

Department of Civil Engineering Curriculum – 2021



Government Polytechnic, Nagpur

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY:	PROGRAMME CORE COURSE
COURSE CODE	: AM102G
COURSE TITLE	: CONCRETE TECHNOLOGY
TEACHING SCHEME:	TH:03 TU: 00; PR: 02 (CLOCK Hrs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEXAM	: 03 HRs
PR. TEEXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Concrete is extensively used as a construction material in almost all types of Civil engineering structures like buildings, roads, flyovers, dams, bridges and water tanks etc. With advanced construction techniques and use of locally available ingredients of concrete, concrete has become very popular construction material. One of the major job functions of civil engineer is to supervise the concreting work. He has to ensure the quality of concreting work.

The total contents of the course will be useful for ensuring the quality of concrete during design, manufacture, transporting and placing in position of concrete. With good knowledge of concrete materials and the concreting operations one can obtain concrete of desired workability and required strength. It will enable a civil Engineering technician to acquire skills of carrying out various tests on concrete materials and concrete itself along with interpretation of test results.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Use relevant types of cement in different site conditions.
2. Use relevant aggregates for required. Concrete works.
3. Prepare concrete of desired compressive strengths.
4. Prepare concrete of required specifications.
5. Maintain the quality of concrete.
6. Use relevant admixtures for concreting for different weather conditions

❖ COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Cement and Its properties.	1a. Describe the given types of cement and justify their relevant use. 1b. Justify the need for the given chemical constituents for given type OPC. 1c. Identify adulterations in the given cement at site 1d. Suggest type of cement for a given condition with justification	1.1 Chemical composition of cement. 1.2 Hydration of cement, testing of physical properties of cement like fineness, normal consistency, initial setting time, final setting time, compressive strength and soundness. I.S. Specifications for ordinary Portland cement (OPC). 1.3 Grades of cement, Adulteration of cement, field tests, storing cement at site, effect of storage on properties of cement. 1.4 Various types of cement and their uses, Rapid hardening cement, Low heat cement, Portland Pozzolana cement, Sulphate resisting cement, Blast furnace slag cement, white cement.	08
2. Aggregates and its properties.	2a. Identify type of given aggregate samples based on source size and shape. 2b. Describe methodology to suggest suitability of given fine aggregate 2c. Identify properties of given aggregate sample. 2d. Calculate fineness modulus of aggregate on given data 2e. Justify given properties of aggregate with compressive strength of concrete.	2.1 Types of aggregates and its Classification 2.2 Properties of fine aggregates like size, specific gravity, bulk density, bulking and silt content. 2.3 Properties of coarse aggregate like size, shape, texture, strength, water absorption, crushing value, impact value, abrasion value, flakiness and elongation index 2.4 Determination of aggregate grading, sieve analysis and fineness modulus. 2.5 Effect of aggregate properties on strength of concrete.	10
3. Concrete and its properties.	3a. Justify use of different grades for concrete and their properties for given application with justification. 3b. Select w/c for a given grade of concrete with justification. 3c. Describe factors affecting workability of given type concrete	3.1 Introduction to concrete grades, definition and importance of concrete, process diagram for concrete, properties of concrete in green and hardened state. 3.2 Duff Abram's water cement ratio (W/C) law, effect of W/C ratio on strength, durability and porosity of concrete, selection of Water Cement ratio, quality of water. 3.3 Concept of workability and factors affecting workability, Slump test, Compaction factor test, workability for different works.	8

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
	3d. Describe procedure of testing of strength of given concrete specimen and member	3.4 Importance of testing, compression test on concrete, interpretation of test results, introduction to Non- Destructive Testing (NDT) of concrete by Rebound Hammer Test and Ultrasonic Pulse Velocity tester	
4. Concrete Mix Proportion	4a. Explain use of given grades of concrete with justification.. 4b. Describe given objectives of Mix proportion. 4c. Explain need of given Information required for mix Proportion. 4d. Calculate quantity of materials for a given mix.	4.1 Grades of concrete. 4.2 Objectives of Concrete mix proportioning. 4.3 Information required for mix Proportion. 4.4 Concrete Mix proportioning by I.S. method as per IS 10262: 2019.	7
5. Concreting Operations.	5a. Describe given type of batching. 5b. Identify suitable type of concrete mixer for given site condition. 5c. Select method of transportation for given site condition. 5d. Explain procedure of placing of concrete for given situation 5e. Select methods of compaction and finishing of concrete for given conditions. 5f. Describe curing method for given situation with justification	5.1 Batching of cement and aggregates by volume and by weight. Introduction to batching plant. 5.2 Mixing concrete ingredients, types of Mixers-Tilting and Non-Tilting. 5.3 Transportation of concrete, methods of transportation, precautions to be taken during transportation. 5.4 Placing of concrete, precautions taken during placing concrete in formwork. 5.5 Compaction of concrete, methods of compaction, types of vibrator and precautions to be taken. Finishing of concrete, screeding, floating and troweling operations, use of power float. 5.6 Curing of concrete, purpose of curing, methods of curing-spraying water, membrane curing, steam curing, curing by wet gunny bags, ponding methods, chemical curing, duration of curing.	9
6. Admixture , Special concrete	6a. Justify need of a particular admixtures for given concrete mix. 6b. Describe given types of special concretes 6c. Explain need of RMC in given concreting work	6.1 Need of admixtures, various types of admixtures, mineral and chemical admixtures. 6.2 Fly-ash concrete, light weight concrete, fiber reinforced concrete, self-compacting concrete, pumped concrete, 6.3 Ready Mix Concrete (RMC).	6
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
GROUPA: CEMENT			
1	Determine fineness of cement.	Cement and its properties.	2*
2	Determine quantity of water for cement paste of Normal consistency.		2*
3	Determine initial and final setting time of cement.		2*
4	Determine compressive strength of cement.		2*
5	Determine soundness of cement.		2*
GROUPB: COARSE AGGREGATE (Minimum FOUR)			
1	Determine fineness modulus and water absorption	Aggregates and its properties.	2*
2	Determine flakiness and elongation index		2
3	Determine abrasion value		2
4	Determine impact value		2*
5	Determine crushing value		2*
GROUPC: FINE AGGREGATES (Minimum FOUR)			
1	Determine fineness modulus	Aggregates and its properties.	2*
2	Determine bulking of sand		2
3	Determine silt contents		2*
4	Determine specific gravity		2*
5	Determine bulk density		2
GROUPD: CONCRETE (Minimum THREE)			
1	Determine Slump of concrete	Concrete and its properties & Concrete Mix Proportion	2*
2	Determine Compaction factor of concrete		2
3	Determine Compressive strength of concrete after casting cube		2*
4	Determine strength of concrete by Rebound Hammer(Non Destructive Test)		2
Total Hrs.			32

- Experiments marked * are compulsory.
- Minimum 12 Practicals should be performed.
- The above list is suggestive and additional Practicals may be conducted if felt relevant by the course teacher.

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Cement and its properties.	02(02)	06(03)	03(00)	11(05)
02	Aggregates and its properties	02(02)	06(00)	03(03)	11(05)
03	Concrete and its properties.	02(02)	03(06)	03(00)	08(08)
04	Concrete Mix Proportion	02(00)	03(06)	06(00)	11(06)
05	Concreting operations.	02(00)	03(06)	06(00)	11(06)
06	Admixture Special concrete	02(00)	03(00)	03(06)	08(06)
	Total	12(06)	24(21)	24(09)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	3	U	3				3/5
03	2	U	3	3	U	3	4	U	3	3	U	3	4	U	3				3/5
04	5	U	3	6	U	3	1	A	3	4	U	3	5	U	3				3/5
05	2	A	3	3	A	3	6	A	3	5	U	3	2	A	3				3/5
06	4	A	6	5	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25@	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1, 2, 3, 4,5,6	
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	5
2	Performance	5
3	Calculation, Result, Drawing Graphs(if any)	5
5	Viva Voce	10
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	3	-	3
2	3	-	-	3	-	-	3	-	3
3	-	-	-	3	-	-	-	-	3
4	3	-	1	-	2	-	3	-	3
5	-	-	-	-	2	-	-	-	--
6	3	-	-	-	-	-	3	-	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Concrete Technology	M.L. Gambhir, Tata McGraw Hill, Fifth Edition, 2013	13:9781259062551 10:1259062554
2	Concrete Technology	M.S. Shetty, S. Chand and Co, First Edition, 2005	13:9788121900034 10:8121900034
3	Concrete Technology	S. Bhavikatti, I K International Publishing House Pvt. Ltd, First Edition, 2015	13:9789384588670 10:9384588679
4	Concrete Technology	A.M. Neville & J.J. Brooks. Pearson Education, First Edition, 2002	13:9788131705360 10:8131705366
5	Concrete Technology	A. R. Santhakumar, Oxford University Press, First Edition, 2006	13:9780195671537 10:0195671538

Sr. No.	IS Code	Published by
1	IS 383: 1970 Specification for coarse and fine aggregates from Natural Sources for concrete.	Bureau of Indian Standards
2	IS 456 : 2000 Code of practice for plain and reinforced concrete(fourth revision)	Bureau of Indian Standards
3	IS 516:1959 Methods of tests for strength of concrete (xii reprintDecember1987)	Bureau of Indian Standards
4	IS 8112 : 1989 Specificationfor43gradeOPC	Bureau of Indian Standards
5	IS12269:2013 Specificationfor53grade OPC	Bureau of Indian Standards
6	IS10262:2019 Recommended Guidelines For Concrete Mix Proportioning	Bureau of Indian Standards
7	I.S.13311(part-1and2)–1992 Methods of non-destructive testing of concrete part-1ultrasonicpulsevelocity.part-2rebound hammer.	Bureau of Indian Standards

❖ E-REFERENCES:

- <https://youtu.be/UOHURuAf5iY> accessed on 21/06/2021
- <https://youtu.be/44yrGm2fxFU> accessed on 21/06/2021
- <https://youtu.be/NUN9cTAIFdE> accessed on 21/06/2021
- <https://youtu.be/yzpWGrh9j6Y> accessed on 21/06/2021

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- Blaine's air permeability apparatus as per IS: 4031 (part 1)-1999, and sieve no. IS 90 micron - IS Brass Sieve (200 mm dia), 90 Micron size.
- Vicats apparatus- VICAT mould of dia. 80 mm & 40 mm high glass base plate, initial needle, final needle. Consistency plunger M.S. base plate (non porous) of weight 300 gm. Vicat mould split type with camping ring.
- Compression testing machine-2000 kN capacity
- Measuring Cylinder of 1000 ml capacity
- Cement mortar cube vibrator with moulds of size 50 cm²(7.07 cm x 7.07 cm) , 6 nos.
- Measuring Cylinder 1000 ml capacity
- Density basket as per IS specification
- I S sieve set (sizes- 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µ, 300 µ, 150 µ and pan) , sieve shaker with adaptors
- Aggregate impact testing m/c with mould, Los Angeles abrasion testing m/c
- Elongation gauge and thickness gauge.
- Slump cone (top dia.100mm, bottom dia.200mm, Height 300mm) Compaction factor test apparatus
- Table vibrator, moulds(150mm x150mmx 150mm)
- NDT apparatus – Rebound Concrete Hammer
- Crushing Value Apparatus
- Compaction Factor Test Apparatus

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute/Industry
1.	Y .K .Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	Arunkumar V. Gupta	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY: ENGINEERING SCIENCE
COURSE CODE : CE101G
COURSE TITLE : CONSTRUCTION MATERIALS
PREREQUISITE : NIL
TEACHING SCHEME: TH : 03 ; TU : 00 ; PR : 02 (CLOCK HRs.)
TOTAL CREDITS : 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM. : 03 HRs.
PR. TEE EXAM. : 02 HRs (Internal)
PT. EXAM. : 01 HR.

❖ RATIONALE :

This subject is mainly concerned with the study of few basic construction materials. Certain Engineering materials like cement and soil have been dealt with in greater details in the course of soil Engineering and concrete Technology where as steel and Reinforced concrete will be studied in R.C.C and Steel, testing of materials is dealt under other courses. This course is therefore very basic to a Civil Engineering field. Visits will help to have firsthand knowledge of different materials of construction. The student should know from personnel market inquiries, the rate of materials of construction. This course is a starting point as far as construction activity is concerned. Hence study of this course is very important.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Identify the basic properties of various engineering materials and their influence on construction operation and strength and durability of structures.
- 2 Identify the sources and method of preparation of different construction materials.
- 3 Use the suitable type of construction material for given job.
- 4 Suggest field and laboratory test to be performed for assessing the required quality standard.
- 5 Classify the different constructional materials.
- 6 Conduct market survey for different construction materials.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. LIME & CEMENT	1. Define lime, Quick lime,& Slacked lime 2. Enlist the types of Lime 3. Classify the Lime according to IS classification 4. State sources & constituents of lime stone 5. State the physical properties Cement 6. Identify the constituents of Cement 7. Outline the Flow Chart of manufacturing process of Cement 8. State the Additives to Cement 9. Name the Harmful constituents of Cement	1.1 Definitions of Lime, quick Lime & Slaked Lime 1.2 Types of lime- fat lime, hydraulic lime, poor lime & their uses 1.3 I.S. classification of lime 1.4 Sources of Lime 1.5 Constituents of lime stone 1.6 Physical properties of cement, Constituents of cement & their functions 1.7 Types of cement & their uses Flow chart of manufacturing process of cement-wet process, dry process 1.8 Additives to cement 1.9 Harmful constituents of cement	10
2. MORTAR & CONCRETE	1. Define the Mortar 2. Name the uses of Mortar 3. Classify the Mortar 4. Retrieve the various ingredients of Mortar & their proportions 5. Define the Concrete 6. Name the uses of Concrete 7. Classify the Concrete 8. Name the various ingredients of Concrete 9. State & explain Consolidation of concrete 10. Describe the process of curing of concrete	2.1 Definition of Mortar ,Uses of mortar 2.2 Classification of sand –fine sand , course sand gravelly sand 2.3 Types of Mortar –lime mortar surkhi mortar cement mortar gypsum mortar & their uses 2.4 Functions of sand in mortar 2.5 properties of cement concrete 2.6 Types of Concrete & their uses 2.7 Ingredients of Reinforced cement Concrete & their functions 2.8 Mixing the materials of concrete – Hand mixing, machine mixing 2.9 Consolidation-Hand Consolidation, vibrators & curing of concrete	10
3. BUILDING STONES & BRICKS	1. Classify the Building Stones 2. Identify the characteristics of good Building Stones 3. Describe the purpose of dressing of Stones 4. Enlist the Composition of good brick earth & harmful ingredients in brick earth 5. Classify the Bricks 6. Identify the conventional Bricks & Standard Bricks 7. Describe Concrete blocks 8. List the qualities of Good bricks 9. Enlist & describe the field &	3.1 Types of Rocks-igneous, sedimentary and metamorphic rocks & their uses 3.2 Characteristics of good building stones 3.3 Dressing of stones –Definition & purpose 3.4 Stone quarrying –definition & site selection 3.5 Composition of good brick earth & harmful ingredients in brick earth 3.6 Types of bricks-Burnt bricks, Fly-ash bricks, hollow bricks	12

	laboratory test on bricks	3.7 Conventional size in practice, standard I.S. size 3.8 concrete blocks 3.9 Qualities of good bricks-Expected standards 3.10 Field and laboratory test on bricks	
4. TIMBER	1. Name the uses of Timber in different parts of building 2. Describe the chief varieties of Timber 3. Define seasoning of Timber 4. Explain preservation of Timber 5. Classify the industrial timber 6. List the requirements of good Timber 7. Explain the uses of different industrial timber	4.1 Use of timber in different parts of buildings 4.2 Chief varieties of timbers –Arjun babul , bakul , bamboo, bijasal, ironwood, mango, sal, sissoom, teak etc. 4.3 Seasoning of timber- meaning & objects, types of seasoning. 4.4 Industrial timber-Veneers, plywoods, Block boards, Fiber boards, laminated boards flush door shutters, particle boards, hardboards 4.5 Requirement of good timber	06
5. FINISHING MATERIALS	1. Describe the uses of Gypsum plaster 2. List the different plastics & state their uses 3. Attribute the uses of PVC materials 4. Define fibers & name their types 5. List the types of paints & their uses 6. List the types of distemper & their uses 7. List the types of Varnishes & their uses 8. List the types of glass & their uses	5.1 Uses of Gypsum plaster 5.2 Classification of plastics according to i) behavior with respect to heating ,ii) structure iii) physical & mechanical properties 5.3 Resins-thermoplastics. thermosetting 5.4 Uses of P.V.C. materials 5.5 Fiber glass reinforced plastic-properties & uses 5.6 Paint-ingredients of an oil borne paint ,types of paints & their uses, process of painting and uses 5.7 Distemper- properties of distempering, ingredients of a distemper, process of distempering, whitewashing & color washing. 5.8 Varnish- characteristics of good varnishes, ingredients of varnish types& their uses process of varnishing. 5.9 Glass- properties of glass, types and their uses	06

6. FLOORING MATERIALS & ROOFING MATERIALS	1. List the types of flooring materials 2. Classify the flooring tiles 3. Identify the common places where the above flooring materials are used 4. Describe industrial flooring 5. List the different types of roofing materials 6. Describe the suitability of different types of Roofing materials	5.10 Types of flooring materials- Stones, Bricks, Cement Concrete (I.P.S.) 6.1 Flooring Tiles-mosaic, glazed, ceramic, marble, granite, vitrified, paving blocks etc. 6.2 Common places where above flooring materials used 6.3 Industrial flooring –importance, materials used. 6.4 Different types of Roofing materials 6.5 Suitability of different types of Roofing materials	04
	Total Hrs.		48

B. LIST OF PRACTICALS/ LABORATORY EXPERIMENTS / ASSIGNMENTS:

Assignments	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Write a report on market survey of various types of cement, their uses and market rates.	Lime & Cement	04
2.	Write a report on market survey of various types of bricks their uses and market rates.	Building Stones & Bricks	04
3.	Write a report on market survey of types of timber, artificial timber, their uses and market rates.	Timber	04
4.	Write a report on market survey of different flooring materials, their uses and market rates	Flooring & Roofing Materials	04
5.	Identify First class, second class and third class bricks From construction site and prepare report on the basis of its properties	Building Stones & Bricks	04
6.	Identify different types of flooring tiles and prepare report on the basis of its specification	Flooring & Roofing Materials	04
7.	Collect information about various finishing materials used in construction and prepare report.	Finishing materials	06
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Lime & Cement	02(02)	06(03)	03(00)	11(05)
02	Mortar & Concrete	02(02)	06(03)	03(00)	11(05)
03	Building stones & Bricks	02(02)	03(06)	06(00)	11(08)
04	Timber	05(03)	06(03)	00(00)	11(06)
05	Finishing materials	05(00)	03(06)	00(00)	08(06)
06	Flooring materials & Roofing materials	02(03)	06(00)	00(03)	08(06)
	Total	18(12)	30(21)	12(03)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T = Unit/Topic Number

L = Level of Question

M = Marks

R-Remember

U-Understand

A-Analyze/ Apply

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
03	4	R	3	4	U	3	1	U	3	4	R	3	5	U	3				3/5
04	2	U	3	4	U	3	5	R	4	4	U	3	5	U	3				3/5
05	1	A	3	2	A	3	5	U	3	6	R	3	6	A	3				3/5
06	3	A	6	6	U	6	3	U	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Scripts	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25@	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Collection of information and presentation	10
2	Performance and involvement in the activity	10
5	Viva Voce	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (Pos)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	-	-	-	-	-
2	3	-	-	-	2	-	-	-	-
3	3	3	-	-	2	2	3	-	2
4	3	3	-	3	-	2	3	-	2
5	3	3	-	-	-	-	-	-	2
6	3	-	-	-	-	2	-	-	2

1:Slight (Low)

2:Moderate(Medium)

3:Substantial(High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Building Construction	B. C. Punmia, Laxmi Publication	8170080533,97881700805
2.	Material of Construction	D. N. Ghose, Tata McGraw-Hill	0-07-4516477
3	Building Construction	Sushil Kumar, Standard Publication	8186308024, 9788186308028
4	Building Material	S. K. Duggal, New Age International	978-81-224-2392-1
5.	Concrete Technology	M. S. Shetty	81-219-0003-4
6.	National Building Code		1296641295, 9781296641290
7.	Engineering Materials	S. C. Rangwala, Charotar Publishing House	978-93-80358-13-0
8.	Engineering Materials	R. K. Rajput, S. Chand & Co. Ltd	81-219-1960-6

❖ **E-REFERENCES:**

https://en.wikipedia.org/wiki/List_of_building_materials , accessed on 9th June, 2021
dir.indiamart.com/industry/builders-hardware.html , accessed on 9th June, 2021
www.exponent.com › Capabilities , accessed on 9th June, 2021
www.journals.elsevier.com/construction-and-building-materials/ , accessed on 9th June, 2021
<https://civiljungle.com/difference-between-mortar-and-concrete/> accessed on 9th June, 2021
<https://www.thespruce.com/basic-types-and-cost-of-roofing-materials-1822016> accessed on 9th June, 2021
<https://firstamericanroofing.com/roofing-materials/> accessed on 9th June, 2021
<https://www.sciencedirect.com/topics/materials-science/material-finishing> accessed on 9th June, 2021
<https://geology.com/minerals/gypsum.shtml> accessed on 9th June, 2021
<https://www.tuf-bar.com/advantages-of-using-glass-fiber-reinforced-polymer-gfrp-rebar/> accessed on 9th June, 2021
<https://civiltoday.com/civil-engineering-materials/timber/224-timber-lumber-definition-types> accessed on 9th June, 2021
<https://theconstructor.org/building/lime-classification-building-construction/15745/> accessed on 9th June, 2021
<https://www.buildersmart.in/blogs/lime-material/> accessed on 9th June, 2021
<https://www.britannica.com/science/rock-geology> accessed on 9th June, 2021

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. N. V. Raut	H.O.D. Civil Engineering Deptt. (First Shift)	Government Polytechnic, Nagpur.
2	Dr.S.R.Kukadapwar	H.O.D. Civil Engineering Deptt. (Second Shift)	Government Polytechnic, Nagpur.
3	Mr M R Shelote	Consulting Engineer	Shelote Associates ,Onkar Nagar ,Nagpur
4	N.H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Dr. S. J. Nikam.	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
6	R. M. Walke	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: ENGINEERING SCIENCE
COURSE CODE	: CE151G
COURSE TITLE	: ELEMENTS OF CIVIL ENGINEERING
TEACHING SCHEME	: TH:00; TU: 00;PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 01 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)
TH. TEE EXAM	: Nil
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: Nil

❖ **RATIONALE:**

Civil engineering students should know the facts, concepts, principles and procedures in civil engineering. This course describes the elementary knowledge related to civil engineering. It is very useful course for the students to visualize the structures while learning higher level courses of Diploma in Civil Engineering.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify different types of buildings and their components.
2. Identify tools and Equipment used in construction activity.
3. Differentiate between Load Bearing & Framed structure Building.
4. Identify different components of Civil Engineering structures like Roads, Bridges, Railway Track.
5. Identify various components of Earthen Dam.
6. Draw flow diagram showing components of Water Supply Scheme.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
NIL			

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

(Any eight of the following)

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the various components of buildings	1. Construction	4
2	Listing of tools and Equipment used in construction activity.	1. Construction	4
3	Introductory differentiation between Load Bearing & Framed structures.	1 Construction	4
4	Identify the various components and elements of roads	2. Highways	4
5	Identify the component parts of Bridge	2. Highways	4
6	Identify the components of Railway Track	2. Highways	4
7	Identify the components of Earthen Dam	3. Irrigation Engineering	4
8	Elaborate Various methods of Irrigation	3. Irrigation Engineering	4
9	Draw flow diagram of water supply scheme & identify the various processes involved in it.	4. Public Health Engineering	4
Total Hrs			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

NIL

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

NIL

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	-	--	--	--	--
		Class Room Assignments		-	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	-	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	25@	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Label the components of structure in the given drawing etc.	20
2	Drawing	10
3	Viva Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	2	-	-
2	3	-	-	-	-	-	2	-	-
3	3	-	-	-	-	-	2	-	-
4	3	-	-	-	-	-	2	-	-
5	3	-	-	-	-	-	2	-	-
6	3	-	-	-	-	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Building Construction	Rangwala, Charotar Publishing House Pvt. Ltd., 33rd Edition, 2015	978-93-85039-04-1
2.	A Text-Book of Building Construction	S. P Arora & S. P Bindra, Dhanpat Rai & Co., 2010	9788189928803, 9788189928803
3.	Transportation Engineering	V.N.Mittal, Arvind Mittal, McGraw Hill Education Pvt. Ltd, Reprint, 2011	13: 978-0-07-059357-2
4.	Irrigation Engineering	S.K.Bhattacharya and K.M.Rastogi., New Age International Publisher, Reprint, 2009.	978-81-224-1042-6
5.	Irrigation Engineering	Gurcharan Singh, Standard Book House 2010	ISBN-13: 9788189401320
6.	Irrigation Engineering	N. N. Basak, Tata McGraw-Hill Education, 1999	
7.	Irrigation and Water Power Engineering,	Dr. B. C. Punmia, Dr. Pande Brij Basi Lal, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, Ltd., 1992	8131807630

8.	Environmental Engineering Vol - I	Dr. P.N. Modi, Standard Book House, 2018	13: 9788189401351
9.	Environmental Engineering	S.G.Tarnekar and P.K.Kharbanda, S.Chand& Company Ltd., Third, 1990	13: 978- 8121901048

❖ **E-REFERENCES:**

<https://www.youtube.com/watch?v=Qftr8EeiiMs> accessed on 15/05/2021

<https://www.youtube.com/watch?v=LgvYswA-7e8> accessed on 15/05/2021

<https://www.youtube.com/watch?v=ecTk6szWBkg> accessed on 15/05/2021

<https://www.youtube.com/watch?v=Ev1wa0wRpqk> accessed on 15/05/2021

<https://www.youtube.com/watch?v=sGNbsZbbefo> accessed on 15/05/2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

No equipment and tools are required

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. N. V. Raut	HOD, Civil Engineering and Programme Head	Government Polytechnic, Nagpur.
2	Dr. S. R. Kukadapwar	HOD, Civil Engineering (Shift II)	Government Polytechnic, Nagpur.
3	Mr. M. D. Keskar	Structural Consultant	Design Engineers, Bhau Saheb Surve Nagar, Nagpur
4	Mr. S. R. Ukey	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr. S. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur
6	Dr. D. N. Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/PK/MT/TX/TR
LEVEL NAME	: AUDIT
COURSE CODE	: EV151G
COURSE TITLE	: ENVIRONMENTAL SCIENCE
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 02; TU: 00; PR: 00 (CLOCK HRs.)
TOTAL CREDITS	: 02 (2 TH CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: NIL
PT.	: NIL

❖ RATIONALE:

The world today is facing the biggest challenge of survival. Degradation of ecosystem, depletion of natural resources, increasing levels of pollution, poses major threat to the survival of mankind. The need of the hour, therefore, is to concentrate on the area of environmental science, which shall provide an insight into various environment related issues.

Environmental science is an interdisciplinary academic field that integrates physical and biological sciences, with the study of the environment. It provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems & gives an insight into solutions of Environmental problems

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Acquire the knowledge of terms related to Environmental Studies.
2. Identify natural resources and resolve problems associated with them.
3. Identify alternate energy resources and use them efficiently during their engineering practices.
4. Develop habits which will reduce various types of pollution.
5. Analyze key issues about environment and create public awareness about those environmental issues.
6. Acquire formal & non formal environmental education.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. EARTH SYSTEMS AND RESOURCES	a) Prepare list of historical events of earthquakes, volcanoes, Tsunami, cyclone & landslides in the world. b) Identify problems associated with soil, water c) Differentiate weather and climate. d) Analyze the global water problems.	1.1 Earth Science: Concepts of Geologic time scale; earthquakes, volcanoes , Tsunami , cyclone & landslides 1.2 The Atmosphere: Weather and climate; the Coriolis Effect 1.3 Global Water Resources and Use: Present scenario, surface and groundwater issues; global problems; and its conservation. 1.4 Soil : soil erosion and other soil problems; methods of soil conservation	04
2.CONCEPT OF BIODIVERSITY	a) Describe Biodiversity b) Identify Levels of biodiversity c) Prepare a list of biodiversity hotspots d) List the endangered species e) Prepare a report on value of Biodiversity f) Suggest methods /steps for Biodiversity conservation	2.1 Definition of Biodiversity 2.2 Levels of biodiversity 2.3 Value of biodiversity 2.4 Threats to biodiversity, loss of biodiversity (biodiversity hotspots) 2.5 Conservation of biodiversity (modern methods of biodiversity conservation)	04
3. ENERGY RESOURCES & CONSUMPTION	a) Match the energy forms projects b) Describe various forms of energy c) Describe advantages and disadvantages of forms of energy d) Select appropriate solutions of Efficient use of energy e) Utilize techniques for energy consumption to reduce impact on environment.	3.1 Energy Consumption history 3.2 Present global energy use, Future energy needs 3.3 Energy forms:(conventional and non conventional) 3.4 Energy Conservation 3.5 Renewable Energy: Solar energy; solar electricity; biomass; wind energy; ocean waves and tidal energy; geothermal	06
4. POLLUTION	a) Define pollution and pollutants b) Classify various types of pollutants. c) Identify the Pollutants and their sources	4.1 Definition of pollution. 4.2 Air pollution: Definition, Classification, sources, effects, Prevention and ambient air quality standards. 4.3 Water Pollution: Definition, Classification, sources effects, Prevention And WHO and BIS	08

	d) Develop habits to reduce pollution e) State the standard / limiting/ controlling values of various types of pollution.	water quality standards. 4.4 Soil Pollution/land pollution: Definition, sources, effects, prevention 4.5 Noise Pollution: Definition, sources, effects, prevention. 4.6 Biomedical Waste and E-Waste -- Origin, Effects and control Measures. 4.7 CPCB and MPCB norms and roles and responsibilities.	
5 SOCIAL ISSUES & ENVIRONMENT	a) Describe sustainable development b) Evaluate sources of Green house effect, acid rains, Global warming c) Describe the incidences of Nuclear Accidents,	5.1 Concept of development, sustainable development 5.2 Watershed management , rain water harvesting 5.3 Global Warming, greenhouse effect; ozone depletion, relevant laws and treaties 5.4 Nuclear Accidents and Holocaust: Basic concepts and their effect on climate, , relevant laws and treaties	05
6. ENVIRONMENTAL EDUCATION	a) Differentiate formal and non formal education b) Describe various acts and their provisions c) Develop awareness about environment.	6.1 Formal and non-formal education 6.2 Role of Govt. and Non-Govt. Organization 6.3 Indian constitutional provisions regarding the environment. Brief description of the following acts and their provisions: Environmental Protection Act and Prevention of Water, air and noise Pollution Act. 6.4. Concept EIA and environmental Ethics	05
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units
1	Prepare report on Loss of biodiversity, its conservation and also describe biodiversity hotspots.	Concept Of Biodiversity
2	Prepare report on use of various renewable energy sources.	Energy Resources And Consumption
3	Assignment on article collection from news papers, magazines and internet on local environmental pollution.	Pollution
4	Prepare report on case study of Industrial /Nuclear / any other Disaster in India.	Social Issues And Environment

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Nil

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Nil

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	Assignment Copy	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				TOTAL	--	--		
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course Survey			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

Nil

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	9	10
1	3	-	-	-	2	-	-	-	-
2	3	-	-	-	2	-	2	-	-
3	3	-	-	-	2	-	2	-	-
4	2	-	-	-	2	-	-	-	-
5	3	-	-	-	2	-	2	-	-
6	2	-	-	-	2	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Environmental studies	Oxford University Press, New Delhi. 2011	0-19-807228-2
2.	Environmental Science	Y.K. Singh, New Age International, New Delhi	8122418481, 9788122418484
3.	A Text Book Of Environmental Science	Arvind Kumar, APH Publishing, New Delhi	817648590X, 9788176485906
4.	Environmental Engg	A Kamla & D.L.Kanth Rao, Tata Mc Graw-Hill, New Delhi	0-07-451708-2
5.	A Textbook of Environmental Studies	Shashi Chawla, Tata Mc Graw-Hill, New Delhi	9781259006388
6	Environmental studies	Erach Bharucha	UGC , New Delhi

❖ **E-REFERENCES:**

1. https://en.wikipedia.org/wiki/Lists_of_nuclear_disasters_and_radioactive_incidents, accessed on 20 January 2021
2. www.legalserviceindia.com/articles/noip.htm accessed on 18 March 2021
3. <https://prezi.com/8mnz--ldkybc/apes-unit-1-earth-systems-resources/> accessed on 23 March 2021
4. <http://www.conserve-energy-future.com/AlternativeEnergySources.php>, 18 March 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr N V Raut	Head of Civil Engineering, (I Shift)	Government Polytechnic, Nagpur.
2	Dr S R Kukadapwar	Head of Civil Engineering, (II Shift)	Government Polytechnic, Nagpur.
3	Dr Mrs R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr A J Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5	Mr V B Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

**PROGRAMME : DIPLOMA IN EC/IT/MC/EE/CM/CE/ME/AE/PK/
TR/TX/MT/AI**

COURSE CATEGORY: AUDIT COURSE

COURSE CODE : IC151G

COURSE TITLE : INDIAN CONSTITUTION

TEACHING SCHEME: TH:01; TU: 00; PR: 00 (CLOCK HRs.)

TOTAL CREDITS : -

TH. TEE EXAM : -

PR. TEE EXAM :-

PT. EXAM : -

❖ RATIONALE:

The Constitution of India is the supreme law of India. The document lays down the framework that demarcates fundamental political code, structure, procedures, powers, and duties of government institutions and sets out fundamental rights, directive principles, and the duties of citizens. Engineer has to perform different works related to project planning, constructing project work, lead a group of workers etc. Engineer must also know about different bodies of administration, fundamental rights of citizen, different levels of Indian Union. Hence every Diploma Holder should have knowledge about Indian Constitution.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret policies of government.
2. Outline structure of Indian Union.
3. Describe functions of State Secretariat and different Ministries .
4. Describe structure of District Administration.
5. Describe role and functions of Chief Election Commissioner.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Topics and Subtopics	Hrs.
1. The Constitution - Introduction	1.1 The History of the Making of the Indian Constitution 1.2 Preamble and the Basic Structure, and its interpretation 1.3 Fundamental Rights and Duties and their interpretation 1.4 State Policy Principles	04
2. Union Government	2.1 Structure of the Indian Union 2.2 President – Role and Power 2.3 Prime Minister and Council of Ministers 2.4 Formation of Lok Sabha and Rajya Sabha and its functions	04
3. State Government	3.1 Role and Power of Governor 3.2 Role and Functions of Chief Minister and Council of Ministers 3.3 Functions and Powers of State Secretariat	03
4. Local Administration	4.1 Structure of District Administration 4.2 Functions of Municipal Corporation 4.3 Functions of Zila Parishad	03
5. Election Commission	5.1 Role and Functions of Chief Election Commissioner 5.2 Role and Functions of State Election Commission	02
	Total	16

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Assignment on each topic (Total 5 Assignments)

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	--	--	--	--
		Journal Writing		Assignments	--	--	--	--
				Total	--	--		Grades A, B, C.
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1	-	-	-	-	3	-	3	-	-	-
2	-	-	-	-	3	-	3	-	-	-
3	-	-	-	-	3	-	3	-	-	-
4	-	-	-	-	3	-	3	-	-	-
5	-	-	-	-	3	-	3	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Ethics and Politics of the Indian Constitution	Rajeev Bhargava, Oxford University Press, New Delhi, 2008	
2	The Constitution of India	B.L. Fadia, Sahitya Bhawan; New edition (2017)	
3	Introduction to the Constitution of India	DD Basu, Lexis Nexis; Twenty-Third 2018 edition	

❖ **E-REFERENCES:**

- <https://www.constitution.org/cons/india/const.html>
- <http://www.legislative.gov.in/constitution-of-india>
- <https://www.sci.gov.in/constitution>
- <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.D.D.Lulekar	HoD, Electrical Engg. Deptt.	Government Polytechnic, Nashik.
2	Prof.A.M.Arekar	Lecturer In Electrical Engg.	Government Polytechnic, Nagpur
3	Mr.M.N.Gawande	Lecturer In Electrical Engg.	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY:	PROGRAMME CORE COURSE
COURSE CODE	: AM202G^s
COURSE TITLE	: MECHANICS OF STRUCTURES
TEACHING SCHEME:	TH:03; TU:00;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04 (01TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEXAM	: 03 HRs
PR. TEEXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Concepts and principles involved in the design of various structures in Civil Engineering are covered in this subject. Design and analysis of structure needs the basic understanding of mechanical properties of material and their behavior under stress. The approach of teaching should develop critical thinking in the students. In laboratory the experiments integrate the knowledge and desired skill in students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1.Determine various material parameters under various load condition.
- 2.Analyse the effect of shear force and bending moments on beams.
- 3.Compute Moment of inertia of different sections..
- 4.Use Moment of Inertia to calculate bending stresses.
5. Calculate the load carrying capacity of column using empirical formulae.
6. Analyse the forces in members of truss using various methods.

