Government Polytechnic, Mumbai

(Academically Autonomous Institute of Maharashtra Government)
49,Ali Yawar jung Marg, Kherwadi, Bandra (E)
gpmumbai@gpmumbai.ac.in

Programme : Civil Engineering **Fifth Semester** **With effect from 2016-17**

Course code	Course Title	Teaching Hours				Credits	Examination Scheme					
		L	P	TU	Total		Theory		PR	OR	TW	Total
							TH	TS				
AM16302	Design of RCC & Steel Structures	4	4	--	8	8	70	30	--	50*	25	175
CE16305	Irrigation Engineering	3	2	--	5	5	70#	30	--	50*	--	150
CE16304	Estimating & Costing	3	4	--	7	7	70	30	--	50*	50	200
CE16309	Contracts, Accounts and Valuation	3	--	2	5	5	70	30	--	50*	25	175
MG16502	Entreprennureship Development	1	--	2	3	3	--	--	--	25*	25	50
CE16308	Project	--	4	--	4	4	--	--	--	50*	50*	100
4TH LEVEL	Optional subject II (Any One)	3	--	--	3	3	70	30	--	--	--	100
AM 16401	Prestressed and Precast Concrete											
AM 16402	Advanced Geotechnical Engineering											
AM16403	Advanced Design of Structures											
CE 16405	Solid Waste Management											
	TOTAL	**17**	**14**	**04**	**35**	**35**	**280**	**150**	**0**	**275**	**175**	**950**

Abbreviations: L - Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work.

* Indicates assessment by External Examiner; # online examination

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Programme : Civil Engineering **Fifth Semester** **With effect from 2016-17**

Course code	Course Title	Teaching Hours				Credits	Examination Scheme					
							Theory		PR	OR	TW	Total
		L	P	TU	Total		TH	TS				
AM16302	Design of RCC & Steel Structures	4	4	--	8	8	70	30	--	50*	25	175
CE16305	Irrigation Engineering	3	2	--	5	5	70#	30	--	50*	--	150
CE16304	Estimating & Costing	3	4	--	7	7	70	30	--	50*	50	200
CE16309	Contracts, Accounts and Valuation	3	--	2	5	5	70	30	--	50*	25	175
MG16502	Entreprennureship Development	1	--	2	3	3	--	--	--	25*	25	50
CE16308	Project	--	4	--	4	4	--	--	--	50*	50*	100
4TH LEVEL	Optional subject II (Any One)	3	--	--	3	3	70	30	--	--	--	100
AM 16401	Prestressed and Precast Concrete											
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	TOTAL	**17**	**14**	**04**	**35**	**35**	**280**	**150**	**0**	**275**	**175**	**950**

Abbreviations: L - Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work.

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Programme : Civil Engineering **Fifth Semester** **With effect from 2016-17**

Course code	Course Title	Teaching Hours				Credits	Examination Scheme					
		L	P	TU	Total		Theory		PR	OR	TW	Total
							TH	TS				
AM16302	Design of RCC & Steel Structures	4	4	--	8	8	70	30	--	50*	25	175
CE16305	Irrigation Engineering	3	2	--	5	5	70#	30	--	50*	--	150
CE16304	Estimating & Costing	3	4	--	7	7	70	30	--	50*	50	200
CE16309	Contracts, Accounts and Valuation	3	--	2	5	5	70	30	--	50*	25	175
MG16502	Entreprennureship Development	1	--	2	3	3	--	--	--	25*	25	50
CE16308	Project	--	4	--	4	4	--	--	--	50*	50*	100
4TH LEVEL	Optional subject II (Any One)	3	--	--	3	3	70	30	--	--	--	100
AM 16401	Prestressed and Precast Concrete											
AM 16402	Advanced Geotechnical Engineering											
AM16403	Advanced Design of Structures											
CE 16405	Solid Waste Management											
	TOTAL	**17**	**14**	**04**	**35**	**35**	**280**	**150**	**0**	**275**	**175**	**950**

Abbreviations: L - Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work.

* Indicates assessment by External Examiner; # online examination

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Programme : **Diploma in Civil Engineering**									
Course Code:**AM16302**				Course Title: **Design of RCC and Steel Structures**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
04	**-**	**04**	**08**	**70**	**30**	**--**	**50***	**25**	**175**

*External Examiner

Rationale:

In this course, the student will study elements of R.C.C. & steel structures. They will be introduced to basic structural elements (for both R.C.C. & Steel design) such as– beams/tension members, columns/compression members, footings/column bases along with the concepts of their designs.

About Design of R.C.C. Structures:

Now a day's reinforced cement concrete is widely used to construction of almost all types of structures. As concrete can be cast in any shape the architect prefers reinforced cement concrete as the main construction material for residential, Public and all other decorative building.

Basic principles of designing R.C.C. shall be helpful for students in supervising and executing construction activities effectively. Hence, it becomes essential for every civil engineer to know the procedure and concepts for designing all components of Reinforced cement concrete.

About Design of Steel Structures:

Design of Steel Structures is a technological subject. Steel is commonly used as a construction material for various steel structures such as steel girders, steel bridges, steel trusses, columns, towers, railway bridges, industrial building etc. For the design of steel structures, the properties of steel, different steel sections, various grades and strength characteristics of steel are required. The analysis and design of the steel members in the curriculum is to be done as per IS: 800-2007.

The topic on different types of loads will be useful for finding different stresses, members and then deciding the section for the members of the structures. The topic on design of joints will be useful for designing widely used bolted connections. The topic on design of tension and compression members will be useful for the design of relevant members in roof trusses.

The total content of this subject will be useful for developing insight for the design concepts and will help student in effective supervision and quality control on site.

Course Objectives:

After studying this course, the student will be able to-

CO1	Read and interpret structural drawings.
CO2	Understand basic principles of R.C.C and Steel design.
CO3	Use IS code 456:2000, IS:875,IS:800 etc.
CO4	Design of different R.C.C. components (e.g. beam, column, slab, footings); & tension/compression members, bolted connections footings for Steel Structures.
CO5	Draw reinforcement details & Steel section details for above component members.

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Course Content Details:

Unit No	Topics / Sub-topics	
1	**Introduction to RCC Design & Design of Beams (by L.S.M.) :**	
	1.1	Introduction W.S.M., L.S.M. & ultimate Load method (Introduction only)
	1.2	**Limit State Method**: Definition and classification of limit state, characteristic strength and characteristic load, partial safety factor for load and factored load. Idealised Stress-Strain relationship for Concrete & Steel.
	1.3	Basic Assumptions in limit state method, stress block parameters for beams, depth of neutral axis. Concept of Under-Reinforced, Over-Reinforced & Balanced Sections.
	1.4	General features for Singly Reinforced & Doubly Reinforced beams. Necessity of providing doubly reinforced section. Concept of moment of resistance for these sections (no derivations).
	1.5	Calculation of moment resisting capacity (M.R.) for singly-reinforced & Doubly-reinforced rectangular beam (simple numericals on Analysis only).
	1.6	Simple numericals on Design of singly reinforced rectangular beams (Value of Moment acting on the beam should be provided in the numerical).
	1.7	Introduction to Flanged Beams: Definition of T- Beams and L- beams, effective width of Flange. Cases to find depth of N.A. lying in flange or web (No Numericals)
2	**Design for Shear (by L.S.M.) :**	
	2.1	Meaning of shear in RCC beams and slabs. IS code specifications. Various forms/sketches of shear reinforcement in beams. Use of bent up bars. Zones of minimum shear reinforcement and reasons to provide minimum shear reinforcement.
	2.2	Only Design procedure of design of shear reinforcement for simply supported rectangular beams using vertical stirrups only.
	2.4	Bond: Meaning of bond in RCC. IS code provisions. Check for development length: Meaning and calculation development length in tension and compression as per IS:456
3	**Design of Simply Supported Slabs (by L.S.M.) :**	
	3.1	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
	3.2	Design procedure on design of simply supported one way slab & two-way slab for flexure with corners free to lift.(No Numericals)
4	**Design of Axially Loaded Columns & Footings (by L.S.M.) :**	
	4.1	Columns: Definition and classification. Longitudinal and Transverse reinforcement requirements as per IS 456:2000.Check for minimum eccentricity.
	4.2	Simple Numericals on Design of axially loaded square, rectangular short columns with Lateral ties only.
	4.3	Footings: Introduction, types of footings, steel details, starter bars, lap length, etc. Sketches with reinforcement detailing for axially loaded pad footings (No Numericals).
	4.4	Design Procedure for Axially Loaded Square Pad footing with Square and Rectangular Columns (No Numericals)
5	**Introduction to Steel Structures & Connections :**	
	5.1	Advantages and disadvantages of steel as construction material. Mechanical Properties of Structural Steel: Stress-Strain behavior of mild steel and High strength steel.
	5.2	Standard Shapes of Rolled Steel Sections.Use of Steel Table and Relevant I.S. Codes like I.S.800:2007. Types of loads coming on steel structures according to IS 875-1987 part I to IV- a) Dead loads b) Live loads c) Impact load d) Snow loads.
	5.3	Introduction to Limit State Method :- Meaning, types (limit state of strength & serviceability) ; FOS & load factors.

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	5.5	**Bolted connections :** (i)Types of bolts and their use. Advantages and disadvantages of bolted connections. Lap & Butt joints. Modes of failure for bolted joints (in tension, shear and bearing). (ii) Specifications for cross-sectional area, pitch, spacing, gauge, end distance, edge distance, bolt holes for bolted connections. (iii) Simple Numericals on Design strength of bolt in shear, tension and bearing.
	5.6	**Welded connections:** Introduction and types of welds – butt and fillet. Advantages and disadvantages of welded connections, size of weld, throat thickness (ii) Procedure for Analysis and design of welded joint (only fillet weld) for members subjected to axial load.(No Numericals)
6	**Design of Tension Members (by L.S.M.)**	
	6.1	Types of sections used. Design strength governed by yielding of section, rupture of net cross-section and block shear.
	6.2	Calculation of Net sectional area for Plates & Angle sections as per IS:800 Provisions.
	6.3	Simple numerical on design of axially loaded single angle and double angle tension members with bolted connections only.
7	**Design of Compression Members (by L.S.M.)**	
	8.1	Types of steel sections used for compression members
	8.2	Design of columns using standard rolled ISHB & ISSC sections.
	8.3	Introduction to lacing and battening: single and double lacing and battening system. (Only Theory & Sketch).
		Design of symmetrical built-up columns using standard rolled I- sections (only for Assignment)
	8.4	Types of steel foundations-Slab Base foundations, Gusseted base foundations (Only Theory & Sketch).

