonry and to improve earthquake resistance of buildings w.r.t. mortar, wall enclosure, openings in walls, masonry bond, horizontal reinforcement in wall, vertical reinforcement in wall. 3.7 Typical ways of damage and failure of stone masonry building. 3.8 General construction aspect of stone masonry and improve earthquake resistance of buildings 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-IV **Ductile detailing and Evaluation Of Earthquake Resistance Of Buildings and seismic retrofitting**	4a. Explain concept of ductility design 4b. Describe the arrangement of reinforcement 4c. Evaluate the performance of the existing building for resisting the earthquake 4d. Describe seismic retrofitting of structure.	4.1 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 4.2 Evaluation steps of earthquake resistance of existing building. 4.3 Concepts of retrofitting. Need of seismic retrofitting, limitations of retrofitting 4.4 Retrofitting techniques-global and local 4.5 Seismic retrofitting for masonry buildings. Seismic retrofitting strategies for RC buildings. 4.6 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	10
Unit-V **Disaster Management and past earthquakes**	5a. Explain the steps of disaster management during earthquake occurrence.	5.1 Guidelines for Earthquake preparedness: protection of life and protection of property. 5.2 Post-earthquake operations w.r.t. buildings, Lifelines and Roads & Bridges 5.3 Prominent past earthquake in India: Koyna, Latur, Jabalpur and Bhuj.	10
		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	Fundamentals of Earthquake, Seismic Waves and Seismic Zones	02	04	10	16
II	Planning of Buildings	02	04	10	16
III	Damage and collapse of RCC and Masonry Buildings	02	04	10	16
IV	Ductile detailing and Evaluation Of Earthquake Resistance Of Buildings and seismic retrofitting	02	04	10	16
V	Disaster Management and past earthquakes	02	04	10	16
	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/TUTORIALS/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
01	IV	Four plates on ductile detailing.	06
02	IV	Six plates on Retrofitting of structures.	06
03	III & IV	Study of IS 13828 (1993) Indian standard guidelines for improving earthquake resistance of low- strength masonry building.	06
04	III & IV	Write & Study about recent development and techniques of earthquake resistant structure and repairs of earthquake affected non-engineered buildings	06
05	I	Write a report of visit at the seismological center	08
		TOTAL	**32**

7.0 SUGGESTED STUDENT ACTIVITIES:

Other than the Classroom and laboratory learning, following are the suggested Student-related co-curricular activities. This can be undertaken to accelerate the attainment of the various outcomes in the course,

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):

These are sample strategies, which the teacher can use to accelerate the attainment of the various outcomes in this course,

1. Show Video Clips earthquake and rehabilitation work
2. Show Picture Clips through Power Point regarding earthquake damages

9.0 LEARNING RESOURCES:

A) Books:

Sr.No.	Title of the book	Author	Publisher
01	Earthquake Resistant Design of Structures	Pankaj Agarwal & Manish Shrikhande	Prentice-Hall of India
02	Earthquake Resistant Design of Structures	S. K. Duggal	Oxford University Press
03	Elements of Earthquake Engineering	Jai Krishna, A. R. Chandrashekharan and B. Chandra	South Asian (Publisher) Pvt Ltd
04	Earthquake Resistant Structures	Dr. S. M. Dumne	Nikita Publication
05	Guide lines for Earth quake resistant Non- Engineered construction	NICEE	NICEE
06	Guide lines for Earth quake resistant of structures	NPEEE	NPEEE

Sr. No.	IS Code	Sr. No.	IS Code	Sr. No.	IS Code
01	IS 13920: 1993	05	IS 13828	09	IS 4967
02	IS 1893: 2002	06	IS 13935	10	IS 13827
03	IS 875	07	IS 6922		
04	IS 4326	08	IS 4991		

B) Software/Learning Websites:

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

10.0 MAPPING MATRIX OF PO's, CO's and PSO's:

Course Outcomes	Programme Outcomes (PO's)							Programme Specific Outcomes (PSO's)		
	1	2	3	4	5	6	7	1	2	3
CO1	--	H	--	--	--	--	--	--	--	M
CO2	--	--	--	M	--	--	--	--	--	M
CO3	M	--	--	--	H	--	M	--	--	M
CO4	--	M	--	--	--	L	--	--	--	M
CO5	M	--	--	--	--	--	--	--	--	M

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

11.0 SUGGESTED QUESTION PAPER PROFILE:

Unit No.	CO	Marks per Unit	1.35 Times marks	Question Number Wise Marks						Actual Distribution of Marks
				01	02	03	04	05	06	
I	CO.1	16	22	08	16	--	--	--	--	24
II	CO.2	16	21	04	--	16	--	--	--	20
III	CO.3	16	22	08	--	--	16	--	--	24
IV	CO.4	16	21	04	--	--	--	16	--	20
V	CO.5	16	22	04	--	--	--	--	16	20
	TOTAL	**80**	**108***	**28**	**16**	**16**	**16**	**16**	**16**	**108**

a) Suggested Bitwise Distribution:

Unit No.	**I**							**II**							**III**							**IV**							**V**							**Total**
CO	**1**							**2**							**3**							**4**							**5**							
Marks per Unit	16							16							16							16							16							80
1.35 Times marks	22							21							22							21							22							108
Bits	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	**a**	**b**	**c**	**d**	**e**	**f**	**g**	
CO	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	
Q1	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	28
Q2	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q3	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16
Q5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	16
Q6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4	-	-	-	16
Sub Total	**24**							**20**							**24**							**20**							**20**							**108**
TOTAL																																				**108**