❖ **COURSE DETAILS:****A. THEORY:**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Simple Stress, Strain and Elastic Constants Strain Energy	1.a. Describe given terms and compute their values 1.b. Calculate Material Properties Under given load condition. 1.c. Compute stresses and load shared by given composite sections subject to direct load 1.d. Calculate the stress, strain due to temperature variation in given homogeneous and compound bars 1.e. Calculate the change in dimensions and volume of the body subjected to uniaxial, biaxial and triaxial loads/stresses of given materials. 1.f. Calculate design constants for given conditions. 1.g. Describe relation between given modulus	1.1 Stress, strain, elasticity. Rigid, elastic and plastic bodies. Deformation of elastic body under various forces. 1.2 Type of stresses-normal and tangential, normal tensile and compressive stresses, standard stress strain curve for mild steel bar under tension test, Hook's law, elastic limit, modulus of elasticity, factor of safety, yield and working stresses. 1.3 Stress and strain in composite section under axial loading. 1.4 Stress and strain due to temperature variation developed in homogeneous and composite bars. 1.5 Longitudinal and Lateral strain, Poisson's ratio, biaxial and triaxial stresses, volumetric strain, change in volume, Bulk modulus. 1.6 Shear stress and strain, modulus of rigidity, complementary shear stress and induced tension and compression due to it. 1.7 Relation between modulus of elasticity, modulus of rigidity and bulk modulus	10
2. Shear Force & Bending Moment	2.a. Describe given terms related to beams and supports 2.b. Interpret with sketch of the given type of beam, load and end condition relevant to the actual field situation. 2.c. Draw Shear Force & Bending Moment Diagram for given Statically Determinate Beams. 2.d. Calculate the shear force and bending moment for given beam and load conditions	2.1 Types of beams, supports and loads. 2.2 Concept and definition of shear force and bending moment. 2.3 Shear force and bending moment diagram for simply supported, Cantilever and one sided over hanging beams subjected to point loads and uniformly distributed loads only. 2.4 Point of maximum sagging and hogging bending moment, point of Contra-flexure, Relation between loads, shear force and bending moment.	08
3. Moment of Inertia	3.a. Describe given terms used and compute their values 3.b. Compute Moment of Inertia of given Symmetric or asymmetric structural sections using given theorems. 3.c. Calculate Polar Moment of inertia of given sections	3.1 M.I. of plane lamina, radius of gyration, parallel and perpendicular axes theorems, M.I. of rectangular, circular, semi-circular and triangular section. 3.2 M.I. of symmetrical and Unsymmetrical I-section, channel section, T-section, angle section, & Hollow sections about centroidal axes. 3.3 Polar Moment of Inertia of circular sections.	06

4. Bending and Shear Stresses in Beams	4.a. Describe given terms related to bending 4.b. Describe given terms related to bending stress and their nature. 4.c. Calculate Bending and shear stresses at any location in the given beam 4.d. Design beams based on allowable stresses on given data. 4.e. Describe given terms related to Shear stress equation 4.f. Determine the location of maximum and minimum bending and shear stress of given beam. 4.g. Draw the stress distribution diagram of given beam.	4.1 Concept of pure bending, theory of simple bending 4.2 Assumption, neutral axis, Bending stresses and their nature 4.3 Bending stress distribution 4.4 Moment of resistance 4.5 Shear stress equation and meaning of term used in equation 4.6 Relation between maximum and average shear stress. 4.7 Shear stress distribution for Rectangular, Hollow rectangular, Angle Sections, Channel section, I-Section, T sections and Compound sections. Simple problems based on based on it	10
5. Columns	5.a. Describe given terms and compute their values 5.b. Determine buckling load of column by given method. 5.c. Determine the critical and safe loading on the column for given end conditions of columns.	5.1 Columns, short column, long column, type of end conditions for Columns, Buckling of axially loaded columns 5.2 Effective length, radius of gyration, Slenderness ratio, Assumptions made in Euler's theory, Euler's buckling load. 5.3 Rankine's formula used for calculated crippling loads.	06
6. Simple Plane Frames	6.a. Describe given terms and classify frames 6.b. Analyze the given truss by method of joint 6.c. Analyze the given truss by method of section 6.d. Draw the Space and vector diagram and calculate the forces and their nature of given frame.	6.1 Introduction, Classification of frames and Assumptions in analysis of frames. 6.2 Calculate forces in members of truss using Method of joints 6.3 Calculate forces in members of truss using Method of section 6.4 Calculate forces in members of truss using Graphical method Simply supported and Cantilever perfect frames with vertical & inclined loads.	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
GROUP A			
1	Operate Universal Testing Machine for different types of test.	1. Simple Stress and Strain	02
2	Measure the elongation of steel by using Extensometer.	1. Simple Stress and Strain	02
3	Operate Compression testing machine for compression test.	1. Simple Stress and Strain	02
GROUP B : (Any Eight)			
4	Tension test on mild steel plane bar as per IS 1608 (2005).	1.Simple stress and strain	02
5	Tension test on HYSD/TOR steel as per IS 1786 (2008).	1.Simple stress and strain	02
6	Determine Water absorption of conventional and fly ash bricks	1.Simple stress and strain	02
7	Determine Compressive strength of dry and wet bricks	1.Simple stress and strain	02
8	Shear test on different metals such as MS (Mild steel), AL (Aluminium), BR (Brass) and CU (Copper) as per IS 5242.	1.Simple stress and strain	02
9	Conduct Abrasion test on Flooring tiles (any one) e.g Mosaic tiles, Ceramic Tiles as per IS 13630(Part 7), Cement Tiles as per IS 5242	1.Simple stress and strain	02
10	Conduct Flexural test on floor tiles IS-1237,IS13630 or roofing tiles as per IS2690	5.Bending and Shear stresses in beams	02
11	Flexure test on wooden beam of rectangular cross section as per IS 1708, IS 2408.	5.Bending and Shear stresses in beams	02
12	Determine the forces in the members of roof Truss	6. Simple Plane Frames	02
GROUP C: (Any One)			
13	Draw shear force and bending moment diagrams of different types of beams and loadings. (Six problems on – Three A2 sizesheets.)	2. Shear force & bending moment	10
14	Draw the space diagram and force diagram of simple plane frames and determine axial forces in its members (Four problems -Two Cantilever and two Simply supported on Two A2 size sheets)	2. Shear force & bending moment	10
Total Hrs.			32

- Minimum 12 Practical should be performed.
- The above list is suggestive and additional practical may be conducted if felt relevant by the course teacher.
- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Blooms's 'Cognitive Domain Taxonomy' as generally required by the industry.

SPECIFICATION TABLE FOR THEORY PAPER

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Simple Stress and Strain and Elastic Strain Energy	02(02)	03(03)	06(03)	11(08)
02	Shear Force & Bending Moment	02(00)	03(03)	06(06)	11(09)
03	Moment of Inertia	02(00)	03(03)	06(03)	11(06)
04	Bending and Shear Stresses in Beams	02(00)	03(00)	03(03)	08(03)
05	Columns	02(02)	03(03)	03(00)	08(05)
06	Simple Plane Frames	02(02)	03(00)	06(03)	11(05)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Bit 7			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2				6/9
	1	R	2	5	R	2	6	R	2													
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3							3/5
03	4	U	3	5	U	3	6	U	3	3	U	3	5	U	3							3/5
04	1	A	3	1	A	3	2	A	3	1	A	3	3	A	3							3/5
05	2	A	3	4	A	3	5	A	3	4	A	3	6	A	3							3/5
06	3	A	6	6	A	6	2	A	6													2/3

T-Unit/Topic Number L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment book	1, 2, 3, 4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous assessment of practical	Students	End of every practical	20	--	Journal	1, 2, 3, 4, 5, 6
		Journal Writing		Assignment	05	--	Journal	1, 2, 3, 4, 5, 6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Practical Answer Scripts	1, 2, 3, 4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing free body diagram, selection of equipment's. writing procedure etc.	10
2	Performance	10
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)							Program specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	-	3	-	-	3	-	2
2	3	3	-	3	-	-	3	-	-
3	3	3	-	3	-	-	3	-	-
4	3	3	-	-	-	-	3	-	-
5	3	3	-	3	-	-	3	-	-
6	3	3	-	3	-	-	3	-	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	A Textbook of Strength of Materials	Dr. R.K. Bansal Publisher: Laxmi; Publications(P) Ltd. 5th edition, 2012	978-8131808146
2	Strength of Material	R. S. Khurmi. Publisher: Chand(S.) & Co. Ltd.	978-8121928229
3	Strength of Material	S. Ramamurtham, Dhanpat Rai Publishing Co.	818743354X, 9788187433545
4	Mechanics of Structure Vol 1	S. B. Junnarkar and H. J. Shah, Publisher: Charotar Publishing House Pvt. Ltd., 2012	978-9380358659
5	Strength of Material	Sunil S. Deo, Nirali Prakashan ,2013	978-9383073283

E-REFERECNES:

<https://youtu.be/67fSwIjYJ-E> accessed on 18th January 2022
https://youtu.be/l20kF6fhScA_ accessed on 18th January 2022
<https://youtu.be/InEpKIYBkvk> accessed on 18th January 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

Universal Testing machine of capacity 400kN,600kN/1000kN, analog type/digital type with all attachments and accessories.
Extensometer with least count 0.01mm, maximum extension 25 mm with single dial gauge/ digital display suitable for various gauge length
Compression testing machine of capacity 2000KN, analog /digital type having facility to measure deformation with all attachments and accessories.
Izod /Charpy impact testing machine confirming to IS:1757.
Torsion testing machine hand operated or motorized.
Accessories: venire caliper, meter scale, weighing balance, weights, punch, file, hammer, screw driver, pliers ,etc.

❖ WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Prof. Y.K.Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	Prof. A. Ateeque Azher	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSES
COURSE CODE	: AM203G
COURSE TITLE	: GEOTECHNICAL ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT.	: 01 HR

❖ RATIONALE:

Supervision of earthwork in the construction of civil engineering structures like Dams, road embankment and Building foundations is one of the important functions of a technician. The basic knowledge of properties and behavior of soil is therefore essential, for civil engineers working Civil Engineering site.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Interpret the physical properties of soil related to given construction activities
2. Use Atterberg's Limits to identify types of soil
3. Use the results of permeability of soil in analyzing soil.
4. Interpret shear strength of various types of soil.
5. Compute optimum values for moisture content for maximum dry density of soil through various tests.
6. Interpret the soil bearing capacity results.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Soil and its physical properties	1a. Describe given terms related to soil and its properties. 1b. Compute given index properties of soil with justification 1c. Use relation between various soil properties in given situation. 1d. Describe effect of swelling pressure in given clayey soil . 1e. Classify given soil based on Indian standard classification method and justify. 1f. Interpret the particle size distribution curve for the given data 1g. Describe sedimentation analysis for given soil	1.1 Definition of soil, Importance of soil in engineering & its necessity. 1.2 Mass of Soil, two and three-phase system, properties like void ratio, porosity, degree of saturation, bulk density, dry density, saturated density, specific gravity and water content and Density index. 1.3 Relation between various properties 1.4 Introduction to swelling pressure in clayey soil eg. (black cotton soil). 1.5 Classification of soil based on Indian standard classification method 1.6 Mechanical analysis – Sieve analysis, grain size distribution curves, characteristic and interpretation, effective size, uniformity coefficient and coefficient of curvature and its significance, well-graded, poorly graded and uniformly graded soil. 1.7 Sedimentation analysis – Stoke's law and principle used in pipette method	12
2. Atterberg's Limits	2a. Calculate Atterberg's limits of Consistency for the given data. 2b. Interpret given plasticity chart.	2.1 Different states of soil, liquid limit, plastic limit and shrinkage limit and their determination, plasticity index, liquidity index, consistency index 2.2 Plasticity chart and A-line diagram	06
3. Permeability	3a. Identify the factors affecting the permeability of given type of soil sample. 3b. Compute the coefficient of permeability for a given soil sample data. 3c. Describe Factors affecting permeability of given soil and justify it	3.1 Definition, coefficient of permeability, Darcy's law, typical values of coefficient of permeability for different soil, 3.2 Determination of coefficient of permeability by constant and variable head method 3.3 Factors affecting permeability.	08

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
4. Shear Strength of Soil	4a. Describe given constituents of Shear Strength of Soil. 4b. Draw typical failure envelop of given soil 4c. Calculate Shear strength of soil using given data	4.1 Constituents of shearing resistance of soil, definition of cohesion, internal friction and angle of shearing resistance. 4.2 Coulomb's law and failure envelop. 4.3 Shear strength of soil, Different type of tests; Applicability, Numerical based on it.	07
5. Compaction of Soil	5a. Describe process of compaction and consolidation in the given situation 5b. Compute optimum moisture content and maximum dry density on given soil sample. 5c. Explain Proctor Tests for given site situation 5d. Compute field density by core cutter & sand replacement method on given data	5.1 Concept of compaction, consolidation, compression and settlement, difference between compaction and consolidation 5.2 Relation between moisture content and dry density under constant compaction effort, optimum moisture content and maximum dry density. 5.3 Light and heavy compaction tests, factors affecting compaction. Standard Proctor Test 5.4 Field compaction methods, quality control tests, Field density by core cutter, sand replacement.	08
6. Bearing Capacity and Soil Stabilization	6a. Suggest the soil parameters to determine bearing capacity of given soil sample with justification 6b. Describe Plate load Test as per given site situation 6c. Choose relevant method of soil stabilization for the given situation with justification	6.1 Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, safe bearing capacity, allowable bearing capacity. Typical values of bearing capacity for common soil as per building codes. 6.2 Plate load test – procedure, set-up, limitations. 6.3 Concept of soil stabilization, necessity of soil stabilization. Different methods of soil stabilization – mechanical stabilization, cement stabilization, bitumen stabilization, fly ash and lime stabilization	07
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Carryout field identification test on soils.	Soil and its physical properties	02
2	Determine water content of a given soil sample by oven dry method.		02*
3	Determine specific gravity of soil by Pycnometer.		02*
4	Carryout grain size analysis and plot particle size distribution curve for given soil sample.		02*
5	Determine Liquid Limit of given soil sample.	Atterberg's Limits	02*
6	Determine Plastic limit of given soil sample.		02*
7	Determine shrinkage limit of given soil sample		02
8	Determine coefficient of permeability by falling head test.	Permeability	02*
9	Determination of field density and dry density by core cutter method.	Compaction of Soil	02*
10	Determine field density by dry density by sand replacement method.		02*
11	Determine Optimum Moisture Content (OMC) and Maximum Dry Density (MDD) by standard proctor test.		02*
12	Prepare a report on following video recorded test on soil/ Expert lecture. 1. Unconfined compression test 2. Triaxial shear test. 3. Direct shear test 4. CBR test 5. Vane shear test	Shear Strength of Soil	06*
13	Prepare a report on different field test.	All	04*
Skill Test			02
Total Hrs.			32

- ❖ Experiments marked * are compulsory.
- ❖ Minimum 12 Practicals should be performed.
- ❖ The above list is suggestive and additional Practicals may be conducted if felt relevant by the course teacher.

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Soil and its physical properties	02(02)	03(00)	06(06)	11(08)
02	Atterberg's Limits	02(02)	06(00)	06(00)	14(02)
03	Permeability	02(02)	00(06)	06(00)	08(08)
04	Shear Strength of Soil	02(00)	06(03)	03(00)	11(03)
05	Compaction of Soil	02(00)	03(03)	03(06)	08(09)
06	Bearing Capacity and Soil Stabilization	02(00)	03(06)	03(00)	08(06)
	Total	12(06)	21(18)	27 (12)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	2	U	3	3	U	3	3	U	3				3/5
03	4	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	6	U	3	3	A	3	3	A	3	6	U	3	6	U	3				3/5
05	4	A	3	5	A	3	6	A	3	5	A	3	5	A	3				3/5
06	1	A	6	2	A	6	1	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1,2,3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	20	--	Practical Answer Sheets	1,2,3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50 @	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1,2,3,4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing figure/diagram, selection of equipment's. writing procedure etc.	10
2	Collection of data/compilation	20
3	Calculation, Result, Drawing Graphs (if any)	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	3	-	-	-	1	3
2	-	-	-	3	-	-	-	-	3
3	3	3	-	3	-	-	-	-	3
4	3	3	-	3	-	-	-	-	3
5	-	3	-	-	-	-	-	-	3
6	3	3	-	3	-	-	-	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Soil Mechanics & Foundation	Dr. B. C. Punmia, Er. Ashok Kumar Jain, Dr. Arunkumar Jain, Laxmi Publication 16 th Edition, 2017	8170087910
2.	Geotechnical Engineering: Principles and Practices of Soil Mechanics	V.N.S. Murthy, CRC Press, Edition, 2002	10: 0824708733 13: 978-0824708733
3.	Basic Soil Mechanics & Foundations	Alam Singh, CBS Publisher, Edition, 2015	9788123901275
4.	IS: 2720 Method of Tests for Soils	Bureau of Indian Standards	-

5.	IS 1498 (1970): Classification and identification of soils for general engineering purposes [CED 43: Soil and Foundation Engineering]	Bureau of Indian Standards,	-
6	IS 1888 (1982): Method of load test on soils [CED 43: Soil and Foundation Engineering]	Bureau of Indian Standards,	-

❖ **E-REFERENCES:**

<http://nptel.ac.in/courses/105103097/web/chap9final/s4.htm>

, assessed on 25th January, 2021

https://youtu.be/pM-w_cvk1nA ,

assessed on 25th January, 2021

<https://youtu.be/C10dkIH12W0> ,

assessed on 25th January, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Liquid limit device as per IS:2720 (part 10), IS:9259.
2. Sieve set as per IS:460, ISS perforated plate, GI frame, sieves 45cm diameter, aperture size 80mm to 2mm with pan and cover.
3. Brass sieves 30cm diameter aperture size 10mm to 38micron with cover and pan.
4. Motorized sieve shaker with adaptor for 30cm and 45cm diameter.
5. Laboratory permeability apparatus falling head method as per IS:2720 (part 17), IS:11209.
6. Core cutter as per IS:2720 (part 29) with cylinder, dolly, rammer etc.
7. Electronic weighing balance capacity 300g to 01g pan size 290*210mm.
8. Electronic weighing balance capacity 20kg to 0.01g pan size 116mm.
9. Laboratory electric dry air oven thermostatic control range 50 deg. To 250 deg., size 600*600*600mm.

10. LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
01	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur
02	Arunkumar V. Gupta	Lecturer, Applied Mechanics	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSES
COURSE CODE	: AM204G
COURSE TITLE	: THEORY OF STRUCTURE
PREREQUISITE	: AM302E
TEACHING SCHEME	: TH: 04; TU: 00; PR: 00
TOTAL CREDITS	: 04 (1 TH CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: NIL
PT.	: 01 HR

1.RATIONALE:

Civil engineering structures are mainly made-up of column ,Beam and Slabs and these structures are subjected to axial as well as eccentric loading along with different end conditions.The content of calculations of shear forces, bending moments, bending stresses, slope and deflection which are developed in various types of beams will useful in design of these members. Analysis of members for axial forces, slope, deflection, combined direct and bending stresses will be useful in safe design of various structural members.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Analyze stresses induced in vertical members subjected to direct and bending loads.
2. Analyze slope and deflection in beam under different loading conditions
3. Analyze end moments of fixed beams
4. Analyze continuous beam under different loading conditions using principles of three moments
5. Analyze continuous beam using Moment Distribution method
- 6/ Draw Shear Force & Bending Moment Diagram for fixed beam, and continuous beam

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1.Direct and Bending stresses	1a. Illustrate given term related to direct and bending stresses 1b. Describe given condition(s) for given sections 1c. Calculate direct and bending , maximum , minimum stresses related to given structure.	1.1 Concept of axial and eccentric load. Eccentricity about one or both Principal axes, stress distribution diagram and nature of stress 1.2 Condition for no tension, limits of eccentricity, Maximum & Minimum stresses, core section for square, Rectangular and circular section 1.3 Short columns, walls, Pillars and Chimney subjected to wind pressure.	10
2.Dams and retaining wall	2a. Calculate direct and bending stresses related to given structure	21 Definition of dam and retaining wall, Maximum and minimum stresses of Rectangular dams and trapezoidal dams with water face vertical Conditions for stability of dam.	06
3.Slope and Deflection	3a. Illustrate given term related to slope, and deflection of beam 3b. Calculate slope and ,deflection of a given beam 3c. Calculate slope and deflection by double integration and Macaulay's method of slope and deflection. of simply supported beams subjected to concentrated load on a given data 3d. Calculate Propped reaction of given cantilevers. And draw shear force & bending moment diagram .	3.1 Concept of slope and deflection, stiffness of beams., Flexure rigidity of beams 3.2 Slope and deflection of beam subjected to pure bending. Relation between slope, deflection and radius of curvature, differential equation 3.3 Double integration and Macaulay's method of calculation of slope and deflection. to simply supported beams subjected to concentrated loads 3.4 Propped cantilevers, reactions of prop, shear force & bending moment diagram for rigid prop.	12
4 Fixed Beam	4a Find fixed end moments of given fixed beam 4b. Calculate fixed end	4.1 Concept of fixity, effect of fixity, advantages and disadvantages of fixity, fixed end Moments, nature of fixed end moments, principle of super	12

	moments for fixed beam subjected to given loads over entire span or part of span and draw Shear Force & Bending Moment diagram for fixed beam	position. 4.2 Formulae for Fixed end Moments for concentrated load and uniformly distributed load(UDL) on entire span, Application in Drawing Bending moment diagram & Shear force diagram for fixed beam subjected to concentrated load, Uniformly distributed load over entire span	
5. Continuous Beam	5a. Illustrate given term related to continuous beam 5b Find fixed end moments of continuous beam under various load of given data 5c Calculate fixed end moments for Continuous Beam using theorem of three moment and draw Shear Force & Bending Moment diagram	5.1 Defination and effect of continuity, nature of moments induced due to continuity, concept of deflected shape. 5.2 Clapeyron's theorem of three moments, application up to two spans only. Supports at the same level, spans may be equal or unequal, Moment of Inertia same for one span and may be different for other span, 5.3 Calculation of Shear force and Bending Moment for concentrated load and Uniformly distributed load on entire span	12
6.Moment Distribution Method	6a. Illustrate given terms related to moment distribution method 6b. Calculate fixed end moment by moment distribution method related to given beam and portal frame and draw Shear Force & Bending Moment Diagram	6.1 Introduction, Sign convention, carry over factor, stiffness factors, distribution factor 6.2 Application of moment distribution method to various types of continuous beam subjected to concentrated load and UDL over entire span for Rigid supports at same level. Shear force diagram & Bending moment diagram for above application	12
Total Hrs.			64

SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the student-related co-curricular activities which can be undertaken to accelerate the attainment of the various outcomes in this course. Student should conduct following activities in the group and prepare reports of about 5 pages for each activity, also collect/record physical evidence for their (students) portfolio which will be useful for their placement interviews:

- Collect the data of existing structures where direct and bending stresses have a predominant role (for example: Leaning of tower Pisa)
- Measure maximum deflection in a simply supported beam in laboratory. Check the results using analytical method.
- Compare fixed beam with simply supported beam of same span and loading.
- Analyse given continuous beam using different method and compare the results.
- Collect the data from You tube/videos showing change in deflected shape due to change in number of supports in a beam

f. SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Direct and bending stresses	02 (02)	03 (03)	06 (00)	11 (05)
02	Dams and retaining wall	02 (02)	03 (00)	00 (00)	05 (02)
03	Slope and deflection	02 (02)	03 (00)	06 (06)	11 (08)
04	Fixed Beam	02 (00)	06 (03)	00 (03)	08 (06)
05	Continuous beam	02 (00)	03 (03)	12 (06)	14 (09)
06	Moment Distribution Method	02 (00)	03 (03)	06 (03)	11 (06)
	Total	12 (06)	18 (12)	30 (18)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORYAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	4	A	3				3/5
03	4	U	3	4	U	3	5	U	3	5	U	3	6	U	3				3/5
04	6	U	3	6	U	3	1	U	3	1	U	3	4	U	3				3/5
05	3	A	6	5	A	6	3	A	6										2/3
06	5	A	6	6	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply



❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Books	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60		Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100			
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	-	-	--	-
		Journal Writing		Assignments	-	-	--	-
				TOTAL	-	-	--	-
	TEE (Term End Examination)	End Exam	Students	End Of the Course	-	-	--	-
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1,2,3,4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF ASSIGNMENT EVALUATION:

S.N.	Description	Max. Marks
NIL		

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	2	-	2	-	-
2	3	3	-	-	2	-	2	-	-
3	3	3	-	-	2	-	2	-	-
4	3	3	-	-	2	-	2	-	-
5	3	3	-	-	2	-	2	-	-
6	3	3	-	-	2	-	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Theory of Structure	R.S.Khurmi, S.Chand & Company, Edition , 2015	10:8121905206
2.	Theory of Structure	R.RamamurthamDhanpatRai & Co(P) Ltd Edition , 2015	9782000000037
3.	Theory of Structure	B.C. Punmia, Laxmi Publication 2015	9788170086185
4.	Theory of structure	S.P.Gupta Tata McGraw Hill, Edition , 2015	10;0074634984 13;9780074634981
5.	Theory of structure	N.SVazirani, Khanna Publication, Edition and Year Of publication	10;8174091424 13;9788174091420

❖ E-REFERENCES:

❖ <https://youtu.be/67fSwIjYJ-E> assessed on 26th oct. 2021❖ <https://youtu.be/l20kF6fhScA> assessed on 26th oct. 2021❖ <https://youtu.be/kwQqVBfdIV4> assessed on 26th oct. 2021

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
3.	A. P. Waghmare	Lecturer in Applied Mechanics Dept.	Govt. Polytechnic, Nagpur
6.			
7.			
8.			

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: Elective
COURSE CODE	: AM205G
COURSE TITLE	: Precast-and Prestressed-Concrete
TEACHING SCHEME	: TH:03 TU: 00; PR: 02(CLOCK Hrs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEXAM	: 04 Hrs.
PR. TEEXAM	: 01 Hrs. (External)
PT. EXAM	: 01 Hr.

❖ **RATIONALE:**

- ❖ Precast and Pre-stressed Concrete construction technology is widely used across the globe for its inherent advantages. It has been adopted in India from past many years, but was mostly limited to civil structures such as tunnels, bridges, flyovers and underpasses. Today, with critical housing shortages, rising labour and input costs and an increased emphasis on quality and timely delivery, more and more developers are opting for innovative construction practices like precast and pre-stressed concrete. Hence it is essential to make upcoming engineering community aware about this. This course is designed to provide basic knowledge of precast and pre-stressed elements, their design aspects, pre-stressing techniques, methods and basic design principles.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1) Select the relevant precast concrete element for given type of construction.
- 2) Test the relevant components for the prefabricated structure.
- 3) Justify the relevance of pre-stressed element in a given situation.
- 4) Select the relevant methods/systems for given construction work.
- 5) Evaluate losses in a given pre-stressed concrete construction.
- 6) Propose a suitable cable profile for the given pre-stressed concrete member.

7) COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
Unit – I Precast concrete Elements	1a. Describe the concepts of precast concrete in the given situation. 1b. Identify the material of relevant specifications for the given pre-cast elements. 1c. Describe the design considerations and IS provisions for given pre-caste element. 1d. Classify the joints of the given pre-cast elements. 1e. Recognize the precast element in the given situation on the basis of different test carried on it. 1f. Justify the need of different tests to decide the relevance of precast element in the given situation.	1.1 Advantages and disadvantages of precast concrete members. 1.2 Material used- PCC, RCC, PSC, SCC, Ferro-cement, Aerated and Foam concrete. 1.3 Non-structural Precast elements – Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, Door & Window frames, curb stones. 1.4 Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles. 1.5 Materials required, IS specifications, casting tolerances, fabricating systems, design considerations, joints, testing, storage and transportation, equipment; for elements mentioned above. 1.6 Testing of Precast components.	08
Unit – II Prefabricated building	2a. Describe the given elements for a Prefabricated building. 2b. Describe modular co-ordination design considerations with IS provisions for prefabricated elements. 2c. Recognize the requirements of structural joints of the given pre-fabricated element. 2d. Describe the procedure of the storage, transportation and erection for a given precast element. 2e. List the various combinations for mixed/composite construction. Recognize the relevant equipment required for the construction of given Prefabricated element with justification.	2.1 Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements. Prefabricated building using precast load bearing and non-load bearing wall panels, floor systems. Material characteristics, Plans & Standard specifications. 2.2 Modules, modular co-ordination, modular grid, finishes. Casting tolerances for above elements. 2.3 Prefab systems and structural schemes and their classification. Design considerations and requirements. Joints-requirements of structural joints and their design considerations for above elements. 2.4 Manufacturing, storage, curing, transportation and erection of above elements, equipment needed. 2.5 Introduction to Mixed and composite construction.	10

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
	2f. Identify the effect of Prefabricated building on the surrounding environment of the given building.	2.6 Ecological aspect of use of Prefabricated building.	
Unit - III Introduction to Pre-stressed Concrete	3a. Illustrate the principle of pre-stressing the given element. 3b. Describe the applications of pre-stressed concrete elements in the given situation. 3c. Distinguish the PSC with other construction materials in given situation. 3d. Justify the use of high strength material for PSC. 3e. Identify relevant type of pre-stressing steel for given member.	3.1 Principle of pre-stressed concrete and basic terminology. 3.2 Applications of pre-stressed concrete. 3.3 Advantages and disadvantages of pre-stressed concrete. 3.4 Materials used and their properties, necessity of high-grade materials. 3.5 Types of Pre-stressing steel – Wire, Cable, tendon, Merits-demerits and applications.	06
Unit – IV Methods and systems of pre-stressing.	4a. Identify the relevant method of pre-stressing for given structural element. 4b. Illustrate the merits and demerits for given method/ system of pre-stressing. 4c. Describe Hoyer system of pre-tensioning with diagram. 4d. Describe relevant system of post-tensioning based on the given criteria with diagram.	4.1 Method of pre-stressing – Internal and External pre-stressing, Pre and Post tensioning – applications, merits and demerits. 4.2 Systems for post-tensioning - process, applications, merits and demerits – Hoyer system. 4.3 Systems for post-tensioning – process, applications, merits and demerits – Freyssinet system, Magnel Blaton system, Gifford Udall system. 4.4 Cover requirement for tendons.	06
Unit – V Losses of Pre-stress	5a. Identify the reasons for loss of pre-stress in the given element. 5b. Describe the situations in which the given elements exhibit the loss of pre-stress. 5c. Calculate the loss of pre-stress during anchoring in the given situation. 5d. Calculate the loss of pre-stress occurring in the given situation.	5.1 Pre-stressing force in Cable, Meaning of Pre-stress. 5.2 Loss of Prestress during the tensioning process – loss due to friction, length effect, wobbling effect and curvature effect. (Simple numerical problems to determine loss of pre-stress.) 5.3 Loss of pre-stress at the anchoring stage. 5.4 Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening and creep in steel. (Simple numerical problems to determine loss of pre-stress.)	08

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
	5e. Describe the IS recommendations for percentage loss in the given pre-stressing method.	5.5 IS recommendations for % loss in case of Pre and Post tensioning.	
Unit – VI Analysis and design of Pre-stressed rectangular beam section.	6a. Describe assumptions made in the analysis of pre-stressed concrete beams. 6b. Draw the cable profiles in the given situation. 6c. Illustrate the effect of the given cable profile on fiber stresses. 6d. Calculate maximum stresses induced in given beam. 6e. Describe the steps adopted in the design of given pre-stressed beam element.	6.1 Basic assumptions in analysis of pre-stressed concrete beams. 6.2 Cable profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic. 6.3 Effect of cable profile on maximum stresses at mid span and at support. 6.4 Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only. 6.5 Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)	10
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Determine water absorption of paver blocks of three different shapes of three different make and size.	I	02*
2	Determine water absorption of solid/hollow building blocks of three different sizes of three different make and size.	I	02*
3	Inspect any three elements (e.g. manhole covers, paver blocks, hollow blocks, solid blocks, curb stones etc) for dimension checking.	I	02*
4	Prepare report of field visit to a manufacturing unit (of precast elements such as fencing pole, transmission pole, electric pole) with reference to the points such as manufacturing process, curing, stacking, handling, in-house inspection and testing.	I	02*
5	Determine compressive strength of given solid precast blocks	I	02*
6	Determine compressive strength of given hollow precast blocks	I	02*
7	Determine compressive strength of given hollow paver blocks	I	02*
8	Flexure test on given manhole cover as per IS 12592:2002 Annex C.	I	02
9	Observe Pressure testing of given precast pre-stressed pipes and prepare a report on it.	I	02
10	Prepare report of field visit to manufacturing unit (of precast elements such as lintel, chajja, door frame, wall panels, stair steps) with reference to the points such as manufacturing process, curing, stacking, handling, in-house inspection and testing.	II	02*
11	Determine flexural strength on given wall panels in lab.	II	02
12	Test in-situ the given prefabricated wall panel to judge its resistance against impact.	II	02
13	Test in-situ the given prefabricated wall panel to judge its resistance against flexure (holding the panel simply supported and applying impact force at centre till collapse)	II	02
15	Prepare the report, collect the samples of various types of pre-stressing wires/cables/strands along with their technical specifications/brochure.	III	02*
16	Prepare report of field visit to bridge site regarding pre-stressed member with reference to the points such as shape, dimensions, cable/tendon, anchor block, method of pre-stressing, transfer of pre-stress, equipment used, etc.	III to VI	04*
Total			32

Note: A judicial mix of minimum 12 or more practicals need to be performed, out of which, the practicals marked as ‘*’ are compulsory.

SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Precast concrete Elements	02(02)	03(03)	03(00)	08(05)
02	Prefabricated building	02(00)	06(03)	06(03)	14(06)
03	Introduction to Pre-stressed Concrete	02(02)	03(03)	00(00)	05(05)
04	Methods and systems of pre-stressing.	02(02)	03(03)	06(00)	11(05)
05	Losses of Pre-stress	02(00)	03(03)	03(03)	08(06)
06	Analysis and design of pre-stressed rectangular beam section.	02(00)	06(03)	06(06)	14(09)
	Total	12(06)	24(18)	24(12)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

8) QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	3	R	2	4	R	2										
02	1	U	3	2	U	3	2	U	3	2	U	3	3	U	3				3/5
03	3	U	3	4	U	3	5	U	3	4	U	3	6	U	3				3/5
04	6	U	3	6	U	3	1	A	3	1	U	3	5	U	3				3/5
05	2	A	3	2	A	3	5	A	3	2	A	3	5	A	3				3/5
06	4	A	6	6	A	6	6	A	6										2/3

T=Unit/Topic Number

L= Level of Question M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

9) ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test answer sheets	1,2,3,4,5,6
		Class Room Assignments		Tutorial Assignments	14	--	Assignment Book	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	--	--	--	----
		Journal Writing		Design Assignments	10	--	Journal	1,2,3,4,5,6
		Drawing Sheets		Drawing Assignments	15	--	Plates and Drawing Sheets	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Practical Sheets	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1,2,3,4,5,6
	End Of Course			End Of the Course	Questionnaires			

10) SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing details of various components of structure from drawing sheet and sketch book.	20
2	Writing Design procedure/IS specifications	10
3	Viva voce	20
	TOTAL	50

11) MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes (POs)							PSOs	
	1	2	3	4	5	6	7	1	2
1	--	3	--	--	2	--	--	3	3
2	--	--	--	--	--	--	--	--	3
3	--	3	--	--	--	--	--	--	--
4	--	3	--	--	--	1	--	3	--
5	--	3	1	--	--	--	--	--	--
6	--	3	--	--	--	--	--	--	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

12) REFERENCE and TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Pre-Cast and Pre-Stress Technology: Process, Method and Future Technology	Mazuki, Nor Ashikin	Create space Independent Pub ISBN 10: 1499353391
2	Handbook on Precast Concrete buildings	---	Indian Concrete Institute
3	Precast Concrete Structures	Elliott, Kim S.	CRC Press, New York, 2011 ISBN- 13: 9781498723992
4	Design of Pre-stressed Concrete Structures	Lin, T.Y.	John Wiley and Sons, New York, 2014 ISBN-8: 0471018988
5	Pre-stressed Concrete	Krishna Raju, N.	Tata McGraw Hill, New Delhi, 2012 ISBN 10: 1259003361

			ISBN 13: 9781259003363
6	Pre-stressed Concrete Structures	Nagarajan, Pravin	Person Education India ISBN 9332517614, 9789332517615
7	IS 12592:2002 Precast Concrete Manhole Cover and Frame	BIS, New Delhi	BIS, New Delhi
8	IS 15658: Precast concrete blocks for paving – Code of Practice	BIS, New Delhi	BIS, New Delhi
9	IS 15916: 2011 Building Design and Erection Using Prefabricated Concrete – Code of Practice	BIS, New Delhi	BIS, New Delhi
10	IS 15917: 2011 Building Design and Erection using Mixed/Composite construction – Code of Practice	BIS, New Delhi	BIS, New Delhi
11	IS 458 – 2003 Precast Concrete Pipes (with without reinforcement) - Specification	BIS, New Delhi	BIS, New Delhi

❖ E-REFERENCES:

1. <http://www.asnu.com.au> accessed on 20th January 2021.
2. www.youtube.com for videos regarding precast and prestressing procedures accessed on 20th January 2021
3. www.nptel.ac.in accessed on 20th January 2021.
4. www.discoveryforengineers.com accessed on 20th January 2021.
5. Website of Precast Concrete Engineers Society (PSEI) accessed on 20th January 2021.
6. Website of Master builder (Precast Concrete Structures-Design aspects and its implementation in India accessed on 20th January 2021.

13) LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

Sr. No.	Equipment Name with Broad Specifications	Exp. No.
1	Hot air electric oven having temperature range 5 ⁰ C to 250 ⁰ C.	1, 2
2	Digital display balance of capacity 10 kg having LC 10 gm and of capacity 30 kg having LC 10 gm.	1, 2
3	Test frame for load test for manhole covers	9
4	Universal Testing Machine: Capacity 1000 KN.	10, 13
5	Compression Testing Machine: Capacity 2000 KN	6, 7, 8

14) LIST OF EXPERTS and TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	A. P. Waghmare	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.
2.	R. D. Dongarwar	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: PROGRAM ELECTIVE
COURSE CODE	: AM 206G
COURSE TITLE	: EARTHQUAKE RESISTANT BUILDINGS
TEACHING SCHEME	: TH:03;TU:00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH= 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

1. RATIONALE

This course is the specialized subject for Civil Engineering. The students having interest in structural engineering and perceive career in this field have a better option to choose this course. Earthquake is a natural disaster phenomenon which could not be denied but its impact on the structure can be reduced by proper analysis and design of civil engineering structures to minimize loss of property and lives. Himalayan region, Indo-Gangetic plain, Western India, Kutch & Kathiyar of Gujrat state are geologically & seismically unstable parts of the country. In recent past, a major part of the peninsular India experienced earthquakes causing loss of property and lives; therefore study of earthquake engineering is introduced in the curriculum of final year civil engineering diploma students.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply principles of earthquake resistant buildings in constructions.
2. Relate failure of structure with different seismic parameters.
3. Draw plan of the building for seismic sustainability in the given situation.
4. Apply the suitable method of restructuring and retrofitting of existing structure to protect from of the building due to construction defects.
5. Use various codal provisions for construction of earthquake resistant buildings.
6. Practice post earthquake management systems.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Unit – I Fundamentals of earthquake engineering	1a. Describe method of determining magnitude of earthquake occurred in given type of situation in a given seismic zone. 1b. Select the relevant seismic zone for the given location using seismic zone map. 1c. Estimate magnitude and intensity of earthquake for the given data. 1d. Suggest appropriate method to enhance earthquake resistance of a building.	1.1 Definition and meaning of terms: Focus, Epicenter, Focal depth, foreshocks, aftershocks, magnitude & intensity of Earthquake. Seismic waves, Body waves. 1.2 Natural period, fundamental natural period, nodal natural period, response spectrum, seismic mass, seismic weight, structural response factor, time history analysis, earthquake zones, zone map, zero period acceleration. 1.3 Measurement of magnitude of earthquake by seismograph, Richter scale method. Measurement of intensity of earthquake, modified Mercalli intensity (MMI) scale and MKS scale. 1.4 Guidelines for earthquake preparedness: Individual home and community planning.	06
Unit– II Causes and effects of earthquake	2a Describe the procedure of formation of earth and movement of tectonic plates for the given earthquake zone. 2b Compare the given type of failure of building with another type on basis of given criteria.	2.1 Formation of earth and its cores. Formation, types & movement of tectonic plates, Elastic rebound theory, Types of earthquake & Faults. 2.2 Ground shaking, Ground failure, Tsunami and fire.	08
Unit III- General planning and design aspects	3a. Relate centre of mass and stiffness on the basis of given data. 3b. Select and justify the geometric shape of given building for seismic stability. 3c. Select and justify the appropriate site of construction for given data of soil strata.	3.1 Terminology for Earthquake resistant Building: Base, base dimensions, centre of mass, centre of stiffness, design eccentricity, design seismic base shear (Vb), diaphragm, storey drift, storey shear, weak storey 3.2 Plan of Building- symmetry, regularity, separation of blocks, simplicity, enclosed area, separate building for different functions, soft storey effect 3.3 Choice of site- Stability of slopes, loose sand	08
Unit –IV Concrete and masonry buildings	4a. Enlist different causes of failure of given building. 4b. Estimate damage to given brick masonry buildings. 4c. Estimate damage to	4.1 Typical damage and failure of brick masonry, causes of damages in brick masonry. 4.2 Damage to buildings: Sliding of roof of support, falling of infill walls, crushing of column ends, diagonal cracking of column beam joints, pulling out of reinforcement	08

	given stone masonry buildings.	bars, foundation sinking and tilting. 4.3 Typical damage and failure of stone masonry, causes of damages in stone masonry	
Unit –V Codal provisions and design philosophy	5a. Implement general provisions for construction of earthquake resistant building. 5b. Check reinforcements in different structural elements. 5c. Estimate base shear for simple building frames. 5d. Suggest appropriate modifications in the given masonry buildings to improve seismic behavior	5.1 IS: 1893 (part I)-2002: General provisions and principles for design of earthquake resistant buildings: Definition of seismic zone factor, Importance factor, damping, critical damping, floor spectra, seismic mass, seismic weight. Meaning of soft storey, storey drift. Assumptions in Earthquake resistant design of structure. (No numerical) 5.2 IS:13920-1993 Ductile detailing of Meaning of ductility, Need of ductility in concrete structure, critical sections in the building where ductile detailing is required, Typical Sketches with reinforcement details of columns, beams and beam to column connections showing longitudinal steel, splicing of steel, transverse steel, stirrups as per IS:13920. (No numerical) 5.3 Determination of design base shear using equivalent static lateral force method, distribution of design base shear. 5.4 IS 4326:1993 Recommended provisions to improve earthquake resistance of masonry buildings: mortar, wall enclosure, openings in walls, masonry bond, horizontal bands, section of bands, dowels at corners and junctions, vertical reinforcement in walls.	10
Unit –VI Disaster management in earthquake	6a. Suggest safety measures for buildings in given situation to minimize damage. 6b. Describe appropriate method to restore the given public utility services. 6c. Suggest with justification the precautions to be taken in construction of buildings in seismic zone from the past learning.	6.1 Guidelines for Earthquake preparedness: Individual, Home and community planning 6.2 Post earthquake handling of building, Lifelines, Roads, Bridges, communication systems, electricity, water distribution systems 6.3 Learning from Prominent past earthquakes in India: Koyna, Killari (Latur), Jabalpur, Bhuj.	08
Total Hrs.			48

B. LIST OF PRACTICALS / LABORATORY EXPERIENCES / ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Group A (Any 10)			
1	Locate correct seismic zone for the given area by correlating it with seismic zone map of India.	I	02
2	Prepare report of past earthquake having magnitude more than 6 on Richter scale.	I	02
3	Mark various seismic zones on a printed map of India and locate there any four cities in each earthquake zone	I	02*
4	Compare the causes and damages occurred in the masonry and concrete structures during any two past earthquakes w.r.t . type of structure, type and magnitude of earthquake, epicenter, geographic conditions etc.	II	02*
5	Estimate the type of damage occurred in a given building with justification during earthquake from available data.	II	02
6	Check the drawing of given building and comment for suitability against earthquake in given seismic zone.	III	02*
7	Prepare action plan for the structural sustainability of existing masonry structure against earthquake shocks.	IV	02
8	Select and describe appropriate method of retrofitting for the given framed buildings against earthquake damages in given situation	IV	02*
9	Comment on structural stability of existing framed structure on the basis of rebound hammer test and other NDT available against earthquake shocks.	IV	02*
10	Calculate strength of concrete for any two structural members of framed structure using rebound hammer and comment on it's seismic stability.	IV	02
11	Check the performance of concrete for any two members of framed structure using ultrasonic pulse velocity.	V	02
12	Classify damages occurred in the given buildings based on earthquake intensity in the given seismic zone by watching videos/simulations/photographs and comment with observations.	IV	02
13	Identify failure pattern observed in the building failure due to earthquake in given seismic zone watching videos/simulations/photographs and comment with observations.	IV	02*
14	Determine the strength of concrete of any one member of framed structure by taking core.	V	02
15	Calculate the base shear using Indian Standard method for single storied structure located in your city.	V	02*
16	Calculate the base shear using software for single storied structure located in your city.	V	02
17	Calculate the base shear using Indian Standard method for three storied structure located in your city.	V	02
18	Calculate the base shear using software for three storied structure located in your city.	V	02
19	Calculate the base shear using software for three storied	V	02

	structure located in your city.		
20	State and explain various methods to determine earthquake forces as per Indian standard.	V	02
21	Draw typical sketches of beam, column and beam to column junction showing reinforcement details as per I.S. 13920-1993.	V	02*
22	Decide the structural sustainability of existing framed structure against earthquake shocks	VI	02*
23	Draw sketches to represent methods to strengthen steel structure with roof truss and gable frame against earthquake damage with brief note.	VI	
24	Locate the reinforcing bar in any one structural element and state its diameter.	VI	02
25	Carryout earthquake simulation for the given type of building structure using software STAADPRO/E-TAB/ABAQUS/SAP etc.	VI	
26	Comment with observations on case study of an earthquake occurred in India by watching videos/simulations/photographs	VI	02
Total Hrs.			32

Note

- 3.1 The term work should consist of A3 size sketchbook, file containing design report and A1 size drawing sheets.
- 3.2 Out of Sr.No.1 to 18 minimum nine plates are to be drawn.
- 3.3 Sr. Nos. marked with ' (*) ' are compulsory.
- 3.4 Collect suitable working drawing /blue print from the site for the data required for the Sr.No.19 to Sr.No.26.
- 3.5 For Sr.No.marked with '(#) ', use AutoCAD software for drawing.
- 3.6 A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so that the student reaches the 'Applying Level' of Blooms's 'Cognitive Domain Taxonomy' as generally required by the industry.
- 3.7 The 'Process' and 'Product' related skills associated with each PrO are to be assessed according to a suggested sample given below:

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Unit – I Introduction to earthquake engineering	02(02)	03(00)	00(00)	05(02)
02	Unit– II Causes and effects of earthquake	02(02)	06(03)	00(00)	08(05)
03	Unit III- General planning and design aspects	02(02)	03(00)	06(06)	11(08)
04	Unit –IV Concrete and masonry buildings	02(00)	03(03)	09(06)	14(09)
05	Unit –V Codal provisions and design philosophy	02(00)	00(00)	09(06)	11 (06)
06	Unit –VI Disaster management in earthquake	02(00)	03(03)	06(03)	11(06)
	Total	12(06)	18(09)	30 (21)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Options
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	2	U	3	2	U	3	2	U	3	3	U	3	4	U	3				3/5
03	4	U	3	3	A	3	5	A	3	4	A	3	4	A	3				3/5
04	4	A	3	4	A	3	5	A	3	5	A	3	5	A	3				3/5
05	6	U	3	6	U	3	6	A	3	6	A	3	3	A	3				3/5
06	3	A	6	6	A	6	6	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	10	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing figure/diagram, selection of equipment's. writing procedure etc.	05
2	Collection of data/compilation	05
3	Calculation, Result, Drawing Graphs(if any)	05
4	Viva Voce	10
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	3	3	-	-	-	-	-	-
3	3	3	3	3	3	-	-	-	-
4	3	3	3	3	-	-	-	-	1
5	3	3	3	3	3	-	3	-	-
6	3	3	3	2	3	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Earthquake Resistant Design of Structures	Pankaj Agarwal and Manish Shrikhande Prentice Hall of India	ISBN-10 8120328922 ISBN-13 9788120328921
2.	Elements of Earthquake Engineering	Jai Krishna , A. R. Chandrashekhara and B. Chandra South Asian Publishers Pvt Ltd	ISBN-10 8170031834 ISBN-13 9788170031833

3.	A Textbook of Earthquake Resistant Structure	Dr. S.M.Dumne Nikita Publication Latur	ISBN 978-93-85124-09-9
4.	Earthquake Resistant Design of Structures	Duggal S. K. Oxford University Press	ISBN10 0198083521 ISBN-13 9780198083528

❖ E- References:

www.nptel.ac.in	Accessed on 16/11/2021
https://youtu.be/q-kHDw37XOM	Accessed on 16/11/2021
https://youtu.be/cjkjsEfKpBQ	Accessed on 16/11/2021
https://youtu.be/tbLU_ivhndY	Accessed on 16/11/2021
https://youtu.be/ELCQkwPWf2w	Accessed on 16/11/2021
https://youtu.be/MP-Tgg75Le4	Accessed on 16/11/2021
https://youtu.be/VTIvbGYfXGU	Accessed on 16/11/2021
https://youtu.be/TzkHS73-M_M	Accessed on 16/11/2021

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
01	Y. K. Chandarana	HOD, Applied Mechanics	Govt. Polytechnic, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: CE201G^s
COURSE TITLE	: TRANSPORTATION ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 Hrs
PR TEE	: 02 Hrs (External)
PT	: 01 Hr

❖ RATIONALE :

The economy of any country is widely dependent either direct or indirect way on the transportation of various commodities which in turn is dependent upon the efficiency of transportation system. Therefore, knowledge and understanding of various designs, construction and maintenance aspects of roads, railways and bridges is very important for engineers working at site so as to develop their understanding in order to apply their knowledge in improving civil infrastructure for transportation.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Design road geometrics of a given type of road.
2. Select suitable materials as required for construction or maintenance of a given type of road.
3. Select traffic control devices/ mechanisms for given conditions at road intersections.
4. Suggest a suitable type of railway component to be used in a railway track under given situation and for given data.
5. Identify the given points and crossings.
6. Draw various components of roadway, railway, and bridges.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1. Road Alignment and Geometrics	1a. Describe various Modes of transportation 1b. Identify the class of road to be chosen under given conditions with justification 1c. Choose the best alignment of a road under given conditions 1d. Draw the cross section of a road to be used under specified conditions 1e. Design the required geometric elements of road under the given situation using IRC specifications.	1.1 Different modes of transportation 1.2 Scope and Importance of roads in India and its characteristics Classification of roads (Nagpur plan and Lucknow plan), Urban Roads 1.3 Road alignment and factors controlling the alignment. 1.4 Cross section of road showing its component as per IRC. Road margin, road formation, right of way, Kerbs. 1.5 Road Geometrics: Camber-purpose, types, IRC recommendations. Design speed and factors affecting design speed IRC – Recommendations. Gradient-Types, IRC Recommendations Super elevation – Calculation Sight distance – Types, Calculation of these distances, IRC-recommendations. Curves - Necessity, types- Horizontal, vertical and transition curves, Extra Widening of roads.	10
2. Road materials and construction of pavements	2a. Describe various types of road construction materials. 2b. Identify the road materials to be used under given conditions and tests to be performed for their quality. 2c. Identify the type of given pavement and justify its use under	2.1 Types of road materials and their tests 2.2 Soil-Necessity of Soil Stabilization and its methods. Aggregates used and required properties Tests on Aggregate: Flakiness and Elongation index test, Angularity number test Abrasion, Attrition, Impact test Bitumen: types and properties and Tests on	06

	given conditions 2d. Describe the latest materials of road construction and technology using these materials 2e. Describe the defects in pavement 2f. Describe various types of failures and maintenance of road. 2g. Describe methods of surface and subsurface drainage.	Bitumen – Penetration, Softening point, Ductility and Flash and Fire point test. 2.3 Pavement: Types of Pavement. Structural components of pavement and their functions Construction of Flexible and Rigid Pavement. Merits and demerits of Bituminous roads 2.4 New technologies and terms - Bituminous Macadam, Bituminous Concrete, Penetration Macadam, Modified Penetration Macadam, Premix Carpets, Dense Bituminous Macadam, Open graded premix surface/carpet, Dry Lean Concrete, Granular Sub Base -gradation and material content, Construction of joints, filler and sealers, Merits and Demerits of Bituminous and Concrete roads 2.5 Drainage of roads: Purpose of drainage. Methods of Surface and Sub-surface drainage. 2.6 Defects in Pavements- Cause of failure and remedial actions 2.7 Maintenance of roads- classification and special repairs of roads	
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3.Traffic Engineering.	3a. Describe traffic and its characteristics. 3b. Recommend type of traffic volume study for given purpose 3c. Describe causes of accident with Collision diagram. 3d. Suggest various traffic control devices to be used under given condition with justification. 3e. Identify the road intersection to be used under given situation with available data	3.1 Road traffic characteristics 3.2 Traffic volume study: Traffic Volume and Density, Objectives of study, Passenger car unit and factors affecting it. 3.3 Accident studies and its causes, Collision diagram. 3.4 Traffic control devices – Road signs-Types, Sketches, Road Markings- Types , Traffic island- Types , Signals- Types, Advantages & disadvantages of signals. 3.5 Road intersections- Intersection at Grade, Grade Separated intersections.	04
4.Railway Track Basics	4a. Describe the factors which govern alignment of permanent way. 4b. Draw the different cross sections of Railway track of different gauges used in India. 4c. Select a rail gauge to be used under given situation with justification. 4d. Describe the requirement of permanent way 4e. Suggest a suitable type of railway component to be used in a railway track under given situation and for given data	4.1 Alignment- Factors governing rail alignment. 4.2 Rail track cross sections – standard cross section of BG and M.G Single and double line in cutting and embankment. 4.3 Rail Gauges – types, factors affecting selection of gauge. 4.4 Permanent ways, Ideal requirement. 4.5 Component parts of Permanent ways: Rails - function and its types. Rail Joints - requirements, types, Sleepers - functions and Requirement, types and their suitability, Sleeper density Ballast - function and different types with their properties, relative merits and demerits. Rail fixtures and fastenings – fish plate, bearing plates, spikes, bolts, keys, anchors and anti creepers.	06

5. Railway Track Geometrics , Branching of Track, Stations and Yards	5a. Describe creep of rail with respect to its causes and prevention. 5b. Describe Coning of wheels and tilting of rails with its purpose. 5c. Describe the rail geometrics 5d. Draw Track Layouts, And line Sketches of Turn Outs, Track junctions 5e. Inspect points and crossings 5f. Classify a given Railway station and yards	5.1 Creep of rail, causes and prevention of creep. 5.2 Coning of wheels & Tilting of rails 5.3 Rail Geometrics -Gradient and its types, Super elevation limits of Superelevation on curves, Cant deficiency , Negative cant, Grade compensation on curves 5.4 Definition of point and crossing, a simple split switch turnout 5.5 Sketch showing different components, their functions and working. Line sketches of track junctions- crossovers, scissor cross over, diamond crossing, triangle. Inspection of points and crossings. 5.6 Classification of Railway Stations, Types of Yard	11
6. Bridges	6a. Classify the bridges according to given criteria 6b. Identify a suitable site for bridge considering the factors affecting its selection. 6c. Describe terms related to bridge. 6d. Select the component parts of bridge from given options to satisfy the given criteria with justification.	6.1 Classification of bridges according to function, material, span, size, Alignment, position of HFL. 6.2 Factor affecting the selection of Bridge Site 6.3 Basic terms: Scour, Afflux, Runoff, Economic Span, Clearance, and Freeboard. 6.4 Component of Bridge and its function, L-section, Cross section. Piers-function, requirements, types. Abutment – function and types. Wing walls – functions and types. Bearing – functions, types of bearing for RCC and steel bridges. Approaches –in cutting and embankment.	11
Total Hrs.			48

LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Draw the dimensional sketches of cross section of NH/SH, MDR/ODR in roads in Embankment and Cutting on straight and curved path on A3 size drawing sheet.	1	04
2.	Perform Flakiness Index test, Elongation Index Test and Angularity number test on the aggregates	2	02
3.	Perform Softening point, Penetration Test, Flash and Fire Point test, and Ductility tests on Bitumen.	2	08
4.	Visit the damaged road site to observe the defects and to suggest possible remedial measures. Prepare a report with the data collected and site photographs	2	02
5.	Carry out Traffic Volume Study for an important road intersection or roadway in the city and perform analysis of the data collected	3	04
6.	Draw the collision diagram for any one case	3	02
7.	Prepare a report on visit to a railway track to identify various components with their functions and draw the dimensional sketches of cross section of railway track on A3 size drawing sheet.	4	02
8.	Prepare a report on visit to a railway track to observe and draw various types of turn outs (Left hand, right hand, cross over, diamond crossing turnout)	5	04
9.	Prepare a report on visit to a road way bridge to observe and draw L section and Cross section of its structure.	6	02
Assignments	Assignment-1. Take photographs of construction of Cement Concrete roads and Bituminous roads going on in your city. Prepare a report based on the information collected from site engineers	2	
	Assignment-2. Take photographs of various road signs, road markings, traffic and channelizing islands in the city. Categorize the road signs and prepare a report stating the importance of each	3	
	Assignment-3.; Observe the defects in the Cement concrete and Bituminous roads at various places in the city and prepare a report on causes and remedial measures	2	
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Road Alignments and Geometrics	02(00)	06(03)	06(06)	14(09)
02	Road materials and its construction aspects	02(02)	06(03)	00(00)	08(05)
03	Traffic Engineering.	02(02)	03(03)	00(00)	05(05)
04	Railway Track Basics	02(00)	03(03)	06(00)	11(03)
05	Railway Track Geometrics , Branching of Track, Stations and Yards	02(02)	03(03)	06(03)	11(08)
06	Bridges.	02(00)	03(03)	06(03)	11(06)
Total		12(06)	24 (18)	24 (12)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	5	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	2	U	3				3/5
03	2	U	3	3	U	3	4	U	3	3	U	3	4	U	3				3/5
04	5	U	3	6	U	3	4	A	3	5	U	3	6	U	3				3/5
05	4	A	3	6	A	3	6	A	3	5	A	3	6	A	3				3/5
06	1	A	6	5	A	6	1	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course	50@	20	Rubrics & Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course			End of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Preparation of experimental set up	10
2.	Setting up and Operation	10
3.	Safety measures	05
4.	Observations and Recording	05
5.	Interpretation of result and conclusion	10
6.	Submission of report	10
	Total	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes(POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	2	-	-	-	-
2	3	-	-	3	-	2	-	3	-
3	3	-	-	3	2	2	-	3	-
4	3	-	-	3	2	2	-	3	-
5	3	-	-	-	2	2	-	3	-
6	3	-	-	-	2	2	-	3	-

❖ REFERENCE and TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Highway Engineering	S K Khanna, C E G Justo, A Veeraragavan, Nem Chand and Brothers, 10 th Edition, 2010,	978-8185240800
2	Road, Railways, Bridge and Tunnel Engg	Birdi, Ahuja, Standard Book House, 16 th Edition, March 2010	978-8189401337
3	Traffic Engineering and Transport Planning	L.R. Kadiyali, Khanna Publishers, 4 th Edition , 2008	978-8174092205
4	A text book of Railway Engineering	S.C. Saxena, S P Arora, Dhanpat Rai Publications (p) Ltd. 8 th Edition , 2010	978-8189928834
5	Principles and Practice of Bridge Engineering	S P Bindra, Dhanpat Rai Publications, 9 th Edition ,	978-8189928841

		2015	
6	Roads, Railways, Bridges, Tunnels and Harbour Dock Engineering	B L Gupta, Standard Publishers.5 th Edition ,2015	9788180140099
7	Road, Railway, Bridge and Tunnel Engineering	T D Ahuja and G S Birdi, Standard book house, 16 th Edition , 2012	9788189401337
8	Laboratory Manual in Highway Engineering	Duggal, Ajay K., Puri, Vijay P. New Age International (P) Limited,Publishers, 1 st Edition ,2010	9788122403107

❖ **E-REFERENCES:**

1. <https://nptel.ac.in/courses/105/101/105101087/> accessed on 22nd February, 2022
2. https://www.researchgate.net/publication/296456254_Introduction_for_Geometric_Design_of_Highways/link/56d5804908ae47742114ff0b/download accessed on 22nd February, 2022
3. <http://nptel.ac.in/courses/105101087/22> accessed on 22nd February, 2022
4. <http://nptel.ac.in/courses/105107123/> accessed on 22nd February, 2022
5. https://onlinecourses.nptel.ac.in/noc21_ce35/preview accessed on 22nd February, 2022
6. nptel.ac.in/courses/105101087/downloads/Lec-2.pdf accessed on 3rd September, 2016
7. <https://nptel.ac.in/courses/105/107/105107123/> accessed on 22nd February, 2022
8. https://www.youtube.com/watch?v=5zKC_aq4ypM accessed on 22nd February, 2022
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11. <https://freevideolectures.com/course/91/introduction-to-transportation-engineering> accessed on 22nd February, 2022
12. <https://www.youtube.com/watch?v=37WMS483T7Y> accessed on 22nd February, 2022
13. https://www.youtube.com/watch?v=w_4V8kwkdNU accessed on 22nd February, 2022
14. <https://www.youtube.com/watch?v=raRNltSeFBA> accessed on 22nd February, 2022
15. <https://www.youtube.com/watch?v=445tbM7sTzE> accessed on 22nd February, 2022
16. <https://www.youtube.com/watch?v=WN2uMkWuTtI> accessed on 22nd February, 2022
17. <https://www.digimat.in/nptel/courses/video/105105165/L01.html> accessed on 22nd February, 2022
18. https://onlinecourses.nptel.ac.in/noc19_ce23/preview accessed on 22nd February, 2022
19. <https://www.youtube.com/playlist?list=PLYX9X4ZldqpYMaPURxSbY1i8vgfVsZfmQ> accessed on 22nd February, 2022
20. https://www.iare.ac.in/sites/default/files/lecture_notes/IARE_TEI_Lecture_Notes.pdf accessed on 22nd February, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Softening point Test (Ring and Ball Apparatus)
2. Ductility Test (Ductility Test Apparatus)
3. Penetration Test (Penetrometer)
4. Flash and Fire point test

❖ **LIST OF EXPERTS AND TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S. N.	Name	Designation	Institute / Industry
1	Dr. N. V. Raut	Head of Civil Engineering and Program Head	Government Polytechnic, Nagpur.
2	Dr. D. N. Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3	Mr. V. B. Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. M. D. Keskar	Structural Consultant	Design Engineer, Nagpur
5	Dr. M. M. Kadu	Professor	Ramdeobaba College of Engineering and Management, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: CORE COURSES
COURSE CODE	: CE202G
COURSE TITLE	: BUILDING CONSTRUCTION
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU: 00; PR: 02(CLOCK HRS.)
TOTAL CREDITS	: 04 (1TH/TU CREDIT=1 CLOCK HR, 1 PR CREDIT=2 CLOCK HR)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT	: 01 HR

❖ **RATIONALE:**

A civil Engineer mainly deals with construction of various structures, building is one of it. He has to see how desired quality of construction, effective supervision and proper management of work is achieved. A Civil Engineer, therefore, has to be knowledgeable about basic concepts and principles of construction processes involved in construction of buildings. Hence in this course, basic facts, concepts, principles and procedures pertaining to construction techniques, have been dealt with. With this knowledge of construction techniques, students will be able to execute the construction work of buildings in a systematic, safe and economic manner so that desired quality is ensured.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify different components of building.
2. Select suitable type of foundation for building construction.
3. Select suitable type of masonry for construction of walls.
4. Propose relevant means of communications for different types of buildings.
5. Select relevant material for flooring and roofing of building.
6. Propose relevant material for finishing and miscellaneous works.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Building Elements	1a. Describe the given component of given building. 1b. Describe the salient characteristics of the given building structure. 1c. Suggest relevant method of site exploration for given site condition with justification.	1.1 Component of building: foundation, plinth, DPC, wall, sill, lintel, doors, windows, floor, roof, parapet, slab, columns, beams and their functions. 1.2 Concept of Load bearing Structure, Frame Structure and composite structure. Advantages of framed structures over load bearing structure. 1.3 Inspection of site and site exploration.	03
2. Foundation	2a. Describe the procedure of layout of the given type of structure. 2b. Suggest the suitable method of timbering and strutting for the given site condition with justification 2c. Propose the suitable type of foundation for the given site conditions with justification. 2d. Suggest relevant type of cofferdam for given site condition with justification.	2.1 Site clearance, preparing job layout, Layout for load bearing structure and framed structure by center line method. Precautions while marking layout on ground. 2.2 Excavation for foundation, Timbering and strutting for foundation trench, Tools and plants for excavation. 2.3 Foundation: purposes of foundation Types of foundation: Shallow foundation: Wall footing, column footing, combined column footing, strap footing, raft foundation. Deep foundation: Pile foundation - different types of piles, concrete piles, precast and cast-in-situ piles, under reamed piles. Well foundation: Components Foundation on black cotton soil, characteristics of black cotton soil. 2.4 Cofferdam: Purpose, types	12

3. Masonry work	3a. Describe major features of the given type of stone masonry construction. 3b. Describe salient features of the given type of brick masonry construction. 3c. Select relevant type of bond for brickwork for the given situation with justification. 3d. Describe the general principles to be observed during construction of given type of masonry. 3e. Compare Stone masonry and brick masonry on the basis of given criteria	3.1 Stone Masonry – Construction of stone masonry in various parts of structure, terms used in stone masonry - facing, backing, hearting, through stone, string course, cornice, blocking course, frieze, corbel, parapet, coping, throating and weathering. Classification of stone masonry: Rubble masonry – uncoursed rubble masonry, coursed rubble masonry, Ashlar masonry – Ashlar fine, rough tooled, rock faced, chamfered faced Important points to be observed in the construction of stone masonry. 3.2 Brick Masonry - Definition of different terms used in brick masonry, General principles to be observed in the construction of good brick masonry Bonds in brick work - Header bond, Stretcher bond, English bond, Single Flemish bond, Double Flemish bond. Laying of brick work - soaking of bricks in water, line, level and plumb.	10
4. Building communication and ventilation	4a. Describe the given type of opening for the given situation with sketches. 4b. Select the relevant type of doors and windows for the given situation with justification. 4c. Select the type of fixtures and fastenings for given type of door or window with justification. 4d. Choose relevant types of sills, lintels or arches in given situations. 4e. Suggest the type of stair for the given situation with justification.	4.1 Horizontal Communication: Doors: Purpose, location, different parts of door, materials used for door frames-timber, metal and concrete frame, aluminum frame, sizes as per BIS for residential and public building. Types of doors- Fully paneled doors, partially paneled and partially glazed doors, fully glazed doors, flush doors, PVC doors, collapsible doors, rolling shutter doors, 4.2 Ventilation: Windows – Components of windows, different materials used for window frames-timber, metal and concrete frame, aluminum frames, Sizes of windows	08

		as per BIS, Types of windows- fully paneled, partially paneled and partially glazed, fully glazed, louvered window, steel window, aluminum sliding window, ventilators. 4.3 Fixtures and fastenings for doors and windows Sills, Lintels and Arches: 4.4 Sills - purpose, Types- concrete, kadappa, marble, granite. Lintels- purpose, bearing, thickness, Types- wooden, stone, brick, R.C.C. Arches – purpose, components and types 4.5 Vertical communication: Stair, Ramps, Lifts, Escalators. Stairs – Location, function technical terms, Rule for design, BIS standards for tread, rise and width for residential and public building. Requirement of good stairs. Types of stairs – straight, dog legged, quarter turn, open well, bifurcated, spiral, circular, geometric. Material of construction – R.C.C., Precast, Metal	
5 Floors and Roofs	5a. Choose the flooring material for the given type of building with justification. 5b. Describe the process of laying and construction of given type of floor. 5c. Choose suitable type of roof and truss for the given type of building with justification. 5d. Suggest suitable type of roof coverings for given type of building in given situations.	5.1. Floors: Ground floor: purpose and requirement of floor, Upper floors: purpose, material of construction, Mezzanine floor: Use, location and requirement. Floor finishes and its suitability: Shahabad, kotah, marble, granite, kadappa, glaze/unglazed ceramic, vitrified, plain cement, mosaic tiles, chequered tiles, skirting, dado and pavement blocks Process for laying, finishing and polishing of floors. 5.2 Roofs: Necessity, Types of roofs – Flat roof, Pitched roof – technical terms and types of pitched roof. Steel trusses types,	07

		requirements, advantages and disadvantages of steel trusses. Roof coverings- A.C. sheet, G.I. sheets. Plastic and fiber sheets, Mangalore tiles, R.C.C slab roof, pre cast slab.	
6 Finishing and Miscellaneous Works	6a. Suggest suitable type of plaster for given situation. 6b. Suggest suitable type of pointing for given situation. 6c. Select relevant type of paint to be used for the given type of wall surface 6d. Choose relevant type of scaffolding for given masonry work in given situation with justification. 6e. Suggest relevant formwork for casting of given concrete work.	6.1 Plastering: Purpose, mortar and its proportion, Process of plastering External finishes such as sand faced, rough cast, pebble dash. Internal finishes such as undercoats, neeru finish and POP. 6.2 Pointing: Purpose, types of pointing. 6.3 Painting: Purpose, types of paints, process of painting. 6.4 Scaffolding, Shoring and Underpinning Scaffolding: Component and types, process of erection. Shoring: Purpose, type. Underpinning: purpose. 6.5 Formwork: Purpose, Requirements of good formwork, formwork for concrete works.	08
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Identify different components of building by observing existing building in the institute campus.	1	02
02	Prepare the foundation plan from the given drawing to mark layout of load bearing structure on ground. (Part-1)	2	02
03	Carryout marking of layout of load bearing structure on ground. (Part-2)	2	02
04	Prepare the foundation plan from the given drawing to mark layout of framed structure on ground. (Part-1)	2	02
05	Carryout marking of layout of framed structure on ground. (Part-2)	2	02
06	Draw Labeled Sketches for Section of column footing on A3 Size Sheet.	2	02
07	Draw labeled sketches of alternate courses for one brick thick wall corner in English and Flemish bond on A3 size sheet. (Part-1)	3	02
08	Develop English and Flemish bond for one brick thick wall corner by using models of bricks. (Minimum 3 courses) (Part-2)	3	02
09	Draw Plan, elevation and section of paneled door on A3 Size Sheet.	4	02
10	Draw Plan and section of R.C.C. dog-legged stair on A3 Size Sheets.	4	02
11	Identify various types of flooring to prepare report. (Part-1)	5	04
12	Establish levels for flooring using a transparent plastic tube and water. (Part-2)	5	02
13	Record the observation of plastering work at construction site to prepare a report	6	04
14	Draw sketches of formwork for concrete works on A3 size sheet.	6	02
Total Hrs			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Building elements	02(00)	03(03)	00(00)	05(03)
02	Foundation	02(02)	06(03)	06(03)	14(08)
03	Masonry work	02(00)	06(03)	03(03)	11(06)
04	Building Communication and Ventilation	02(00)	06(03)	03(03)	11(06)
05	Floors and roofs	02(02)	00(03)	06(00)	08(05)
06	Finishing and miscellaneous work.	02(02)	03(00)	06(06)	11(08)
	Total	12(06)	24(15)	24(15)	60 (36)

R – Remember

U – Understand A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	5	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
03	2	U	3	3	U	3	4	U	3	3	U	3	4	U	3				3/5
04	3	A	3	4	U	3	6	U	3	2	A	3	5	U	3				3/5
05	4	A	3	6	A	3	6	A	3	3	A	3	4	A	3				3/5
06	2	A	6	5	A	6	6	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3, 4, 5 & 6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3, 4, 5 & 6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3, 4, 5 & 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4, 5 & 6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3, 4, 5 & 6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50@	20	Rubrics & Practical Answer Sheets	1, 2, 3, 4, 5 & 6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4, 5 & 6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Correct drawing	10
2	Labeling and Dimensioning	10
3	Neatness	10
4	Viva -Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	2	-	-	-	-
2	3	-	-	3	-	2	-	3	-
3	3	-	-	3	2	2	-	3	-
4	3	-	-	3	2	2	-	3	-
5	3	-	-	-	2	2	-	3	-
6	3	-	-	-	2	2	-	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building construction	Sushil kumar, Standard Publication, 2010	19788180141683
2.	A textbook of building construction	S.P.Arora and S.P.Bindra Dhanpat Publication, Revised 2018	8189928805
3.	Building construction	B.C.Punmia, Ashok kumar Jain Arun kumar Jain , Laxmi Publication, 11 th edition, January 2019	9788131804285
4.	Building construction	S.K.Sharma, S Chand & Company pvt.Ltd. ,2013	9788121904797
5.	Building Construction	Varghese P. C., PHI; 2nd edition (1 January 2016)	978-8120352841
6	Indian Practical Civil Engineers' Handbook	P.N. Khanna, UBS Publishers' Distributors Ltd	0274198339
7	National Building Code of India 2016 (NBC 2016)	Bureau of Indian Standards	Bureau of Indian Standards, New Delhi

❖ **E-REFERENCES:**

- <https://www.aboutcivil.org/building-construction-and-design.html>, accessed on 14/02/2022
- <https://civiconcepts.com/blog/building-construction-process-steps>, accessed on 14/02/2022
- <https://civiljungle.com/building-construction/>, accessed on 14/02/2022
- <https://theconstructor.org/construction/project/basics-building-construction/25260/>, accessed on 14/02/2022
- <https://civiltoday.com/construction/wall/244-masonry-wall-definition-types>, accessed on 14/02/2022
- <https://mccoymart.com/post/types-of-doors-and-windows/>, accessed on 14/02/2022
- <https://civilengineeringx.com/super-structures/doors-and-windows/>, accessed on 14/02/2022
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- <https://www.youtube.com/watch?v=K1s0y2v6gOs>, accessed on 14/02/2022
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❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

Sr. No.	Equipment Name with Broad Specification	PrO, Sr. No.
1	Measuring Tape, Pegs, Arrows, Hammer, Line dori, Lime powder,	2,3,4, 5
2	Models	
	a. Model depicting various components of building	1
	b. Models of bricks to develop bonds	7,8
	c. Types of doors and windows	9
	d. Types of stairs	10
	e. Types of formwork for RCC elements	14

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr N. V. Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Mr. R. M. Walke	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. M. D. Keskar	Structural Designer	Keskar & Associates, Nagpur
5	Dr. Mahendra. Kadu	Professor & Head, Civil Engineering	Ramdeobaba College of Engineering, Nagpur

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSES
COURSE CODE	: CE203G
COURSE TITLE	: BUILDING DRAWING
PREREQUISITE	: ME101G
TEACHING SCHEME	: TH: 02; TU: 00; PR: 04(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2CLOCK HR.)
TH. TEE	: 04 HRs
PR. TEE	: 02 HRs
PT	: 02 HRs

❖ RATIONALE:

Drawing is a language of communication between various agencies involved in construction work. At each stage of construction, different types of drawing are necessary. This course is intended to develop and inculcate basic drawing skills. This will enable students to read and interpret the drawing and enable them to understand the basic aspect of building planning, design and the working drawings. The course has close relationship with other courses i.e. Building construction and Estimating and costing. The drawing to be drawn by the students must have approach adopted in the field and according to the I.S. code requirements and byelaws of the sanctioning authority

❖ COURSE OUTCOMES:

After completing this course students will be able to–

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. Identify rules, regulations and standard bye-laws of local sanctioning authorities.
4. Apply ethics, responsibilities and norms of standard practice in drawing.
5. Use methods and procedures of preparing working and submission drawing.
6. Draw one / two-point perspective view of given small objects.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction	a) Identify various types of lines in preparing drawing. b) Draw various symbols of materials and building components. c) Choose proper scale for preparing drawing. d) Describe the role of various agencies involved in construction work	1.1 I.S specification for drawing 1.2 Types of Lines – Visible line, Centre line, Hidden line, Section line, Dimension line, Extension line, Pointers, Arrow heads or dots 1.3 Symbols – Materials used in construction, building components 1.4 Scales used for preparing drawing. 1.5 Agencies in construction work 1.6 Role of Owner, Architect, Structural Designer, Contractor, Interior Designer, Specialists. 1.7 Importance of Line Plan	4
2 . Planning of Residential Buildings	a) Identify various planning principles used in planning of residential building b) Describe various planning principles such as aspect, prospect, grouping, roominess, elegance, circulation, privacy c) Describe the importance of orientation. d) Describe the significance of planning principles in planning of residential building.	2.1 Principals of planning –aspect, prospect, grouping, roominess, elegance, circulation, privacy 2.2 Furniture layout, economy and sanitation 2.3 Orientation 2.4 Other requirements: - Light and ventilation, Climate and its effect, Sun diagram. 2.5 Planning of residential building from given data.	6
3. Plan Sanctioning Procedure And Authorities	a) Identify various Plan sanctioning authorities b) Differentiate role of different Plan sanctioning authorities c) Describe Purpose of Bye-laws d) Compare various types of areas used in building construction. d) Describe procedure of plan sanctioning. e) Prepare list of documents required for plan sanctioning	3.1 Plan sanctioning authorities- Gram Panchayat, Municipality, Municipal corporation, N.I.T 3.2 Purpose of Bye-laws 3.3 Building rules and Bye-laws of plan sanctioning authority regarding – plot area, side margins, floor space index, floor area ratio, built up area, plinth area, super built up area, minimum height of plinth, sill, Floor to floor height, maximum height of building, no. of storey's, minimum dimension	4

		of various rooms and other units such as balcony, passage, stair case 3.4 Appropriate sizes of various units 3.5 Procedure of plan sanctioning, documents required.	
4. Planning of Public Building	a) Describe various principles of architectural composition. b) Identify the need & sizes of various units required as per function c) Identify common units required for various public buildings d) Select the data required for planning of public building	4.1 Functional design on the basis of function or purpose 4.2 Principles of architectural composition (Form, Units, Contrast, Rhythm, Scale.) 4.3 Different unit required as per function 4.4 Appropriate sizes of various units 4.5 Common units required for various public buildings such as Entrance, Sanitary units, Parking space and Telephone booth etc. 4.6 Data required for planning of public building such as Library, Community health center, High school, market, hospital, Post office, Bank, Primary school, canteen, Hostel, shopping mall etc.	6
5. Types of Drawing	a) Draw developed plan from line plan b) Draw Elevation, Section, Site plan, Location Plan, Foundation plan c) Prepare Area statement, Schedule of openings, Construction notes and other details d) Differentiate between Submission Drawing and Working Drawing	5.1 Development of line plan, Elevation, Section, Site plan, Location Plan, Foundation plan, Area statement, Schedule of openings, Construction notes and other details. 5.2 Measured Drawing and its significance 5.3 Submission Drawing and Working Drawing	8
6. Perspective Drawing	a) Define various Terms used in Perspective drawing b) Describe procedure of drawing perspective view c) Draw one point perspective view of a small object. d) Draw two point perspective view of a small object.	6.1 Introduction- Concept of one point perspective and two point perspective 6.2 Terms associated- picture plane, station point, vanishing point, horizon plane and horizon line 6.3 Procedure for developing one point perspective view. 6.4 Procedure for developing two point perspective view.	4
Total Hrs.			32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare line plans of small residential building (two/three rooms + sanitary blocks) for different plot orientation and with different scale on graph paper (A1 size) Sheet no. 1:	1.Introduction & 3.Plan Sanctioning Procedure and Authorities	06
2	Prepare detailed drawing of small load bearing residential building with minimum two rooms, kitchen, sanitary block consisting of plan, elevation, two sections, details of foundation in 1:50 scale, site plan, area statement, schedule of openings, construction notes on A1 size sheet. Sheet no. 2:	2. Planning of Residential Buildings, 3. Plan Sanctioning Procedure and Authorities and 5. Types of Drawing	16
3	Prepare data drawing of two storied residential building framed structure type with three rooms at ground floor & sanitary block and minimum two rooms & sanitary block on first floor. The building has partly pitched slab roof. The drawing shall include ground floor plan, first floor plan, elevation, section passing through staircase, W.C. and both room, details of foundation in 1:20 scale, schedule of openings, site plan, area statement, area diagram, construction notes on A1 size sheet (scale 1:100). Sheet no. 3:	2. Planning Of Residential Buildings, 3. Plan Sanctioning Procedure And Authorities and 5. Types of Drawing	16
4	Prepare plan and draw public building from given data. The sheet shall consist of plan, elevation, section, site plan, area statement, area diagram, schedule of openings, construction notes on A1 size sheet (scale: 100). Sheet no. 4:	4. Planning of Public Building 5. Types of Drawing	14
5	Draw line plan of different types of public building such as hostel, library, school, community center, public health center, Post office, bank etc. on graph sheet (A1 size). Sheet no. 5:	4.Planning of Public Building	08
6	Draw one point and two point perspective of small objects such as steps and pedestal on imperial drawing sheet (A1 size). Sheet no. 6:	6.Perspective Drawing	04
		Total Hrs	64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition ProcessDimension			Total Marks
		R	U	A	
01	Introduction	02(00)	03(00)	00(00)	05(00)
02	Planning Of Residential Buildings	04(02)	03(03)	00(00)	07(05)
03	Plan Sanctioning Procedure and Authorities	02(02)	03(03)	00(00)	05(05)
04	Planning Of Public Building	00(00)	00(00)	08(08)	08(08)
05	Types of Drawing	00(00)	03(03)	22(00)	25(03)
06	Perspective Drawing	02(00)	00(00)	08(08)	10(08)
	Total	10(04)	12(09)	38(16)	60(29)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	2	R	2	3	R	2	6	R	2	2	R	2	5/7
	3	R	2																
02	5	A	8	5	A	8	5	A	6	5	U	3	5	U	3				4/5
03	6	A	8	6	A	8													1/2
04	4	A	8	4	A	8													1/2
05	1	U	3	2	U	3	2	U	3										2/3
06	3	U	3	3	U	3													1/2

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3, 4,5,6
		Assignments		Continuous	15	--	Sketch Book	1, 2, 3, 4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3, 4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Drawing Portfolio		Continuous	05	--	Drawing Portfolio	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25@	10	-	1, 2, 3, 4,5,6-
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ SCHEME OF PRACTICAL EVALUATION:

S. N.	Description	Max. Marks
1	Draw line plan of given public building / one or two point perspective drawing / any given view of detailed drawing like foundation plan ,site plan ,area statement with area diagram ,schedule of openings etc	30
2	Viva voce	20
	TOTAL	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	-	-	-	-	-
2	3	-	-	-	-	-	2	-	-
3	3	-	-	-	-	-	2	-	-
4	3	-	-	-	3	-	-	-	-
5	3	-	3	3	-	3	2	-	-
6	3	-	3	3	-	3	2	-	-

❖ REFERENCE & TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Building Drawing and Planning with an Integrated Approach to Built Environment	M.G. Shah, C.M. Kale, V.Y. Patki, Tata McGraw- Hill Publication, 4 th Edition, 2002	10: 0-07-463876-9
2.	Building Planning & Drawing	Dr. N. Kumarswamy , A. Kameswara Rao, Charotar Publishing House Pvt. Ltd. - Anand; 7th Revised Edition, 2013	10: 9380358849 13: 978-9380358840
3.	Civil Engineering Drawing & House Planning	B.P. Verma, Khanna Publications, 2010	8174091688
4.	Civil Engineering Drawing	Gurucharan Singh, Standard Publications, 2009	8180140040
5.	Civil Engineering Drawing	R.S.Malik, G.S.Meo, Asian Publishers/Computech Publication Pvt. Ltd., 2015	10: 8173180024 13: 978-8173180026

❖ **E-REFERENCES:**

- <https://law.resource.org/pub/in/bis/SO3/is.sp.7.2005.svg.html>, assessed on 18th Feb. 2022
- <https://law.resource.org/.../is.962.1989>, assessed on 28th Feb. 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Drawing Board (D1 size)
2. Mini Drafter
3. Drawing Instruments

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. N V Raut	Head of Civil Engineering (I Shift)	Government Polytechnic, Nagpur.
2	Dr. S R Kukadapwar	Head of Civil Engineering (II Shift)	Government Polytechnic, Nagpur.
3	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. R.M. Walke	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	:	CORE COURSE
COURSE CODE	:	CE204G
COURSE TITLE	:	BASIC SURVEYING
PREREQUISITE	:	NIL
TEACHING SCHEME	:	TH: 03; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	:	05 (1 TH/TU CREDIT=1CLOCK HR; 1 PR CREDIT=2 CLOCK HRs)
TH. TEE	:	03 HRs.
PR. TEE	:	02 Hrs (Internal)
PT	:	01 HR.