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teach -ing Hrs.	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to R.C.C. Design & Design of Beams	14	04	04	06	14
2	Design for Shear	06	02	04	--	06
3	Design of Simply Supported Slabs	08	04	06	--	10
4	Design of Axially Loaded Columns & footings	08	04	--	06	10
5	Introduction to Steel Structures & Connections	10	04	04	04	12
6	Design of Tension Members	08	--	04	04	08
7	Design of Compression Members	08	06	04	--	10
	Total	**64**	**16**	**22**	**32**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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List of Assignments/sketch Book:

Sr. No.	Unit	Experiment/Assignment	Appx. Hrs
A		**R.C.C.**	
1	01	**Assignment No. 1** – Design of beams(04 Problems)	6
2	02	**Assignment No. 2** – Design for shear reinforcement (02 Problems)	6
3	03	**Assignment No. 3** – One-way Slab & Two-way Slab reinforcement detailing (02 Problems)	6
4	04	**Assignment No. 4** –Design of Axially Loaded Columns with reinforcement detailing (02 Problem each)	4
5	04	**Assignment No. 4** –Design of Pad Footing with reinforcement detailing sketch (01 Problems)	6
6	2	Collecting a set of Professional structural drawings including reinforcement detailing of the components slabs, beams, columns, footings and stair-case shall be collected from nearby consultants.	08
B		**D.S.S.**	
1	5	Types of bolts and symbols (in Sketchbook)	04
2	6	**Assignment No. 2** - Net effective Areas for plate & Angle sections; Two Problems on L.C.C & design of tension members.	04
3	7	**Assignment No. 3** - 01-Problem on design of compression members; 01-Problem each on design of columns using standard ISHB & ISSC sections.	06
4	7	Assignment No. 4 - Problem on Design of symmetrical built-up columns using standard rolled I- sections.	04
5	7	Lacing and battening (in Sketchbook)	02
6	7	Slab base & Gusseted base details (in Sketchbook)	04
7	*	Types of trusses for different spans (in Sketchbook)	04
		Total	**64**

References/ Books:

Sr No	Name of Book	Author	Publisher
		R.C.C. (As per L.S.M.)	
1	RCC Theory and design	M.G. Shah and Kale	Tata McGraw Hill Publisher Co. Ltd. New Delhi
2	Illustrated reinforced concrete design (IS:456-2000)	Dr. V.L. Shah	Tata McGraw Hill Publisher Co. Ltd. New Delhi
3	Reinforced concrete design (IS:456-2000)	N. Krishna Raju	Structures Publications, Pune
4	Limit State Design	Dr. A.K. Jain	Prentice – Hall of India Pvt. Ltd. New Delhi.
		D.S.S. (As per L.S.M.)	
1	Steel Structures	L.S. Negi	Tata McGraw Hill Publisher Co. Ltd. New Delhi
2	Design of Steel Structures	S.K. Duggal	Tata McGraw Hill Publisher Co. Ltd. New Delhi
3	Limit State Design of Steel Structures	Dr. V. L. Shah and Mrs. Veena Gore	Structures Publications, Pune
4	Steel Structures (Design & Practice)	N. Subramanian	Oxford University Press, New Delhi.

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IS, BIS and International Code (should be permitted in examination)

1. IS: 456-2000 and other relevant IS codes such as SP:16
2. IS800-2007 Indian Standard code of practice for use of structural steel in general building construction, BIS New Delhi.
3. IS-875-1987 Part-1 to 5: Indian Standard Code for Loading Standards.
4. IS hand book No. 1 Properties of structural steel rolled section.
5. Steel tables.

Course Curriculum Development Committee:

a. **Internal Faculty :** Mr. S. V. Khadake

b. **External Faculty :** Mr. Jagtap A B

29-6-16

Academic Coordinator **Head of Department (Civil Engineering)** **Principal Govt. polytechnic Mumbai**

Course Name: Design of R.C.C. & Steel Structures **Course Code: AM16302**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	-	-	1	-	2	1
CO2	2	1	2	2	-	1	1	1	2	1
CO3	2	2	2	2	-	-	-	2	1	-
CO4	1	2	1	3	-	-	-	-	2	1
CO5	1	2	1	2					2	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Read and interpret structural drawings.	1	2	2
CO2	Understand basic principles of R.C.C and Steel design.	1	2	2
CO3	Use IS code 456:2000, IS:875,IS:800 etc.	1	2	2
CO4	Design of different R.C.C. components (e.g beams Columns and Slabs); tension/compression members, bolted connections footings for Steel Structures.	1	2	2
CO5	Draw reinforcement details & Steel section details for above component members.	1	2	2

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Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to R.C.C. Design	1,3
2	2	Design of Beams	1,3,4
3	3	Design for Shear	2,4,5
4	4	Design of Simply Supported Slabs	1,2,3,5
5	5	Design of Axially Loaded Columns & footings	1,2,3,4,5
6	6	Introduction to Steel Structures & Connections	1,5
7	7	Design of Tension Members	1,2,3,4,5
8	8	Design of Compression Members	1,3

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Programme : **Diploma in Civil Engineering**									
Course Code: **CE16305**				Course Title: **Irrigation Engineering**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	**-**	**2**	**5**	**70 #**	**30**	**--**	***50**	**--**	**150**

On line Examination *External Examiner

Rationale:

India is basically an agricultural country and all its resources depend on the agricultural output. Water is evidently the most vital element in plant life. The total rainfall in a particular area may be either insufficient or ill timed. In order to get maximum yield it is essential to supply the optimum quantity of water and to maintain correct timing. This is possible only through a systematic irrigation system. Irrigation engineering, being an essential part of civil engineering has been included in the course.

Course Outcomes:

Student should be able to

CO1	State importance of irrigation, advantages, disadvantages in Indian context.
CO2	Discuss methods water application to crops and types of crops in Maharashtra and evaluate duty and delta relation for crops.
CO3	State types of dams, spillway structures and their suitability conditions and identify different forces acting on gravity dam and conditions of stability of dam.
CO4	Describe types of canals, canals structures and cross drainage works and functions of regulating and cross drainage.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction to Irrigation engineering and Hydrology** 1.1 Irrigation Engineering: Definition, necessity of irrigation, Different Irrigation engineering systems, National Water Policy. 1.2 Hydrology: Concept of hydrology, Hydrologic cycle, Definition of rain fall, rainfall intensity. 1.3 Rain Gauges - Symon's rain gauge, automatic rain gauge, its construction and functioning, average rainfall, methods of calculating average rainfall. arithmetic average method, Thiessen's polygon method, isohyetal method. 1.4 Runoff: Definition, Factors affecting Run off, Computation of runoff Using Inglis formula, Stranges and Bennie's tables. 1.5 Maximum Flood Discharge (MFD): Concept of MFD, Computation of MFD by Inglis and Dicken's formula. 1.6 Simple numerical problems.
2	**Water requirement of crops** 2.1 Cropping seasons and crops in Maharashtra. 2.2 Definitions of terms - Crop season, crop period, base period crop rotation,

	Intensity of Irrigation, command area, Gross command area, Cultivable command area, Irrigable Command Area, Crop pattern. 2.3 Duty &Delta, Relation between duty &delta, factors affecting duty, Methods of improving duty. 2.4 Time factor, capacity factor. 2.5 Determination of water requirements &capacity of canal. 2.6 Assessment of irrigation water. 2.7 Numerical problems on water requirement of crops.
3	**Reservoir planning** 3.1 Investigating survey for reservoir planning and data collection. 3.2 Area capacity curves- Construction and uses. 3.3 Silting of reservoir, rate of silting, factors affecting silting, sediment control. 3.4 Evaporation from reservoir, method of reducing evaporation. 3.5 Fixing Control levels and respective storage in reservoir. Simple numerical problems on Fixing Control levels.
4	**Dams** 4.1 Definition, types - gravity dam (masonry and concrete), earthen dam, choice of type of a dam. 4.2 Earthen Dam: Components and their function, typical cross section, seepage through embankment and foundation, seepage control though embankment and foundation. Phreatic line & its characteristics. Slope protection, Downstream drainage system, Criteria for safe design of earthen dam, Causes of failure of earthen dam and condition of Stability. Construction of earthen dam. 4.3 Gravity Dam: Forces acting on gravity dam, Conditions of stability, theoretical and practical profile, high & low dams. Galleries- Function, Types. Control of cracking in gravity dams. Outlets in gravity dams.
5	**Spillways** 5.1 Definition, purpose, components parts, types of spillways - with &without gates, ogee spillway, bar spillway Conditions favouring each type. 5.2 Energy dissipation below spillways, stilling basin. 5.3 Spillway crest gates - Radial and vertical lift gates.
6	**Canal** 6.1 Classification of canals according to alignment and position in the canal network. 6.2 Canal alignments - ridge canal, contour canal, side slope 6.3 Cross section of canal in embankment and cutting, partial embankment and cutting, balancing depth. Design of most economical canal section. 6.4 Canal lining - Purpose, material used and its properties. Advantages of canal lining 6.5 CD works- Aqueduct , siphon aqueduct, super passage, level crossing 6.6 Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets. 6.7 Canal maintenance.
7	**Diversion Head works** 7.1 Layout of diversion head works - component parts and their function - weir or

	barrage, divide wall, pocket, scouring sluices, silt excluder, silt Extractor, fish ladder. 7.2 Weirs - Functions, site selection, types - sloping weir, vertical drop weir, K.T. Weir, situation favoring its Construction. 7.3 Barrage - Components and their functions, layout of typical barrage, situation favoring Construction of barrage, 7.4 Comparison between weir & barrage.
8	**Minor and Micro Irrigation** 8.1 Bandhara, construction and working Advantages and disadvantages of bandhara irrigation, layout and component parts, solid and open bandhara. 8.2 Percolation Tanks – Need, selection of site, construction 8.3 Lift irrigation scheme-Components and their functions ,lay out 8.4 Drip and Sprinkler Irrigation- Need, components, Layout, operation and Maintenance.