❖ RATIONALE:

The knowledge and skill of surveying is a basic requirement for a Civil Engineer to initiate the Civil Engineering Project. He will able to choose appropriate method of surveying to prepare the plans / maps. The survey work and relevant maps / plans are useful to decide the feasibility of the project. Surveying skills are very important for a Civil Engineer. This further will lead the students as professionals / entrepreneur in surveying.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Select the type of survey required for given situation.
2. Use linear measuring instrument for survey.
3. Compute area of field, from cross staff survey using given data.
4. Carry out traversing in the field using chain and compass.
5. Carry out leveling and contouring.
6. Carry out plane table survey.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Surveys, signs and Symbols	a) Classify given type of survey based on purpose and instrument used. b) Compare Plain and Geodetic survey on given points c) Identify conventional signs and symbols.	1.1 Definition of survey, Objects of surveys, Uses of surveys. Classification of surveys-Primary and Secondary, Primary Survey- Plane and Geodetic Surveys, Secondary Survey- Based on instruments used, Nature of field and Objective. Principles of survey. Reconnaissance, preliminary, detailed survey. 1.2 Conventional signs and symbols used in survey maps - Wall, Wall & Gate, Road, Foot Path, Cutting, Embankment, Railway line (single & double line), Triangulation station, Traversing station, Bench mark, Garden (flower & fruit), Sand, Tank & Pond, Hedge, tree, Church, Temple, Mosque, Barren land, water line, electric line, telephone line, Crossings (Railway, Road over Railway, Railway over Road, Bridge carrying Railway, Electric pole, Telephone pole, Tunnel, Canal or Stream, Nallah or Natural river etc. Abbreviations used: - LB, TP, EP, PO, TO, PS, DB, RH, IB, TB etc.	06
2. Linear Measurements	a) Describe given technical terms related to linear measurements. b) Describe given method of ranging. c) Describe measurement of true length on slopping ground.	2.1 Study and use of instruments for linear measurements- Metric chain, Measuring Tapes and its types, Ranging rod, Arrow, Peg, Digital tape, Methods of linear measurements- By pacing, by speedometer, by chaining, by digital tape. DDM, ODM, EDM. 2.2 Ranging- Direct and indirect ranging and procedure, Line Ranger, Code of signals used in ranging, Concept of Leader and Follower.	06

		2.3 Chaining Procedure on plane and sloping ground. Correction of linear measurement for incorrect length of chain/tape.	
3. Chain And Cross Staff Survey	a) Describe given Technical terms related to chain and cross staff survey. b) Describe the instruments used for offset. c) Apply the knowledge of Maths in surveying for obstacles in surveying. d) Compute area of open given field by using chain and cross staff.	3.1 Chain Triangulation – Survey Station and their Selections, Survey lines, Check lines, Tie lines, Base line. Well conditioned and Ill conditioned triangles. 3.2 Taking offsets, Instruments used in taking offsets – Cross staff & Optical square; Types of offsets- Long and Short offsets, Perpendicular and Oblique offsets, Degree of precision in taking offset. 3.3 Obstacles in Chaining: The obstacles in Ranging but not Chaining, The obstacles in Chaining but not ranging, The obstacles in both, Chaining & Ranging. (No numerical problems). 3.4 Chain & Cross Staff survey- Noting on page of field book, Precautions in booking field notes, Recording the observation. Calculation of Areas from cross staff survey, Positive areas and Negative areas, Determination of areas from plotted plans using the field notes. Numericals on determining the area of a field.	08
4. Chain And Compass Traversing	a) Describe given technical terms related to chain and compass traversing. b) Convert WCB to RB and vice versa to find included angle. c) Compute the corrected bearings from the given observed bearing. d) Apply corrections to bearings affected by Local attraction. e) Adjust the closing error of the traverse for given data.	4.1 Prismatic Compass – Component parts, construction and use, Comparison with Surveyors compass. 4.2 Technical Terms – True bearing, Magnetic bearing, and Arbitrary bearing, Whole Circle Bearing, Quadrantal Bearing (Reduced Bearing), Conversion of bearings (Numerical problems). 4.3 Fore bearing, Back bearing, finding Included angles from bearings and calculation of bearings from included angles (Numerical problems). 4.4 Local attraction, Causes,	10

	f) Calculate bearings and included angles.	Precautions and Corrections to bearings affected by Local attraction, calculation of included angles. 4.5 Traversing – Methods of plotting a traverse and closing error, Graphical adjustment for closing error. 4.6 Numerical problems on calculation of Bearings, Angles and Local attraction.	
5. Leveling & Contouring	a) Describe the given term related to leveling. b) Describe construction and use of the level instrument. c) Correlate different axis of level. d) Compute reduce levels from the given data using HI and rise and fall method. e) Select type of leveling for the given work with examples and justification. f) Compute missing readings from the given observed readings. g) Interpret RLs to know topography of land. h) Describe characteristics of contours for the given terrain. i) Prepare contour map from the given RLs of grid points with examples.	5.1 Dumpy level – Components, Construction, Fundamental axes and their relationships Line of sight, Line of Collimation, Axis of bubble tube, 5.2 Types of leveling Staff – Ordinary, Telescopic and Folding type, Temporary adjustments of dumpy level. 5.3 Tech. Terms – Level surface, Level line, Horizontal line, Vertical line, Datum surface, Reduced level, Bench mark and its types. Foresight, Back sight, Intermediate sight, Change point, Height of collimation. Recording in Level book. Permanent adjustments of dumpy level (only relationships). 5.4 Methods of Reduction of level – Height of instrument method and Rise and Fall method. Arithmetical checks, Computation of missing readings (Numerical problems). 5.5 Classifications of leveling - Simple, Differential, Profile, Cross sectional, fly leveling, Sources and Errors in leveling, Precautions and difficulties faced in leveling. 5.6 Study and use of Auto level. 5.7 Contouring- Tech. Terms – Contour, Contour Interval, Horizontal Equivalent. 5.8 Characteristics of contours, Method of locating contours, Direct and Indirect method of contouring, Interpolation of	12

		contours, 5.9 Uses of Contour Maps. Interpretation of Typical Contour Sheets.	
6. Plane Table Survey	a) Describe Accessories required for plane table survey. b) Recommend suitable method of plane table survey for a particular field. c) Compare merits and demerits of plane table survey with given survey.	6.1 Principles of Plane Table Survey, Accessories required, Setting out of plane table, Leveling, Centering and Orientation, Use of Telescopic Alidade. 6.2 Methods of Plane Table surveying –Radiation, Intersection, and Traversing. 6.3 Merits and Demerits of Plane Table Surveying, situations where Plane Table Survey is used.	06
Total Hrs.			48



B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Measure distances on plain and slopping ground using 20m and 30m metric chains, steel and metallic tapes, line ranger. Direct and indirect ranging.	Linear Measurements	02
02	Set out the perpendicular offsets using optical square and open cross staff.	Chain And Cross Staff Survey	02
03	Find areas of given field (positive and negative areas) using Chain and cross staff survey.		04
04	Record fore and back bearings and calculate angles from recorded bearings using prismatic compass.	Chain And Compass Traversing	04
05	Measure and calculate corrected bearings for 5-6 sided closed traverse, identifying stations affected from local attraction. Apply check for included angles, elimination of local attraction.		04
06	Project no 1: (A Whole day Project) Locate details and plot (A-1 size imperial drawing sheet)map using Chain and compass survey for simple closed traverse (5-6 sided) enclosing building. (individual sheet for each student)		08
07	Calculate R.L. by height of instrument method and by Rise and Fall method using dumpy level. Record the reading in level book for differential leveling with arithmetic checks.	Leveling & Contouring	04
08	Set the bench mark by double check method. (at least 500 m away) using dumpy level or auto set level.		04
09	Use auto set level for leveling purpose.		02
10	Project no 2: (A Whole day Project) Draw the mapof Profile leveling and cross sectioning at least 600 m with 30 m peg interval. Take Length of cross section 10 m on both sides and spot level at 10 m c/c (or as per site conditions) (Individual sheet for each student).		08
11	Project no 3: Draw the map of Block contouring on A-1 size imperial drawing sheet – (200 x 200 m or as per site conditions) with spot levels at (10 x 10 m). (Individual sheet for each student).		08
12	Perform plane table survey using, Radiation method.	Plane Table Survey	04
13	Perform plane table survey using, intersection method.		02
14	Project no 4: (A whole day project.) Perform traverse survey using plane table enclosing a building. Prepare a map on A-1 size imperial drawing sheet. (Individual sheet for each student).		08
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Surveys, signs and symbols	00(02)	03(03)	00(00)	03(05)
02	Linear Measurements	02(00)	06(03)	00(00)	08(03)
03	Chain And Cross Staff Survey	02(00)	03(00)	06(06)	11(06)
04	Chain And Compass Traversing	02(02)	03(00)	06(06)	11(08)
05	Leveling & Contouring	04(00)	06(03)	06(06)	16(09)
06	Plane Table Survey	02(02)	03(03)	06(00)	11(05)
	Total	12(06)	24(12)	24(18)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	2	R	2	3	R	2	4	R	2	5	R	2	5	R	2	6	R	2	6/9
	1	R	2	4	R	2	6	R	2										
02	1	U	3	2	U	3	2	U	3	2	U	3	5	U	3				3/5
03	3	U	3	4	U	3	5	U	3	6	U	3	1	U	3				3/5
04	5	U	3	6	U	3	3	A	3	3	A	3	3	A	3				3/5
05	3	A	3	4	A	3	4	A	3	4	A	3	4	A	3				3/5
06	5	A	6	6	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3,4,5,6
		Journal Writing		Continuous	05	--	Field Book	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50 @	20	Rubrics & Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1.	Preparation, setting and operation of experiment.	20
2.	Observation, recording and interpretation of result and conclusion	20
3.	Viva voce.	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7				1	2
1	-	-	-	-	2	-	-				-	-
2	3	3	-	-	2	-	-				-	-
3	3	3	-	2	2	2	-				-	-
4	-	3	-	2	2	2	-				-	-
5	3	3	-	2	2	2	-				-	-
6	-	-	-	-	2	2	-				-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Surveying and Levelling	N. N. Basak Tata McGraw Hill Education Pvt. Ltd.	13: 978-0-07-460399-4 10: 0-07-460399-X
2.	Surveying and Levelling	R. Agor. Khanna Publishers	13: 978-81-7409-235-9 10: 81-7409-235-9
3.	Surveying Vol. 1	Dr. B. C. Punmia, Luxmi Publisher.	10: 8170088534
4.	Surveying Vol. 2	Dr. B. C. Punmia, Luxmi Publisher	10: 8170088836
5.	Surveying and Levelling	R. Subramaniam. Oxford Higher Education, Oxford Uni. Press.	10: 0198085427
6	Surveying Theory and Practice	S.S. Bhavikatti, I K International Publishig House Pvt Ltd	10: 9380578253

❖ **E-REFERENCES:**

- <https://www.youtube.com/watch?v=ZkPcr5v7xP8> assessed on 5th February 2022
- <https://www.youtube.com/watch?v=ZkPcr5v7xP8>
civil.engineering.webservices.utoronto.ca/.../Survey+Camp+Class+Notes..., assessed on 5th February 2022
- https://www.youtube.com/watch?v=HqLtbAaNkBg&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=13 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=ovGnF-yZZ2E&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=1 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=F6ZZBQG_PtU&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=2 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=WSk3iCA5crc&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=3 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=TKzEJB1qkz8&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=4 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=Gne1Dvecn8U&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=5 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=bPqAtloPWv4&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=6 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=LFeTaFcz_k0&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=7 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=1zW_mEx0E9w&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=8 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=un2QYlMvzkM&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=9 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=p0eikt9OSZI&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=10 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=hQLp63PmPT4&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=11 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=7L3jaOvhoZk&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=12 assessed on 2nd March 2022

- https://www.youtube.com/watch?v=Ykw_k-DVzbg&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=14 assessed on 2nd March 2022
- https://www.youtube.com/watch?v=o-aiwOu5Sbw&list=PLe0_66zqdXSmwzZ7MLAWTtb3sOzK1WMiq&index=16 assessed on 2nd March 2022
- <https://www.google.com/search?q=fundamentals+of+surveying+pdf&oq=fundamentals+of+surveying&aqs=chrome.2.69i57j46i512j0i512l5j46i512j0i512l2.16570j0j7&sourceid=chrome&ie=UTF-8> assessed on 2nd March 2022
- <https://civilenggforall.com/fundamentals-of-surveying-textbook-by-civilenggforall-free-download-pdf/> assessed on 2nd March 2022
- www.iamcivilengineer.com › ... › Surveying › Surveying and Levelling, assessed on 2nd March 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Chain, Tape, Cross staff, Optical square, Line ranger etc.
2. Prismatic Compass
3. Dumpy Level, Auto Level
4. Plane Table with accessories
5. Digital Level

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. R. Kukadapwar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Shri. N. H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Shri. S. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Shri. M. D. Keskar	Structural Designer	
5	Dr. Mahendra Kadu	Professor and Head	Ramdeobaba College of Engineering and Research

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	:	PROFESSIONAL COURSES
COURSE CODE	:	CE207G
COURSE TITLE	:	ADVANCED SURVEYING
PREREQUISITE	:	CE204G
TEACHING SCHEME	:	TH: 03; TU: 00; PR: 04 (CLOCK HRs.)
TOTAL CREDITS	:	05 (1 TH/TU CREDIT=1CLOCK HR; 1PR CREDIT=2 CLOCK HRs)
TH.TEE	:	03 HRs
PR.TEE	:	02 HRs (External)
PT	:	01 HR.

❖ RATIONALE:

Modern instruments like Micro optic theodolite, Digital theodolite, EDM, Total Station, GPS, etc. are necessary to minimize the instrumental errors. Theodolite, a versatile instrument, used to measure the horizontal and vertical angles directly. Also calculate the co-ordinates, and plot the map / plan. With the skill of optical distance measurements (ODM), students will be able to measure the horizontal and vertical distances in tacheometric survey. Total station is modern digital magical survey instrument used for all types of surveys with greater accuracy. Survey skills are developed among the students so that they will able to select appropriate instruments for the particular type of survey for civil engineering works.

The skill of minimizing personnel errors to achieve maximum accuracy should be developed among the students. .

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Calculate bearings, angles, and coordinates using given data.
2. Apply Bowditch rule and Transit rule in theodolite traversing
3. Calculate necessary data for setting out curve.
4. Use transit theodolite as tacheometer to measure RLs and distances.
5. Use modern survey instruments for linear, angular and coordinates measurement.
6. Record the readings using various instruments in field book/soft copy.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Theodolite survey	- Recall the knowledge of Basic Survey. - Define the Tech. Terms. - Describe the steps for measurement of angles with theodolite. - Describe uses of theodolite. - Describe the steps to measure deflection angle, Magnetic bearing, and prolongation of straight line using theodolite. - Describe the sources of errors. - Draw traverse. - Calculate the error in traversing. - Apply the check. - Calculate the co - ordinates. - Draw Gale's Traverse Table. - Describe Bowditch and Transit rules. - Draw a map/plan. - Calculate bearings, deflection angles and missing coordinates.	Components of Transit Theodolite and their functions. Technical terms used. Temporary adjustments of Transit Theodolite, Swinging the telescope, Transiting, Changing the face. Measurement of Horizontal angle- method of Repetition, Errors eliminated by method of repetition, Method of Reiteration, Measurement of Deflection angle & Direct angle, Measurement of Vertical angle, Measurement of Magnetic Bearing of a line by Theodolite. Use of Theodolite for Prolonging a Straight line, locating point of intersection of lines (Simple numerical problems on Deflection angle). Sources of Errors in Theodolite Surveying. Permanent adjustment of Transit Theodolite (only relationship of different axes of Theodolite.). Traversing with Theodolite – Method of Included angles, locating details, checks in Closed traverse, Calculation of bearings from angles. Traverse Computation - Latitude, Departure, Consecutive Co-ordinates and Independent Co-ordinates, Error of closure and its adjustment, Balancing the traverse by Bowditch & Transit rule, Gale's Traverse table; (Simple problems).	14

2. Tacheometric survey	1. Define the Tech. Terms. 2. Describe ODM. 3. Describe principle of tacheometry. 4. Calculate the constants. 5. Calculate the RLs and distances. 6. Illustrate survey work by sketch. 7. Distinguish between theodolite and Tacheometer.	2.1 Definition, Principle of Tacheometry, Essential requirements of Tacheometer, Components of tacheometer. 2.2 Use of Theodolite as a Tacheometer with staff held in Vertical and Fixed hair method (No derivation). Equation used in Tacheometer, provisions of lenses, Determination of Tacheometric constants. 2.3 Simple numerical problems, finding Horizontal and Vertical distances and Reduced levels of points.	06
3. Computation of area and volumes	1. Define the Tech. Terms. 2. Differentiate between Polar and Digital planimeter. 3. Describe zero circle. 4. Calculate the area of a map. 5. Calculate the volume of earthwork. 6. Describe Prismoidal and Trapezoidal formula.	3.1 Planimeter – Polar and digital, Component parts, construction and use, area of zero circle, Computation of areas using both types of planimeter and comparing. 3.2 Prismoidal formula, Trapezoidal formula. 3.3 Computation of volume from contour maps by Trapezoidal and Prismoidal formulae, Calculation of earthwork quantity from Profile levelling sheet of IIIrd Sem.	06
4. Curves	1. Define the Tech. Terms. 2. Illustrate the curves with sketch. 3. Draw the curves using given data. 4. Calculate the necessary data to trace the curve by offset from long chord method and Rankine's method. 5. Name the components of curve.	4.1 Types of Horizontal and Vertical curves used in Road and Rail alignment, terms used. Commonly used Radii and Degree of curves for road and railway alignments. 4.2 Notation for Circular curves and corresponding calculations. Calculation of data required to set a curve. 4.3 Calculate the ordinates of curve by long chord method. Calculate data to trace the curve by Rankine's method. 4.4 Setting out Curves - Methods – Offset from Long Chord method and Tangential method (Rankine's method).	08

5. Advanced survey equipments	1. Define the Tech. Terms. 2. State advantages of modern equipment. 3. Describe the principles of EDM. 4. Describe working of Micro optic theodolite, Electronic theodolite, EDM, Total station, GPS. 5. Describe the process of traversing and profile survey by Total Station. 6. Analyze the survey data. 7. Describe the process to create a digital map.	5.1 Construction and use of One Second Micro Optic Theodolite, Electronic Digital Theodolite. Features of Electronic Theodolite. 5.2 Principle of E.D.M, Components of E.D.M and their functions, use of E.D.M. 5.3 Construction and Use of Total Station. Measurements with Total Station. Hor angles, vertical height measurements, Traversing, Profile Survey, 5.4 Contouring with Total Station. 5.5 Construction and Use of Digital Level. 5.6 Construction and Use of G.P.S. 5.7 Introduction of GIS.	08
6.Aerial survey and remote sensing	1. Define the Tech. Terms. 2. Identify topographical map. 3. Describe aerial survey. 4. Describe Remote Sensing. 5. State application of remote sensing. 6. Distinguish between Active and Passive remote sensing.	6.1 Aerial Survey Introductions, definition, Aerial photograph. 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy, Remote sensing system- Passive system, Active system. Applications – Minerals, Land use / Land cover, Natural Hazards and Environmental engineering system.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Identify the components of Theodolite and their functions, reading the Vernier and temporary adjustments of Theodolite.	Theodolite survey	06
2	Measure Horizontal angles by Theodolite.		04
3	Measure Horizontal angles by method of Repetition.		04
4	Measure Vertical angles by Theodolite.		02
5	Measure Magnetic bearings of a line, Prolongation of straight line, Measure Deflection angles using Theodolite.		04
6	Mini Project- 1: (A whole day project.) Compute and plot the Gale's Traverse table using Theodolite for minimum 5-6 sided traverse including building inside for small area. Use A1 size imperial drawing sheet for plotting and measurement of area from independent coordinates.		08
7	Use of Tacheometer, finding the constants of Tacheometer.	Tacheometric survey	04
8	Find reduced levels and horizontal distances using Theodolite as a Tacheometer.		02
9	Use simple planimeter to find the area of irregular figure.	Computation of area and volumes	02
10	Use digital planimeter to measure the area enclosed by contours. Use drawing plotted in Basic Surveying course for this practical.		02
11	Use One Second Micro Optic Theodolite for measurement of Horizontal and Vertical angles	Advance survey equipments	04
12	Use Electronic Theodolite for measurement Of Horizontal and Vertical angles.		04
13	Project – 2: (A whole day project.) Use Total Station for finding Horizontal and Vertical Angles, Profile levelling, Contouring and Traversing.		08
14	Use of Global Positioning System to identify the location of various stations and structures.		04
15	Set out Simple circular curve by Rankine's method of Deflection angles and Long Chord method for a given problem.	Curves	04
Skill Assessment			02
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Theodolite Survey	02(02)	09(06)	06(03)	17(11)
02	Tacheometric Survey	02(02)	03(03)	00(03)	05(08)
03	Computation of Area and Volumes	02(00)	03(03)	06(00)	11(03)
04	Curves	02(00)	03(00)	06(06)	11(06)
05	Advanced Survey Equipments	02(02)	03(03)	06(00)	11(05)
06	Aerial Survey and Remote Sensing	02(00)	03(00)	00(03)	05(03)
	Total	12(06)	24(15)	24 (15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	3	R	2	4	R	2	5	R	2	6	R	2	1	R	2	6/9
	2	R	2	2	R	2	5	R	2										
02	2	U	3	1	U	3	1	U	3	5	U	3	1	U	3				3/5
03	2	U	3	3	U	3	4	U	3	5	U	3	1	U	3				3/5
04	5	U	3	6	U	3	3	U	3	1	A	3	6	A	3				3/5
05	1	A	3	3	A	3	3	A	3	2	A	3	1	A	3				3/5
06	4	A	6	5	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Field Book	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Figure/ Index sketch	10
2	Observations,	15
3	Calculations and Result	15
4	Viva voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7				1	2
1	3	3	-	-	-	-	-				-	-
2	3	3	-	3	2	-	2				-	-
3	3	3	-	3	-	-	-				-	-
4	3	3	-	3	2	-	2				3	-
5	3	3	-	3	-	-	-				3	-
6	3	3	-	3	-	-	-				3	-

1: Slight (Low); 2: Moderate (Medium); 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	A Text book of Advance Surveying.	R. Agor. Khana Publishers, 2002	8174090533
2.	Surveying Vol 2	K R Arora, Standard Book House Publishers, 2010	8189401246
3.	Surveying Vol. 2	Dr. B. C. Punmia, Luxmi Publisher, Sixteenth Edition, 2016	8170088836
4.	Advance Surveying	Satheesh Gopi, Pearson Publications, 2007	8131700674
5.	Advanced Engg Surveying: Problems and Solutions	Shepherd F A. Better World Books Ltd (UK), 1982	9780713134162

❖ **E-REFERENCES:**

<http://flh.fhwa.dot.gov.>survey>documents>, assessed on 24th Februar 2022

<http://www.jntubook.com> , assessed on 24th Februar 2022

<https://www.cbeps-cceag.ca>, assessed on 24th Februar 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Vernier Theodolite (Vernier Transit theodolite 127mm/178mm, export quality fitted with /without Optical Plummet with suitable attachment and accessories in wooden/metal box with telescopic aluminum/wooden stand & 20/10 Sec Accuracy).
2. Micro-optic Theodolite (1" Least Count 30 X magnification, Hor standard deviation $\pm 2''$, Ver standard deviation $\pm 6''$, Optical Plummet, Reflector, including accessories).
3. Polar Planimeter (Planimeter with sliding base pattern having a mechanism consisting of circular disc roller, vernier, along with tracing and fixing arms with the values of multiplying constant and additive constants).
4. Digital Planimeter (Planimeter with sliding base pattern having a mechanism consisting of circular disc roller, LCD screen, Keyboard, Battery, Charger)
5. Electronic Theodolite with EDM (30X, 3.0" resolving power, min focus 1m, laser, reflector, laser/optical plummet, 1" accuracy, Two sided LCD/LED screen, battery, Internal memory with accessories)
6. Total Station (30X, EDM 45mm, 3.0" resolving power, min focus 1m, laser, reflector, laser/optical plummet, 1" accuracy, Two sided LCD/LED screen, battery, Internal memory with accessories).
7. GPS (18X 5Hz or 18x LVC or any other relevant instrument used for surveying).

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr.N.V. Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr.S.R.Kukadpawar	Head of Civil Engineering	Government Polytechnic, Nagpur.
3	S.K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	N.H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5			

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE208G
COURSE TITLE	: ADVANCED CONSTRUCTION EQUIPMENTS
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT	: 01 HR

❖ RATIONALE:

Civil Engineering is mainly concerned with construction and maintenance of various types of structures. In today's world, the work project is required to be completed in stipulated time period with required quality. If the construction is carried out with traditional method and equipment's, it may lead to delay in time, which may increase the cost of construction project. In view of speedy construction activities, it is essential to use modern civil engineering equipment's. Thus civil engineering technicians should be thoroughly familiar with the working, application and maintenance of the wide range of modern civil engineering equipment's.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify various construction equipment in civil engineering project
2. Describe working principle of various construction equipments.
3. Justify the need of suitable equipment as per requirement of job.
4. Draw the line sketches of different construction equipments.
5. Draft a report informing important features of Construction equipment.
6. Demonstrate the function of various components of Construction equipment at site.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Earth Moving Machinery	1a. Describe given Excavating and Compacting Equipments for given site conditions. 1b. Select relevant excavating and Compacting Equipments for given site conditions / situations with justifications.	1.1 Excavation Equipments: General consideration in Excavation, Factors affecting Choice of Equipment Different types of Excavating Equipment's - Power Shovel, JCB, Dragline, BullDozer, Scraper, Clam-shell. Construction & working principles, uses ,advantages & disadvantages for Different types of Excavating Equipments. 1.2 Compaction Equipments: Need of compaction machinery. Various types of Compaction machineries, Study of Different types of Compacting Equipments - Smooth wheeled roller, Sheep foot roller, Vibratory and Pneumatic rollers	08
2. Hoisting and Conveying Machinery	2a. Describe given Hoisting and conveying Machineries for given site conditions. 2b. Select relevant Hoisting and conveying Machineries for given site conditions / Situations with justifications	2.1 Hoisting Equipments: Need of Hoisting machinery, Various types of Hoisting machineries, Studying Different types of Hoisting machineries - Tower cranes, Crawler cranes, Truck mounted cranes, Gantry cranes, Mast cranes, Derricks 2.2 Conveying Equipments: Need of Conveying machinery, Various types of Conveying machineries, Studying Different types of Conveying Machineries - Belt conveyors, dumpers, tractors and trucks.	08
3. Concreting Equipments and stone crushing Equipments	3a. Describe given Concreting Equipments and stone crushing equipments for given site conditions. 3b. Select relevant Concreting Equipments and stone crushing Equipments for given site conditions / Situations with justifications	3.1 Concreting Equipments : Need of Concrete Equipments, Various types of concrete Mixers, Studying different types of Concrete Mixers - Batch Mixer, Continuous mixer, Drum Mixer, Pan Mixer. Equipments used for transportation of concrete - Trollies , Lifts, Transit Mixer, Concrete Pumps Various types of Concrete Vibrators.- Needle vibrator, Shutter Vibrator , Screed Vibrator, Table Vibrator.	08

		Working of Ready Mix Concrete Plants. 3.2 Stone crushers Types of stone crushers, capacities & Working - Jaw Crusher, Hammer mill, Gyratory Crusher, Cone crusher, roll crusher	
4. Water supply & Dewatering Equipments	4a. Describe given Water supply & Dewatering Equipments for given site conditions. 4b. Select relevant Water supply & Dewatering Equipments for given site conditions / Situations with justifications	4.1 Water supply & Dewatering Equipments : Need of Water supply & Dewatering Equipments , Application of Pumping, factors affecting most economical type of pumping arrangements, methods of dewatering -well point system, bored well system) various types of Water supply & Dewatering Equipments -centrifugal pump , reciprocating, multistage pump, submersible pump	08
5. Drilling and Pile Driving Machinery	5a. Describe given Drilling and Pile Driving Machineries for given site conditions. 5b. Select relevant Drilling and Pile Driving Machineries for given site conditions / Situations with justifications	5.1 Drilling and Pile Driving Machinery: Need/ purpose of Drilling, Various types of Drilling machineries - Percussion Drill, Rotary drill, Hydraulic drill Jack hammers, Drifters, shot drill, Diamond drill , Drill bits 5.2 Pile Driving equipments: Need/ purpose of Pile Driving Types of Pile Driving Machinery - Drop hammer, Diesel Hammer.	08
6. Miscellaneous equipments and Equipment management	6a. Describe given Miscellaneous equipments for given site conditions. 6b. Select Miscellaneous equipments for given site conditions / Situations with justifications 6c. Suggest suitable measures to maintain given equipments	6.1 Miscellaneous Equipments : Concrete Paving machines. Grouting Equipments Hot mix bitumen plant Prestressing Equipments 6.2 Equipment Management: Selection of equipment, Economic life of construction equipment, Owning and operation cost of construction equipment. Standard equipment, Special equipment,... Preventive maintenance of equipment, Break down maintenance of equipments.	08
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Prepare a report containing line sketch, process, working principles, suitability of Excavation and Earth moving machinery.	1.Earth Moving Machinery	04
2	Prepare a report containing line sketch, process, working principles, and suitability of various Compaction machineries.	1.Earth Moving Machinery	04
3	Prepare a report containing line sketch, process, working principles and suitability of various Hoisting machineries.	2.Hoisting and Conveying Machinery	02
4	Prepare a report containing line sketch, process, working principles and suitability of different Conveying machineries.	2.Hoisting and Conveying Machinery	02
5	Prepare a report containing line sketch, process, working principles and suitability of various Mixing machineries.	3.Concreting Equipments	04
6	Prepare a report containing line sketch, process, working principles and suitability of various Crushing machineries.	3.Concreting Equipments	04
7	Prepare a report containing line sketch, process, working principles, and suitability, of various Pumping and Dewatering Machineries.	4.Pumping and Dewatering Machinery	04
8	Prepare a report containing line sketch, process, working principles, and suitability, of various Drilling and Pile Driving Machineries.	5.Drilling and Pile Driving Machinery	02
9	Prepare a detailed visit report of Ready Mix Concrete plant (RMC) or Bitumen hot mix plant	6. Concreting Equipments Miscellaneous equipments and Equipment Management	02
10	Prepare a detailed report of visit to construction site either of High rise building, Road or any other civil engineering project using advanced construction equipments.	All units	02
Skill Assessment			02
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Earth Moving Machinery	02(00)	03(03)	06(03)	11(06)
02	Hoisting and Conveying Machinery	02(02)	03(03)	03(00)	08(05)
03	Concreting Equipment's	02(02)	06(00)	06(06)	14(08)
04	Pumping and Dewatering Machinery	02(02)	03(03)	06(00)	11(05)
05	Drilling and Pile Driving Machinery	02(00)	03(03)	03(03)	08(06)
06	Miscellaneous equipment's and Equipment Management	02(00)	06(03)	00(03)	08(06)
	Total 60	12(06)	24(15)	24(15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	3	R	2	4	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	2	U	3				3/5
03	3	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	6	U	3	6	U	3	2	A	3	6	U	3	1	A	3				3/5
05	5	A	3	3	A	3	3	A	3	5	A	3	6	A	3				3/5
06	1	A	6	4	A	6	3	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Rubrics & Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of relevant Equipment	05
2	Drawing of line sketch	05
3	Description of process	05
4	Viva-voce	10
	Total	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	2	2	2	2	-
2	3	-	-	-	2	2	2	2	-
3	3	-	-	-	2	2	2	2	-
4	3	-	-	-	2	2	2	-	-
5	3	-	-	-	2	2	2	2	-
6	3	-	-	-	2	2	2	2	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Construction Planning Equipment, and Methods	Peurifoy, Schexnayder, Shapira. Tata McGraw-Hill Edition, 2010	13: 978-0-07-070699-6 10: 0-07-070699-9
2.	Construction Equipment and Its Management	S. C. Sharma, Khanna Publisher, 2013	10: 8174092285 13: 9788174092285
3.	Construction Equipment and Its Planning Application	Dr.MaheshVarma, Melropotam Book Co.(P) Ltd., 4 th Edition, 2014,	--
4.	Construction Equipment and Job Planning	S.V.Deodhar, Jain Book Agency, 4 th Edition, Reprint 2014,	8174091149

❖ **E-REFERENCES:**

- www.engineeringcivil.com/theory/construction-equipments , accessed on 4th September, 2022
- www.sanyglobal.com/product/equipments accessed on 4th September, 2022
- <http://theconstructor.org/construction/equipment/construction-equipments-for-different-purposes/901/> accessed 4th September, 2022
- <http://www.uceindia.com/https://www.youtube.com/watch?v=ubrbizILJk> Apr 10, 2016 - Uploaded by Carl Jennings accessed on 4th September, 2022
- <https://www.youtube.com/watch?v=ApmPxKGEX6E> Oct 22, 2015 - Uploaded by Heavy Construction Machinery accessed on 4th September, 2022
- <http://www.slideshare.net/abhijitpawar9406/construction-book> accessed 4th September, 2022

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION****Working Models of**

1. Earth Moving Machinery
2. Hoisting and Conveying Machinery
3. Concreting Equipment's
4. Pumping and Dewatering Machinery
5. Drilling and Pile Driving Machinery
6. Crusher

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N.V.Raut	Head of Civil Engineering, Shift-1	Government Polytechnic, Nagpur.
2..	Dr. S. R. Kukadapwar	Head of Civil Engineering, Shift-2	Government Polytechnic, Nagpur.
3	Mr. V.B.Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur
4			

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSES
COURSE CODE	: CE209G ^s
COURSE TITLE	: ESTIMATING COSTING AND VALUATION
PREREQUISITE	: CE203G
TEACHING SCHEME	: TH: 03; TU:00;PR: 04(CLOCK HRS.)
TOTAL CREDITS	: 05 (1TH/TU CREDIT=1 CLOCK HR, 1 PR CREDIT=2CLOCK HRS)
TH.TEE	: 04 HRS.
PR. TEE	: 02 HRS. (External)
PT	: 01½ HRS.

❖ RATIONALE:

A civil engineer mainly deals with construction of civil engineering structure. This course enables the students to prepare the estimate for all type civil engineering construction works. In case of unavailability of market rates, they can prepare their own rate analysis and thereby prepare the estimate. Estimating and costing skills are very important for a Civil Engineer for the estimation of project cost. The skills acquired will lead the students as professionals / entrepreneurs in Civil Engineering.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify various methods of estimation & Apply principle of estimating for preparing estimates.
2. Prepare approximate estimates of various Civil Engineering Works.
3. Prepare detailed estimates of various Civil Engineering Works.
4. Compute rates of various items of Civil Engineering Works.
5. Draft specifications for various items of Civil Engineering Works.
6. Carry out the valuation of various civil Engineering Works.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Principles of Estimating	1. Define (a) Estimating (b) Costing 2. Describe need of Estimating and costing 3. Describe various types of estimates 4. Enlist different civil engineering items of works along with standard mode of measurements. 5. Describe rules for deduction for various items of work as per I.S.1200 / P.W.D. hand books. 6. Describe various provisions and purpose - Contingencies charges, Work charge Establishment charges, Quality control charges, Centage charges, Electrification Charges, Water supply and sanitary charges. 7. Define various Terms used in estimates.	1.1 Definition (a) Estimating (b) Costing 1.2 Purpose/need of Estimating and costing. 1.3 Types of estimates - (a) Approximate Estimate (b) Detailed Estimates (c) Revised Estimate (d) Supplementary Estimate (e) Annual maintenance and repair estimate. 1.4 Units and standard modes of measurements for different civil engineering items of works as per I.S. 1200/as per P.W.D. Handbook. 1.5 Different civil engineering items of works different / various items of works and rules for deduction as per I.S.1200 / P.W.D. hand books. 1.6 Provision and purpose of - (a) Contingencies charges (b) Workcharge establishment charges (c) Quality control charges (d) Centage charges (e) Electrification charges (f) Water supply and sanitary charges. 1.7 Terms used in estimates: (a) Prime cost (b) Provisional sum (c) Provisional quantities (d) Lump sum (e) Extra items	06

2. Approximate estimate.	1. State purpose of preparing approximate estimate 2. Identify method of estimate to be adopted for different types of civil engineering structures	2.1 Purpose of preparing approximate estimate. 2.2 Method / Types / Classification of approximate estimate for buildings with application and numerical (a) Service unit method (b) Plinth area method (c) Cubical content method	04
3. Detailed Estimates	1. Prepare check list of various items of given Civil Engineering work. 2. Describe steps in preparing detailed estimate. 3. Sketch/draw the format generally adopted in estimating. 4. Describe Methods/ Procedures for taking out quantities of various items of works 5. Compute quantities for given item of work	3.1 Check list of items of small residential building (Load bearing Structure). 3.2 Steps in preparing detailed estimate – (a) Measuring the dimension. (b) Squaring the dimension. (c) Abstracting or working up. (d) Billing. 3.3 Contents of measurement sheets / Abstract sheet / Bar Bending Schedule. 3.4 Methods / Procedure for taking out quantities of various items of works by – (a) for load bearing structure (i) Long wall & shortwall methods. (ii) Centre line method with examples (b) For Framed structure. 3.5 Methods of earthwork estimate for road and canals with examples. 3.6 Calculation of M.S. (Mild Steel) bars reinforcement with bar bending schedule in R.C.C. (Reinforced Cement Concrete) members like footings .beams, columns and slabs	18

4. Rate Analysis.	1. Define various Technical. Terms used in rate analysis 2. Identify factors affecting rate analysis. 3. Identify factors affecting task work and schedule of rates 4. Compute the quantities of materials required for different items of civil engineering works. 5. Prepare rate analysis for civil engineering works	4.1 Definition of rate analysis. 4.2 Purpose and importance of rate analysis. 4.3 Major & minor factors affecting rate analysis. 4.4 Definition of lead and lift. 4.5 Task work, factors affecting task work and schedule of rates. 4.6 Categories of labour with their prevailing wages. 4.7 Working the quantities of materials required for different items of civil engineering works. 4.8 Preparing rate analysis for a few common items of civil engineering works such as - (a) PCC (b) R.C.C. for Beam / Column / Lintels (c) IInd class B.B.Masonry in C.M. (d) 10 cm thick Brick Partition Wall (e) 12 mm. thick cement Plaster in C.M. (f) Cement Pointing in a C.M.1:1 (g) Ashlar Masonry in a C.M.1:6 (h) UCR Masonry in a C.M.1:3	08
5. Specification	1. Describespecification. 2. Enlist points to be observed in drafting the specification of an item.	5.1 Definition ofspecification. 5.2 (a) Necessity (b) Importance (c) Purpose of specification. 5.3 Points to be observed in drafting the specification of civil engineering items – (a) Method of writing specification (b) Specification paragraph (c) Legal aspect of specifications. 5.4 Types of Specification- (a) Brief Specification (b) Detailed Specification. 5.5 Types of Detailed specification.	04

6.Valuation	1. Describe the purpose of valuation of the given structure in a given situation. 2. Classify the value of the given structure based on the various criteria. 3. Calculate depreciation of given structure using relevant method for the given data. 4. Classify the term 'outgoings' in the given situation.	6.1 Definition and purpose of valuation, Define :cost , price and value, factors affecting value 6.2 Types of value: Book value, scrap value, salvage value, speculative value, distress value, market value, sentimental value, monopoly value, 6.3 Factors affecting value. 6.4 Depreciation, obsolescence, sinking fund, Methods of calculation of depreciation – straight line method, sinking fund method, constant percentage method. 6.5 Computation of capitalized value, Gross income, outgoings, Net income, Year purchase, 6.6 Types of outgoings.	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (PsychomotorDomain)	Units	Hrs
01	Prepare a check list of items of the following types of civil engineering works. (a) Load Bearing type Building. (Ground Floor only) (b) Framed structure type Building (Ground Floor only). (c) Water Bound Macadam Road. (d) any two from-(i) Septic tank (ii) Community well (iii) Hume pipe culvert or slab culvert (iv) Percolation Tank (v) Canal Earthwork..	Principles of Estimating, Approximate estimate	12
02	Prepare detailed estimate of a load bearing structure of single storied residential building for all items of works, considering quantity of reinforcement in percentage.		8
03	Prepare detailed estimate of R.C.C. single storied residential building for all items of work, considering quantity of reinforcement in percentage.		8
04	Prepare the estimate of small R.C.C. hall by considering only following items of works. – (i) Quantity of cement concrete for footing, columns, beams and slabs. (ii) Quantity of steel reinforcement for above items of works by preparing bar bending schedule. (iii) Formwork for above items.		8
05	Prepare detailed estimate of road for State or National Highway of any category of road for 1 Km. length.		8
06	Prepare detailed estimate of any three of the following: (i) Septic tank (ii) Community well (iii) Hume pipe culvert or slab culvert (iv) Percolation Tank (v) Canal Earthwork.		08
07	Prepare rate analysis of following items of works for building work- (a) Excavation in any type of soil (b) First class B.B. masonry in C.M. 1:6 (c) 12 mm thick cement Plaster in C.M – 1:5 (d) R.C.C. mix for e.g. M20 excluding reinforcement.	Rate Analysis	04
08	Draft a specification for following items of works: (a) First class B.B. masonry in C.M. 1:6 (b) Coursed or Uncoursed rubble masonry in C.M. 1:6 © 12 mm thick cement Plaster in C.M. 1:5 (d) Reinforced Cement Concrete mix. e.g. M20.	Specification	04
09	Any One From 1) Determine the valuation of given structure and submit the valuation report in given format. 2) Determine the monthly rent of given building/quarter as per PWD methods/norms	Valuation	04
Total Hrs			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Principles of Estimating	04 (02)	06 (03)	00 (00)	10 (05)
02	Approximate estimate	02 (00)	03 (03)	03 (03)	08 (06)
03	Detailed Estimate.	02 (00)	03 (03)	12 (06)	17 (09)
04	Rate Analysis	02 (02)	03 (03)	06 (00)	11 (05)
05	Specification	00 (00)	03 (03)	03 (00)	06 (03)
06	Valuation	02 (02)	06 (00)	00 (06)	08 (08)
	Total	12(06)	24 (15)	24 (15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	6	R	2	1	R	2	6/9
	1	R	2	4	R	2	6	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	4	U	3	5	U	3	3	U	3	4	U	3				3/5
04	6	U	3	6	U	3	2	A	3	5	U	3	2	A	3				3/5
05	5	A	3	4	A	6	6	A	6										1+1/2
06	3	A	6	3	A	6	3	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50 #	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Work out quantity of the item.	10
2	Compute rate of engineering item.	10
3	Draft specification for given civil engineering item	10
2	Viva voce.	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (PO's)										PSO's	
	1	2	3	4	5	6	7				1	2
1	3	-	-	-	-	-	-				-	-
2	3	3	3	3	-	-	-				-	-
3	3	3	3	3	-	-	-				-	-
4	3	3	3	3	-	-	2				3	-
5	3	3	3	3	3	-	2				3	-
6	3	3	3	3	3	-	2				3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Estimating and Costing in Civil Engineering	B.N. Dutta, UBS Publishers' Distributors Ltd., 2012	9788174767295
2	Estimating, Costing, Specification & Valuation	M. Chakraborty, M. Chakraborty Publishers, 2006	978-8185304366
3.	Estimating, Costing And Valuation	S. C. Rangwala, Charotar Publication House, 2015	9788185594859
4	Textbook Of Estimating and Costing (Civil Engineering)	G. S Birdie, Dhanpat Rai & Sons, 2015	978-93-84378-13-4
5	Estimating Contract & Accounts Vol -I	B. S. Patil, Orient Longman Limited, 1998	9788125002154.

❖ **E-REFERENCES:**

1. <http://www.tnhighways.gov.in/pdf/PWD%20SOR-2015-16.pdf>, assessed on 8th September 2022.
2. <https://law.resource.org/.../is.1200>, assessed on 8th September 2022.
3. www.google.co.in/search?q=1.%09cpwd.gov.in%2FPublication%2FSpecs200, assessed on 8th September 2022.
4. www.standardsbis.in/Gemini/search/Browse.action?saleModeName=HARD_COPY&subDivisionId=92, assessed on 8th September 2022.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATIONNil**❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N.V. Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. S.R. Kukadpawar	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. S. J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. V.B.Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: CE210G^s
COURSE TITLE	: HYDRAULICS
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs.
PR. TEE	: 02 HRs. (External)
PT	: 01HR.

❖ RATIONALE :

It is necessary for Civil Engineer to understand the fluid flow in different water conveying systems. Basics of hydraulics and its application oriented content will help them to apply the principles of hydraulics for planning, designing, supervising, executing and maintaining the work in the field of Water Resources, Irrigation, Environmental engineering and Transportation engineering systems to solve practical problems. This course is intended to teach the student facts, Concepts, principles and procedures of Hydraulics.

COURSE OUTCOMES :

After completing this course students will be able to–

1. Determine the physical properties of given fluids.
2. Measure the Hydrostatic pressure and difference of pressure.
3. Determine total hydrostatic pressure and its point of application under different conditions.
4. Analyze flow through pipe systems/Open channels for discharges and head losses under given conditions.
5. Measure the discharges/ velocity of flow through pipes and channels using suitable devices.
6. Identify various components of pumps and its suitability for given situation.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs .
1. Physical properties of fluids and Pressure Measurement	1a. Describe the application of hydraulics in given civil engineering field. 1b. Compute different properties of fluid from given data 1c. Convert guage pressure into absolute pressure and vice versa, pressure into pressure head, pressure head of one liquid to that of another liquid for the given data. 1d. Compute pressure head at a point, difference of pressure between two points for the given data	1.1. Technical Terms used in Hydraulics- fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics. Difference in behavior of liquids and solids, Applications of hydraulics in Civil Engineering field. 1.2. Physical properties of fluids – specific weight, mass density, specific gravity, viscosity, surface tension, Capillarity, bulk modulus of elasticity, compressibility, Newton's law of viscosity, ideal and real fluids 1.3. Various types of pressure- Atmospheric pressure, Guage pressure, absolute pressure, vacuum pressure, free liquid surface, pressure head, Pascal's law of fluid pressure and its applications. Conversion of pressure head of one liquid in terms of the other liquid 1.4. Measurement of pressure by using Piezometers, simple U tube manometers and Bourdons pressure guage. Measurement of difference of pressure by Differential U tube manometers and inverted U-tube manometers	08

2 Hydrostatics	2a. Develop pressure diagram for given situation 2b. Determine total pressure and centre of pressure for given immersed surface with sketches. 2c. Determine the resultant pressure and its position for given situation of liquid in a tank 2d. Determine the resultant pressure and its position on either side of partition wall of tanks, containing liquids under the given situation.	2.1 Variation of pressure in horizontal and vertical direction. Pressure diagram – concept and use. 2.2 Total hydrostatic pressure on immersed surfaces and on surfaces retaining liquids. Centre of pressure. 2.3 Computation of total pressure and centre of pressure on vertical, inclined and horizontal immersed surfaces 2.4 Determination of total pressure and centre of pressure on sides and bottom of tanks containing two or more liquids, vertical surfaces in contact with liquid on either side.	09
3. Fundamentals of fluid flow	3a. Differentiate between the given types of flow 3b. Interpret the type of flow using Reynold's number 3c. Calculate velocity and discharge in a given situation using continuity equation 3d. Apply Bernoulli's theorem to determine the given parameters under given situation. 3e. Apply Bernoulli's theorem to determine the given parameters under given situation.	3.1 Types of flow- Gravity and Pressure flow, Laminar and Turbulent, Steady and Unsteady, Uniform and Non-uniform, Compressible and Incompressible, Various combination of flow through pipe and channel 3.2 Reynold's Number 3.3 Discharge and its unit, Continuity equations of flow 3.4 Energy of flowing fluid: Potential, Kinetic and Pressure energy, Total energy. 3.5 Bernoulli's theorem- statement, assumptions, equation and Modified Bernoulli's Theorem	06

4. Flow through pipes and tanks.	4a. Describe the given type of head losses in a pipe flow 4b. Determine head loss due to friction using Darcy Weisbach Equation 4c. Determine minor head losses for a given pipe system 4d. Use Moody's diagram for finding friction factor using given Relative roughness and Reynolds number 4e. Compute the discharge in the given parallel or series pipe network 4f. Calculate diameter of equivalent pipe from the given data. 4g. Plot Hydraulic grade line and Total energy line for the given situation 4h. Describe the water hammer phenomenon in pipes stating its causes, effects and remedial measures. 4i. Calculate the discharge or coefficient of discharge of Venturimeter from given data 4j. Calculate the discharge or hydraulic coefficients of an Orifice from given data	4.1 Major head Loss : Frictional head loss and its computation by Darcy-Weisbach equation $h_f = \frac{f l v^2}{2 g D}$ 4.2 Minor loss of head in flow through pipe- Loss of head due to sudden expansion, gradual expansion, sudden contraction, gradual contraction, at entrance, exit and head loss in various pipe fittings such as bends, valves, elbows etc 4.3 Relative roughness, Use of Moody's diagram and Nomograms for design of pipe 4.4 Flow through pipes in series and parallel, compound pipe, Siphon, Dupit's equation for equivalent pipe 4.5 Hydraulic gradient line and Total energy line 4.6 Water hammer –Causes, effects and remedial measures 4.7 Discharge measuring devices for pipe flow: Venturimeter- Construction and working, Determination of its hydraulic coefficient 4.8 Discharge measuring devices for tanks: Orifice-Vena contracta Classification according to size, shape and discharge condition Hydraulic Coefficients. Relation between them. Determination of C_c, C_v, C_d of small sharp edge circular orifice discharging free.	10
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5. Flow through open channels	5a. Compute the geometric properties of a given channel 5b. Determine discharge in the given channel using relevant formulae for the given data 5c. Design the most economical channel section for the given condition 5d. Determine the discharge/velocity through the channel for the given data of a flow measuring/ velocity measuring device 5e. Describe the hydraulic jump with respect to its cause, locations, effects and uses.	5.1 Different shapes of artificial channels, Geometric properties of channel: - Wetted perimeter, Wetted area, hydraulic mean depth, Comparison of flow through pipe and open channel 5.2 Determination of discharge by - Chezy's equation and Manning's equation 5.3 Conditions for most economical rectangular and trapezoidal channel sections. 5.4 Discharge measuring devices: Notches – types of notches- rectangular, triangular, trapezoidal, expression for discharge through them. Weir - Types, Expression for discharge over rectangular sharp crested weir, Cippoletti weir, Flumes – Venturi flumes, Standing wave flume, expression for discharge 5.5 Velocity measuring devices- Floats , Current meter, Pitot tube – expression for velocity 5.6 Specific Energy Diagram, Froude number, Hydraulic jump-locations where hydraulic jump occurs and its use	10
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6. Hydraulic Pumps	6a. Describe the construction of hydraulic pump in the given situation with sketches 6b. Describe the construction and working of a given pump 6c. Find power required for a pump under a given situation. 6d. Select a suitable pump for given conditions	6.1 Concept of Pump-, Types- Centrifugal, Reciprocating and submersible pumps 6.2 Centrifugal Pump – Component parts, principle of working, priming of pump, Reciprocating Pump: Single acting and double acting, component parts and working Submersible pump-Component parts & working 6.3 Suction head, Delivery head, Static head and Manometric head. Computation of power required for pumps. 6.4 Selection and choice of pump	5
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Compute the physical properties of given water, oil and Mercury	1	02
2.	Measure pressure by Piezometers and pressure gauges.	1	02
3.	Measure pressure difference by using U-tube differential Manometer/ Inverted U tube manometer.	1	02
4.	Assignment on Determination of resultant pressure and centre of pressure on immersed laminas, sides of tanks and on dams and canal gates	2	02
5	Identify type of flow through a pipe using Reynolds apparatus.	3	02
6.	Use Bernoulli's Apparatus to verify Bernoulli's Theorem and to get total energy line for flow in a closed conduit of varying cross sections	3	02
7.	Determine friction factors for a given pipes of different diameters using Darcy Weisbach equation.	4	02
8.	Determine minor losses in pipeline for (any one) 1. Sudden contraction. 2. Sudden expansion 3. Bend and elbows	4	02
9.	Calibrate a given Venturimeter to find out discharge through pipe	4	02
10.	Calibrate a given Orifice to find out discharge through tank.	4	02
11.	Calibrate a Triangular notch to find out discharge through channel.	5	02
12.	Use current meter to measure the velocity of flow through channel	5	02
13.	Use Pitot tube to measure the velocity of flow through channel	5	02
14.	Determine the efficiency of a given centrifugal pump.	6	02
15..	Identify parts of centrifugal pumps. Collect pamphlet of any make of centrifugal/submersible pump	6	02
Skill Assessment			02
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction and physical properties of fluid	02(02)	03(00)	03(03)	08(05)
02	Hydrostatic pressure and pressure measurement in pipes	02(02)	03(03)	06(00)	11(05)
03	Fundamentals of fluid flow	02(00)	03(03)	06(03)	11(06)
04	Flow through pipes and tanks	02(02)	03(06)	06(03)	11(11)
05	Flow through open channel	02(00)	03(00)	06(03)	11(09)
06	Pumps	02(00)	03(00)	03(00)	08(00)
	Total	12(06)	18(12)	30(18)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
02	1	U	3	1	A	3	2	U	3	1	A	3	2	U	3				3/5
03	3	U	3	3	A	3	3	A	3	3	U	3	3	A	3				3/5
04	4	U	3	4	U	3	4	U	3	4	A	3	5	A	3				3/5
05	5	U	3	6	U	3	6	A	3	5	A	3	5	A	3				3/5
06	2	A	6	4	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M = Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1, 2, 3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Rubrics & Practical Answer Sheets	1, 2, 3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Preparation of experimental set up	5
2	Setting and operation	10
3	Safety measures	5
4	Observations and recording,	10
5	Interpretation of results and conclusion	10
6	Answer to oral questions	5
7	Submission of Report	5
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes(POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	2	-	-	-	-
2	3	-	-	3	-	2	-	3	-
3	3	-	-	3	2	2	-	3	-
4	3	-	-	3	2	2	-	3	-
5	3	-	-	-	2	2	-	3	-
6	3	-	-	-	2	2	-	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Hydraulics and Fluid Mechanics Including Hydraulics Machines	P. N. Modi & S. M. Seth, Standard Book House, 18 th Edition, 2011	8189401269
2	Fluid Mechanics and hydraulics	Jagdish Lal, Metropolitan book co. pvt. Ltd. , 9 th Edition 2008	8120004221
3	Fluid Mechanics and Hydraulic Machines	R. K. Bansal, Laxmi publication New Delhi, , 9 th Edition 2015	8131806618
4	Fluid Mechanics & Hydraulic Machines	R.K. Rajput, S . Chand Publisher, , 5 th Edition 2014	8121916666
5	Hydraulics Fluid Mechanics and fluid machines	S. Ramamrutham, Dhanpat Rai and Sons, Delhi, 1 st Edition 2006	8187433841
6	Hydraulics, Fluid Mechanics and fluid machines	R. S. Khurmi S. Chand Publisher, 19 th Edition 2007	8121901626
7	Hydraulic Machines	D. P. Kothari, V. V. Ambade and G. K. Awari, New Age International Publishers, New Delhi, 1st Edition 2016	9789388818193

❖ **E-REFERENCES:**

- <https://nptel.ac.in/courses/105/103/105103096/> accessed on 22nd Feb. 2022
- <https://nptel.ac.in/courses/105/105/105105203/>
- <https://nptel.ac.in/courses/112/106/112106300/> www.howstuffworks.com
- <https://nptel.ac.in/courses/105103096> accessed on 22nd Feb. 2022
- <https://nptel.ac.in/courses/105103096> accessed on 22nd Feb. 2022
- <http://ndl.ethernet.edu.et/bitstream/123456789/87956/12/Chapter%201%20open%20channel%20flow.pdf>
- <https://archive.nptel.ac.in/courses/105/101/105101082/>
- <https://bu.edu.eg/portal/uploads/Engineering.%20Shoubra/Civil%20Engineering/3015/crs-14332/Files/FLUIDS%20-%20III.pdf>
- https://www.academia.edu/33781865/Fluid_Mechanics_NPTEL
- <https://www.youtube.com/watch?v=f0TRQq8k3Vc>

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr. N. V. Raut	Head of Civil Engineering and Program Head	Government Polytechnic, Nagpur.
2	Dr. D. N. Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3	Mr. N. H. Telang	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	Mr. M. D. Keskar	Structural Consultant	Design Engineer, Nagpur
5	Dr. M. M. Kadu	Professor	Ramdeobaba College of Engineering and Management, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE211G
COURSE TITLE	: LOW COST HOUSING
PREREQUISITE	: CE402E
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CLOCK HR= 1 CREDIT, 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs(Internal)
PT	: 01 HR

❖ **RATIONALE:**

Shelter is the basic need of human being and closely associated with socio-economic development of every individual. In India, large number of population living in old or dilapidated houses in both urban and rural areas, similarly many families having no shelter are forced to spend their life on road side or under open sky or otherwise in unhygienic condition. The immediate solution for such housing condition is to plan low cost houses and construct them on mass scale with such design, technique and specifications that these will be within reach of intending buyer.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify the need of low cost housing
2. Describe the low cost techniques in mass housing.
3. Choose appropriate construction material for low cost houses.
4. Draw the layout for low cost housing project
5. Prepare estimate for low cost housing scheme.
6. Use appropriate low cost material & technique in designing housing scheme.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Housing Situation in India	1. Enlist various types of housingschemes as per economic status. 2. Describe the present housing condition in India. 3. Enumerate Factors causingshortage of houses in India. 4. Describe Prime Minister AawasYojna. 5. Describe the contribution of MHADA in mass low costhousing schemes.	1.1 Definition of Housing 1.2 Classification of housing as per economic status i.e. HIG, MIG, LIG, EWS etc. 1.3 Housing shortage in urban and rural area. 1.4 Study of present housing condition w.r.t. structural condition, overcrowding, sanitary facility, density etc. 1.5 Different Government schemes for propagating low cost mass housing 1.6 Different government, semi-government, private organization involved in low cost housing	08
2. Need of Low Cost Housing	1. Identify various factors causing necessity of low cost housing. 2. Draw a pie chart showing various expenses incurred in construction of house.	2.1 Factors causing necessity of low cost housing viz. 2.2 Poverty in India, Rapid increase in slums, Resources availability, Urban land values, Cost of construction, Cost of material, Expenses on labour etc.	06
3. Building Materials for Low Cost Houses	1. List various organic and non-organic traditional building material used for low cost housing. 2. Illustrate process of using ricehusk as construction material 3. Describe, how industrial waste is used as construction material. 4. Enlist various new materials used in low cost housing.	3.1 Traditional Building Materials- 3.1.1 Study of different organic and non-organic traditional building material used for low cost housing. 3.1.2 Modification in the properties of traditional building materials for low cost housing. 3.2 Agro-Industrial Waste Materials- 3.2.1 Study of Agro-Industrial Waste i.e. fly ash, rice husk, lime sludge, phosphorus- gypsum etc. 3.2.2 Use of Agro-Industrial Waste in construction of low cost houses. 3.3 New Construction Materials-Fly ash concrete block, Foam concrete panel,	10
4. Planning Consideration for Low Cost Housing	1. Enlist the Factors affecting the planning of low cost houses. 2. Describe various planning standards adopted by CBRI for low cost houses. 3. Draw a plan for EWS family in Nagpur city. 4. Compare Planning standards adopted by NIT and MHADA.	4.1 Study of planning standards for low cost housing to achieve economy such as plot area, height, shape, ventilation, grouping of houses etc. 4.2 Study of planning consideration given by different planning agencies, C.B.R.I. and various state housing boards for low cost houses	08

5. Low Cost Construction Techniques	1. State the necessity of changes in construction technique for low cost houses. 2. Describe Reinforced brickpanel system. 3. Draw a plan and elevation of Rat-trap bond. 4. Distinguish between foundation proposed by CBRI and conventional foundation.	5.1 Necessity of changes in construction technique for low cost houses. 5.2 Study of new construction techniques i.e. Reinforced Brick panel system, Channel unit, L-panel, RCC planks, thin RCC slab, Precast joist, Ferro cement products, Rat-trap bond, Low cost foundation propagated by CBRI. 5.3 Study of reduction in cost due to new techniques compared to traditional methods.	10
6 Low Cost Sanitation	1. State advantages of low cost sanitation, 2. Describe salient features of sulabh sauchalaya with a neat sketch. 3. Draw a neat sketch of rural sanitation scheme. 4. State importance of Swachha Bharat Abhiyan.	6.1 Need of low cost sanitation 6.2 Advantages of low cost sanitation., 6.3 Study of different types of low cost sanitary facilities such as C.B.R.I. type, sulabh sauchalaya. 6.4 Different Government schemes for propagating low cost sanitation.	06
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Collect information about at least two new low cost construction materials from market / industry / literature and prepare a report.	3. Building Materials for Low Cost Houses	04
2.	Collect information about at least two new low cost construction techniques from market / industry / literature and prepare a report.	5. Low Cost Construction Techniques	04
3.	Draft a report on visit to two Low Cost Housing schemes.	4. Planning Consideration for Low Cost Housing 5. Low Cost Construction Techniques	10
4.	Prepare a Group Project (batch of 10 students) which includes- - Planning of low cost housing scheme - Preparation of theoretical model of housing scheme by using low cost materials and techniques - Estimation of model - Preparation of drawing(at least two drawing sheets of A1 size) - Report writing	All units	14
Total			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Housing Situation in India	02(00)	03(00)	00(00)	05(00)
02	Need of Low Cost Housing	02(00)	03(03)	03(03)	08(06)
03	Building Materials for Low Cost Houses	02(02)	06(03)	06(03)	14(08)
04	Planning Consideration for Low Cost Housing	02(02)	03(03)	06(00)	11(05)
05	Low Cost Construction Techniques	02(00)	06(03)	06(06)	14(09)
06	Low Cost Sanitation	02(02)	03(03)	03(03)	08(08)
	Total	12(06)	24(15)	24(15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	3	R	2	4	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	2	U	3	3	U	3				3/5
03	3	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	5	U	3	6	U	3	6	A	3	6	A	3	6	U	3				3/5
05	2	A	3	4	A	3	4	A	3	2	A	3	3	A	3				3/5
06	3	A	6	5	A	6	5	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing of relevant sketches	15
2	Preparation of report	15
3	Viva-voce	20
	Total	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7				1	2
1	3	3	-	-	2	-	2				-	-
2	3	3	-	-	2	-	2				-	-
3	3	3	3	-	2	3	2				-	-
4	3	3	3	-	2	3	2				-	-
5	3	3	3	-	2	3	2				-	-
6	3	3	3	-	2	3	2				-	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Handbook of Low Cost Housing 1st Edition	A.K. Lal, New Age International, 1st Edition, 2011	9788122407891, 8122407897
2.	Building an Affordable House: Trade Secrets to High-Value, Low-Cost Construction	Fernando Pages, Taunton Press, Edition: 2005	9781561585960, 1561585963
3.	Low Cost Housing in Developing Countries	G. C. Mathur, Oxford & I.B.H. Publishing Company Pvt. Ltd. Edition: 1993	9788120407749
4.	Advances in Building Material and Construction	Mohan Raj and M.P. Jaisingh Roorkee Central Building Research Institute 1986	-
5	Building Materials and Components	C.B.R.I. Roorkee	-
6	Ecohome 94	All India Seminar on low income housing	-
7	IS 8888-1993-Guide for requirement of low income housing	I.S. Code, Government of India.	-

❖ E-REFERENCES:

- <https://law.resource.org/pub/in/bis/S03/is.8888.1.1993.pdf> assessed on 1st September 2022
- <http://cbri.res.in/concrete-masonry-blocks/> assessed on 1st September 2022
- <http://cbri.res.in/wood-without-tree-rice-husk-plastic-wood/assessed on 1st September 2022>
- <http://esatjournals.net/ijret/2015v04/i25/IJRET20150425077.pdf> assessed on 1st September 2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

NIL

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. N.V.Raut	Head of Civil Engineering, Shift - I	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Head of Civil Engineering, Shift - II	Government Polytechnic, Nagpur.
3.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. S. K. Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)_____
(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

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COURSE CURRICULUM

PROGRAMME	:	DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	:	CORE COURSE
COURSE CODE	:	CE212G
COURSE TITLE	:	CONTRACTS AND ACCOUNTS
PREREQUISITE	:	NIL
TEACHING SCHEME	:	TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	:	04
TH.TEE	:	03 HRs
PR.TEE	:	25 @
PT	:	01 HR.

❖ RATIONALE:

This is a core technology course which will enable the students to know the different facts, concepts and procedure of tender and tender documents, contracting procedure, P.W.D account and execution method, working knowledge of stores and stock account, preparation of contractors bill, materials account etc. and also knowing about various formats used by P.W.D for accounting purposes

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Describe P.W.D method of execution of work.
2. Draft the tender notices for various Civil Engineering works.
3. Apply various conditions of contract for given situations
4. Prepare bills for work done and to make the different types of payments to the contractor.
5. Describe the procedure of maintaining account of materials at site, road metal return account, imprest cash account and store and stock accounts.
6. Apply procedure to maintain stores and stock accounts.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (CognitiveDomain)	Topics and subtopics	Hrs.
1. Public Works Department Method / Procedure of Execution of works.	1. Describe the procedure adopted by P.W.D for construction of Civil Engineering Work. 2. Describe the various Approval, sanctions and Provisions 3. Describe the methods used in P.W.D to carry out work. 4. Use the relevant rules to record the M.B and S.M.B. 5. Describe the types of NMR.	1.1 PWD Procedure of initiating the works, classification of works. 1.2 Administrative Approval, Technical Sanction, Expenditure Sanction, Budget Provision. 1.3 Method of Execution- a) Departmental method by employment of labours as daily wages b) Contracts methods (Only Introductory) c) Rate List methods d) Piece work method e) Day work method 1.4 Measurements book (M.B) and rules regarding recording the measurements in M.B, standard Measurement book (S.M.B) and rules regarding recording measurements in S.M.B. 1.5 Nominal Muster Roll (N.M.R) Three parts of NMR – a) NMR-I b) NMR-II c) NMR-III	08
2. Tender and Tender Document	1. Define the term Tender, Necessity and types of tender. 2. Describe the term tender notice, procedure / rules for drafting the tender notice, Explain the pretender conference, preparation and three envelope systems, Tender forms. 3. Describe procedure for opening scrutiny and acceptance of tender, rejection of lower or all tenders, issue of work orders, comparative statement and unbalanced bid. 4. Describe Schedule-A, Schedule-B, Schedule-C	2.1 Definition of tender, Necessity of tender, Types of tender- a) Local Tender, b) Global Tender. 2.2 Tender Notice, points to be included while drafting tender notice, Drafting of tender notice of work, pretender conference, Preparation and submission of tender, three envelope system, Tender forms. 2.3 Procedure for opening, scrutiny and acceptance of tender & rejection of all tenders, issue of work order, comparative statement and unbalanced bid. 2.4 Tender document Schedule-A, Schedule-B, Schedule-C	10

3. Contract and Condition of Contract	1. Define Contract, objects of contract, Essential requirements of valid contract, condition of contract, special clauses and schedule. 2. Enlist the types of contract and describe each. 3. Describe Contract documents, procedure for registration of contractor 4. Enlist the various condition of contract and describe each	3.1 Definition of contract as per Indian contract Act 1872, object of contracts essential requirements of valid contract, conditions of contract, special condition, clauses and schedules 3.2 Types of contract- a) Lump sum contract, b) Item rate contract, c) Percentage rate contract d) Cost plus fixed rate contract, e) Cost plus percentage contract, f) Turn key contract, g) BOT contract, h) Target contract, i) Labour contract, j) Negotiated contract, k) Cost plus fluctuating fee contract, l) Demolition contract, m) All in one contract 3.3 Contract documents, Registration of contract 3.4 Condition of contract- a) Earnest money deposit, b) Security deposit, c) Time limit, d) Time Extension, e) Breach of contract, f) Termination of contract, g) Subletting of contract, h) Defect liability period, i) Escalation, j) Extra items, k) Termination of contract, l) Arbitration.	10
4. A. Payment to the Contractors B. Imprest Cash Account / Imprest and Imprest Account	A.1 Describe the mode of payments to the contractors by various types of payments A.2 Describe the various types of advance given to the contractor A.3 Prepare forms of bills, voucher and hand receipts. B.1 Define Imprest / Imprest cash, Purpose of imprest, Nature of payment of imprest, Describe the use of form No.2 or PWA/D 3 for	4A.1 Mode of payment to the contractor- a) Interim payments to the contractor b) Final Payment c) First and Final Payment d) Intermediate Payment 4A.2 Advances to the contractors- a) secured Advances b) Advance Payments c) Petty Advance d) Mobilization Advance / Machinery Advance e) Temporary Advance 4A.3 Form of bills, Vouchers, Hand receipts. 4B.1 Definition of Imprest / Imprest cash, Purpose of imprest, Nature of payment of	10

	imprest cash account B.2 Describe the rules to maintain Imprest, Granting limits and responsibilities of imprest cash holders.	imprest, use of form No.2 or PWA/D for imprest cash account. 4B.2 Rules/ Procedure to maintained imprest, granting limits and responsibilities of imprest cash holders.	
5. Material at site Account and Road Metal Returns	1. Describe the meaning of Material at site account (MAS), Enlist the various forms used for register of MAS. 2. Describe the salient features of MAS, Issue of materials to contractors, Account of materials directly charged to work site and disposal of surplus materials 3. Describe the various causes under which the material charge directly to work site 4. Describe the meaning of Road Metal Return and explain the various forms used for it. 5. Describe the rules of maintaining the road metal returns, Shortage and surplus road metal.	5.1 Meaning of Material at Site Accounts forms used for register of Materials at Site Account, Form no.35- Detailed statement of materials compared with estimated requirements, Form no.37- Reporting the value and verification of unused materials. Form no.38- Statement showing disposal of unused material at site 5.2 Salient Features of material at site accounts, Issue of materials to contractors, Accounts of material directly charge to work site, Disposal of surplus materials. 5.3 Circumstances under which the material charged directly to work- Case-I- The material issued in a small quantity and when the work done departmentally. Case-II- The material issued in huge and large quantity and reserved stock limit is over. Case-III- When the work is done through contractor on labour basis. 5.4 Meaning of road metal return, uses of form no.16, form no.16/16A and Form no. 17. 5.5 Rules of maintaining the road metal return, shortage and surplus road metal.	06
6.Stores and Stock Account	1. Describe the meaning of Stores and Stock and classify the stores. 2. Describe accounting procedure of store and for purchase of store materials, safe custody of stores. 3. Describe the method of issue of materials on indent, issue rate, unstamped receipt, sales and write off stores.	6.1 Meaning of store and stock, Classification of stores- a) General store and stock b) Tools and Plants c) Inflammable Materials d) Road Metals 6.2 Account procedure of stores, procedure for purchase of store materials, safe custody of stores. 6.3 Indent for issue of materials, issue rate, unstamped receipt, sales and write off stores. 6.4 Stock accounts, reserve stock limit, physical verification of stock, Indemnity bond, Credit note.	04
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Collection of Tender Notice published in News Paper for:- a) W.B.M or B.T. Road. b) Residential Building c) Any three Civil Engineering structure a) and b) of Government Department / Undertaking Government Department / Public (Local) Bodies	Tender and Tender Document	04
2	Collect old set of Tender Documents and compose a report on it.	Tender and Tender Document	04
3	Prepare a tender documents stated below for W.B.M Road or residential building covered in Estimating Costing a) Tender Notice b) Tender Agreement c) Condition of Contract (related with W.B.M Road or Residential building) d) Schedule-A e) Schedule-B f) Schedule-C	A) Tender and Tender Document B) Contract and Condition of Contract	10
4	Prepare R.A bills, First and final bills, Forms of bill, voucher	Payment to the Contractors	04
5	Collect the various account forms stated below from P.W.D and writing on it. a) Ruling the forms of Nominal Muster Roll (All three parts) b) Measurement Book c) Daily Labour Report d) Rate list e) Hand Receipt f) Form of Material at Site Account g) Road Metal Return Account h) Form of Imprest i) Form of Indent for issue of materials	A) Public Works Department Method / Procedure of Execution of works. B) Imprest Cash Account / Imprest and Imprest Account C) Material at site Account and Road Metal Returns D) Stores and Stock Account	10
Total Hrs.			64

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	P.W.D Method / Procedure of Execution of works.	02(02)	06(03)	03(03)	11(08)
02	Tender and Tender Document	02(02)	03(00)	06(06)	11(08)
03	Contract and Condition of Contract	02(00)	06(06)	03(00)	11(06)
04	Payment to the Contractors	02(00)	03(03)	06(03)	11(06)
05	Material at site Account and Road Metal Returns	02(02)	03(03)	03(00)	08(05)
06	Stores and Stock Account	02(00)	03(00)	03(03)	08(03)
	Total	12(06)	24(15)	24 (15)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	5	R	2										
02	1	U	3	1	U	3	2	U	3	1	U	3	1	A	3				3/5
03	3	U	3	3	U	3	1	A	3	3	U	3	3	U	3				3/5
04	3	A	3	4	U	3	5	A	3	4	U	3	4	A	3				3/5
05	6	U	3	5	U	3	6	A	3	5	U	3	6	A	3				3/5
06	2	A	6	4	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Field Book	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25@	10	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Draft a Tender Notice / Bill of Payments / Stock Register etc.	10
4	Viva voce	15
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7				1	2
1	3	-	-	-	-	-	-				3	-
2	3	-	3	3	2	-	2				3	-
3	3	-	-	3	-	-	2				3	-
4	3	-	-	3	2	3	2				3	-
5	3	3	3	3	-	3	2				3	-
6	3	3	3	3	-	3	2				3	-

1: Slight (Low); 2: Moderate (Medium); 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Estimating and Costing in Civil Engineering	B. N. Datta, UBS Publisher Pvt. Ltd. 2003	9788174767295
2.	Construction Management and Contract Practices	V. K. Raina, Shroff Publisher & Distributor Pvt. Ltd. 2009	9788184047875
3.	Estimating and Costing	G. S. Birdie, Dhanpat Rai. Ltd. 2016	9789384378134
4.	Civil Engineering Contracts and Estimate	B. S. Patil, Orient Longman, 2010	9788173715594, 8173715599

❖ **E-REFERENCES:**

<http://flh.fhwa.dot.gov.>contracts>documents>, assessed on 2nd February 2023

<http://www.mahatenders.gov.in>, assessed on 2nd February 2023

<http://www.gem.gov.in>, assessed on 2nd February 2023

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**Nil****❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr.N.V. Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr.S.R.Kukadpawar	Head of Civil Engineering	Government Polytechnic, Nagpur.
3	S R Ukey	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4	A A Bansod	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

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(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN CIVIL ENGINEERING

LEVEL NAME : CORE COURSE

COURSE CODE : CE251G

COURSE TITLE : CAD IN CIVIL ENGINEERING

TEACHING SCHEME: TH: 00; TU: 00; PR: 02 (CLOCK HRs.)