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Irrigation engineering and Hydrology	02	04	02	--	06
2	Water requirement of crops	08	02	02	04	08
3	Reservoir planning	06	02	04	02	08
4	Dams	10	02	06	08	16
5	Spillways	06	02	04	04	10
6	Canal	08	02	04	04	10
7	Diversion Head works	04	03	03	--	06
8	Minor and Micro Irrigation	04	03	03	--	06
	Total	**48**	**20**	**28**	**22**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

List of experiments/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Collect data from irrigation atlas for rivers, basins, major and minor irrigation projects in Maharashtra	02
2	2	Solving a problem on water requirements for crops.	02
3	3	Illustrate any Minor Irrigation Schemes executed in Maharashtra	02
		Fixing control levels for a Reservoir, based on given data.	02

4	4,5,3 ,8	Power point Presentation on any of the following topics based on existing project in Maharashtra, specifically Mumbai district. _Earthen dam _Gravity dam _Composite dam _Spillway structure any type _Canal structure _CD Works _Any method of irrigation _Any minor irrigation scheme	08
5	4	Sketching and illustrating Masonry / Earthen Dam section	02
6	6	Sketching and explaining canal structures.	02
7	4,5,6	Visit to any major/minor irrigation project site and write report based on visit.	08
8	--	Report on any article published in journal /magazine regarding international practices in irrigation.	04
		Total	**32**

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Irrigation Engineering and water power engineering	B.C Punmia	
2	Irrigation and water power engineering	S.K Garg	
3	Irrigation and water power engineering	K.R Arora	
4	Hydrology and Water Resources Engineering	K.C Patra	

Course Curriculum Development Committee:

a. **Internal Faculty**

i. Smt. S S Male (L C E – G P Mumbai)

b. **External Faculty**

i. **Mrs. S. S. Kasulla (Lecturer, G.P. Thane)**

ii. **Mrs. Vijaya Bangale (SL Lecturer, VJTI, Matunga)**

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Course Name: - Irrigation Engineering **Course Code: - CE16305**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	1	-	-	-	-	-	-	-	-
CO2	1	1	1	1	1	1	1	-	-	-
CO3	-	2	1	2	1	1	1	1	1	1
CO4	-	2	1	2	1	1	1	1	1	1

State importance of irrigation, advantages, disadvantages in Indian context.

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	State importance of irrigation, advantages, disadvantages in Indian context.	1	-	-
CO2	Discuss methods water application to crops and types of crops in Maharashtra and evaluate duty and delta relation for crops	-	1	1
CO3	State types of dams, spillway structures and their suitability conditions and identify different forces acting on gravity dam and conditions of stability of dam.	1	2	2
CO4	Describe types of canals, canals structures and cross drainage works and functions of regulating and cross drainage.	1	1	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to Irrigation engineering and Hydrology	CO1
2	2	Water requirement of crops	CO2
3	3	Reservoir planning	CO2
4	4	Dams	CO3
5	5	Spillways	CO3
6	6	Canal	CO4
7	7	Diversion Head works	CO4,CO2
8	8	Minor and Micro Irrigation	CO1, CO2

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Programme : **Diploma in Civil Engineering**									
Course Code: **CE16304**				Course Title: **Estimating & Costing**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	**--**	**4**	**7**	**70 $**	**30**	**--**	**50***	**50**	**200**

*External Examiner $ duration of examination 4 hrs

Rationale:

This is a core technology subject which will enable the students to learn core facts, concepts, principles & procedures in Estimating & Costing. With this knowledge and skill, he will be able to prepare estimate before start of construction and systematically procure materials during execution using specifications for ensuring appropriate type of construction processes & quality of engineering products in specialized areas in Building Construction, Irrigation, Transportation and Environmental Engineering. In absence of market rates they can prepare their own rate and thereby prepare the detailed estimate.

Course Outcomes: Student should be able to:

CO1	Understand Necessity, Types and Use of Estimate.
CO2	Identify modes of measurements of items of work as per IS 1200.
CO3	Prepare approximate and detailed Estimates for buildings, Roads.
CO4	Write specifications for various items of building works.
CO5	Prepare Rate Analysis for various items of building works.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction & principles of Estimating & Costing :** 1.1 Definition of estimating, costing. Purpose of Estimating & Costing. 1.2 Types of estimates - Approximate and Detailed estimate.
2	**Principles of Estimating** 2.1 Units and standard modes of measurements for build works as per I.S. 1200. 2.2 Desired accuracy in taking measurements for different items of works and rules for deduction as per I.S.1200. 2.3 Provision and purpose of (a) Contingencies charges (b) Work charged establishment charges (c) Quality control charges (d) Centages Charges (e) Electrification Charges (F) Water supply and sanitary charges.
3	**Approximate estimates** 3.1 Purpose of approximate estimate. 3.2 Methods of approximate estimate used for buildings: - Plinth area or square metre method, Cubic metre method, Approximate quantity method, Service unit method, Bay method. Simple problems. 3.3 Methods of approximate estimate used for Roads, Bridges, Railways, Water Supply, and Irrigation projects. Simple Problems.

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4	**Detailed Estimate** 4.1 Purpose of detailed estimate. 4.2 Types of detailed estimate: - Detailed estimate for new work, Revised estimate, Supplementary estimate, Revised & Supplementary estimate, Annual Repairs & Maintenance estimate and Complete estimate. 4.3 Data required for preparing detailed estimate: - drawings, specifications, rates, mode of measurements, standing circulars, etc. 4.4 Factors to be considered during preparation of detailed estimate: - Quantity of material, availability of material, location of site, transportation of materials, labour charges. 4.5 Provisions in detailed estimate for contingencies, work charged establishment, Provisional items, Provisional Sum, Provision for water Supply & Sanitary works, Electrical wiring & installations, centage charges, Prime cost. 4.6 Preparation of detailed estimate for Buildings. 4.7 Steps in preparing detailed estimate – (a) Measuring the dimension (b) Squaring the dimension (c) Abstracting or working up. Measurement Sheet, Abstract sheet, Face sheet. 4.8 Preparation of check list – by adoption of sequence of execution for building estimate. 4.9 Different methods of estimating for building work items such as earthwork in foundation, foundation concrete, stone / brick masonry work in foundation and plinth and superstructure walls, etc. by- (i) Long wall & short wall methods (ii) Centre line method with examples for load bearing structure. 4.10 Calculation of concrete & reinforcement with bar bending schedule in R.C.C. members like footings .beams, columns and slabs. 4.11 Use of thumb rules for calculating reinforcement quantity in slab, beam, column, footing, etc. 4.12 Methods of earthwork estimate for road and canals with examples. Unit and mode of measurement of earthwork as per IS1200. 4.13 Computation of earthwork using (1) Mid section method (2) Trapezoidal or Mean sectional area and prismoidal method for road, railways and canal. Examples.
5	**Specification :** 5.1 Definition, purpose & types. 5.2 Necessity and importance of specifications of an item, points to be observed in framing specifications of an item, Legal aspects of specification. 5.3 Types of Specification – Brief and detailed, standard and manufacturers specification. 5.4 Preparing detailed Specifications of items in civil engineering works such as earthwork in foundation, stone / brick masonry works in foundation, plinth and superstructure, plain cement concrete, RCC for slab, beam, column and footing, Plastering, etc. 5.5 Standard Specification book.
6.	**Analysis of Rates :** 6.1 Definition, necessity of rate analysis. 6.2 Factors affecting rate analysis. 6.3 Data required for rate analysis. 6.4 Market rates for materials & labour. 6.5 Task work – definition and factors affecting the task work, task work for various

	items of work. 6.6 Meaning of lead and lift. Capacities of trucks, dumpers, carts, etc. 6.7 Labour - Categories of labours, labour rates, overheads: - General & Job overhead, contractor's profit, water charges. 6.8 Quantity of materials required for various items of works such as BB masonry, Half brickwork, stone masonry, Cement concrete, PCC flooring, Tiled flooring, cement plastering, etc. 6.9 Analysis of rates of common items of Civil Engineering works such as Plain Cement Concrete (M15), Reinforced cement concrete (M20), First/second class brick masonry in CM 1:8 in superstructure, UCR stone masonry in CM 1:6 in plinth and footing, 12 mm thick cement plaster in CM 1:4, PCC flooring, any one type of modern flooring. 6.10 District Schedule of Rates: Introduction.

Suggested Specifications Table with Hours and Marks:

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction to Estimating & Costing	02	02	00	00	02
2	Principles of estimating	04	02	02	04	08
3	Approximate estimates	06	02	02	04	08
4	Detailed Estimates & Preparation of detailed estimates.	26	04	08	20	32
5	Specification	04	04	04	00	08
6	Analysis of Rates	06	02	04	06	12
	Total	48	16	20	34	70

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

List of experiments/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	4	Preparing detailed estimate of a load bearing structure of single storied residential building having three rooms flat roof for all items of works (Considering quantity of reinforcement in percentage (%)).	16
2	4	Preparing 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.	16
3	4	Prepare detailed estimate for any one: (1) slab culvert (2) Community well (3) Septic tank.	08

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4	4	Preparing detailed estimate of road for State or National Highway of any category of road for 1 KM length.	08
5	6	Preparing rate analysis of following items of works for building work. (a) Excavation in any type of soil (b) IInd 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.	08
6	5	Drafting the specifications for any two items of building work.	08
		Total	**64**

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Estimating & costing	B.N.Datta.	UBS Publisher, Distributor Pvt. Ltd. New Delhi.
2	Estimating, costing, specifications & valuation in Civil Engg.	M Chakraborti.	M. Chakraborty; 21 B, Bhabananada Rd., Calcutta -7000 26
3	Elements of estimating & costing	S.C.Rangwala	charotar publication, court rd. Anand - 388001
4	Text Book of estimating & costing	G.S.Birdi.	Dhanpat rai & sons, Delhi.
5	Civil Engg. contracts and estimate	B. S. Patil	Orient Longman Ltd. Hyderabad
6	Legal aspects of building and engg. Contracts.	B. S. Patil	Orient Longman Ltd. Hyderabad
7	IS 1200 SP 27-1987	BIS	Bureau of Indian Standards