TOTAL CREDITS : 01 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)

TH. TEE : NIL

PR.TEE : 02 HRs (Internal)

PT : NIL

❖ **RATIONALE:**

All civil engineering works required sets of working drawings for execution of work. This sets of drawings were earlier prepared manually, which resulted in time consuming process, repetition of work for editing again resulted in wastage of stationary and time of human resources. With the advances in computer hardware and software like AUTOCAD, Computer Aided Drawing is being used widely for preparation of drawings with high precision and using less time compared to manual drafting. Hence, it becomes mandatory for the students of diploma in civil engineering to have skills of drawing of civil engineering structures by using advanced CAD software of computers. This course is designed to develop these skills.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Create, save CAD drawing files & modify particular building drawing
2. Use drafting set-up.
3. Modify and edit 2D commands.
4. Prepare line plan for residential building Using CAD commands.
5. Draw developed plan, elevation, and section with Auto CAD.
6. Prepare Submission drawing/ working drawing of buildings with Auto Cad and also Print / Plot the drawing

❖ **COURSE DETAILS:**

A. THEORY :

CO	Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.	PO
	NIL				

❖ B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

CO	Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.	PO
CO1	1.	Identify and locate components of CAD classic screen by using File menu of New, Open, Save, Save as and Close.	Fundamental ofCAD	02	1
CO2 CO3	2.	Identify Editing commands – copy, move, offset, , chamfer, trim, stretch, lengthen, Scale, extend, rotate, mirror, array etc with Civil Engineering Application	CAD Commands	04	1
CO4	3.	Draw a line plan 2BHK residential building using absolute coordinate method. Use LIMITS, UNITS, LINE, ARC, CIRCLE, OFFSET, FILLET and other CAD commands.		04	1
CO4	4.	Draw dimensions on line plan prepared in practical No. 3.		02	1
CO4	5.	Drawing symbols of construction materials /components such as stone, brick, glass, partition, wall doors and windows.		04	1
CO5	6.	Prepare working and detailed drawing for any two items, such as foundation plan, plan of Stair such as straight, dog legged, open Newel.		04	1
CO5	7.	Draw a developed plan of Load Bearing structure 2BHK residential building using Draw and Modify commands. Use all above commands including POLYGON, ELLIPSE, COPY, MIRROR, ROTATE, CHAMFER commands.	Working Drawing	02	1
CO5 CO6	8.	Draw a section of 2BHK residential building. of given plan of given plan of Practical no.7.		04	1
CO5 CO6	9.	Draw a elevation of 2BHK residential building of given plan of Practical No.7		04	1
CO6	10.	Plot/print the above drawings of given plan of Practical No.7 ,8 & 9		02	1
	Total Hrs.			32	

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests willbe computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1, 2, 3, 4,5,6
		Journal Writing		Continuous	05	--	Journal & Printouts	1, 2, 3, 4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25@	10	Rubrics, Practical Answer Sheets & Printout	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressi veTest	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing diagrams of 2D of given line plan	10
2	Aesthetic of component part of building	05
3	Dimensioning figure	05
4	Viva	05
	TOTAL	25

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7				1	2
1	3	-	-	-	-	-	2				-	-
2	3	-	-	-	-	-	2				-	-
3	3	-	-	-	-	-	2				-	-
4	3	3	3	-	2	3	2				-	-
5	3	3	3	-	2	3	2				-	-
6	3	3	3	-	2	3	2				-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	AUTOCAD-2000	David Frey, BPB Publication, New Delhi,	10 8176560804 13 9788176560801
2.	Introduction to Auto CAD 2012 for Civil Engineering Applications	Nighat Yasmin, SDC Publication, 2011	978-1-58503-642-4
3.	AutoCAD 2016: A Problem-Solving Approach, Basic and Intermediate	Shyam Tickoo, CAD/CIM Technologies, 22 nd Edition, August 2015	10: 1942689004 13: 978-1942689003
4.	Auto CAD 2010 Instructor	James Leach Tata McGraw Hill, 2007	0073375411 9780073375410
5.	Auto CAD and its Applications-Basics 2010	Terence M. Shumaker, David A. Madsen, David P. Madsen Goodheart- Willcox Publishers, 17 th Edition, 2010	10: 1590707605 13: 9781590707609

❖ E-REFERENCES:

- www.zwsoft.com/cad accessed on 15th October 2016,
- <https://www.scribd.com/doc/260678036/> accessed on 12th October 2016,
- medobute.pixnet.net/blog/post/123908069 accessed on 10th October 2016

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

1. Personal Computer's with latest version, TFT monitor 17 inches and Window based operating system with networking-
2. Printer
3. Software's: AUTOCAD

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. N.V.Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr.S.R.Kukadpwar	Head of Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. V.B.Dhait	Lecturer in Civil Engineering	Government Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: OPEN ELECTIVE
COURSE CODE	: OE201G
COURSE TITLE	: BUILDING SERVICES
PRE-REQUISITE	: NIL
TEACHING SCHEME	: TH: 02; TU: 00; PR:00
TOTAL CREDITS	: 02(1 TH/TU CLOCK HR = 1 CREDIT. 1 PR CREDIT. = 02CLOCK HR)
TEE	: 01 HR (Objective Type Online Examination)
PR.TEE	: NIL
PT	: 20 Min (Objective Type)

❖ RATIONALE:

Building cannot be used for occupancy unless various services required for effective working of a building are provided. Building services includes designing, installing & servicing everything that is needed to make buildings comfortable, safe & convenient. Good building services create a healthy & conducive working environment. Therefore every Civil engineering students should develop skills in the field of building services. A Civil Engineer, with adequate knowledge of building services shall be able to work closely with Construction Professionals, Structural Engineers, electrical engineers etc.

❖ COURSE OUTCOMES:

After completing this course students will be able to –

1. Plan various building services required in residential , public and commercial buildings
2. Identify various building sanitary fittings & fixtures, type of building drainage systems.
3. Suggest suitable water proofing/ damp proofing / termite proofing treatments.
4. Provide suitable fire proofing arrangements in buildings.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Plumbing Engineering	a) Prepare list of objectives of plumbing. a) Describe various systems of plumbing. b) Describe plumbing arrangement for high rise buildings. c) Identify various types of pipes used in plumbing work. d) Describe various plumbing fittings. e) Select suitable type of valve at given location in pipeline. f) Prepare list of various principles used in building drainage system. g) Describe inspection chamber and manholes. h) Identify various sanitary fittings and pipes used in house plumbing.	1.1 Objectives of plumbing, 1.2 Purpose of plumbing, 1.3 Systems of plumbing – One Pipe system, Two Pipe system, 1.4 Plumbing arrangement for high rise buildings 1.5 Service pipe, communication pipe, consumer pipe, water meter, rain water pipes 1.6 Plumbing fittings 1.7 Valves & Terminal Fittings like Sluice valve, Reflux valve, Scour valve, Air relief valve, Pressure relief valve, Gate valves. Bio-taps & Stop valve, Self closing valve. 1.8 Building drainage system - Principles 1.9 Inspection chambers, man holes etc. 1.10 Sanitary fittings - water closets, urinals, wash basins, sinks, flushing cisterns, Traps & their types, soil pipe, waste pipe, anti siphonage pipe pipe.	12
2. Water Proofing& Damp Proofing Treatment/	a) Describe water proofing/damp Proofing. b) Prepare a list of materials required for water proofing, c) Describe the procedure of water proofing for terrace and basement of a building. d) Identify various precautions to be taken while carrying out water proofing in buildings.	2.1 Introduction to water proofing/damp Proofing, 2.2 Material required for water proofing, 2.3 Terrace and basement water proofing, 2.4 Precautions to be taken while carrying out water proofing.	8

3. Termite Proofing	a) Describe General principles of termite proofing, b) Describe various methods of termite proofing. c) Identify various termite proofing materials available in local market with their suitability.	3.1 General principles of termite proofing, 3.2 Methods of termite proofing. 3.3 Termite proofing materials available in local market with their suitability.	6
4. Fire proofing	a) Prepare a list of fire protection requirements for multi storeyed buildings. b) Describe various fire detection systems. c) Describe the use of various fire extinguishing systems.	4.1 Fire protection requirement for multi storeyed buildings. 4.2 Fire detection – Manual fire alarm system, Automatic fire alarm system 4.3 Fire extinguishing system – Manual fire extinguishing equipment, fire hydrants, Wet riser system (Typical arrangement)	6
		Total	32

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
NIL			

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember		U – Understand		A – Analyze / Apply	
Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Plumbing Engineering	02(01)	04(01)	04(00)	10(02)
02	Water Proofing & Damp Proofing Treatment	02(00)	02(01)	04(00)	08(01)
03	Termite Proofing	02(00)	02(00)	02(01)	06(01)
04	Fire proofing	02(00)	02(00)	02(01)	06(01)
	Total	08(01)	10(02)	12(02)	30(05)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
Que. 1 to 35	1	R	1	4	R	1	2	U	1	1	A	1	2	A	1	30/35
	1	R	1	4	R	1	2	U	1	1	A	1	3	A	1	
	1	R	1	1	U	1	2	U	1	1	A	1	3	A	1	
	2	R	1	1	U	1	3	U	1	1	A	1	3	A	1	
	2	R	1	1	U	1	3	U	1	2	A	1	4	A	1	
	3	R	1	1	U	1	4	U	1	2	A	1	4	A	1	
	3	R	1	1	U	1	4	U	1	2	A	1	4	A	1	

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed) (Out of 20)	15	--	--	--
		Assignments		Continuous	05	--	--	--
	TEE (Term End Examination)	End Exam Online	Students	End Of the Course (Out of 35)	30	12	--	--
				Total	50	20	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	Rubrics & Assessment Sheets	1, 2, 3, 4
		Journal Writing		Continuous	--	--	Journal	1, 2, 3, 4
				TOTAL	--	--		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	Rubrics & Practical Answer Sheets	1, 2, 3, 4
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
	NIL	

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3	--	--	--	2	2	2	--	--
2	3	--	--	--	2	2	2	--	--
3	3	--	--	--	2	2	2	--	--
4	3	--	--	--	2	2	2	--	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Plumbing :Design & Practice	S.G. Deolalikar, Tata McGraw-Hill Education Pvt. Ltd., 2004	10: 007462069X 13: 9780074620694
2	Building Construction: Design Aspects of Leakage and Seepage Free Buildings	Krishna Kant, Tata McGraw-Hill Education Pvt. Ltd, 2012	10: 1259006069 13:9781259006067
3	National Building Code 2005	Bureau of Indian Standards	-----

❖ **E-REFERENCES:**

- <http://nptel.ac.in/courses/108108076/1> , accessed on 28 July 2021
- <http://www.electrical4u.com> , accessed on 18th January 2021
- <https://www.youtube.com/watch?v=A9KSGAnjo2U>, accessed on 18th January 2021.
- <https://www.youtube.com/watch?v=BmwdSoGBIlg> accessed on 16 mar 2021.
- www.electricaltechnology.org › EE Review accessed on 16 mar 2021.
- <http://www.slideshare.net/gauravhtandon1/lifts-escalators> on accessed on 5 Jul2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N. V. Raut	Head, Civil Engineering (shift – I)	Government Polytechnic, Nagpur
2.	Dr. S. R. Kukadapawar	Head, Civil Engineering (shift – II)	Government Polytechnic, Nagpur
3.	Mr. A.J.Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur
4.	Mr. S. R. Ukey	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)_____
(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
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COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: CORE COURSE
COURSE CODE	: AM301G^s
COURSE TITLE	: Design of Structures (RCC and Steel)
TEACHING SCHEME	: TH:04 TU: 00; PR: 04(CLOCK Hrs.)
TOTAL CREDITS	: 06(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEEXAM	: 04 Hrs.
PR. TEEXAM	: 01 Hrs. (External)
PT. EXAM	: 01 Hr

❖ **RATIONALE:**

- ❖ Reinforced concrete material is widely used in the construction of residential building, public buildings and other civil engineering works. Principles of designing reinforced concrete structures are based on the concepts covered in Mechanics of structures and theory of structures. The properties of concrete have applications in designing components of Reinforced cement concrete Building. The basic principles of designing simple structure in Reinforced cement concrete shall help students in carrying out construction and supervision effectively which happen to be a major activity of technicians. The reading and interpretation of structural drawings is the basic skill required to be developed. The use of design aids is another ability to be possessed by technicians. It is therefore essential to provide adequate experience to students of reading structural drawings, following IS code requirements, using design aids in Limit state Method.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1) Use steel table and IS code 800:2007 at work sites.
- 2) Design connections for the given steel joints.
- 3) Design of singly reinforced rectangular beams.
- 4) Design of shear reinforcement and development length for beam and slabs.
- 5) Design various slabs for the given edge condition.
- 6) Design of axially loaded short columns and footings.

7) COURSE DETAILS:

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
Unit – I Fundamental of Steel Structures	1a. Select a relevant steel structure for the given condition. 1b. Use steel table to identify different properties of given steel sections. 1c. Illustrate various type(s) of loads (Dead load, live load, impact load, seismic load, snow load etc.) acting on the given steel structures as per IS 875-1987 part I to IV. 1d. Select the relevant factors to calculate seismic forces for given civil structure. 1e. Choose the partial safety factor as per the guidelines laid in IS for the given situation.	1.1 Steel as construction material. 1.2 Steel structures: Towers, Roof trusses, Water Tanks, Bridges, Columns, Chimney, building frames etc. Types, grades and strength of steel sections, Steel Table, IS 808-1989. Stress Strain graph for mild steel. 1.3 Loads acting on steel structures according to IS 875-1987 part I to IV. 1.4 Limit State Method of Design: Meaning and types of limits states, loads, design criteria, limit states of serviceability. 1.5 Factors of safety and load factors as per IS 800:2007.	08
Unit – II Design of Steel Connections	2a. Compute the strength of the given bolted connections. 2b. Design the bolted connections for the given situations. 2c. Calculate the strength of the given welded connections. 2d. Design the welded connections for given situations.	2.1 Type and uses of bolts and joints: Black bolts And High strength bolts, modes of failure. 2.2 Specifications of bolt holes for bolted connections. Strength of bolt in shear, tension, bearing and efficiency of joint. 2.3 Analysis and design of bolted joints for axially loaded plate, single and double angle members. 2.4 Welded connections: Butt and Fillet welds, size of weld, throat thickness. Analysis and design of Fillet welded joint for plate, single and double members subjected to axial load.	12

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
Unit - III Introduction to Limit State Method (LSM) and Analysis and Design of Singly Reinforced Sections by LSM	3a. Describe given terms: Limit State and terms related to it. Enlist various loads acting on structures. Describe partial safety factor as laid in IS provisions for the given situation. Draw stress-strain diagram. Calculate design constants and ultimate moment of resistance. 3b. Design balanced and under-reinforced singly reinforced rectangular sections for given beam section.	3.1 Definition of RCC, functions of Reinforcement, material properties Definition and types of limit state, partial safety factors materials and loads, characteristic strength. Types of loads use of IS: 875-1987, characteristic load and design load. Limit state of collapse (flexure) assumptions, stress-strain relationship for concrete and steel, design parameters and constants, ultimate moment of resistance. Under reinforcement, over reinforcement and balanced sections- meaning and comparison. 3.2 Analysis and design – Numerical problems on determination of design constants, ultimate moment of resistance, ultimate load carrying capacity, design of balanced and under reinforced sections. I.S. specifications regarding spacing, cover, minimum reinforcement, effective span.	12
Unit – IV Shear reinforcement and development length by LSM	4a. Calculate ultimate shear strength of beam for given data 4b. Design beam for shear for given data. 4c. Calculate development length of beam given data.	4.1 Meaning and distribution of shear in RCC beams and slab, IS code specifications, various forms of shear reinforcement in beams, use of bent-up bars. 4.2 Numerical problems on design of beam for shear. 4.3 Meaning of bond and development length in RCC, IS code provisions and calculation of development length in tension and compression.	08
Unit – V Design of Slabs by LSM	5a. Identify type of slab from the given data. 5b. Design various types of slabs for given data and draw reinforcement detailing diagram for slabs.	5.1. Definition and classification of slabs as one-way and two-way slabs, support conditions, main and distribution steel, I.S. specifications regarding spacing and cover for reinforcement, effective span, minimum reinforcement. 5.2 Design of slabs- Procedure and numerical problems on design of one-way simply supported slab, cantilever slab, two-way simply supported slab with corners free to lift.	14

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
Unit – VI Design of Column and Footing by LSM	6a. Describe given terms related to column. Calculate ultimate load carrying capacity of a given axially loaded column. 6b. Design column and draw reinforcement detailing from given data. 6c. Describe given terms related to footing and compare types of footings from given data. 6d. Design isolated sloped footing and draw reinforcement detailing from given data.	6.1 Limit state of collapse in compression- assumptions, minimum eccentricity, slenderness ratio, short and long columns, calculation of ultimate load carrying capacity of axially loaded short rectangular and circular columns. 6.2 Design of axially loaded short rectangular and circular columns. 6.3 Introduction to various types of RCC footings like stepped, sloped, combined footing and piles. 6.4 Design of isolated square sloped footing- Flexural design with checks for one way and two-way shear.	10
Total Hrs.			64

2 LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Sketch/ Draw tables/Graphs/ from IS code provisions and commonly used Standard rolled steel sections, built up sections, types of bolts and welds and welded joints, typical reinforcement details of R.C. sections. (5 plates) based on concept of limit state method.	All Units	10
2	Design and Draw (G+1) R.C.C. residential building for followings members (Draw on two A1 size sheets).		
a)	Draw key plan showing positions of columns and beams.	III, IV, V, VI	04
b)	Design one way simply supported continuous, cantilever and two-way slabs.	Design of Slab V	14
c)	Design singly reinforced beams.	Design of Beams III, IV	10
d)	Design columns and columns footings.	Design of Column and Footing VI	10
e)	Draw a set of structural drawings consisting of two A1 size sheets. Drawing shall normally contain key plan, structural plan showing positions of columns and column footings. Typical c/s and longitudinal section of beams, slabs, column, footings and bar bending schedule of reinforcement	III, IV, V, VI	16
Total Hrs.			64

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Fundamental of Steel Structures	04(02)	00(00)	00(00)	04(02)
02	Design of Steel Connections	00(00)	06(03)	06(00)	12(03)
03	Introduction to Limit State Method (LSM) and Analysis and Design of Singly Reinforced Sections by LSM	02(00)	03(03)	06(00)	11(03)
04	Shear reinforcement and development length by LSM	00(00)	03(03)	06(06)	09(09)
05	Design of Slabs by LSM	00(00)	03(00)	12(06)	15(06)
06	Design of Column and Footing by LSM	00(02)	03(03)	06(06)	09(11)
	Total	06(04)	18(12)	36(18)	60(34)

SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember

U – Understand

A – Analyze / Apply

1. QUESTION PAPER PROFILE FOR THEORY PAPER

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	01	R	02	01	R	02	01	R	02	03	R	02	06	R	02				3/5
02	02	U	03	03	U	03	04	U	03	05	U	03	06	U	03				3/5
03	02	U	03	02	U	03	03	U	03	04	U	03	06	U	03				3/5
04	02	A	06	03	A	06	04	A	06										2/3
05	04	A	06	05	A	06	05	A	06										2/3
06	05	A	06	06	A	06	06	A	06										2/3

T=Unit/Topic Number

L= Level of Question M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

2. ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test answer sheets	1,2,3,4,5,6
		Class Room Assignments		Tutorial Assignments	15	--	Assignment Book	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	ST	Students	One skill test at end of term	--	--	--	----
		Journal Writing		Design Assignments	10	--	Journal	1,2,3,4,5,6
		Drawing Sheets		Drawing Assignments	15	--	Plates and Drawing Sheets	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Practical Sheets	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form		1,2,3,4,5,6	
	End Of Course			End Of the Course	Questionnaires			

3. SCHEME OF PRACTICAL EVALUATION:

S.N.	Description	Max. Marks
1	Drawing details of various components of structure from drawing sheet and sketch book.	20
2	Writing Design procedure/IS specifications	10
3	Viva voce	20
	TOTAL	50

4. MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes	Program Outcomes (POs)							PSOs	
	1	2	3	4	5	6	7	1	2
1	3	3	3	--	--	--	3	3	--
2	3	3	3	--	3	--	3	3	--
3	3	3	3	--	3	--	3	3	--
4	3	3	3	--	3	--	3	3	--
5	3	3	3	--	3	--	3	3	--
6	3	3	3	--	3	--	3	3	--

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

5. REFERENCE and TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Limit State Design of Steel Structures	Shah V. L., Gore Veena	Structures Publications, Pune. ISBN-13: 1234567170961
2.	Limit State Design of Steel Structures	Shiyekar M. R.	PHI Learning, Delhi ISBN-13: 978-8120347847
3.	Analysis and Design Practices of Steel Structures	Ghosh, Moy, Karuna	PHI Learning, Delhi. ISBN-13: 978-8120349377
4.	Design of Steel Structures	Dayarathnam P.	S. Chand and Company, Delhi ISBN-13: 978-8121923200
5.	Reinforced Concrete (Vol.-I)	H.J.Shah, Charotar Publucation., 9 th Edition, year	9789380358475

6.	Illustrated Reinforced Concrete Design	Dr. V.L. Shah, Dr. S.R. Karve, Structure Publication, 5 th Edition, 2015.	81-903717-3-8
7.	Design of RCC Structures	R.R. Gadpal, D.J. Khamkar, R.B. Narhari, NiraliPrakashan, 2 nd Edition, 2016.	978-93-5164-302-9
8.	IS 456 -2000: Plain and Reinforced Concrete - Code of. Practice	Bureau of Indian Standards, Third Reprint, October 1998.	--
9.	IS-875(Part1): Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part1: Dead Loads-Unit Weight of Building Materials (Second Revision).	Bureau of Indian Standards, Published-1987.	--
10.	IS-13920-1993, Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces-Code of Practice.	Bureau of Indian Standards, Reaffirmed 1998 Edition, 1.2(2002-03).	--
11.	IS-1893(part 1)-2002. Criteria for Earthquake Resistant Design of Structures, Part1: General Provisions and Buildings (Fifth Revision)	Bureau of Indian Standards, Published-2002.	--
12.	IS-875(Part2): Code of Practice for Design Loads (Other Than Earthquake) For Buildings and Structures. Part2: Imposed Loads. (Second Revision).	Bureau of Indian Standards, Published-1987.	--

Others:

1. Steel tables.

❖ **E-REFERENCES:**

1. www.icjonline.com/ accessed on 20th January,2022
2. www.springer.com/engineering/civil+engineering/journal/40069accessed on 20th January,2022
3. www.youtube.com/watch?v=vuZcPTp51Zkaccessed on 20th January,2022

6. LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION
NIL

7. LIST OF EXPERTS and TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	R. D. Dongarwar	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY:	ELECTIVE
COURSE CODE	: AM302G \$
COURSE TITLE	: ELECTIVE II (APPLIED MECHANICS) ADVANCED DESIGN OF STRUCTURES
TEACHING SCHEME:	TH:03; TU:00; PR:02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TE EXAM	: 03 HRs
PR. TE EXAM	: 02 HRs (Internal)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Advanced Design of Structures is the application of design concepts to various civil engineering RCC and steel structures and methodical investigation of the stability, strength, and rigidity of structures. The objective is to produce a structure capable of resisting all applied loads without failure during its intended life. In the design of steel structures Limit State Method is to be used. For the design of steel components, the properties of steel, available sections, grades and strength characteristics are used along with IS:800-2007. In the design of RCC structures Limit State Method is to be used as per IS:456-2000 and IS:875-1987 is to be used for loading standards.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

- 1.Design the steel tension members under different loading conditions.
- 2.Design the steel compression members under different loading conditions.
- 3.Analyse and Design the doubly reinforced rectangular RCC beams under different loading conditions.
- 4.Analyse and Design the flanged RCC beams under different loading conditions.
- 5.Design waist slabs of RCC Dog legged staircase.
- 6.Design the circular columns and the isolated RCC rectangular column footings.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Design of Steel Tension Members	1.a Identify the type of the steel sections from the given data that can be used as tension member in the given structure with justification. 1.b Illustrate the method of computing the capacity of the given tension member for given end connection. 1.c. Design the given tension member for the given situation from the specified data.	1.1 Types of sections used for Tension members. 1.2 Strength of tension member governed by yielding of section, rupture of net cross-section and block shear. 1.3 Design of axially loaded single angle and double angle tension members with bolted and welded connections.	08
2. Design of Steel Compression Members	2.a. Identify the type of the given steel sections that can be used as a compression member with justification. 2.b Illustrate the method of computing the capacity of the given compression member for given end conditions. 2.b. Design the given compression member for the specified situation from the given data. 2.c. Draw sketches for single and double lacing system for the given built up columns of the specified structure. 2.d. Draw sketch of battening system for the given built up columns of the given structure.	2.1 Types of sections used as compression member. Calculation of effective length, radius of gyration and slenderness ratio. Permissible values of slenderness ratio as per IS 800. Design compressive stress. 2.2 Strength of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate only. Limits of width to thickness ratios to prevent local buckling. 2.3 Design of axially loaded single angle and double angle compression members with bolted and welded connections. 2.4 Introduction to built up sections, lacing and battening (Meaning and purpose). Diagrams of single and double lacing and battening system. (No numerical problems)	08
3. Analysis and Design of Doubly Reinforced Rectangular Concrete Sections	3.a. Recognize the given section for its use as doubly or singly reinforced section from the given data. 3.b. Calculate the Young's modulus for the given parameters of the specified doubly reinforced beam. 3.c Describe the method of determining ultimate moment of resistance of doubly reinforced beam from the given data. 3.d. Design reinforcement for the given doubly reinforced	3.1 Conditions for providing doubly reinforced sections. 3.2 Stress in steel (f_{sc}) for different values of d'/d ratio. 3.3 Analysis of doubly reinforced section, strain and stress diagrams, numerical problems on ultimate moment of resistance of a doubly reinforced beam. 3.4 Design of doubly reinforced sections for given size and loading, calculation of A_{st} and A_{sc} only.	08

	beam section for the specified conditions.		
4. Analysis and Design of Flanged Concrete Beams	4.a Determine the reinforcement for the specified section for its use as a flanged section from the given data. 4.b Illustrate the procedure of calculating the effective flange width of the specified flanged beam under given situation. 4.c Calculate ultimate moment of resistance of the given flanged section. 4.d Calculate A_{st} required for the specified flanged beam for case of neutral axis lying in the flange from the given data.	4.1 Conditions for formation of flanged (T and L) beams as per IS 456:2000, comparison with rectangular beams, effective width of flange. 4.2 Analysis of singly reinforced flanged beams having neutral axis in flange or web. Determination of Moment of Resistance. 4.3 Determination of reinforcement in a singly reinforced flanged beam for the given dimensions. (Neutral axis lies in flange only).	08
5. Design of RCC Staircase Slab	5.a Calculate different loads on the waist slab of the given dog legged staircase from the given data. 5.b Design the waist slab of the given dog legged staircase from the given data. 5.c Draw reinforcement detailing diagram for the flight from the given data of the given dog legged staircase. 5.d Describe the method of determining the live load for the given type of the building.	5.1 Various clauses in IS456-2000 regarding effective span and load calculation for typical flight of a dog legged staircase. 5.2 Live load on staircase of different types of buildings such as residential, office, commercial, public, factory etc. 5.3 Load calculation for a typical flight of a dog legged staircase with load distribution on landing slab as per IS 456-2000. 5.4 Design of waist slab of a dog legged staircase for given rise, tread, width, and number of steps, with supporting beams at the ends of flight, parallel to steps. Reinforcement detailing of typical flight of dog legged staircase.	06
6. Design of RCC Circular Column and Rectangular Footing	6.a Design the given axially loaded short circular column with spiral ties for the given data. 6.b. Design the given isolated rectangular footing for given rectangular column for flexure from the given data. 6.c Draw the reinforcement detailing for the specified type of footing from the given data. 6.d Describe the method of determining the load on the given axially loaded short column of the specified structure.	6.1 Introduction to rectangular and circular columns and related codal provisions in IS:456-2000. 6.2 Procedure and numerical problems on design of axially loaded short rectangular and circular columns with lateral and spiral ties. 6.3 Introduction to various types of RCC footings like isolated, stepped and sloped footings, combined footings, piles, raft, eccentric footing. 6.4 Design of isolated rectangular footing of uniform depth, flexural design with checks for one-way shear, two-way shear and bond.	10
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Design and draw a tension member for the given situation.	1. Design of Steel Tension Members	02*
2	Determine the effective length of the given compression member for various configurations under different end conditions with neat sketches.	2. Design of Steel Compression Members	02
3	Design and draw a compression member for the given situation.	2. Design of Steel Compression Members	02*
4	Draw sketches for single & double lacing of given built up columns.	2. Design of Steel Compression Members	02
5	Draw sketches for battening of given built up columns.	2. Design of Steel Compression Members	02
6	Design and draw a doubly reinforced RCC beam for given data.	3. Analysis and Design of Doubly Reinforced Rectangular Concrete Sections	02*
7	Design and draw a flanged RCC beam for given data.	4. Analysis and Design of Flanged Concrete Beams	02*
8	Draw reinforcement details of the flanged RCC beam designed in Pr.No.7	4. Analysis and Design of Flanged Concrete Beams	02
9	Draw the neat sketches of different staircases used in your institute building mentioning its type, tread, rise, thickness of waist slab.	5. Design of RCC Staircase Slab	02
10	Design and draw the waist slab of dog legged staircase for the given data.	5. Design of RCC Staircase Slab	02
11	Draw reinforcement details of waist slab for typical flight of a dog legged staircase designed in Pr.No.10	5. Design of RCC Staircase Slab	02*
12	Design and draw a circular column with spiral ties for the given situation.	6. Design of RCC Circular Column and Rectangular Footing	02*
13	Design and draw the isolated rectangular footing of uniform depth for the given situation.	6. Design of RCC Circular Column and Rectangular Footing	02
14	Draw reinforcement details of the isolated rectangular footing designed in Pr.No.13	6. Design of RCC Circular Column and Rectangular Footing	02*
15	Interpret the given RCC structural drawings with reference to reinforcement details of various structural elements.	3 to 6	02*
16	Show the reinforcement detailing of structural elements like beams, columns, staircase and footing of the given structure.	3 to 6	02*
Total Hrs			32

- Experiments marked * are compulsory.
- Minimum 12 Practical's should be performed.
- A suggestive list of PrOs is given in the above table. More such PrOs can be added to attain the COs and competency. All the above listed practical need to be performed compulsorily, so

that the student reaches the ‘Applying Level’ of Blooms’s ‘Cognitive Domain Taxonomy’ as generally required by the industry.

• **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Design of Steel Tension Members	02(00)	03(03)	06(00)	11(03)
02	Design of Steel Compression Members	02(00)	03(03)	06(00)	11(03)
03	Analysis and Design of Doubly Reinforced Rectangular Concrete Sections	02(02)	03(00)	06(06)	11(08)
04	Analysis and Design of Flanged Concrete Beams	00(00)	03(03)	06(06)	09(09)
05	Design of RCC Staircase Slab	00(00)	03(00)	06(00)	09(00)
06	Design of RCC Circular Column and Rectangular Footing	00(02)	03(03)	06(06)	09(11)
	Total	06(04)	18(12)	36(18)	60(34)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	01	R	02	02	R	02	03	R	02	03	R	02	06	R	02				3/5
02	01	U	03	02	U	03	03	U	03	01	U	03	02	U	03				3/5
03	04	U	03	05	U	03	06	U	03	04	U	03	06	U	03				3/5
04	01	A	06	02	A	06	03	A	06										2/3
05	03	A	06	04	A	06	04	A	06										2/3
06	05	A	06	06	A	06	06	A	06										2/3

T-Unit/Topic Number

L- Level of Question

M-Marks

R-Remember

U-Understand

A-Analyze/ Apply

ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3, 4, 5, 6
		Class Room Assignments		Assignments	15	--	Assignment book	1, 2, 3, 4, 5, 6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Scripts	1, 2, 3, 4, 5, 6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous assessment of practical	Students	End of every practical	20	--	Journal	1, 2, 3, 4, 5, 6
		Journal Writing		Assignment	05	--	Journal	1, 2, 3, 4, 5, 6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Practical Answer Scripts	1, 2, 3, 4, 5, 6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course Survey			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Interpretation of given data and its presentation.	10
2	Selection of sketches/Process of designing of the given structural components using relevant IS codes/writing of visit report.	15
3	Precision in sketch book, sheets and report and its neatness, cleanliness.	15
4	Submission of assigned work in time	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes	Program Outcomes (POs)							Program specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	3	-	3	-	3	3	-
2	3	3	3	-	3	-	3	3	-
3	3	3	3	-	3	-	3	3	-
4	3	3	3	-	3	-	3	3	-
5	3	3	3	-	3	-	3	3	-
6	3	3	3	-	3	-	3	3	-

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Design of Steel Structures	Dayarathnam P. S. Chand and Company, Delhi, 2012	13: 978-8121923200
2	Design of Steel Structures	Sairam, K.S. Pearson Publication, Delhi, 2015	13: 9332516308
3	Fundamentals of Reinforced Concrete	Sinha N.C. Roy S.K. S. Chand and Co., New Delhi, 2007.	13: 978-8121901277
4	Reinforced Concrete Design Principles and Practice	Krishna Raju, N.Pranesh, R.N. New Age International, umbai,2018	13: 978-8122414608
5	Reinforced concrete Design	Pillai, S.U. Menon, Devdas McGraw Hill Publications, New Delhi,2017	978-0070141100
6	Limit State Design of Reinforced Concrete	Varghese, P. C. PHI Learning Private Limited, Delhi, 2008	978-8120320390

I.S. CODES:

1. IS 800-2007 Indian Standard code of practice for use of structural steel in general building construction , BIS New Delhi.
2. IS-875-1987 Part-1 to 5: Indian Standard Code for Loading Standards.
3. IS hand book No. 1 Properties of structural steel rolled section.
4. Steel tables
5. IS 456:2000 – Plain and Reinforced concrete code of Practice
6. SP16- Design Aids for reinforced concrete to IS 456
7. I.S. 875 (Part 1-5) – 1987 code of practice of design loads for Buildings and structures.
8. SP 24 – Explanatory Handbook on IS 456
9. SP34: 1987 – Handbook on concrete reinforcement and Detailing.

E-REFERECNES:

<https://youtu.be/UWM59FWB32E> accessed on 31st Jan 2022

<https://youtu.be/1ntF-4217JU> accessed on 31st Jan 2022

<https://youtu.be/nSHj-IrFFjU> accessed on 31st Jan 2022

<https://youtu.be/aTirfKA0atE> accessed on 31st Jan 2022

<https://youtu.be/VyFAsHrweyW> accessed on 31st Jan 2022

<https://youtu.be/oJBIGoQ0S5M> accessed on 31st Jan 2022

❖ WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Prof Y.K.Chandarana	Head of Applied Mechanics Dept.	Government Polytechnic, Nagpur.
2.	Prof A.G.Bhaiswar	Lecturer in Applied Mechanics	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
COURSE CATEGORY	: ELECTIVE
COURSE CODE	: AM303G^{\$}
COURSE TITLE	: ADVANCED CONCRETE TECHNOLOGY
PREREQUISITE	: M102G
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 04 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TE EXAM	: 03 HRs
PR. TE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

Concrete is the most widely used construction material in all types of civil engineering structures. Now a day's science and technology is changing rapidly. The technicians have to use knowledge of certain tests on ingredients of concrete to find properties for mix design. New techniques are developed in the field of concreting processes. They are required to supervise the modern concreting processes. Therefore knowledge of these processes will give upper hand to the technicians.