Course Curriculum Development Committee:

a. **Internal Faculty**
   i. Smt.S.S.Chavan

b. **External Faculty**

1. Mr. K. V. Kelgendre
   Sr. Lecturer,
   K.J.S.Polytechnic, Vidya Vihar

29-6-18

Academic Coordinator **Head of Department (Civil Engineering)** **Principal Govt. polytechnic Mumbai**

Course Name: - Estimating & Costing **Course Code: - CE 16304**

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CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	-	-	3	-	-	-	-	-	1
CO2	-	-	-	2	-	-	1	-	2	2
CO3	1	1	2	-	-	-	1	-	-	-
CO4	1	1	3	-	-	-	-	-	-	1
CO5	-	-	3	-	-	-	-	-	-	-

CO Vs PSO matrix

COs		PSO1	PSO2	PSO3
CO1	Understand Necessity, Types and Use of Estimate	-	2	
CO2	Identify modes of measurements as per IS 1200	-	3	3
CO3	Prepare approximate and detailed Estimates for buildings, Roads.	-	2	3
CO4	Write specifications for various items of Civil Engineering works.	-	2	3
CO5	Prepare Rate Analysis for various items of Civil Engineering works.	1	2	3

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction to Estimating & Costing	CO1
2	2	Principles of estimating	CO2
3	3	Approximate estimates	CO3
4	4	Detailed Estimates & Preparation of detailed estimates.	CO3
5	5	Specification	CO4
6	6	Analysis of Rates	CO5

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Academic Committee
G.F. Women

Programme : **Diploma in Civil Engineering**									
Course Code: **CE16309**				Course Title: **Contracts, Accounts and Valuation**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	**2**	**-**	**5**	**70**	**30**	**-**	**50***	**25**	**175**

Rationale:

The Students will learn Concepts, Principles and Procedures of Contracts, Accounts and Valuation. The student will know procedure for preparing Tender documents and Contracts. The students will understand the procedure for execution of Civil Engineering works in Government and private sector. The student will prepare valuation reports.

Course Outcomes: The student will

CO1	Draft tender notice and prepare tender documents for works.
CO2	Prepare contract documents.
CO3	Execute works in Public and Private Sectors by various methods.
CO4	Make payments to contractor.
CO5	Maintain accounts of works.
CO6	Prepare valuation reports and rent fixation.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Tenders and Tender documents** 1.1 Purpose for inviting tender, classification of tenders. Various Tender forms, Tender Notice, Information to be given in tender notice, Corrigendum to tender notice and its necessity. 1.2 Tender Documents, Methods of submitting tender, Opening and Scrutiny of tender, Acceptance of Tender, Rejection of Tender, Unbalanced tender, Work order, E Tendering.
2	**Contract and Conditions of contract** Contract :- 2.1 Definition, object and requirement of Valid contract 2.2 Types of contracts. Lump sum contract, Item rate contract, Percentage rate contract, Cost plus percentage rate contract, Target contract, Negotiated contract, Labour contract, Sub-contract, B.O.A.T. contract, PPP mode. Conditions of contract :- 2.3Earnest Money, Security deposit, Additional security deposit, Time limit and its importance, Extension of Time, Defect liability period, Liquidated damage, Un-liquidated damage, Subletting of contract, Escalation price, Extra items, Termination of contract. 2.4 Arbitration - Causes of disputes, Purpose of Arbitration, Qualities of Arbitrator, Power of an Arbitrator, Advantages of Arbitration. 2.5Act of god, Retention Money, Reduced Rate, Safety and security of site, Third party insurance.

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3	**Methods of Execution of works** 3.1 Fundamental principles of execution of work in Public & Private sector. Procedure for Administrative approval, Technical sanction, 3.2 Piece work method, Rate list method, Day work method, Departmental method by employing labours on daily wages-Nominal Muster Roll. 3.3Class of Contractor's registration with its limits, Procedure of registration and documents required for registration and up gradation as contractor in P.W.D. 3.4 Procedure of execution or work in private sector by appointing various subcontractors.
4	**Payments of works and supplies** 4.1Measurement Book, Inspection and checking the measurement. Method of measurement of work and payment in private sector. 4.2 Interim payment, secured Advance, Advance payment, petty advances, Running Bill and Final Bills, Mobilization Advance, Bill Forms.
5	**Accounts-Public works account:** 5.1 Various accounts forms & their uses - Acquaintance roll, Treasury challans, Cash book, Invoice, Bill, Voucher, 5.2Temporary advance, Daily diary, Imprest, Indent, Bin card, Hand receipt.
6	**Valuation :** 6.1 Definition & purpose. 6.2 Definitions - Cost, Price, Value, difference between them, Factors affecting value of a property. 6.3 Types of Value: - Scrap value, Salvage value, Market value, Book value, Assessed value, distress value, Replacement value, Potential value, Monopoly value, Sentimental value, Speculative value. 6.3 Sinking fund, determination of sinking fund, simple examples. 6.4 Depreciation, Obsolescence, Difference between depreciation and obsolescence, Methods of calculation of depreciation –Straight line method, Sinking fund method constant percentage method, Quantity survey method, simple examples 6.5 Capitalized value, computation of capitalized value, Gross income, outgoings, net income, Years Purchase. Types of outgoings and their percentages. 6.6 Valuation of a property, Different methods of valuation, Rental method, Land & building method, direct comparison method, simple examples. Ready recknor. 6.7 Fixation of rent as per P.W.D. practice, simple examples.

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Tenders and Tender documents	06	04	02	02	08
2	Contract & Conditions of contract	16	10	06	04	20
3	Methods of Execution of works	06	04	04	02	10
4	Payments of works and supplies	06	04	04	02	10
5	Accounts	06	04	02	02	08
6	Valuation	08	08	04	02	14
		48	**34**	**22**	**14**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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List of experiments/Assignments:

Sr. No.	Unit	Experiment/Assignment	Approx. Hours
1	1	Collection of any five Tender Notices.	02
2	1	Drafting of Tender Notice for Government and Private work.	04
3	2	Assignment on Types of Contract.	06
4	3	Assignment on Class of Contractor's registration with its limits and Procedure of registration & documents required for registration and up gradation as contractor in P.W.D.	06
5	4	Assignment on Interim payment, secured Advance, Advance payment, petty advances, Running Bill and Final Bills, Mobilization Advance,	08
6	6	Numerical on Rent fixation and Capitalized value of property.	06
		Total	**32**

References / Books:

Sr. No.	Name of Book	Author	Publisher
1	Estimating & costing	B. N. Datta	UBS Publishers & Distributors Ltd. 5, Ansari Road, Delhi.
2	Elements of Estimating & costing	S.C. Rangawala	Charatar Publishers House, Anand
3	Contracts and Estimates	B.S. Patil	Orient Longman Ltd. Delhi
4	Estimating & costing, Specification & valuation	B.S.Chakraborty	M. Chakraborty, Calcatta 700026
5	State e - DSR	--	Public Works Department, Government of Maharashtra

Course Curriculum Development Committee:
Internal Faculty
S. V. Chaudhari. (Lecturer, G.P. Mumbai)

External Faculty
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6-7-18
Academic Coordinator

Head of Department
(Civil Engineering)

Principal
Govt. polytechnic Mumbai

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Academic Co-ordinator
G. P. Mumbai

Course Title: Contracts, Accounts and Valuation **Course Code: CE16405**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	2	1	-	-	1	-	-	1
CO2	2	3	3	2	1	2	1	3	2	1
CO3	2	3	2	2	-	-	2	1	2	1
CO4	2	3	2	-	-	-	2	1	-	1
CO5	2	2	1	1	2	-	2	1	2	1
CO6	2	2	2	1	2	-	2	2	2	2

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Draft tender notice and tender documents for works.	1	2	1
CO2	Prepare contract document.	3	3	2
CO3	Execute works in Public and Private Sectors by various methods.	2	2	3
CO4	Make payments to contractor.	1	-	1
CO5	Maintain accounts of works.	1	2	1
CO6	Prepare valuation reports and rent fixation.	2	1	1

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Tenders and Tender documents	CO1
2	2	Contract and Conditions of contract	CO2
3	3	Methods of Execution of works	CO3
4	4	Payments of works and supplies	CO4
5	5	Accounts	CO5
6	6	Valuation	CO6

Programme : CE/ME/EC/CO/IF/IS/EE/LG/LT									
Course Code: MG16 502				Course Title: **Entrepreneurship Development**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
1	2	-	3	-	-	-	25*	25	50

*External Examiner

Rationale:

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

Course Outcomes:

Student should be able to

CO1	Appreciate the concept of Entrepreneurship
CO2	Identify entrepreneurship opportunity
CO3	Understand the Marketing Strtegy .
CO4	Collect and use the information to prepare project report for business venture.
CO5	Develop awareness about enterprise management

Course Content Details:

Sr. No.	Contents
1.	**INTRODUCTION** • Definition of Entrepreneur. • Characteristics of Entrepreneur. • Functions of an Entrepreneur. • Barriers to Entrepreneur. • Distinction between Entrepreneur, Manager and Intrapreneur • Women Entrepreneur-problems and developing trends. • Entrepreneurship-definition, need.
2.	**FROM BUSINESS IDEA TO OPPORTUNITY** • Identifying trends, opportunities and ideas. • Creativity techniques for idea generation. • Evaluate business opportunities • Use of SWOT analysis.

3.	**MARKET ASSESSMENT AND PRODUCT FEASIBILITY** • Marketing -Concept and Importance • Market Identification, • Customer need assessment, • Market Survey • Meaning and definition of product feasibility • Technical, Market, Financial feasibility including break even analysis.
4.	**SUPPORT SYSTEMS** • **Information Sources** Information related to project, procedures and formalities • **Support Systems** • Business Planning & Requirements for setting up an SSI • Govt. & Institutional Agencies (Like MSFC, DIC, MSME, MCED, MSSIDC, MIDC, LEAD BANKS), Statutory requirements and agencies.
5.	**PROJECT/BUSINESS PLAN** • Meaning and Importance • Concept of vision and mission • Components of project report/profile
6.	**ENTERPRISE MANAGEMENT AND MODERN TRENDS** • Essential roles of Entrepreneur in managing enterprise • E-Commerce: Concept and process • Global trends and opportunities. • Steps in starting small scale industry • Causes Of Sickness

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	INTRODUCTION	01				
2	FROM BUSINESS IDEA TO OPPORTUNITY	02				
3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	03				
4	SUPPORT SYSTEMS	02				
5	PROJECT/BUSINESS PLAN	04				
6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	04				
	Total	16				

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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Term Work

Term work consists of following interactive type assignments. Faculty acts as a facilitator in providing conducive, dynamic environment, exposing students to various aspects of entrepreneurship. Assignments are aimed at compelling the students to critically think and apply the concepts learnt, leading to better insight development.

Sr. No	Unit	Assignments	Hours
1		**Assimilation Of Profile Of A Successful Entrepreneurs** Every student will study the biography of a successful entrepreneur and make a write up of two pages, indicating milestone achievements. Summarize the important traits and share their understanding in the peer group.	
2		**Assess yourself as an entrepreneur?** Several skills and traits are essential in an entrepreneur, to achieve success. What is your potential in this regard?..Assess yourself and reflect upon the findings. Faculty will provide you a suitable instrument.	
3		**Brain Storm To Generate Business Ideas.** Brain storming is a group creativity exercise designed to come out with a number of solutions to a problem. Follow the steps. ✓ State the problem (Ex What business would you start if you are given Rs Lacs?) ✓ Select the participants. ✓ Select a leader ✓ Set the stage Rules to be followed are. • Focus on quantity • Postpone criticism • Build on others ideas • Encourage crazy ideas • Work with a dead line	
4		**Identify A Business Opportunity Suitable For You** ✓ This activity will help you to identify opportunity that may be right for you. Once identified you will use this business idea to carry out the mini project, throughout the session. ✓ List your interests and hobbies. List the business ideas that relate to each interest. Use the following steps to end up with the opportunity. ✓ Make SWOT analysis of self, cross out those ideas that no longer seem suitable for you. ✓ Assess your aptitude and identify those ideas that match with	

		your aptitude ✓ Make a matrix of advantages and disadvantages of remaining ideas, find which one is of maximum advantage ✓ Use internet or library and find out at least one source of information for each idea. ✓ Choose one of the business opportunities that suit your life style requirements. ✓ Write vision and mission statement. Set personal financial and non financial goals you hope to achieve in five years perspective. Be realistic and be sure to include specific activities for each plan	
5		**Begin To Develop Your Business Plan** ✓ Write a vision and mission statement for the business enterprise ✓ Describe one page report that fully describes your product or service and how it differs from what is currently available. ✓ List your short, medium and long term goals. What steps do you need to achieve each of these goals? Do you foresee any obstacles in attaining them? What are they? ✓ What are the economic, technological or growth trends in this industry? Is the location of your business is a critical factor in its success? Why or why not?	
6		**Design A Market Strategy** ✓ Identify the market for your business. Use the secondary data source that could help you assess demand for your product or service. ✓ Based on secondary data, develop a customer profile. Figure out which market segment of your industry you are targeting. be specific. ✓ Develop a questionnaire to conduct primary data research.Coduct a mock survey and analyze the results. Determine what course of action you will take? ✓ Determine who your competitor are, both direct and indirect. Analyse each competitor in terms of price, location, facility, strength and weakness. Determine strategy to deal with each competitor. ✓ Write down your strategies for maintaining customer loyalty, and describe why you think each one will work.	
7		**Find Out Break Even Point For Your Business** Perform a break even analysis for your business. How many units you are required to sell to break even? Is this a feasible number? Why or Why not? Can you think of ways to lower the breakeven point?	
8		**Feasibility Study Reports** Make a feasibility study analysis of sample reports provided and discuss your observations in the class.(Group work each consisting 4 students)	
9		**Interactive Session With An Entrepreneur** In live conversation with an entrepreneur raise the issues of your interest pertaining to various aspects of entrepreneurship and make	

		a report on it.	
10		**Mini Project** Develop a mini project on a business opportunity incorporating various aspects as per the standard format provided. This activity should be carried out on continual basis, under the guidance of the concerned faculty. Components of Project Report: 1. Project Summary (One page summary of entire project) 2. Introduction (Promoters, Market Scope/ requirement) 3. Project Concept & Product (Details of product) 4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength) 5. Manufacturing Process & Technology 6. Plant & Machinery Required 7. Location & Infrastructure required 8. Manpower (Skilled, unskilled) 9. Raw materials, Consumables & Utilities 10. Working Capital Requirement (Assumptions, requirements) 11. Market (Survey, Demand & Supply) 12. Cost of Project, Source of Finance 13. Projected Profitability & Break Even Analysis 14. Conclusion.	

Notes: If possible an industrial visit should be arranged or videos should be shown of different die and operations.

Learning Resources:

1) Reference Books:

Sr.No.	Name of Book	Author	Publisher
1	Entrepreneurship Development	Preferred by Colombo plan staff college for Technical education.	Tata Mc Graw Hill Publishing co. ltd. New Delhi.
2	A Manual on How to Prepare a Project Report	J.B.Patel D.G.Allampally	EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website :
3	A Manual on Business Opportunity Identification & Selection	J.B.Patel S.S.Modi	
4	National Directory of Entrepreneur Motivator & Resource Persons.	S.B.Sareen H. Anil Kumar	
5	New Initiatives in Entrepreneurship Education & Training	Gautam Jain Debmani Gupta	
6	A Handbook of New Entrepreneurs	P.C.Jain	

7	Evaluation of Entrepreneurship Development Programmes	D.N.Awasthi , Jose Sebastian	http://www.ediindia.org
8	The Seven Business Crisis & How to Beat Them.	V.G.Patel	
9	Entrepreneurship Development	Special Edition for MSBTE	McGraw Hill Publication
10	Entrepreneurship Development	-	TTTI, Bhopal / Chandigarh

2) VIDEO CASSETTES

NO	SUBJECT
1	Five success Stories of First Generation Entrepreneurs
2	Assessing Entrepreneurial Competencies
3	Business Opportunity Selection and Guidance
4	Planning for completion & Growth
5	Problem solving-An Entrepreneur skill

SOURCE

EDI STUDY MATERIAL
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Website : http://www.ediindia.org

Course Curriculum Development Committee:

a. **Internal Faculty**
   i. Mr. S.V.Joshi.
   ii. Mr. B.B.Kulkarni.

b. **External Faculty**

Academic Coordinator (Dr. R.A. Patil)

Head of Department (Mechanical Engineering)

Principal Govt. polytechnic Mumbai

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Academic Co-ordinator
G. P. Mumbai

Course Name:- Entrepreneurship Development Course Code:- me 16 502

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	3	-	-	1	-	2	2	2	3
CO2	1	3	-	-	1	-	2	2	2	3
CO3	1	3	-	-	1	-	2	2	2	3
CO4	1	2	-	-	1	-	2	2	2	3
CO5	1	3	-	-	1	-	2	2	2	3

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Appreciate the concept of Entrepreneurship	-	3	2
CO2	Identify entrepreneurship opportunity	-	3	2
CO3	Understand the Marketing Strtegy.	-	3	2
CO4	Collect and use the information to prepare project report for business venture.	-	2	2
CO5	Develop awareness about enterprise management	-	3	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	INTRODUCTION	CO1
2	2	FROM BUSINESS IDEA TO OPPORTUNITY	CO1 & 2
3	3	MARKET ASSESSMENT AND PRODUCT FEASIBILITY	CO2 & 3
4	4	SUPPORT SYSTEMS	CO3 & 4
5	5	PROJECT/BUSINESS PLAN	CO4 & 5
6	6	ENTERPRISE MANAGEMENT AND MODERN TRENDS	CO1, 2 & 4

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Subject Co-ordinator
GP, Mumbai

Programme : **Diploma in Civil Engineering**									
Course Code: **CE16308**				Course Title: **Project**					
Compulsory / Optional: **Compulsory**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
--	--	**04**	**04**	--	--	--	*** 50**	*** 50**	**100**

*External Examiner

Rationale:

The Project work is included in the curriculum to encourage the students to undertake and tackle an independent problem related to Civil Engineering field. The project also comprises of literature survey of a problem assigned.

Course Outcomes:

CO1	Identify, analyze and define the problems in Civil Engineering field.
CO2	Find different solutions to the problems by Collecting data and select most appropriate solution using latest practices in Civil Engineering
CO3	Use and integrate knowledge of different courses and data collected to make simple designs with the help of handbooks, standard data books, I.S. codes etc
CO4	Prepare and present report prepared.
CO5	Work independently as a leader as well as member of a team.

Course Content Details:

Unit No	Topics / Sub-topics
1	**Project Work** The students will select a topic related to any course in the curriculum, design various units involved, prepare and present a report of the work done. The Project work will be done by a group of 4 to 6 students. Oral will be based on term-work. Following is the list of suggestive areas for selection of project. **List of some civil engineering project areas :** 1. Campus development. 2. Bridge/Fly over/Sky walk. 3. Junction planning for city roads/planning for roads for congested area/parking studies. 4. Concrete mix design. 5. NDT of any RCC building. 6. Structural audit of an existing building. 7. Manufacturing of Pre- cast concrete products. 8. Concrete pipe manufacturing unit. 9. Solid waste management. 10. Hospital waste disposal. 11. Recycling of resources. 12. Non conventional sources of energy. 13. Advance construction techniques.

	14. Transfer of technology to villages. 15. Neighbourhood planning. 16. Planning and design for residential apartments/commercial complex. 17. Planning and design of water treatment plant for given data. 18. Planning and design of water supply scheme for given lay out. 19. Planning and design of sewage treatment plant for given data. 20. Planning and design of sanitary scheme for given lay out. 21. Lift Irrigation scheme. 22. Micro irrigation –Drip/Sprinkler Irrigation. 23. Water shed development of small catchments. 24. Recent development and new technologies in civil engineering. 25. Entrepreneurship development The Project Report shall contain the following as the case may be - a. Test results. b. Photographs. c. Design d. Drawings e. Detailed Estimate of project.