He should get acquainted with latest developments in the field of concrete technology, admixtures and chemicals used in concreting.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to—

1. Design quantities of materials for concrete mix proportion
2. Use the proper admixture for concrete.
3. Select special concrete according to the nature of work and site conditions.
4. Use appropriate Precast Concrete member.
5. Use Prestressed Concrete member at appropriate place.
6. Appraise Special Processes of concrete

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
1. Concrete mix Proportioning	1a. Describe factors governing mix proportioning in given situation 1b. Compare given methods of mix proportioning and justify 1c. Calculate quantities of materials for a given grade of concrete	1.1 Introduction, factors affecting choice of mix proportion. 1.2 Methods of concrete mix design, trial and adjustment method, ACI method, rapid method, computer aided mix design. Comparison of methods. 1.3 Mix design of ordinary, standard and high strength concrete. Simple numerical problems based on it.	9
2. Concrete Admixtures	2a. Classify given admixtures with justify 2b. Choose proper admixture for a given conditions. 2c. Describe properties of given pozzolanic admixtures. 2d. Describe advantages & disadvantages of pozzolana concrete.	2.1 Definition of admixtures, functions of admixtures, IS classification, 2.2 Types of admixtures, accelerators, retarders, air entraining and water reducing, plasticizers, super plasticizers, hyper plasticizers, special admixtures, uses of admixtures. 2.3 Physical properties of pozzolanic materials like fly ash, rice husk ash, Metakaolin, silica fume and natural pozzolana. 2.4 Ecological concept behind using fly ash, advantages & disadvantages of pozzolana concrete, properties of concrete influenced by pozzolana.	9
3. Special Concrete	3a. Explain properties of given special concretes. 3b. Describe Applications of special concretes in given situation 3c. Explain use of ready-mix concrete in given situation with justification 3d. Describe advantages & disadvantages of using RMC in given situation and justify it	3.1 Properties, ingredients required, advantages & disadvantages of- Light weight concrete, Lightweight aggregate concrete & foamed concrete, Autoclaved aerated concrete, No fines concrete, High strength concrete, Refractory concrete, High density & radiation shield concrete, Polymer concrete, Fibre reinforced concrete, self compacting and roller compacted concrete. 3.2 Applications of special concretes. 3.3 Definition of ready mixed concrete (RMC), types of plants, truck mixer efficiency, transit duration, effect of prolonged agitation, quality control acceptance and compliance. 3.4 Applications, advantages and disadvantages of RMC.	9

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and Subtopics	Hrs.
4.Precast Concrete	4a. Describe manufacture of given precast concrete member 4b. Explain Special formwork requirements for a given precast component unit 4c. Draw plant layout for a precast unit. 4d. Compare advantages & disadvantages of precast concrete. with given other concrete	4.1 Definition of precast concrete, process diagram showing manufacture of precast products, layout of plant for manufacture of precast products, review of small and large products. 4.2 Special formwork requirements, methods of compaction, curing and handling of components. 4.3 Application, advantages & disadvantages of precast concrete.	8
5. Prestressed Concrete	5a. Describe given prestressing losses of concrete 5b. Describe methods of prestressing concrete. 5c. Compare advantages & disadvantages of pre-stressed concrete with given other concrete.	5.1 Definition of pre-stressed concrete, concept of pre-stress, material requirement, methods of pre-stressing, losses in pre-stress, simple numerical. 5.2 Application, advantages & disadvantages of prestressed concrete.	7
6. Special Processes	6a. Describe given types of special processes of concrete 6b. Choose type of surface coating for a given condition.	6.1 Sprayed concrete, Underwater concreting, Grouting, Slip-form construction, Pumping concrete, Vacuum concrete process. 6.2 Concrete coating and surface treatments.	6
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Design a mix of at least TWO grades of concrete by TWO different methods	Concrete mix Proportioning	10*
2	Compare compressive strength of fly ash concrete & normal concrete for different proportion of fly ash. (at least TWO).	Concrete Admixtures.	12*
3	Prepare report on minimum TWO visits to 1) Ready mix concrete plant. 2) Special concreting operations. 3) Precast concrete unit.	Special Concrete and Precast Concrete	10*
Total Hrs.			32

- Experiments marked * are compulsory.
- The above list is suggestive and additional Practicals may be conducted if felt relevant by the course teacher.

❖ **SPECIFICATION TABLE FOR THEORY PAPER**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Concrete mix Proportioning	02(02)	03(00)	06(06)	11(08)
02	Concrete Admixtures.	02(02)	06(00)	06(00)	14(02)
03	Special Concrete.	02(02)	00(06)	06(00)	08(08)
04	Precast Concrete	02(00)	06(03)	03(00)	11(03)
05	Prestressed Concrete	02(00)	03(03)	03(06)	08(09)
06	Special Processes	02(00)	03(06)	03(00)	08(06)
	Total	12(06)	21(18)	27 (12)	60 (36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER**

T- Unit/Topic Number

L- Level of Question

M- Marks

R-Remember

U-Understand

A-Analyze/ Apply

1 R 2 means Unit/Topic Number No- 1, Level of Question –Remember, Marks – 2 Marks

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	3	R	2										
02	1	U	3	2	U	3	2	U	3	3	U	3	3	U	3				3/5
03	4	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	6	U	3	3	A	3	3	A	3	6	U	3	6	U	3				3/5
05	4	A	3	5	A	3	6	A	3	5	A	3	5	A	3				3/5
06	1	A	6	2	A	6	1	A	6										2/3

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	15	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	60	24	Theory Answer Scripts	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Practical Answer Scripts	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment. writing procedure etc.	10
2	Performance	10
3	Calculation, Result, Drawing Graphs(if any)	10
4	Viva Voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO	
	1	2	3	4	5	6	7	1	2
1	3	3	1	1	-	-	-	-	2
2	-	-	-	-	3	-	3	-	2
3	3	3	-	-	3	-	3	-	-
4	3	-	-	-	3	1	-	-	-
5	3	-	-	-	3	1	-	-	-
6	-	3	-	-	3	-	3	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1	Concrete Technology	M. L. Gambhir, Tata Mc Graw Hill, Fifth Edition, 2013	13 :9781259062551 10 :1259062554
2	Concrete Technology	M. S. Shetty, S.Chand and Co, First Edition, 2005	13 : 9788121900034 10 : 8121900034
3	Concrete Technology	S. Bhavikatti, I K International Publishing House Pvt. Ltd, First Edition, 2015	13 : 9789384588670 10 : 9384588679
4	Concrete Technology	A.M. Neville & J.J. Brooks. Pearson Education, First Edition,2002	13 : 9788131705360 10 : 8131705366
5	Concrete Technology	A.R. Santhakumar, Oxford University Press, First Edition,2006	13 : 9780195671537 10 : 0195671538

Sr. No.	IS Code	Published by
1	IS 383 : 1970 Specification for coarse and fine aggregates from Natural sources for concrete.	Bureau of Indian Standards
2	IS 456 : 2000 Code of practice for plain and reinforced concrete (fourth revision)	Bureau of Indian Standards
3	IS 516 : 1959 Methods of tests for strength of concrete (xii reprint December 1987)	Bureau of Indian Standards
4	IS 8112 : 1989 Specification for 43 grade OPC	Bureau of Indian Standards
5	IS 12269 : 2013 Specification for 53 grade OPC	Bureau of Indian Standards
6	IS 10262 : 2019 Recommended Guidelines for Concrete Mix Proportioning	Bureau of Indian Standards
7	I.S. 13311 (part-1 and 2) –1992 Methods of non-destructive testing of concrete part-1 ultrasonic pulse velocity. part-2 rebound hammer.	Bureau of Indian Standards

❖ E-REFERENCES:

- <https://youtu.be/7tHrG98Mmug> accessed on 23/01/2022
- <https://youtu.be/bHT1SySn6z4?list=TLpQMjMwMTIwMjKRYE5-awUKmA> accessed on 23/01/2022
- <https://youtu.be/eJ1klO4JfSo> accessed on 23/01/2022
- <https://youtu.be/zNmzS6OOMFA> accessed on 23/01/2022

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

- Blaine's air permeability apparatus as per IS: 4031 (part 1)-1999, and sieve no. IS 90 micron - IS Brass Sieve (200 mm dia), 90 Micron size.
- Vicats apparatus- VICAT mould of dia. 80 mm & 40 mm high glass base plate, initial needle, final needle. Consistency plunger M.S. base plate (non porous) of weight 300 gm. Vicat mould split type with camping ring.
- Compression testing machine-2000 kN capacity
- Measuring Cylinder of 1000 ml capacity
- Cement mortar cube vibrator with moulds of size 50 cm²(7.07 cm x 7.07 cm) , 6 nos.
- Density basket as per IS specification
- I S sieve set (sizes- 80 mm, 40 mm, 20 mm, 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 µ, 300 µ, 150 µ and pan) , sieve shaker with adaptors
- Aggregate impact testing m/c with mould, Los Angeles abrasion testing m/c
- Elongation gauge and thickness gauge.
- Slump cone (top dia.100mm, bottom dia.200mm, Height 300mm) Compaction factor test apparatus
- Table vibrator, moulds(150mm x150mmx 150mm)
- NDT apparatus – Rebound Concrete Hammer
- Crushing Value test Apparatus
- Compaction Factor Test Apparatus

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Y. K. Chandarana	HOD Applied Mechanics	Govt. Polytechnic, Nagpur
2.	Arunkumar V. Gupta	Lecturer in Applied Mechanics	Govt. Polytechnic, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)



GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSES
COURSE CODE	: CE301G ^s
COURSE TITLE	: ENVIRONMENTAL ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU:00;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)
TH. TEE	: 03 HRs;
PR TEE	: 02 HRs (External)
PT	: 01 HR

❖ RATIONALE:

Environmental engineering encompasses the scientific assessment and development of engineering solutions to environmental problems impacting the water, wastewater and solid waste. The course covers the physical, chemical and biological principles of process design and treatment of water and wastewater. With a view to provide adequate water supply of required quality and quantity to every village, town and city, It also provides an efficient method of sewage treatment, its disposal and effective solid waste management.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Estimate the total water demand for a city.
2. Determine various characteristics of water to check its potability.
3. Plan suitable conveyance and distribution system for water supply scheme.
4. Identify the different components of building sanitation and type of Sewerage system.
5. Select the relevant method of treatment of sewage in the given situation.
6. Identify the methods of collection and safe disposal of solid waste.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Demand of water	a) Describe the need for protected water supply b) Identify various water borne diseases c) Identify surface and subsurface sources of water d) Describe various types of intake structures. e) Compute various types of water demand, f) Describe rate of demand g) Identify factor's affecting rate of demand h) Analyze design period for water supply scheme i) Compare various methods of forecasting of population. j) Compute numerical problem on forecasting of population k) Estimate total quantity of water required for atown/city	1.1 Need for protected water supply, water borne diseases 1.2 Surface and subsurface sources of water 1.3 Intake structures :Definition andtypes. 1.4 Demands of water – Domestic, Industrial, Commercial, Public, Fire demand, Losses and wastages 1.5 Rate of demand, Factor's affecting rate of demand, variations of rate of demand 1.6 Design period for water supply scheme 1.7 Forecasting of population – Methods of forecasting, Numerical problem on forecasting of population 1.8 Estimation of total quantity of water for a town/city	06
2. Quality of water and Treatment of water	a) Describe the characteristics of potable water. b) Classify impurities present in water c) Describe the need for water analysis. d) Classify different tests carried out on water for assessing its potability. e) Describe precautions to be taken for collection of samples. f) State water quality standards as per IS specification.	2.1 Meaning of potable water 2.2 Impurities present in water and it's classification 2.3 Need for analysis of water 2.4 Tests on water- Physical test for Colour, Taste, Odour and Turbidity; Chemical test for total solids, Hardness, Chlorides, Dissolved oxygen, pH, Fluoride, Nitrogen and it's compounds; Bacteriological test – E coli index, MPN. 2.5 Sampling of water, Precautions to be taken for collection of samples. 2.6 Water quality standards as per IS specifications 2.7 Aeration – Objects and methods ,aeration fountain	12

	g) Describe various water treatment processes. h) Draw flow diagram of typical water treatment plant.	2.8 Sedimentation – objects, plain sedimentation, sedimentation with coagulation, principles of coagulation, types of coagulation, process of coagulation, Types of sedimentation tanks, study of clari-flocculator and its working. 2.9 Filtration – objects and theory of filtration, filter media, classification of filters: Slow sand filters, rapid sand filters, construction, working and design aspects of slow sand filter and rapid sand filter, suitability merits and demerits, back washing of rapid sand filters. 2.10 Disinfections - objects and methods, Chlorination – different forms, Application of chlorine, Residual chlorine and it's importance. 2.11 Components of water treatment plant	
3. Conveyance and Distribution of water	a) Identify different types of pipes used for conveyance of water, b) Compare choice of pipe material used in pipe lines. c) Describe the joints in cast iron pipes and concrete pipes d) Describe procedure of the laying of pipes, e) Describe the testing of pipe line – pressure test and leakage test f) Describe the valves , its types and utility of the valves. g) Compare methods of distribution of water- Gravity, pumping and combined system. h) Identify various layouts of water distribution system. their suitability, merits and demerits	3.1 Different types of pipes used for conveyance of water, choice of pipe material 3.2 Joints in cast iron pipes and concrete pipes 3.3 Laying of pipes, testing of pipe line – pressure test and leakage test 3.4 Valves – types, functions, use and location on a pipe line 3.5 Methods of distribution of water- Gravity, pumping and combined system. 3.6 Layouts of water distribution system. – Dead end, Grid iron, Circular and radial system; their suitability, merits and demerits	06

4. Building sanitation , Sewerage and Sewer appurtenances	a) Identify the terms related to Sanitary Engineering. b) Describe various Building sanitary fittings and fixtures, c) Compare system of sewerage – Separate system, Combined system, Partially separate system d) Identify various types of sewers e) Compare various types of sewers f) Select type of sewers for specific applications. g) Describe System of sewerage h) Describe laying, testing and maintenance of sewers i) Describe manholes and drop Manhole with neat sketch: their component parts and location, j) Describe sewer and street inlets.	4.1 Necessity of building sanitation Term – Sewage, sullage, refuse, garbage, rubbish, storm water, domestic sewage 4.2 Building sanitary fittings- Water closet, Flushing cistern, Wash basin, Sink, Urinals, Traps – Types, their function and location. Inspection chambers. 4.3 System of sewerage – Separate system, Combined system, Partially separate system, their comparison and suitability 4.4 Types of sewers – Their comparison, suitability and selection 4.5 System of sewerage 4.6 Laying, testing and maintenance of sewers 4.7 Manholes and drop Manhole: their component parts, location, Types of sewers – Their comparison, suitability and selection 4.8 spacing, construction details, sewer inlets street inlets	08
5. Treatment of sewage	a) Analyze the characteristics of sewage, B.O.D. / C.O.D. and its significance, b) Compare aerobic and anaerobic process c) Describe the function of sewage treatment plant, Grit chamber, skimming tank, sedimentation tank, sludge digestion tank, trickling filters, d) Describe the activated sludge process e) Design septic tank, f) Describe Oxidation pond g) Identify various methods of disposal of sewage.	5.1 Characteristics of sewage, B.O.D. / C.O.D. and its significance, Aerobic and anaerobic process 5.2 Objects of sewage treatment general layout and flow diagram of sewage treatment plant, Grit chamber, skimming tank, sedimentation tank, sludge digestion tank, trickling filters, Activated sludge process 5.3 Disposal of sewage, septic tank, Oxidation pond	10

6. Solid waste and industrial waste	a) Identify common constituents of dry refuse b) Describe methods of collection and disposal of dry refuse c) Identify characteristics of industrial waste water from following industry- Sugar, Dairy, Textile, Paper and pulp. d) Describe with neat sketch, general idea regarding disposal of waste water from above industries	6.1 Dry refuse, common constituents of dry refuse 6.2 Collection and method of disposal of dry refuse 6.3 Industrial waste water, Characteristics of industrial waste water from following industry- Sugar, Dairy, Textile, Paper and Pulp industry. 6.4 General idea regarding disposal of waste water from above industries.	06
	Total Hrs.		48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

CO	Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.	PO
CO2	01	Determine the pH of a given water sample by using digital p ^H meter.	2	04	PO4
CO2	02	Determine the turbidity of the given sample by using Turbidity meter	2	04	PO4
CO2	03	Determine residual chlorine of a given sample by orthotolidine test	2	04	PO4
CO2	04	Determine optimum dose of coagulants in given water sample by jar test	2	04	PO4
CO2	05	Determine the dissolved oxygen of a given water sample	5	04	PO4
CO5	06	Design and draw septic tank and soak pit for a hostel building.	5	04	PO3
CO5	07	Prepare a report on visit to the water treatment plant.	3	04	PO6
CO5	08	Prepare a report on visit to sewage treatment plant.	5	04	PO6
Total Hrs.				32	

❖ SPECIFICATION TABLE FOR THEORY PAPER:

R – Remember		U – Understand		A – Analyze / Apply	
Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Demand of Water	00(04)	03(00)	06(00)	09(04)
02	Quality of Water and Treatment of Water	02(02)	06(03)	06(03)	14(08)
03	Conveyance and Distribution of Water	02(00)	03(03)	00(03)	05(06)
04	Building Sanitation of Sewerage and Sewer Appurtenances	04(00)	03(03)	03(06)	10(09)
05	Treatment of Sewage	02(00)	06(03)	06(03)	14(06)
06	Solid Waste and Industrial Waste	02(00)	03(03)	03(00)	08(03)
	Total	12(06)	24(15)	24(15)	60(36)

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

[illegible]

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1,2,3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1,2,3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25#	10	Rubrics & Practical Answer Sheets	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S. N.	Description	Max. Marks
1	Performance of practical; Selection of Chemicals, Observation, Calculations, Result	30
2	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	2	-	2	-	-
2	3	-	-	3	2	-	2	2	3
3	3	-	-	-	2	-	2	2	-
4	3	-	-	-	2	-	2	2	-
5	3	-	-	2	2	-	2	2	3
6	3	-	-	-	2	-	2	2	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Water Supply and Sanitary Engineering	G. S. Birdie, J. S. Birdie, Standard Publishers Distributors	8187433795, 9788187433798
2.	Water Supply And Sanitary Engineering	S. C. Rangwala Charotar Publishing House, 2005	8185594597, 9788185594590
3.	Elements of water supply and wastewater disposal	Gordon Maskew Fair; John C New York u.a. : Wiley u.a., 1981; Charles Geyer; Daniel A Okun	0470390980
4.	Water Supply Engineering	B. C. Punmia, Laxmi Publications; Second edition, 2016	8131807037 978-8131807033
5.	Wastewater Engineering (Including Air Pollution)	B. C. Punmia, Arun Kumar Jain, Ashok Kumar Jain, Laxmi Publications; Second Edition, 2016	8131805964 978-8131805961

• **E-REFERENCES:**

- www.leka.lt/sites/default/files/dokumentai/concise-environmental-engineering.pdf accessed on 31st August, 2021.
- www.tnu.edu.vn/sites/quynhntt/references/8064517-Environmental-Engineering.pdf accessed on 31st August, 2021.
- bookboon.com/en/environmental-engineering-ebooks, accessed on 31st August, 2021.
- <https://www.engr.udel.edu/downloads/UndergradEnvironmental.pdf> accessed on 31st August, 2021.
- <https://www.youtube.com/watch?v=syn4lUvF3YE> accessed on 31st August, 2021.
- <https://www.youtube.com/watch?v=yZJbgimr5hg> accessed on 31st August, 2021.

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. Digital pH meter
2. Water analysis kit
3. Jar Test Apparatus
4. Orthotolidine Test Apparatus
5. Digital Turbidity meter
6. Digital weighing balance

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N. V. Raut	Head of Civil Engineering Shift I	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Head of Civil Engineering Shift II	Government Polytechnic, Nagpur.
3.	Dr. Mrs R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSE
COURSE CODE	: CE303G^{\$}
COURSE TITLE	: WATER RESOURCES ENGINEERING
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 04; TU: 00; PR: 02 (CLOCK HRs.)
TOTAL CREDITS	: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: 01 HR

❖ **RATIONALE:**

India is basically an agricultural country and development of the country depends on the agricultural output. Water is most vital element in plant life. Moreover, in India there is uncertain and inadequate rainfall. Therefore, each drop of water is required to be utilized appropriately with systematic irrigation system. It is essential that technicians in civil engineering become aware of basic background of theory & practice and acquire the skill of understanding the importance & necessity of various irrigation structures. The purpose of learning this course is to prepare students to efficiently supervise and construct & maintain various irrigation structures.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Estimate hydrological parameters.
2. Calculate crop water requirement of command area and capacity of canals.
3. Calculate storage capacity of reservoirs.
4. Select suitable dam and spillway structure as per site condition.
5. Select and maintain minor and micro irrigation scheme.
6. Plan & maintain canal structures.

COURSE DETAILS:**A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Hydrology	1a. Illustrate the importance of irrigation in given area. 1b. Identify benefits of irrigation of given type. 1c. Classify irrigation scheme for given condition. 1d. Describe with neat sketch the given hydrological parameters. 1e. Calculate average rainfall by given method using given data. 1f. Describe the construction and functioning of given type of rain gauge. 1g. Compute run-off using relevant method from the given data. 1h. Describe given type of catchment area 1i. Compute the Maximum flood discharge using relevant method from the given data. 1j. Calculate dependable yield from the given catchment for the given data.	1.1 Definition of irrigation Concept, Necessity, Scope and development of irrigation in India. 1.2 Benefits of Irrigation, Ill effects of over- irrigation 1.3 Types of irrigation schemes, single & multipurpose projects. 1.4 Hydrology- Definition &Hydrological Cycle 1.5 Rainfall- Factors affecting rainfall, Methods of calculating average rainfall, Simple numerical problems 1.6 Rain gauge- Symons and automatic rain gauge 1.7 Run-off- Definition, factors affecting runoff , Computation of run-off, Simple numerical problems 1.8 Catchment area,-definition & types 1.9 Max. Flood discharge measurement- Definition, Rational method and empirical methods, Simple numerical problems 1.10 Yield and dependable yield of a catchment, determination of dependable yield	09
2. Water requirement of crop	2a. Differentiate given types of cropping seasons in Maharashtra. 2b. Compare base period and crop period on given points. 2c. Describe methods of improving duty for given site condition. 2d. Justify the importance of given factor. 2e. Suggest suitable method of applying water to the crop for given condition. 2f. Calculate the water requirement of crops and capacity of canal from the given data.	2.1 Crops and cropping seasons in Maharashtra- Kharif, Rabi, Hot weather & Perennial 2.2 Base period, Crop period, Duty, Delta, GCA, CCA, ICA, intensity of irrigation. 2.3 Factors affecting duty, Methods of improving duty 2.4 Definition of time factor, capacity factor, 2.5 Methods of application of Irrigation water and its assessment. 2.6 Numerical on water requirements of crops and capacity of canal	08
3. Reservoir planning	3a. Describe the given survey for reservoir planning. 3b. Draw area – capacity curve for given data.	3.1 Surveys for reservoir planning, data collection for reservoir planning 3.2 Area – capacity curve 3.3 Silting of reservoir- Rate of silting,	09

	3c. Suggest relevant measures of silt control in a given situation. 3d. Develop the relationship between different control levels of reservoir for given condition. 3e. Calculate control levels for the given reservoir from the given data.	Factors affecting silting and control measures. 3.4 Fixing of control levels – Dead storage level, Full reservoir level, High flood level and Top of bund level. Flood absorption capacity of reservoir 3.5 Simple numerical problems on fixing of control levels.	
4. Dams and spillways	4a. Justify the choice of dam at given site condition. 4b. Draw a sketch of given profile of gravity dam 4c. Draw a labeled sketch of earthen dam for given condition. 4d. Suggest suitable measure to prevent seepage through given part of earthen dam. 4e. Justify preventive measures for the given type of dam failure. 4f. Elaborate the necessity of spillways for given type of dam. 4g. Propose the type of spillways for the given type of dam with justification. 4h. Describe the given type of energy dissipater for given spillway. 4i. Suggest the relevant types of gates for given type of dams with justification	4.1 Dams and its classification- Gravity and Earthen dams, choice of type of dam 4.2 Gravity dams – Forces acting on dams, typical cross section, Theoretical and practical profiles, Drainage gallery, Joints in gravity dam, Concept of high dam and low dam 4.3 Earthen dams – Components of earthen dam and their function, Typical cross section of an earthen dam 4.4 Seepage through earthen dam, Methods to reduce seepage through embankment and foundation 4.5 Methods of construction of earthen dams, types of failure of earthen dam and preventive measures. 4.6 Spillways- Definition, function, location and components 4.7 Types of Spillways- Emergency and various types of service spillways 4.8 Discharge over spillway, Energy dissipation, spillway with and without gates. 4.9 Radial gate, vertical gates.	14
5. Minor & Micro Irrigation	5a. Draw a layout of given type of bandhara irrigation scheme 5b. Describe the necessity of Percolation tank for given condition. 5c. Describe construction and operation of given type of weir in the given situation. 5d. Compare weir and barrage on given points. 5e. Describe the necessity of diversion head work for given situation. 5f. Illustrate the importance of given component of Lift irrigation. 5g. Prepare a checklist for maintenance of given type of irrigation scheme. 5h. Describe the yield of given type of well. 5i. Describe given type of water	5.1 Bandhara irrigation- Layout, Components, construction and working, solid and open bandhara. 5.2 Percolation tank – Necessity and selection of site 5.3 Weir-component parts, types, K.T.weir- components and construction 5.4 Barrages – Components and their functions, Comparison between weir and barrage. 5.5 Diversion head work – necessity, layout of diversion head work with its components and their function 5.6 Lift Irrigation- Components and their functions, layout 5.7 Sprinkler and Drip irrigation- Need, layout of scheme and component parts, maintenance, Merits & demerits 5.8 Well Irrigation- types of well, yield of well 5.9 Farm ponds, Jalyukt shivar scheme	12

	shade scheme		
6. Canals	6a. Classify canals on the basis of given criterion. 6b. Calculate the balancing depth for the given cross section of canal from the given data. 6c. Design a most economical section for the given type of canal section for given condition. 6d. Suggest suitable material for given type of canal lining with justification. 6e. Plan the suitable CD work for given situation. 6f. Describe the working of given canal structure. 6g. Prepare the checklist for maintenance of the given canal. 6h. Suggest relevant remedial measures against water logging in given situation.	6.1 Canals-Classification according to alignment and position in the canal network. 6.2 Typical canal section – Cross section of canal in embankment and cutting, partial embankment and cutting. Balancing depth of canal (simple numerical). 6.3 Design of most economical section of canal (simple numerical) 6.4 Canal lining – purposes, materials used and its properties, advantages of canal lining 6.5 Canal CD work-Definition, Types-Aqueduct, siphon aqueduct, super-passage, level crossing 6.6 Canal regulators- Head regulator, Cross regulator, Escapes, Falls and Outlets. 6.7 Canal maintenance 6.8 Water Logging-Causes of water logging, effect of water logging, prevention and remedial measure against water logging	12
Total Hrs.			64

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Sr.No.	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Calculate average rainfall for the given area using a) Arithmetic mean method, b) Thiessen polygon method and c) Isohyetal method	1.Hydrology	2
2	Mark the contributory area for the given outlet from the given topo-sheet and compute the yield of said catchment area.	1.Hydrology	2
3	Estimate the crop water requirement for the given data	2. Water requirement of crop	2
4	Estimate the capacity of canal for the given data	2. Water requirement of crop	2
5	Calculate the reservoir capacity from the given data	3. Reservoir planning	2
6	Calculate control levels for the given data for the given reservoir.	3. Reservoir planning	2
7	Draw typical cross-section of given type of earthen dam.	4.Dams and spillways	2
8	Draw the theoretical and practical profile of the given gravity dam section	4.Dams and spillways	2
9	Draw sketch of spillway with gate and energy dissipation arrangement for the given dam section.	4.Dams and spillways	2
10	Draw a labelled sketch of given Kolhapuri type weir (plan & sectional elevation)	5. Minor & Micro Irrigation	4

11	Draw a labelled sketch of the given Diversion head work, detailed sketch of any one component of it. (Divide wall / Silt excluder / Fish ladder)	5. Minor & Micro Irrigation	2
12	Draw Plan and Sectional elevation of any Canal cross-drainage work i.e., Aqueduct, super passage, level crossing (Any one)	6. Canals	2
13	Prepare detailed report with sketches on the visit to Irrigation structures (e.g., Dam, Weir, Barrage, Canals structures, Percolation tank, Lift irrigation, Sprinkler/Drip irrigation work, farm pond, Jalayukt shiwar work),)	All Units	6
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Hydrology	02(00)	03(03)	06(03)	11(06)
02	Water requirement of crops	02(02)	03(00)	06(06)	11(08)
03	Reservoir planning	02(00)	03(00)	06(06)	11(06)
04	Dams and spillways	02(02)	09(03)	00(00)	11(05)
05	Minor irrigation scheme	02(00)	03(03)	00(00)	05(03)
06	Canals and Canal cross drainage works	02(02)	03(06)	06(00)	11(08)
	Total	12(06)	24(15)	24(15)	60(36)

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	2	R	2	4	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	1	U	3	4	U	3				3/5
03	4	U	3	4	U	3	4	U	3	5	U	3	6	U	3				3/5
04	1	A	3	5	U	3	6	U	3	1	A	3	6	U	3				3/5
05	1	A	3	2	A	3	2	A	3	3	A	3	3	A	3				3/5
06	3	A	6	6	A	6	2	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1,2,3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1,2,3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	25#	10	Rubrics & Practical Answer Sheets	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4, 5, 6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Sketch of assigned component to suitable scale	20
2	Description	10
3	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	3	-	-	2	-	3	-	-
2	3	3	-	-	2	-	3	-	-
3	3	3	-	-	2	-	-	-	-
4	3	2	-	-	2	2	3	3	-
5	3	2	-	-	2	2	3	3	-
6	3	3	-	-	2	2	-	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of publication	ISBN Number
1.	Irrigation and Water Power Engineering	B. C. Punmia, B. B. Pande . Standard Publisher. 16 th Edition 2015	9788131807637
2.	Irrigation and Hydraulic Structure	S. K. Garg, Khanna Publisher, New Delhi, 2010. 29 th Edition 2015	8174090479
3.	Irrigation and Water Resources Engineering	G. L. Asawa New Age International, 2006	8122416738
4.	Irrigation Engineering	N. N. Basak, Tata Mcgraw Hill 10 th Edition 2007	0074635387
5.	Irrigation Engineering	R. K. Sharma, T. K. Sharma, S. Chand and Co., 3rd Edition 2008 Reprint 2015	9788121921282

• **E-REFERENCES:**

- <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/hydrological-cycle>, accessed on February 20, 2022.
- https://wrd.maharashtra.gov.in/Upload/PDF/Planning%20of%20LISchemes_Pathak_1552_020.pdf, accessed on February 20, 2022

- <https://www.adda247.com/defence-jobs/dams-and-reservoir>, accessed on February 20, 2022
- <https://www.sciencedirect.com/topics/engineering/rain-gauge>, accessed on February 21, 2022.
- <https://www.theweathermakers.org/how-rain-gauge-work/> accessed on February 21, 2022.
- <https://theconstructor.org/water-resources/irrigation/water-requirement-crops-delta-duty-water/37581/> accessed on February 21, 2022.
- <https://civilengineeringnotes.com/reservoir-types-storage-zones/> accessed on February 21, 2022.
- <https://engineeringcivil.org/articles/seepage-in-earth-dam-seepage-analysis-control-measures/> accessed on February 21, 2022.
- <https://osme.co.in/wp-content/uploads/2020/04/irrigation.pdf> accessed on February 21, 2022.
- <https://theconstructor.org/water-resources/cross-drainage-works-types/12051/> accessed on February 21, 2022.
- <https://www.conserve-energy-future.com/types-causes-effects-solutions-waterlogging.php> accessed on February 21, 2022.

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. S. R. Kukadapwar	Head of Civil Engineering (Second Shift)	Government Polytechnic, Nagpur.
2.	Mr. R. M. Walke	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. M. D. Keskar	Structural Designer	
4.	Dr. M. M. Kadu	Professor & Head, Civil Engineering	Ramdeobaba College of Engineering and Management, Nagpur

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE304G^s
COURSE TITLE	: MAINTENANCE OF STRUCTURES
PREREQUISITE	: -
TEACHING SCHEME	: TH: 03; TU: 00; PR: 02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TUCREDIT = 1CLOCK HR; 2 PR CREDIT=1 CLOCK HR)
TH. TEE	: 03 HRs
PR. TEE	: 02 HRs (Internal)
PT	: 01 HRs

❖ **RATIONALE:**

It is absolutely necessary to maintain the building structure in order to preserve the assets and protect the building the building occupants. Normally, the external parts of a building get weathered quickly being exposed to the natural environment. Overlooked dilapidation and inadequate maintenance in the building lead to loose mortar, tiles and bricks of external walls, spalled concrete and thereby threaten public safety. Proper building maintenance ensures that the building and the environment remain healthy, clean and a safe place to work or reside. The strengthening of elements for sustaining loads in future enhances the life, use and raise the value of structures. Regular inspection and maintenance is therefore necessary for timely identification of deteriorated building elements. However, this requires a scientific approach through the investigation of failure pattern. The civil engineering technologists are required to prevent the deterioration of different types of buildings and also to repair the damages in the building. This course is therefore designed to develop the competency to do all these activities.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Select the relevant method of maintaining different building structures.
2. Test the structures to predict its stability
3. Select the relevant materials for repair of structures.
4. Apply the relevant methods of repair for the masonry structures.
5. Restore the damages of building structural elements using suitable method of repair.
6. Prepare the structural audit and budget for the maintenance of structures.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Basics of maintenance and repairs	1a. Describe the necessity of maintenance and repairs of the civil structure. 1b. Identify the factors that influence on maintenance of given structure with justification. 1c. Describe the concept of retrofitting, re-strengthening, rehabilitation, and restoration 1d. Describe the periodical maintenance and its manual, monsoon maintenance, maintenance history sheet.	1.1 Maintenance and its classifications, repair, retrofitting, re-strengthening, rehabilitation and restoration. 1.2 Necessity, objectives and importance of maintenance and repairs. 1.3 Factors influencing the maintenance and repairs 1.4 Advantages and limitations of maintenance and repairs. 1.5 Approach of effective management for maintenance and repairs. 1.6 Periodical maintenance, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, pre and post monsoon maintenance.	08
2. Causes and detection of damages	2a Identify the causes of damages occurred in the given structures. 2b Describe the systematic approach of damages. detection 2c Describe non-destructive test with respect to the given damaged structural elements 2d Describe the procedure of non-destructive test used to detect the damages.	2.1 Common defects and failures with possible causes in Building, Roads, Bridges, Water supply and Sewerage scheme, canal and Cross Drainage (CD) works. 2.2 Material used for different repairs Epoxy resin, Epoxy mortar, polypropylene, poly-sulphate, silicon, gypsum cement mortar, polymer concrete, fiber reinforce concrete. Etc observations for detection of damages. 2.3 Tests on damaged structures: rebound hammer, ultrasonic pulse velocity, rebar locator, cover gauge, crack detection microscope, chloride test, sulphate attack, pH measurement, half- cell potential meter.	08

3. Materials for maintenance and repairs	3a. Select the relevant materials to repair the given type of damages with justification. 3b. Suggest the suitable materials for the anti-corrosion, adhesives and mortar repairs. 3c. Suggest the relevant materials for waterproofing, and joint sealants for the repairing of given structure. 3d. Select the relevant materials for surface coating and grout for the repairing of given structure. 3e. Choose the relevant materials for the repair of damaged structures with justification.	3.1 Factors influencing the material selection for maintenance and repairs. 3.2 Anti-corrosion coating materials: cement slurry mortar, polymer modified cement slurry and epoxy zinc. 3.3 Adhesives materials: solvent free adhesives: epoxy adhesive, polyester adhesive, acrylic adhesive and water borne adhesives: polyvinyl acetate and vinyl acetate co-polymer. 3.4 Mortar repair materials: cementitious mortar, polymer modified cementitious mortar and resin mortar. 3.5 Joint sealants materials: oleo resinous mastics, bitumen/rubber based sealants and acrylic resin sealant. 3.6 Grout materials: cement grout, cement sand grout, cement sand grout with additives, polymer modified cement grout and normal epoxies. 3.7 Waterproofing roof materials: poly-isobutylene (PIP) sheet, glass fiber reinforced plastics, bitumen and bituminous emulsion and latex cement coating. 3.8 Surface coating materials for concrete protection: bituminous cuthacks, chlorinated rubber coating, Vinyl coatings, epoxy coating and coal tar epoxy. 3.9 Additional repairing materials: plastic or aluminum nipples, polyester putty or 1:3 cement sand mortar and galvanized steel wire fabrics & clamping rods.	08
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4. Maintenance and repair methods for masonry	4a. Identify the various causes of wall cracks and their probable locations 4b. Select the relevant repair techniques for the damages in the given civil structures with justification. 4c. Describe the repairing methods for the different crack types for the given structure. 4d. Describe the damping effect and its repair techniques 4e. Describe the various methods of improving the bearing capacity of foundation	4.1 Causes of wall cracks due to bulging of wall, shrinkage, bonding, shear and tension, differential settlement of foundation, thermal movement and vegetation. Probable crack location_ column & wall, junction cracks in masonry joints. 4.2 Stages of repair: material removal and surface preparation, fixing suitable formwork, bonding/ passivating coat and repair applications. 4.3 Repair techniques: grouting, patch spalling replacement or delaminating and epoxy bonded mortar. 4.4 Repairing methods for minor & medium cracks include epoxy injection, grooving & sealing, shotcrete, stitching, grouting and gunting. 4.5 Repairing methods for major cracks (width more than 5mm) include fixing mesh across cracks, dowel bars, RCC band and installing ferro-cement plates at corners and propping. 4.6 Effects of dampness in wall, damping repair techniques such as replacement or inserting DPC in brick wall, bituminous painting, painting using water proof solution and cement with adhesive gum. 4.7 Causes and remedies of foundation settlement, improvement techniques by compaction, intruding sand piles, stone columns and grouting cement slurry.	08
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5. Maintenance and repair methods for RCC	5a. Identify the probable crack location in RCC and causes of RCC failure 5b. Identify the causes of dampness in roof slab and its various repair techniques 5c. Suggest the repair methods for the cracked RCC elements 5d. Select the relevant repair methods for cracks in RCC structures 5e. Identify the repair of corroded RCC elements, honeycomb and large voids in the given structure	5.1 Probable location of cracks in RCC elements, various causes of RCC failure. 5.2 Causes of dampness in roof slab and its repair techniques such as mud phuska with brick tile topping, lime concrete terracing, ferro-cement topping and brick coba. 5.3 Repair methods for cracks in RCC structures such as epoxy injection, grooving & sealing, stitching, rebaring, grouting, spalling replacement, jacketing, shotcrete and gunniting. 5.4 Repair of corroded RCC element: exposing and undercutting rebar, cleaning reinforcing steel, compensating reinforcement and protective coating. 5.5 Repair methods for honeycomb and larger voids.	08
6. Structural audit and Budget	6a. Describe the necessity and importance of structural audit & budget estimation 6b. Describe the procedure involved in structural audit and budget estimation 6c. Describe the step-by-step procedure for maintenance of the given structure. 6d. Prepare the formats for the process of structural audit and budgeting 6e. Describe the rules & regulations of structural audit and budget estimation as recommended by competent authority	6.1 Necessity and importance of structural audit and budget estimation 6.2 Distress survey, detailed inspection, Recommendations for budget estimation 6.3 Steps involved in structural audit and budget estimation. 6.4 Format preparation for structural audit including general information of building, building data, complain reported by users, inspection of internal and external areas of building. 6.5 Overview on rules and regulations of structural audit and budget estimation as recommended by competent authority such as Public Work Department.	08
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

(Any 08 from the list given below covering all six units.)