Course Curriculum Development Committee:

a. **Internal Faculty**

Smt S S Chavan
Shri S V Chaudhari
Shri D K Fad

b. **External Faculty**

29-6-18

Academic Coordinator | **Head of Department (Civil Engineering)** | **Principal Govt. polytechnic Mumbai**

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Course Name: Project **Course Code: - CE16308**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	2	2	3	2	3	3	2
CO2	3	3	3	3	2	3	2	3	2	2
CO3	2	3	3	3	2	3	3	2	2	2
CO4	3	3	3	3	3	3	2	3	2	3
CO5	2	2	3	2	2	2	3	2	2	3

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Identify, analyze and define the problems in Civil Engineering field.	3	2	3
CO2	Find different solutions to the problems by Collecting data and select most appropriate solution using latest practices in Civil Engineering	3	3	3
CO3	Use and integrate knowledge of different courses and data collected to make simple designs with the help of handbooks, standard data books, I.S. codes etc	3	2	2
CO4	Prepare and present report prepared.	3	2	2
CO5	Work independently as a leader as well as member of a team.			

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Project Work	CO1,CO2,CO3,CO4,CO5

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Programme : **Diploma in Civil Engineering**									
Course Code: **CE1640~~5~~**				Course Title: **Solid Waste Management**					
Compulsory / Optional: **Optional**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	-	-	**03**	**70 (3 Hrs.)**	**30**	-	-	-	**100**

*External Examiner

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: Student should be able to-

CO1	Understand various types of solid waste produced with their characteristics.
CO2	Use different transportation equipments.
CO3	Apply different methods of disposal of solid waste for safe disposal.
CO4	Understand concept of Bio medical waste, E-waste and Industrial waste.
CO5	Apply various Recycling Techniques
CO6	Understand Various Health Hazards while handling Solid Waste .

Course Content Details:

Unit No	Topics / Sub-topics
1	**Introduction** 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. 1.7 Solid waste management techniques – solid waste management Hierarchy, waste prevention and waste reduction. 1.8 Factors affecting on solid waste generation

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2	**Storage, collection and Transportation of Municipal solid waste.** 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. Transfer station- meaning, necessity, location. 2.6 Role of rag picker. 2.7Organization pattern of solid waste Management.
3	**Disposal of Solid Waste** 3.1 Composting of waste, Principles of composting process, Factors affecting on composting process. 3.2 Methods of composting - a) Manual Composting - Bangalore method, Indore Method b) Mechanical Composting - Dano Process c) Vermi composting- Concept 3.3 Land filling technique, Factors for site Selection, Land filling methods-Area method, Trench method and Ramp method. Leach ate and its control, Biogas from landfill, Advantages and Disadvantages of landfill method. 3.4 Incineration of waste, Introduction of incineration process. Types of incinerators-Flash, Multiple chamber incinerators. Products of incineration, process with their use. Pyrolysis of waste -Definition, methods. 3.5 Advantages and Disadvantages of incineration Process.
4	**Biomedical waste Management, E-waste Management ,Industrial waste Management** 4.1 Definition of Biomedical Waste. 4.2 Sources and generation of Biomedical Waste 4.3 Classification of Biomedical Waste. 4.4 Management technologies. 4.5 Definition of E- waste, Varieties of E- waste, Dangers of E- waste. 4.6 Disposal of E- waste. 4.7 Recycling of E- waste. 4.8. Variety of industrial waste. 4.9 Collection and disposal of industrial waste. 4.10 Control measures of industrial waste. 4.11Recycling of industrial waste.
5	**Health aspect and Public involvement in solid waste management :** 5.1 Health aspect during handling and processing 5.2 Health problem during time of segregation, reuse, recovery, recycling of solid waste. 5.3 Public Involvement and participation in Solid waste management
6	**Recycling of solid waste** 6.1 Introduction, purpose of recycling. 6.2 Benefits of recycling. 6.3 Methods of collecting recyclables. 6.4 Solid waste recycling in India.
	Assignments on Site visit of sewage disposal treatment plant

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Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	08	06	04	00	10
2	Storage, collection and Transportation Of Municipal solid waste	10	04	04	02	10
3	Disposal of Solid Waste	14	02	08	06	16
4	Biomedical waste Management, E-waste Management, Industrial waste Management	10	10	06	04	20
5	Health aspect and public Involvement in solid waste management	03	04	02	02	08
6	Recycling of solid waste	03	02	04		06
		48	**28**	**28**	**14**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Solid Waste Management	Dr. A.D.Bhide	Indian national Documentation Centre 4,Satsang Vihar Marg. Off S.J.S. Sansanwal special Institutional area,New Delhi,
2	Solid Waste	Gorge Techobanoglous	McGraw Hill
3	Environmental Studies	D.L. Manjunath	PEARSON Publication
5	Solid Waste Management	K.Sasikumar	PHI learning
6	Environmental Pollution	Khopkar S.M.	New Age International limited
7	Earthworm Biology	Edwards and Lofty	
8	Environmental Studies	Anindita Basak	PEARSON Publication
9	Environmental Pollution Control Engineering	Rao C.S.	Wiley Eastern Limited
10	Prospect and Perspectives of Solid Waste Management	B.B. Hosetti	NEW AGE International limited

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Course Curriculum Development Committee:

a. **Internal Faculty**

i. Smt. M K. Anserwadekar

b. **External Faculty**

i. Mrs. Vijaya Bangale (SL. Lecturer, VJTI, Matunga)

29-6-18

Academic Coordinator **Head of Department (Civil Engineering)** **Principal Govt. polytechnic Mumbai**

Course Name: - Solid Waste Management **Course Code: - CE16408**

CO1	Understand various types of solid waste produced with their characteristics.
CO2	Use different transportation equipments.
CO3	Apply different methods of disposal of solid waste for safe disposal.
CO4	Understand concept of Bio medical waste, E-waste and Industrial waste.
CO5	Apply various Recycling Techniques
CO6	Understand Various Health Hazards while handling Solid Waste.

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	1	2	1	1	3	-	-	-	1	1
CO2	1	3	1	3	3	1	2	2	2	1
CO3	1	3	1	2	3	-	1	2	1	1
CO4	1	3	1	2	2	2	-	2	-	1
CO5	1	2	1	2	3	3	1	2	1	1
CO6	1	2	1	2	1	-	2	2	1	1

CO Vs PSO matrix

CO/PSOs		PSO1	PSO2	PSO3
CO1	Understand various types of solid waste produced with their characteristics.	-	2	-
CO2	Use different transportation equipments.	1	2	-
CO3	Apply different methods of disposal of solid waste for safe disposal.	1	1	2
CO4	Understand concept of Bio medical waste, E-waste and Industrial waste.	1	2	2
CO5	Apply various Recycling Techniques	-	1	2
CO6	Understand Various Health Hazards while handling Solid Waste.	-	-	2

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Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	CO1,
2	2	Storage, collection and Transportation Of Municipal solid waste	CO1, CO2,
3	3	Disposal of Solid Waste	CO1,CO2, CO3
4	4	Biomedical waste Management, E-waste Management, Industrial waste Management	CO1, CO2,CO3
5	5	Health aspect and public Involvement in solid waste management	CO5
6	6	Recycling of solid waste	CO6

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Programme : **Diploma in Civil Engineering**									
Course Code:**AM16401**				Course Title: **Prestressed and Precast Concrete**					
Compulsory / Optional: **Optional**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	-	-	**03**	**70**	**30**	--	-	-	**100**

Rationale:

In today's system fast developing technology, use of prestressed and precast concrete is increasing with leaps and bounds. Due to several attractive and elegant features prestressed concrete and precast concrete is becoming popular in many fields, it has successfully replaced the conventional structural materials like R.C.C. and steel.

All these revolution in area of Structural Engineering made it essential to specialise the Engineering students in the subject of "Prestressed & Precast Concrete".

Course Objectives:

After studying this course, the student will be able to-

CO1	Understand theory and basic principle of prestressed concrete.
CO2	Studying different Pretensioning & Post-tensioning systems
CO3	Estimate Losses in prestressing and Analysis of prestress.
CO4	Understand theory and Applications of precast Structures.
CO5	Distinguish between pre-tensioning and post-tensioning
CO6	Compare prestressed concrete with RCC

Course Content Details:

Unit No	Topics / Sub-topics	
1	**Introduction**	
	1.1	Basic concept of prestressing.
	1.2	Definition and Assumptions.
	1.3	Materials for prestress concrete.
	1.4	Need for high strength concrete.
	1.5	Need for high tensile steel.
	1.6	Use of untensioned steel.
	1.7	Advantages and Applications of prestressed concrete.
2	**Pretensioning System :**	
	2.1	Introduction to prestressing systems.
	2.2	Externally and Internally prestressed members.
	2.4	Linear and Circular prestressing.
	2.5	Hoyer's system.
	2.6	Tensioning Devices.
3	**Post-Tensioning Systems :**	
	3.1	Introduction.
	3.2	Different methods of post tensioning like: -
	3.3	Fressinet system.
	3.4	Tendon Splices.
	3.5	Detailing of cross section showing position of tendons in rectangular beam.

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4	**Losses of Prestress:**	
	4.1	Loss of prestress at various stages:-
	4.2	Loss due to length and curvature effect.
	4.3	Loss due to elastic shortening of concrete.
	4.4	Loss due to shrinkage of concrete.
	4.5	Loss of stress at anchoring edges.
	4.6	Loss due to creep of concrete
	4.7	Calculation of Loss of prestress in pretension and post tension members. (Simple problems).
5	**Analysis of Prestress :**	
	5.1	Basic Assumptions.
	5.2	Stress concept.
	5.3	Tendons placed axially.
	5.4	Tendons placed eccentrically.
	5.5	Bent and curved tendons.
6	**Precast Structures :**	
	6.1	Advantages & disadvantages of precast framed structure.
	6.2	Quality control, cladding materials and their sizes & grading
	6.3	Proportions, durability of concrete. Different precast unit such as –Hollow and solid blocks, Hollow tile slabs, heat insulation, Precast walls, Precast slabs, Large precast slab, Pipes,Water storage tanks, Sills, Sun shades, Jellies, Shaft Slabs,I-Joist, T-Joist, Floor tiles, Paver block, Poles
7	**Miscellaneous :**	
	7.1	Pre-cast & pre- stressed concrete products such as poles, sleepers, pipes, water tanks, floors, (Theory only) (No numerical problems shall be asked in written examination on this chapter.
	7.2	Modular coordination and prefabrication.

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	04	04	--	--	04
2	Pretensioning System	07	02	04	04	10
3	Post-Tensioning Systems	07	02	04	08	14
4	Losses of Prestress	10	02	04	10	16
5	Analysis of Prestress:	08	02	02	06	10
6	Precast Structures	08	02	04	04	10
7	Miscellaneous	04	02	04	--	06
	Total	**64**	**16**	**22**	**32**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

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Assignments:

1. Site Visit to Prestressed Construction work and prepare a report.
2. Site Visit to Precast Construction work and prepare a report.

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Prestressed Concrete	N.Krishna Raju.	Tata McGraw Hill, Delhi
2	Prestressed Concrete	S Ramamurthum	Dhanpat Rai & Sons, Delhi
3	Prestressed Concrete	Dayaratnam	Oxford & IBH Publishing Co. Delhi
4	Pre-stressed Concrete Design	Dr. Amlan K Sengupta	Indian Institute of technology, Madras
5	IS: -1343		

Course Curriculum Development Committee:

a. **Internal Faculty**

Smt. Ekbote S. S.

b. **External Faculty** Shri. Khadke S.V.

22-10-18

Academic Coordinator

Head of Department
Civil Engineering)

Principal
Govt. polytechnic Mumbai

Course Name: Prestressed and Precast Concrete **Course Code: AM16401**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	-	-	1	-	2	1
CO2	2	1	2	2	-	1	1	1	2	1
CO3	2	2	2	2	-	-	-	2	1	-
CO4	1	2	1	3	-	-	-	-	2	1
CO5	1	2	1	2					2	1
CO6	1	2	1	3	-				2	1
CO7	1	2	1	2				2	1	1

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CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Read and interpret structural drawings.	1	2	2
CO2	Understand basic principles Prestressed and Percast Members	1	2	2
CO3	Use IS code 456:2000, IS875, etc.	1	2	2
CO4	Detailing of cross section showing position of tendons in rectangular beam.	1	2	2
CO5	Calculation of Loss of prestress in pretension and post tension members.	1	2	2
CO6	Analysis of Prestress Members	1	2	3

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	1,3
2	2	Pretensioning System	1,3,4
3	3	Post-Tensioning Systems	2,4,5
4	4	Losses of Prestress	1,2,3,5
5	5	Analysis of Prestress:	1,2,3,4,5
6	6	Precast Structures	1,5,6
7	7	Miscellaneous	1,2,3,4,5,6

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Programme : **Diploma in Civil Engineering**									
Course Code:**AM16303**				Course Title: **Advanced Design of Structures**					
Compulsory / Optional: **Optional**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
03	**-**	**-**	**03**	**70**	**30**	**--**	**--**	**--**	**100**

Rationale:

Design of Steel Structures is a technological subject. Steel is commonly used as a construction material for various steel structures such as steel girders, steel bridges, steel trusses, columns, towers, gantry girders, chimney, railway bridges, industrial buildings, water tanks, etc. For the design of steel structures, the properties of steel, different steel sections, various grades and strength characteristics of steel are required. The analysis and design of the steel members in the curriculum is to be done as per IS: 800-2007.

The topic on different types of loads will be useful for finding different stresses, members and then deciding the section for the members of the structures. The topic on design of joints will be useful for designing bolted and welded connections. The topic on design of tension and compression members will be useful for the design of relevant members in roof trusses. The topic on design of beams, columns with column bases will be useful for the design of steel structure.

The total content of this subject will be useful for developing insight for the design concepts and will help student in effective supervision and quality control on site.

In this course, the student will study elements of steel structures. They will be introduced to basic structural steel elements - structural connections, tension members, compression members, column bases, and roof trusses along with the concepts of their designs.

Course Objectives:

After studying this course, the student will be able to-

CO1	Understand the analysis of forces acting on different members and select proper material and sections from steel table.
CO2	To Understand the design of tension members, compression members, beams, , column bases and understand design values for members using IS 800-2007.
CO3	Know different rolled steel section, their properties and use.
CO4	To Understand and interpret the fabrication drawings and structural drawings
CO5	Estimate different loads coming on members and design them along with their connections.

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Course Content Details:

Unit No	Topics / Sub-topics	
1	**Introduction**	
	1.1	Advantages and disadvantages of steel as construction material.
	1.2	Functions and components of common steel structures like steel towers, roof trusses, steel bridges, gantry and crane girders, steel columns, building frames .
	1.3	Stress-Strain behavior of mild steel and High strength steel(like Tor Steel), Hardness and Toughness and other mechanical properties.
	1.4	Standard Shapes of Rolled Steel Sections. Use of Steel Table and Relevant I.S.Codes like I.S.800:2007.
	1.5	Types of loads coming on steel structures according to IS 875-1987 part I to IV a) Dead loads b) Live loads c) Impact load d) Snow loads.
	1.6	Methods of Design: (i)Working stress method - (Concept only). (ii)Limit State Method - (Meaning and types of limit states, loads, design criteria, limit states of strength, limit states of serviceability.FOS & load factors).
2	**Connections (or Joints) in Steel Structures by L.S.M. :**	
	2.1	Advantages and disadvantages of Welded and bolted joints.
	2.2	**Bolted connections :** (i) Ordinary(Black) bolts and High strength bolts and their use. (ii)Types of joints and failure modes. (iii)Specifications for cross-sectional area, pitch, spacing, gauge, end distance, edge distance, bolt holes for bolted connections. (iv)Design strength of bolt in shear, tension and bearing. (v)Analysis and design of bolted joints for axially loaded single and double angle members only.
	2.3	**Welded connections :** (i) Types of welded joints (butt and fillet) and their symbols. (ii) Size of weld, throat thickness. Strength of fillet weld, standard specifications. (iii) Analysis and design of welded joint (only fillet weld) for single and double angle members subjected to axial load only.
3	**Design of Tension Members (by L.S.M.)**	
	3.1	Different types of Tension members used in structures.
	3.2	Strength governed by yielding of section, rupture of net cross-section and block shear, capacity calculations.
	3.3	Analysis and design of axially loaded single angle and double angle tension members on same side or either side of gusset plates.
4	**Design of Compression Members (by L.S.M.)**	
	4.1	Types of steel sections used for compression members
	4.2	Axially loaded Single (or Double) angle struts on same side or either side of gusset plates (Numericals on strength calculation & design).
	4.3	Design of columns using standard rolled ISHB & ISSC sections.
	4.4	Design of symmetrical built-up columns using standard rolled I- sections only.
	4.6	Single and double lacing and battening system.(only Theory and sketch).
5	**Beams (Limit State Method)**	
	5.1	Different steel sections used for beams, simple and built-up sections
	5.2	Main Beam , Secondary Beam , Standard I Sections , Laterally restrained and unrestrained beam ,
	5.3	Flexural analysis and design of simple beams which are laterally supported and subjected to udl OR Central Point Load only.
	5.4	Check for shear and deflections only.

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6	**Column Bases (Limit State Method)**	
	6.1	Types of steel foundations -Slab Base foundations, Gusseted base foundations.
	6.2	Introduction to Slab base foundation & Gusseted base Foundations.
	6.3	Numerical problems on Slab base Foundation under Column made up of Single H -Section only.
7	**Miscellaneous Steel Structures**	
	7.1	Introduction to Tubular Structures- Definition, Types, Uses, Advantages & disadvantages. Short note on design considerations as per I.S. code for tubular structure used as scaffolding.
	7.2	Introduction to PEB structures (Pre-Engineered steel buildings)
	7.3	Information & advantages of cold formed sections with insight on IS 801: "Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction".

Site Visit : At least one Industrial site visit for Steel-Structure detailing /PEB/Tubular sections/Roof Truss/Gantry or Plate Girder should be arranged

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	Introduction	06	06	--	--	06
2	Connections in Steel Structure	10	02	04	04	10
3	Design of Tension Members	10	02	04	08	14
4	Design of Compression Members	14	02	04	10	16
5	Beams	10	--	02	06	08
6	Column Bases	10	02	04	04	10
7	Miscellaneous Steel Structures	04	02	04	--	06
	Total	**64**	**16**	**22**	**32**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weightage. Numerical questions are to be asked only if specified.*

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Steel Structures	L.S. Negi	Tata McGraw Hill Publisher Co. Ltd. New Delhi
2	Design of Steel Structures	S.K. Duggal	Tata McGraw Hill Publisher Co. Ltd. New Delhi
3	Limit State Design of Steel Structures	Dr. V. L. Shah and Mrs. Veena Gore	Structures Publications, Pune
4	Steel Structures (Design & Practice)	N. Subramanian	Oxford University Press, New Delhi.

IS, BIS and International Code

1. IS800-2007 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.

Course Curriculum Development Committee:

a. **Internal Faculty :-** Smt. Ekbote S. S.

b. **External Faculty** Shri. khadke S.V.

22-10-18

Academic Coordinator | **Head of Department (Civil Engineering)** | **Principal Govt. polytechnic Mumbai**

Course Name: Advanced Design of Steel Structures **Course Code: AM16303**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	-	-	1	-	2	1
CO2	2	1	2	2	-	1	1	1	2	1
CO3	2	2	2	2	-	-	-	2	1	-
CO4	1	2	1	3	-	-	-	-	2	1
CO5	1	2	1	2					2	1

CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Understand the analysis of forces acting on different members and select proper material and sections from steel table.	1	2	2
CO2	To Understand the design of tension members, compression members, beams, column bases and understand design values for members using IS 800-2007.	1	2	2
CO3	Know different rolled steel section, their properties and use.	1	2	2
CO4	To Understand and interpret the fabrication drawings and structural drawings.	1	2	2
CO5	Estimate different loads coming on members and design them along with their connections.	1	2	2

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Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	Introduction	1,3
2	2	Connections in Steel Structure	1,3,4
3	3	Design of Tension Members	2,4,5
4	4	Design of Compression Members	1,2,3,5
5	5	Beams	1,2,3,4,5
6	6	Column Bases	1,5
7	7	Miscellaneous Steel Structures	1,3

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Programme : **Diploma in Civil Engineering**									
Course Code:**AM16402**				Course Title: **Advanced Geotechnical Engineering**					
Compulsory / Optional: **Optional**									
Teaching Scheme and Credits				Examination Scheme					
TH	TU	PR	Total	TH	TS	PR	OR	TW	Total
3	**-**	**-**	**03**	**70**	**30**	**--**	**-**	**-**	**100**

Rationale:

The loads from any structure have to be ultimately transmitted to a soil through foundation. Thus the foundation is an important part of a structure and the type and details of which can be decided upon only with the knowledge and application of the principles of soil mechanics. Knowledge of this subject is a must for civil engineering students.