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Identify the causes of damages for the given building elements.	1	04
02	Prepare the check list for materials required for repair of load bearing building and framed building.	1	04
03	Prepare a check list for repair of a load bearing building and framed building.	1 & 2	04
04	Determine the compressive strength of any two structural elements such as column, beam, slab etc for damaged or undamaged structure using Rebound Hammer.	2	04
05	Determine the extent of efflorescence in masonry or concrete for damaged or undamaged structure.	2	04
06	Determine the crack nature of any two structural elements such as column, beam, slab etc. for damaged structure using Ultrasonic Pulse Velocity test.	2	04
07	Determine the bond strength of any one structural element such as column, beam, and slab etc. using pull out test.	2	04
08	Determine the size, depth and location of reinforcing bar using Rebar locator of any two structural elements such as column, beam, slab etc. for damaged or undamaged structure	2	04
09	Determine Maximum Chloride content in concrete in percent by weight of cement using Rapid Chloride Test of any one structural element such as column, beam, slab etc for undamaged structure.	2	04
10	Determine the depth of carbonation of concrete using phenolphthalein indicator of any two structural elements such as column, beam, slab etc. for undamaged structure.	2	04
11	Determine the moisture content using Moisture Meter of any two structural elements such as column, beam, slab etc. for damaged or undamaged structure.	2	04
12	Determine the corrosion of reinforcing bar using Half-cell Potentiometer of any two structural elements such as column, beam, slab etc for damaged or undamaged structure.	2	04
13	Determine the compressive strength of extractor core using Compression Testing Machine of any one structural element such as column, beam, slab etc. for damaged or undamaged structure.	2	04
14	Prepare a list of material requirements and check list for repair of wall cracks as per the damages found.	3	04

15	Prepare a report on damage assessment of non-residential structures such as dams, bridges, industrial buildings etc.	4	04
16	Prepare a check list for repair and material requirement for flooring of given structure.	4	04
17	Prepare a check list for materials required and resources for repair of sanitary unit of the building.	4	04
18	Repair the cracks for a damaged plane concrete member of size of 100x100x500mm or 150x150x750mm	5	04
19	Prepare a budget estimation considering materials, task force, equipment's and methodology for the given damaged structure.	6	04
20	Determine the flexural strength of repaired beam in practical no 18.	4 & 5	04
Total Hrs.			32

❖ SPECIFICATION TABLE FOR THEORY PAPER:

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Basics of maintenance and repairs	02(02)	03(00)	00(00)	05(02)
02	Causes and detection of damages	02(00)	03(03)	06(03)	11(06)
03	Materials for maintenance and repairs	02(02)	03(03)	03(03)	08(08)
04	Maintenance and repair methods for masonry	02(00)	06(03)	06(06)	14(09)
05	Maintenance and repair methods for RCC	02(00)	06(03)	06(03)	14(06)
06	Structural audit and budget	02(02)	03(03)	03(00)	08(05)
	Total	12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ QUESTION PAPER PROFILE FOR THEORY PAPER:

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	3	R	2	6	R	2										
02	1	U	3	2	U	3	3	U	3	2	U	3	3	U	3				3/5
03	4	U	3	4	U	3	5	U	3	4	U	3	5	U	3				3/5
04	5	U	3	6	U	3	6	A	3	6	U	3	5	A	3				3/5
05	2	A	3	3	A	3	2	A	3	3	A	3	2	A	3				3/5
06	4	A	6	5	A	6	4	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	20	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		Questionnaires	1, 2, 3, 4,5,6
	End Of Course			End Of The Course				

❖ SCHEME OF PRACTICAL EVALUATION

S No.	Description	Max Marks
1.	Selection of materials	10
2	Identification of Defects	10
3	Remedial Measures	10
4	Viva -voce	20
	Total	50

❖ MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes (POs)										PSO's	
	1	2	3	4	5	6	7				1	2
1	3	-	-	-	2	-	-				-	-
2	3	3	-	3	2	2	2				3	3
3	3	-	-	-	2	2	2				3	-
4	3	3	-	3	2	2	2				3	-
5	3	3	-	3	2	2	2				3	-
6	3	3	-	-	2	2	2				3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ REFERENCE and TEXT BOOKS:

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Maintenance and Repairs of Building	P.K. Guha. New Central Book Agency,	10: 8173813558 13 : 978-8173819559
2.	Maintenance Engineering for Civil Engineering	C. S. Nayak, Standard Publisher	
3.	Building Construction	Sushil Kumar, Standard publications	10: 8180141683 13:978-8180141683
4.	Theory and Practices of concrete Technology	M.S. Shetty, S Chand and Co. New Delhi.	10: 8121903483 13: 978-8121903486
5	Building Maintenance	Ivor H. Seeley, Redwood Burn Ltd, ThrowbridgeandEsher	10: 0333171608 13: 978-0333171608
6	Maintenance and Repairs of Buildings	Hutchin Son, BD	Newnes-Butterworth, London (UK) ISBN : 0408001917

❖ E-REFERENCES:

- http://www.unesco.org/education/pdf/7_30.pdf , assessed on 24th October, 2021
- <http://www.iitk.ac.in/nicee/wcee/article/0153.pdf> , assessed on 24th October, 2021

- <http://cpwd.gov.in/Publication/CPWDMaintainencemanual.pdf> , assessed on 24th October, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATIONNIL**

❖ **LIST OF EXPERTS and TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N. V. Raut	Head of Civil Engineering Shift I	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Head of Civil Engineering Shift II	Government Polytechnic, Nagpur.
3.	Dr. Mrs R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5.	Dr. D.N.Kongre	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: ELECTIVE COURSES
COURSE CODE	: CE305G^s
COURSE TITLE	: SOLID WASTE MANAGEMENT
PREREQUISITE	: NIL
TEACHING SCHEME:	TH: 03; TU:00;PR:02(CLOCK HRs.)
TOTAL CREDITS	: 04(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR)
TH. TEE	: 03 HRs;
PR TEE	: 02 HRs (External)
PT	: 01 HR

❖ 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. 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 decision about the collection and transportation of waste produced. Various disposal methods 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, recovering and reuse, will lead to proper disposal with acceptability. This will further lead to keeping the natural resources contamination free.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Identify various types of solid waste produced with their characteristics.
2. Describe different methods of collection, transportation and disposal of solid waste.
3. Select suitable method of disposal of solid waste.
4. Describe Bio medical waste, E-waste and Industrial waste.
5. Identify health aspects at various stages of handling & processing of solid waste.
6. Suggest suitable method of recycling and reuse of solid waste.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1.Introduction	a) Identify various types of solid wastes. b) Classify various types of solid wastes. c) Differentiate hazardous & non-hazardous waste. d) Identify the various sources of solid waste, e) Describe physical & chemical characteristics of solid waste. f) Identify the impact of solid waste on environment g) Describe various solid waste management techniques. h) Identify various factors affecting solid waste generation.	1.1 Definition of solid waste 1.2 Meaning of different solid waste – Domestic waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E waste, hazardous waste, institutional waste, etc. 1.3 Sources of solid waste 1.4 Classification of solid waste – hazardous and non-hazardous waste. 1.5 Physical and Chemical characteristics. 1.6 Impact of solid waste on environment. Solid waste management techniques – solid waste management Hierarchy, waste prevention and waste reduction. 1.7 Factors affecting solid waste generation.	08
2. Storage, Collection and Transportation of Municipal Solid Waste.	a) Describe storage of municipal waste b) Classify various methods of collection of municipal waste. c) Identify various tools & equipments used for collection of solid waste. d) Classify different solid waste transportation vehicles. e) Describe the necessity & location of transfer station. f) Draw organization pattern of solid	2.1 Storage of municipal waste 2.2 Collection methods of municipal waste.. 2.3 Tools and Equipments – Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community Bin like movable and stationary Bin. 2.4 Transportation of municipal waste. 2.5 Transportation vehicles with their capacity and working-Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumper, Compactor vehicles. 2.6 Transfer station- meaning, necessity, location 2.7 Organization pattern of solid waste management.	08

	waste management.		
3. Disposal of Solid Waste	a) Identify factors affecting composting of waste, b) Describe various methods of composting of waste. c) Describe various land filling methods. d) Identify advantages & disadvantages of landfill method. e) Describe various types of incinerators. f) Identify the products of incineration process with their use. g) Identify advantages & disadvantages of incineration process..	3.1 Composting of waste 04 - Principles of composting process - Factors affecting composting process - Methods of composting – A) Manual Composting – Bangalore method, Indore Method B) Mechanical Composting – Dano Process C) Vermicomposting- Concept 3.2. Land filling technique04 - Factors for site Selection - Land filling methods-Area method, Trench method and Ramp method - Leachate and its control - Biogas from landfill - Advantages and Disadvantages of landfill method 3.3 Incineration of waste 04 - Introduction of incineration process. - Types of incinerators-Multiple chamber incinerators and Municipal incinerators - Products of incineration process with their use - Pyrolysis of waste –Definition, methods, Advantages and Dis – advantages of incineration process	12
4. Special Types of Solid Wastes	a) Identify the sources of biomedical waste generation. b) Classify biomedical waste generation technologies. c) Identify the dangers posed by E waste. d) Describe disposal & recycling of E waste. e) Describe collection & disposal of industrial waste. f) Describe recycling of industrial waste.	4.1 Biomedical Waste 04 - Definition of Biomedical Waste - Sources of Biomedical Waste generation - Classification of Biomedical Waste Management technologies & handling as per rule 1998. 4.2 E-waste04 - Definition of E- waste - Varieties of E- waste - Dangers of E- waste - Disposal of E- waste - Recycling of E- waste 4.3 Industrial waste04 - Variety of industrial waste - Collection & disposal of industrial waste - Control measures of industrial waste. - Recycling of industrial waste.	12

5. Health aspect and public Involvement in solid waste management	a) Identify health aspects at various stages of handling & processing of solid waste.	5.1 Health aspects during handling and processing of solid waste. 5.2 Health problems encountered during time of segregation, reuse, recovery, recycling of solid waste.	04
6 Recycling of Solid Waste	a) Identify the purpose of recycling of solid waste. b) Describe methods of collecting recyclables.	6.1 Introduction, purpose of recycling of solid waste 6.2 Benefits of recycling of solid waste 6.3 Methods of collecting recyclables. 6.4 Solid waste recycling in India..	04
Total Hrs.			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
01	Prepare visit report on solid waste disposal plant nearby city	01	04
02	Prepare visit report on composting plant.	03	04
03	Prepare visit report on Biogas plant.	03	04
04	Prepare visit report on vermin composting plant.	03	04
05	Prepare visit report on biomedical waste treatment plant	04	04
06	Prepare visit report on Industrial solid waste treatment plant.	04	04
07	Collect information of various machinery used for collection and transportation of solid waste.	02	04
08	Prepare report on health aspect during handling and transportation of solid waste	05	04
09	Prepare visit report on transfer station	02	04
10	Prepare report on organization pattern of solid waste management	02	04
(Any Eight practicals to be conducted)		Total Hrs.	32

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1,2,3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1,2,3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1,2,3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	1,2,3,4,5,6
		Journal Writing		Continuous	05	--	Journal	1,2,3,4,5,6
				TOTAL	25	10		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	50#	10	Rubrics & Practical Answer Sheets	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S. N.	Description	Max. Marks
1	MCQ based Questionnaire	30
2	Viva voce	20
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (Pos)							PSO's	
	1	2	3	4	5	6	7	1	2
1	3	-	-	-	3	-	3	3	-
2	3	3	-	2	3	2	3	3	-
3	3	-	-	-	3	-	3	3	-
4	3	-	-	-	3	2	3	3	-
5	3	-	-	-	3	-	3	3	-
6	3	3	-	2	3	2	3	3	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Water Supply and Sanitary Engineering	G. S. Birdie, J. S. Birdie, Standard Publishers Distributors	8187433795, 9788187433798
2.	Water Supply And Sanitary Engineering	S. C. Rangwala Charotar Publishing House, 2005	8185594597, 9788185594590
3.	Elements of water supply and wastewater disposal	Gordon Maskew Fair; John C New York u.a. : Wiley u.a., 1981harles Geyer; Daniel A Okun	0470390980
4.	Solid Waste Management	Bhide, A. D., National Scientific Documentation Centre, New Delhi.	---
5.	Wastewater Engineering (Including Air Pollution)	B. C. Punmia, Arun Kumar Jain, Ashok Kumar Jain, Laxmi Publications; Second Edition, 2016	8131805964 978-8131805961

• E-REFERENCES:

- www.leka.lt/sites/default/files/dokumentai/concise-environmental-engineering.pdf accessed on 31st August, 2021.
- www.tnu.edu.vn/sites/quynhntt/references/8064517-Environmental-Engineering.pdf accessed on 31st August, 2021.
- bookboon.com/en/environmental-engineering-ebooks, accessed on 31st August, 2021.
- <https://www.engr.udel.edu/downloads/UndergradEnvironmental.pdf> accessed on 31st August, 2021.
- <https://www.youtube.com/watch?v=syn4lUvF3YE> accessed on 31st August, 2021.
- <https://www.youtube.com/watch?v=yZJbgimr5hg> accessed on 31st August, 2021.

❖ LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION

NIL

❖ LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:

S.N.	Name	Designation	Institute / Industry
1.	Dr. N. V. Raut	Head of Civil Engineering Shift I	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Head of Civil Engineering Shift II	Government Polytechnic, Nagpur.
3.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Mr. S K Rangari	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: CORE COURSE
COURSE CODE	: CE306G
COURSE TITLE	: CONSTRUCTION MANAGEMENT
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 03; TU: 00; PR: 00(CLOCK HRs.)
TOTAL CREDITS	: 03(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: 03 HRs
PR. TEE EXAM	: Nil
PT. EXAM	: 01 HRs

❖ RATIONALE:

Management of human and material resources in any organization is of primary importance to economize and optimize the cost factor. It is necessary for the students of civil engineering to use advanced scientific techniques of management. Civil engineering students need to understand the importance of Human Resource along with the scarce material resources.

❖ COURSE OUTCOMES:

After completing the course students will be able to-

- 1 Identify the roles of individuals, companies, and agencies involved in the construction process and communicate effectively.
- 2 Describe various types of organizational structures, principles of organization and role of Entrepreneurs in National development.
- 3 Apply various techniques and methods to plan, schedule and control construction projects.
- 4 Describe functions of Personnel Management.
- 5 Identify various techniques of material management and quality control.
- 6 Describe various Labour laws.

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs
1. Introduction to Management	1 Define Management, Administration. 2 Compare Management and Administration. 3 Define Function of Management. 4 Apply the principles of management. 5 State the social responsibility of civil engineer	1.1 Definition of Management 1.2 Necessity of Management in construction industry 1.3 Evolution of management – Role of F.W. Taylor, Henry Fayol and Gilberth 1.4 Henry Fayol's Principles of Management 1.5 Function of management - Planning, Organizing, Directing, Controlling, Coordinating and Supervising 1.6 Application of Principles of management to Civil Engineering Construction projects. 1.7 Social and Public responsibility of Management 1.8 Levels of management and Management structure 1.9 Administration and Management	4
2. Organization	1 Define the organization. 2 Compare various types of organizations. 3 Prepare typical organizational charts. 4 Interpret appropriate type of ownership. 5 Apply the principles of organization.	2.1 Definition of Organization 2.2 Need of organization 2.3 Principles of organization 2.4 Types of organization - Line, Line and staff and Functional organizations their merits and demerits. 2.5 Typical organizational charts for small, Medium and Large Construction Firms. 2.6 Organizational chart of Public Works Department and Irrigation department 2.7 Forms of Ownership- Proprietorship, Private Ltd. Company Joint Stock Company, Cooperative Societies with their definitions, scope, Merits and demerits of these forms of Ownership.. 2.8 Government, Semi Government and public undertaking, Organization working in construction sector	10

3. Project Management	1. State the necessity of planning and scheduling. 2. Compare PERT (Project/ Programme Evaluation and Review technique) and CPM (Critical Path Method) methods of network analysis. 3. Prepare schedule for construction activities. 4. Calculate the project duration.	3.1 Necessity and importance of planning and scheduling 3.2 Pre tender and Post tender planning of owner and contractor 3.3 Preparation of schedule- work break down structure, 3.4 Types of schedules - Construction schedule, material schedule, manpower schedule, financial schedule. 3.5 Bar chart method- procedure, merits and limitations of bar chart. Preparation of bar chart for construction work of septic tank, open well, isolated column footing. 3.6 Network methods of planning and scheduling - Terms associated, Precautions to be taken, Numbering the events by Fulkerson's Rule and Development of network. C.P.M - Concept of C.P.M, terminology used , Types of time estimate - EST, EFT, LST, LFT. Critical path - forward pass, backward pass, critical activities, and various floats- total, free and independent, Calculation of project duration 3.7 P.E.R.T- Beta distribution curve, Various time estimates - Optimistic, Pessimistic, Most likely and Expected duration. Simple Problems on CPM and P.E.R.T. 3.8 Advantages and limitations of network method, Comparison between C.P.M and P.E.R.T	12
4. Human Resource	1 Define Personnel Management.	4.1 Personnel management - Definition ,and Functions. Types of labour	08

Management	2 Describe the functions of Personnel Management. 3 Identify appropriate style of leadership. 5. Interpret the human needs. 4 Apply the motivational techniques.	4.2 Staffing - Introduction to Human Resources planning, Recruitment Procedure. 4.3 Leadership –Types of leadership its suitability, advantages and disadvantages, Qualities of good leader. 4.4 Human relations and its effects on efficiency. 4.5 Human needs – varieties and its hierarchy 4.6 Douglas Mc Gregor's Theory X and Theory Y 4.7 Kinds of Motivation, Hygiene and Motivational Factors, Herzberg model.	
5. Material Management and Quality Control	1. State inventory management techniques. 2. Identify and choose appropriate method for inventory management. 3. Employ appropriate method for inventory procurement. 4. Define terms Quality and ISO. 5. Describe various quality control techniques. 6. Compare various techniques of quality control. 7. Interpret importance of ISO, Quality Circle.	5.1 Inventory management - meaning and objectives of Inventory and Inventory control. (No numerical problems) 5.2 Techniques of inventory control, ABC analysis 5.3 Economic order quantity (EOQ) Ideal inventory model (reorder point), Graphical representation 5.4 Modern Techniques of Material management 5.5 Introduction to JIT/SAP/ERP techniques of Inventory management. 5.6 Concept of Quality ,Definition of Quality and Quality Assurance, Introduction to International Organization for Standardization (I.S.O.), Quality circle.	08
6. Labour Laws	1. Identify the necessity of labour laws. 2. Describe the methods of payment to worker. 3. Interpret provisions of various acts.	6.1 Introduction of Labour law, Necessity of Laws. 6.2 Method of wage payment- Time rate system, Piece rate system, 6.3 Meaning and important Provision of- Minimum wage Act, Workmen compensation act -Definitions of Dependent, Partial and Total Disablement, Contract Labour Act, ESI Act, Industrial Dispute Act, Factory Act.	06
Total Hrs			48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
Nil			

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	Introduction to Management	02(02)	03(03)	00(00)	05(05)
02	Organization and Entrepreneurship Development	02(02)	06(03)	06(03)	14(08)
03	Project Management	02(00)	06(03)	12(06)	20(09)
04	Human Resource Management	02(02)	03(03)	03(03)	08(08)
05	Materials Management and Quality Control	02(00)	03(03)	03(03)	08(06)
06	Labour Laws	02(00)	03(00)	00(00)	05(00)
		12(06)	24(15)	24(15)	60(36)

R – Remember

U – Understand

A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	2	R	2	3	R	2	4	R	2	5	R	2	6	R	2	6/9
	1	R	2	2	R	2	4	R	2										
02	1	U	3	2	U	3	2	U	3	1	U	3	2	U	3				3/5
03	3	U	3	3	U	3	4	U	3	3	U	3	4	U	3				3/5
04	5	U	3	6	U	3	5	A	3	5	U	3	5	A	3				3/5
05	2	A	3	2	A	3	4	A	3	2	A	3	4	A	3				3/5
06	3	A	6	3	A	6	3	A	6										2/3

T= Unit/Topic Number

L= Level of Question

M= Marks

R-Remember

U-Understand

A-Analyze/ Apply

❖ ASSESSMENT AND EVALUATION SCHEME:

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	25	--	Test Answer Sheets	1, 2, 3,4,5,6
		Assignments		Continuous	15	--	Assignment Book / Sheet	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End Of the Course	60	24	Theory Answer Sheets	1, 2, 3,4,5,6
				Total	100	40		
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	--	--	--	--
		Journal Writing		Continuous	--	--	--	--
				TOTAL	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
NIL		

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7				1	2
1	3	-	-	-	2	-	-				-	-
2	3	3	-	3	2	3	2				3	-
3	3	3	-	3	2	3	2				3	-
4	3	-	-	3	2	3	2				3	-
5	3	-	-	3	-	3	2				3	-
6	3	-	-	-	2	-	2				3	-

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Industrial Engineering & Management	T.R.Banga & S.C.Sharma, Khanna Publishers, Edition-25, 2014	10: 81-7409-078-9 13:978-81-7409-078-9
2.	Industrial Engineering And Management	O.P. Khanna, Dhanpat Rai, New Delhi, 1999	978-81-89928-35-3
3.	Construction Planning and Management	P.S.Gahlot and B.M.Dhir, New Age International, Pvt. Ltd. New Delhi	81-224-0411-1
4.	Construction Planning and Management	Dr.U.K.Shrivastava, Galgotia Publication, Pvt. Ltd. New Delhi	81-7515-246-X
5.	Construction Management And Accounts	V.N.Vazirani and S.P.Chandola, Khanna publishers, Delhi	978-81-7409-303-5
6.	Entrepreneurial Development	S.S.Khanka, S.Chand & Co. Ltd, Delhi, 1 st , 1999, reprint 2006	81-219-1801-4

❖ **E-REFERENCES:**

- www.isixsigma.com › Methodology › Project Management assessed on 16April 2021
- www.iso.org/ assessed on 16April 2021

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N. V. Raut	Head of Civil Engineering Shift I	Government Polytechnic, Nagpur.
2.	Dr. S. R. Kukadapwar	Head of Civil Engineering Shift II	Government Polytechnic, Nagpur.
3.	Dr. (Mrs) R A Wankhade	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
4.	Dr. S. J. Nikam	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.
5.	Mr. A. J. Fulzele	Lecturer in Civil Engineering	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CIVIL ENGINEERING
LEVEL NAME	: PROJECT
CODE	: CE307G ^s
COURSE TITLE	: PROJECT (CIVIL)
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 04(CLOCK Hrs.)
TOTAL CREDITS	: 02(1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE EXAM	: NIL
PR. TEE EXAM	: 02 HRs (External)
PT. EXAM	: NIL

❖ RATIONALE:

Project course is the manifestation of technical knowledge acquired by the student during their course of work. This course provides an opportunity to the students to identify and solve real life problem of the industries /research organization / society. Students also get opportunity to provide innovative, economic and technological viable solution to the world of work.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Select possible project work through market survey /Literature survey.
- 2 Select project and Develop method of commencement of project work.
- 3 Analyze feasibility using analysis tools
- 4 Perform project work in group
- 5 Prepare project report
- 6 Present project work, Demonstrate and justify the outcome of project work

❖ COURSE DETAILS:

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1.	Perform introductory Task - Form project batch of four-five students - Select project as per area of interest - Select topic / industrial problem / work by consulting the guide from following list Projects based on the following areas - Environmental engineering - Transportation engineering - Water resources engineering - Advanced Survey - Construction management - Construction materials - Contracts, Accounts and valuation - Small scale industry related to civil engineering, - Construction technology - Remote sensing & GIS - Any other recent topic related to civil engineering Perform Literature Survey - Refer various Periodicals, Journals, Books, Internet literature related to project topic - Note down findings - Prepare database of collected literature on the basis of title, area of work, methodology used, type of work - Analyze industrial need - Prepare brief report	Introductory Task and Literature Survey	10
2	Plan project - Prepare Synopsis in standard format which includes following. Title Page: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name - Use Latex for preparing synopsis. - Submit the Synopsis to guide. - Approve synopsis from guide - Prepare action plan of project activities - Submit the action plan to guide. - Approve action plan from guide	Planning	10
3	Perform Project work Activities to be performed - Literature Survey - Survey/ testing	Project Work	15

	• Drawings • Computations • Result compilation • Conclusions • Report Writing		
4	Test Project work	Testing	15
5	Prepare project report in standard format, which includes following. • Title Page which includes: Project Title, Purpose of submission, Institute logo, Students Name, Guide Name, Department and Institute Name • Certificates: Student declaration, Certificate from guide • Acknowledgement • Table of contents • List of Tables • List of Figures • List of abbreviations and acronyms (if any) • Text 1. Introduction, objectives 2. Literature Survey 3. Methodology/Materials/Methods/Estimate. 4. Results 5. Summary/Conclusion. 6. References Use Latex for preparing report. Perform plagiarism check from free internet site. • Submit report of plagiarism check to the guide with project report	Project Writing	10
6	Present project work • Prepare power point presentation of work done. • Prepare yourself to handle examiner questions after presentation. • Practice group presentation. • Present before guide.	Presentation	4
		Total	64

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Not Applicable

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Not Applicable

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	80	--	Rubrics, Assessment Sheets & Project work done	1, 2, 3, 4,5,6
		Writing		Continuous	20	--	Project Report	1, 2, 3, 4,5,6
				TOTAL	100	40		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	100#	40	Rubrics & Project Report and work done	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form		1, 2, 3, 4,5,6	
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of Topic	10
2	Literature Survey	10
3	Project planning and implementation	10
4	Project work and Results and conclusions	20
5	Group Presentation of Work Done	10
6	Viva voce	40
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)	
	1	2	3	4	5	6	7	1	2
1	3	3	3	3	3	3	3	3	-
2	3	3	3	3	3	3	3	3	-
3	3	3	3	3	3	3	3	3	-
4	3	3	3	3	3	3	3	3	2
5	3	3	3	3	3	3	3	3	-
6	-	-	-	-	-	3	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1	Models & Methods for Project Selection	Graves, Samuel B., Ringuest, Jeffrey L, International Series in Operations Research & Management Science Volume 58 2003	978-1-4615-0280-7
2	R and D Project Selection	Joseph P. Martino, Wiley series in Engineering and Technical Management	978-0471595373

❖ **E-REFERENCES:**

<http://www.che.iitb.ac.in/online/resources/academic-resources/technical-guides-and-tools/report-writing/guidelines-presentation-semin>, accessed on 4th November 2021

<http://www.jgsee.kmutt.ac.th/exell/General/PaperThesis.html>, accessed on 4th November, 2021

<http://www.engineeringcivil.com/how-to-write-a-project-report.html>, assessed on 28th October, 2021

<https://newton.ex.ac.uk/handbook/PHY/forms/WLB010919-4.pdf>, accessed on 4th November, 2021

<http://civil.final-year-projects.in/>, accessed on 4th November, 2021

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr.. N.V.Raut	Head of Civil Engineering	Government Polytechnic, Nagpur.
2.	Dr. S.R.Kukadapwar	Head of Civil Engineering	Government Polytechnic, Nagpur.
3.	Mr. A. J. Fulzele	Lecturer in Civil Engg.	Government Polytechnic, Nagpur.
4.	Mr. R.M.Walke	Lecturer in Civil Engg.	Government Polytechnic, Nagpur.

 (Member Secretary PBOS)

 (Chairman PBOS)

Appendix
Suggestive Project Diary Format

Week No.:
Activities Planned:
Activities Executed:
Reason for delay if any
Corrective measures adopted
Remark and signature of the Guide

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME : DIPLOMA IN AE/AI/CM/CE/EC/EE/IT/MC/ME/MT/
PK/TX/TR

COURSE CATEGORY: HUMANITIES AND SOCIAL SCIENCE COURSE

COURSE CODE : ES351G

COURSE TITLE : ENTREPRENEURSHIP AND START UP

TEACHING SCHEME : TH: 02; TU: 00; PR: 02 (CLOCK HRS.)

TOTAL CREDITS : 03 (1 TH/TU CREDIT = 1 CLOCK HR., 1PR CREDIT = 2 CLOCK HR.)

TH. TEE EXAM : --

PR. TEE EXAM : --

PT. EXAM : --

RATIONALE:

Entrepreneurship as a mind set and a way of looking toward opportunity, focus and creativity. It's about creating value for customers, investor, entrepreneur, gaining independent in engineering career. Taking bold risk and solving challenges with undefined solution to be an entrepreneur, you need to have the ability to innovate, to improve the old and invent the new. In recent times, our society is influenced by knowledge creation and technological advancements. Competencies affecting Innovation and creativity have become important in all walks of life, including business context. This makes entrepreneurship education even more important for enhancing quality of life. Entrepreneurship plays an influential role in the economic growth and development of the nation. As the world economy is changing so is the dynamism of the business world. The aim of this course is to instil and kindle the spirit of Entrepreneurship amongst students. The idea of this course is to create job providers rather than job seekers.

❖ COURSE OUTCOMES:

After completing this course students will be able to

1. Develop Entrepreneurial mindset.
2. Select self-employment as a viable option for earning dignified career.
3. Adapt the dynamic changes happening in the economy to create employment.
4. Prioritize entrepreneurship as life-skills to improve quality of life and skills of creation to start up.

5. Evaluate opportunities for new creation with overall business Potential and weakness.
6. Develop leadership skill particularly in the area of entrepreneur leadership.

❖ **COURSE DETAILS:**

A. THEORY :

Units	Topics and Subtopics	Hrs.
1. Entrepreneurship Concept and Functions	1.1 Introduction to Entrepreneurship, Entrepreneurship – Concept, Functions and Need 1.2 Entrepreneurship – The Indian Scenario. 1.3 Business Environment and Domain knowledge	04
2. An Entrepreneur & Entrepreneurial Journey	2.1 Development of Entrepreneurial skill and inclination towards entrepreneurship. 2.2 Dimension of Entrepreneurship 2.3 Competencies and characteristics for entrepreneur.	05
3. Entrepreneurs-hip as Innovation and Start up	3.1 Entrepreneurs as problem solvers 3.2 Innovations and Entrepreneurial Ventures – Global and Indian 3.3 Idea generation, Incubation centre.	06
4. Understanding the Market	4.1 Market Concept 4.2 Micro and Macro Market Environment 4.3 Market Research – Concept and Marketing Mix	05
5. Business Finance and Project preparation	5.1 Business plan and project 5.2 Feasibility study of the project 5.3 Project report preparation	06
6. Resource Mobilization	6.1 Institutional Infrastructure to promote entrepreneurship 6.2 Selection and utilization of human resources. 6.3 Business Environment and start up	06

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Outline the success story of any Three entrepreneur from Your Discipline.	1.Entrepreneurship Concept and Functions	02
2	Outline the contribution of SME in GDP of India.	1.Entrepreneurship Concept and Functions	02
3	List out the Barriers faced by entrepreneurship.	1.Entrepreneurship Concept and Functions	02
4	Identify the entrepreneurial traits in students.	1.Entrepreneurship Concept and Functions	04
5	Elaborate the formation of family Business in case study format.	2.An Entrepreneur & Entrepreneurial Journey	02
6	Develop Case study on Technopreneurs like Infosys, UBER, and ZOMATO.	2.An Entrepreneur & Entrepreneurial Journey	06
7	Compose idea generation of new enterprises related to your branch.	3.Entrepreneurship as Innovation and Start up	04
8	Organization of technical feasibility report for the stakeholders and submission for approval.	4.Understanding the Market	04
9	Survey on SSI in your discipline.	5.Business Finance and Project preparation	04
10	List out the facilities and subsidy of SSI unit in your own discipline.	6.Resource Mobilization	02
Total Hrs.			32

❖ **SPECIFICATION TABLE FOR THEORY PAPER: Nil**❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:-Nil**

❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	PT	Students	Two PT (average of two tests will be computed)	--	--	Test Answer Scripts	1, 2, 3,4,5,6
		Class Room Assignments		Assignments	--	--	Assignment Book	1, 2, 3,4,5,6
	TEE (Term End Examination)	End Exam	Students	End of the Course	--	--	Theory Answer Scripts	1,2,3,4,5,6
				Total	--	--		
Direct Assessment Practical	CA (Continuous Assessment)	Continuous Assessment of Practical	Students	End of Every Practical	20	--	Journal	1, 2, 3,4,5,6
		Journal Writing		Assignments	05	--	Journal	1, 2, 3,4,5,6
				Total	25	10		
	TEE (Term End Examination)	End Exam	Students	End of the Course				
Indirect Assessment	Student Feedback on course		Students	After First PT	Student Feedback Form			1, 2, 3, 4,5,6
	End of Course Survey			End of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Practical Content	20
2	Entrepreneur Skills Observed	10
3	Result and Conclusion	10
4	Viva Voce	10
	TOTAL	50

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (COs)	Program Outcomes (POs)							Program Specific Outcomes (PSOs)		
	1	2	3	4	5	6	7	1	2	3
1					3	3	3			
2					3	3	3			
3					3	3	3			
4					3	3	3			
5					3	3	3			
6					3	3	3			

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Entrepreneurship Development and Small Business Management.	Charantimath, P.M.	
2	Entrepreneurship Development in India.	Gupta C.B.	
3	Fundamental of Entrepreneurship and Small Business Management	Himalaya Publishing House.	

❖ **E-REFERENCES:**

1. Harvard Business Review
2. Business India/Business Today/Business World, University News
3. The Journal of Entrepreneurship by SAGE Publisher.
Journals.sagepub.com/home/joe
4. The journal of Entrepreneurship and Innovation in Emerging Economies by SAGE Publisher, journals.sagepub.com/home/eie.
5. International journal of Entrepreneurship and small Business by Inderscience Publisher, www.inderscience.com/ijesb
6. Vikalp Prabandhan

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION:**

Nil

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1	Dr.C.P.Kapse	In Charge Head of Deptt, Textile Technology	Government Polytechnic, Nagpur.
2	Dr.G.K.Awari	Head of deptt. , Automobile Engg. Deptt.	Government Polytechnic, Nagpur.
3	Dr.K.S.Dixit	Lecturer, Automobile Engg.Deptt.	Government Polytechnic, Nagpur.

(Member Secretary PBOS)

(Chairman PBOS)

GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	: DIPLOMA IN CE/ME/EE/EC/CM/IT/AE/MT/PK/TX
LEVEL NAME	: PROJECT & INTERNSHIP
COURSE CODE	: IN351G
COURSE TITLE	: INTERNSHIP
PREREQUISITE	: NIL
TEACHING SCHEME	: TH: 00; TU: 00; PR: 30 (CLOCK Hrs.)
TOTAL CREDITS	: 06 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)
TH. TEE	: NIL
PR. TEE	: 02 HRs (Internal)
PT. EXAM	: NIL

❖ RATIONALE:

The aim of the polytechnic education is to create a pool of skill based manpower to support office and field operations as a middle level link between technicians and engineers. Diploma pass out plays an important role in managing field operations. Therefore, it is necessary to the diploma pass out to get acquainted with the actual field operations in the industry. This course has been designed to give actual working environment exposure to the diploma students.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

- 1 Adhere to field safety practices
- 2 Carry out survey related to civil field processes.
- 3 Work in civil field working environment.
- 4 Identify field problems for civil engineering project course
- 5 Prepare field training report based on work experience
- 6 Present the seminar

❖ **COURSE DETAILS:****A. THEORY :**

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
Nil			

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Weeks
1.	Adhere field Safety Practices - Talk to safety officer - Record the safety practices to be followed in industry. - Record Don'ts and Do's. - Follow all instructions.	Safety Practices	02
2	Perform field Process Survey - Collect information regarding various processes carried out in an industry by discussing the allotted supervisor/officer - Note down findings - Prepare brief report	Survey	03
3	Work in field working environment - Follow instructions of supervisor - Observe industrial processes - Record daily work done in diary	Working Experiences	06
4	Identify field problems - Discuss with the supervisor and workers - Identify the problem in any of the industrial process/system - Record your findings.	Problem Identification	03
5	Prepare field training report in standard format, which includes following. - Title Page which includes: Title, Purpose of submission, Institute logo, Students Name, Industry Name, Department and Institute Name - Certificates: Student declaration, Certificate from industry - Acknowledgement - Text - Introduction to field site - Safety Practices in field site - field site Process - Working Experience - Results - Summary/Conclusion. - References Use Latex for preparing report. Perform plagiarism check from free internet site. - Submit report of plagiarism check to the allotted teacher with field site training report	Report Writing	After Completion of Training
6	Prepare power point presentation & Present seminar before panel of teachers.	Presentation	
Total Weeks			14

- ❖ **SPECIFICATION TABLE FOR THEORY PAPER:** Not Applicable
- ❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:** Not Applicable
- ❖ **ASSESSMENT AND EVALUATION SCHEME:**

	What		To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	CA (Continuous Assessment)	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	--	--	--	--
		Assignments		Continuous	--	--	--	--
	TEE (Term End Examination)	End Exam	Students	End Of the Course	--	--	--	--
				Total	--	--	--	--
Direct Assessment Practical	CA (Continuous Assessment)	Skill Assessment	Students	Continuous	80	--	Rubrics, Assessment Sheets & Report	1,2,3,4,5,6
		Report Writing		Continuous	20	--	Report	1,2,3,4,5,6
				TOTAL	100	40		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	100#	40	Rubrics, Report & Presentation	1, 2, 3, 4,5,6
Indirect Assessment	Student Feedback on course		Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
	End Of Course			End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Selection of field / field supervisor's remark	10
2	Survey	10
3	Work done and Feasibility of work/ problem identified	30
4	Report writing	30
5	Presentation Skills	10
6	Viva voce	10
Total		100

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

Course Outcomes (Cos)	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7				1	2
1	3	3	2	2	2	3	3				-	-
2	3	3	2	2	2	3	3				-	-
3	3	3	-	-	-	3	3				-	-
4	3	3	-	-	-	3	3				-	-
5	3	3	-	-	-	3	3				-	-
6	3	3	-	-	-	3	3				-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Industrial Training and Education	Lokesh Choudhary, Mittal Publications, 2007	10: 8183242367 13: 9788183242363
2.	Training Practice	Penny Hackett, McGraw-Hill Education, September 2003	10: 0852929803 13: 9780852929803

❖ **E-REFERENCES:**

- <http://ihmshimla.org/wp-content/uploads/2013/05/Industrial-Training-Rule-Book.pdf>, assessed on 25th September, 2021

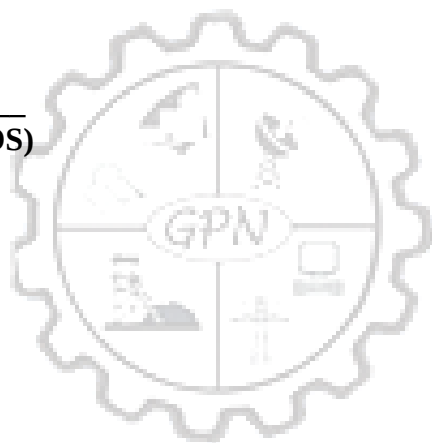
❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

- DLP Projector, latest specification
- Computer, latest specification

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. N V Raut	HoD ,Civil Shift I	Government Polytechnic, Nagpur.
2.	Dr S R Kukdapwar	HoD ,Civil Shift II	Government Polytechnic, Nagpur.
3.	Mr. A. J. Fulzele	Lecturer in Civil Engg.	Government Polytechnic,Nagpur.
4.	Mr. R.M.Walke	Lecturer in Civil Engg.	Government Polytechnic,Nagpur.

(Member Secretary PBOS)



(Chairman PBOS)