Course Objectives:

After studying this course, the student will be able to-

CO1	Describe different structure and composition of earth
CO2	State the meaning of different terms related to structural geology.
CO3	Describe the Earth movement and Volcanism
CO4	Describe field application of Geo-technical Engineering and foundation Engineering

Course Content Details:

Unit No	Topics / Sub-topics	
1	**General geology, mineralogy and petrology :**	
	1.1	Introduction of geology, different branches of geology, importance ofgeology for civil engineering structure and composition of earth.
	1.2	Introduction to mineralogy, physical properties of minerals dependingon light and state of aggregation.
	1.3	Introduction of petrology, definition of a rock, classification based on their genesis (mode of origin), formation, classification and engineering uses of igneous, sedimentary and metamorphic rocks.
2	**Structural Geology :**	
	2.1	Structural Geology: Definition, importance, Outcrop, dip, strike.
	2.2	Folds-Definition parts and types.
	2.3	Joints- Definition and classification.
	2.4	Faults-Definition, parts and Types.
3	**Physical Geology :**	
	3.1	Introduction of Physical geology, weathering-Definition, Types.
	3.2	Soil-Definition, formation of soil, classification of soils.
	3.3	Earthquakes-Definition, Terminology-focus, Epicenter, Intensity, Seismograph, Isoseismic lines.
	3.4	Classification of Earthquakes based on focus, origin, Richter's scale.
	3.5	Causes and effect of earthquakes. Record of earthquake, seismic waves Indian earthquakes, earthquake resistant structures

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4	**Introduction to Foundations :**	
	4.1	Concept and definition of foundation Introduction.
	4.2	Types of Shallow foundations- strip , isolated , combined. Strap/ cantilever footing, Mat / Raft foundation.
	4.3	Deep foundations:- Piles, Pier, Caissons.
	4.4	Factors important for selecting a foundation.
	4.5	Distribution of pressure along base of a spread footing subjected to concentric vertical loads a) Flexible footing on clay b) Flexible footing on Sand c) Rigid footing on clay d) Rigid footing on sand e) simplied distribution.
5	**Shallow Foundations:**	
	5.1	Construction of different types of foundations, choice of foundations.
	5.2	Proportioning of footings for equal settlement, Combined footing and cantilever footing.
	5.3	Design considerations for rafts on sand and clays excluding design.
6	**Pile foundation :**	
	6.1	Concept of bearing capacity- ultimate bearing capacity,Safe bearing capacity and allowable bearing capacity.
	6.2	Local shear failure general shear failure and punching shear failure.
	6.3	Terzaghi's theory and Meyerof's theory Assumption in Terzaghi's Theory, simple problems on Terzaghi theory.
	6.4	Factor affecting bearing capacity and Methods to improve bearing capacity.
	6.5	Method to determine bearing capacity by – Plate load test, Standard penetration test
7	**Advanced Ground Improving Techniques :**	
	7.1 7.2 7.3	Ground Improvement by Sand/band Drains, Stone Columns, Lime piles, Lime Slurry Injection etc.Mechanical and chemical soil stabilization Geo-synthetics in Roads and Embankments Coir and Jute Fabrics in Construction of Roads Introduction to Soil Reinforcement.

Suggested Specifications Table with Hours and Marks (Theory):

Unit No	Topic Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
1	General geology, mineralogy and petrology	04	06	--	--	06
2	Structural Geology	07	--	04	04	10
3	Physical Geology	07	--	04	08	10
4	Introduction to Foundations	10	02	04	10	14
5	Shallow Foundations	08	02	02	06	10
6	Pile foundation	08	02	04	04	12
7	Advanced Ground Improving Techniques	04	--	04	--	08
	Total	**48**	**16**	**22**	**32**	**70**

Legends: R- Remember; U-Understand; A- Apply and above levels (Bloom's revised Taxonomy).

Notes: *This specification table shall be treated as a general guideline and actual distribution of marks may slightly vary from table. But the questions from each topic should be asked as per marks weight age. Numerical questions are to be asked only if specified.*

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Assignments:

1. Site Visit to Prestressed Construction work and list observations.
2. Site Visit to Precast Construction work and list observations.

References/ Books:

Sr. No.	Name of Book	Author	Publisher
1	Soil Mechanics and Foundation Engineering	K.R Arora	Standard Publishers; ISBN: 9788180141126, 8180141128; Edition: 2011;
2	Soil Mechanics and Foundation Engineering	B.C Punmia	Standard Book House, New Delhi.
3	Geotechnical Engineering	Prof. T. N. Ramamurthy & Prof. T. G. Sitharam	S. Chand and Company LTD.
4	Pile foundation	Alamsingh	CBS Publishers & Distributor; 2017
5	Foundation Engineering	B. G. Kasmalkar	Pune Vidyarthi Griha Prakashan, Pune. 2.

Course Curriculum Development Committee:

a. **Internal Faculty** Smt. Ekbote S.S.

b. **External Faculty** Shri. Khadke S.V.

22-10-18

Academic Coordinator **Head of Department (Civil Engineering)** **Principal Govt. polytechnic Mumbai**

Course Name: Advanced Geotechnical Engineering **Course Code: AM16302**

CO Vs PO matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	2	2	1	-	-	1	-	2	1
CO2	2	1	2	2	-	1	1	1	2	1
CO3	2	2	2	2	-	-	-	2	1	-
CO4	1	2	1	3	-	-	-	-	2	1
CO5	1	2	1	2					2	1

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CO Vs PSO matrix

CO/POs		PSO1	PSO2	PSO3
CO1	Describe different structure and composition of earth	1	2	2
CO2	State the meaning of different terms related to structural geology.	1	2	2
CO3	Describe the Earth movement and Volcanism	1	2	2
CO4	Describe field application of Geo-technical Engineering and foundation Engineering	1	2	2

Unit Number and COs

Sr. No.	Unit No.	Topic Title	COs
1	1	General geology, mineralogy and petrology	1,3
2	2	Structural Geology	1,3,4
3	3	Physical Geology	2,4,5
4	4	Introduction to Foundations	1,2,3,5
5	5	Shallow Foundations	1,2,3,4,5
6	6	Pile foundation	1,5
7	7	Advanced Foundation Techniques	1,2,3,4,5

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Government Polytechnic, Mumbai

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49,Ali Yawar jung Marg, Kherwadi, Bandra (E)
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Programme : Civil Engineering **Sixth Semester** **With effect from 2016-17**

Course code	Course Title	Teaching Hours				Credits	Examination Scheme					
							Theory		PR	OR	TW	Total
		L	P	TU	Total		TH	TS				
CE16410	Industrial Training	---	20	---	20	20				50*	50*	100
	TOTAL	**0**	**20**	**0**	**20**	**20**	**0**	**0**	**0**	**50**	**50**	**100**

Abbreviations: L - Theory Lecture; P-Practical; TU-Tutorial; TH- Theory Paper; TS- Term Tests (02); PR-Practical Exam; OR-Oral Exam; TW- Term Work.

* Indicates assessment by External Examiner

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Head of Department
(Civil Engineering)

Principal
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203

203

Programme Code: CE												
Course Code: CE16410				Course Title: Inplant Training								
Compulsory / Optional: Compulsory												
Teaching Scheme and Credits				Duration of Examination			Examination Scheme Marks					
TH	TU	PR	Total Credits	TH	TS	PR	TH	TS	PR	OR	TW	Total
00	00	# 20	20	--	--	--	--	--	--	50*	50*	100
(*) indicates assessment by Internal and External examiners # Twenty Weeks Industrial Training												

Rationale:

We are in the era of skill development. Indian Construction Industry is passing through highly competitive and mechanized phase due to globalization and advancement. Quality is one of the decisive factors for sustainability. Quality has become a decisive factor in attracting students and faculty to an institution. The institutions which offer quality education will survive in present scenario.

Industry training has been established to provide students an opportunity to corelate theoretical knowledge with practical activities. They will also get an overview of construction processes and industrial environment by exposing them to different aspects of construction processes, all under the guidance of skilled and experienced persons within the organization. This exposure will include all or most of the following aspects of business: management; personnel policy, financial, marketing and purchasing functions, legal and social aspects, materials and operations and other allied activities. This mechanism of inplant training also provides an opportunity for the industries to contribute during the formative period of students' development.

Course Outcomes: After the industrial training student will:

CO1	Get first-hand experience of working as an engineering professional, including the technical application of engineering methods.
CO2	Work with other engineering professionals and to experience the discipline of working in a professional organization.
CO3	Develop technical, interpersonal and communication skills, both oral and written.
CO4	Have interactions with other professional groups.
CO5	Observe the functioning and organization of business and companies
CO6	Be Exposed to management programmes and systems, effective administration methods and documentation.

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CO VsPO matrix

Enter correlation levels 1, 2 or 3 as defined below:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	-	2	3	2	3	2	3	3	3	3
CO2	-	2	3	2	3	2	3	3	3	3
CO3	-	2	-	-	1	2	3	3	3	3
CO4	-	2	-	-	1	2	3	3	3	3
CO5	-	3	-	-	1	2	3	3	3	3
CO6	2	2	1	1	2	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) *If there is no correlation, put "-"*

CO's vs PSO's

CO	Course Outcomes	PSO1	PSO2
CO1	Get first-hand experience of working as an engineering professional, including the technical application of engineering methods.	1	3
CO2	Work with other engineering professionals and to experience the discipline of working in a professional organization.	1	3
CO3	Develop technical, interpersonal and communication skills, both oral and written.	1	--
CO4	Have interactions with other professional groups.	1	2
CO5	Observe the functioning and organization of business and companies	2	1
CO6	Be Exposed to management programmes and systems, effective administration methods and documentation.	1	1

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