



Government Polytechnic, Mumbai

Department of Civil Engineering

**P-19 Curriculum
(Sandwich Pattern)**

**Semester-V
(Course Contents)**

GOVERNMENT POLYTECHNIC MUMBAI
(Academically Autonomously Institute, Government of Maharashtra)
Teaching and Examination Scheme (P19)
With effect from AY 2019-20

Programme: Diploma in Civil Engineering (Sandwich Pattern)

Term / Semester - V

Course Code	Course Title	Teaching Hours/Contact Hours				Credits	Examination Scheme (Marks)						
		L	P	TU	Total		Theory			PR	OR	TW	Total
							TH	TS1	TS2				
AM19501	Design of Reinforced Concrete and Steel Structures	4	4	--	8	8	60	20	20	--	25*	25	150
CE19501	Estimation and Costing	4	2	--	6	6	60	20	20	--	--	25	125
CE19502	Contracts, Accounts and Valuation	4	2	--	6	6	60	20	20	--	25*	--	125
CE19503	Irrigation Engineering	3	--	--	3	3	60	20	20	--	--	--	100
	Elective – II (Any one)	4	--	--	4	4	60	20	20	--	--	--	100
AM19502	Prestressed & Precast Concrete	--	--	--	--	--	--	--	--	--	--	--	--
CE19504	Construction Management	--	--	--	--	--	--	--	--	--	--	--	--
AM19503	Advanced Geotechnical Engineering	--	--	--	--	--	--	--	--	--	--	--	--
CE19505	Solid Waste Management	--	--	--	--	--	--	--	--	--	--	--	--
CE19506	Project	--	4	--	4	4	--	--	--	--	50*	50	100
CE19507	Entrepreneurship (NPTEL)	--	4 [#]	--	4	4 [#]	--	--	--	--	--	--	--
	Total	19	16	--	35	35	300	100	100	--	100	100	700

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment)

* Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination

Note: Duration of Examination--TS1&TS2 -1 hour , TH- 2 hours 30 minutes, PR/OR – 3 hours per batch , SCA- Library - 1 hour, Sports- 2 hours, Creative Activity-2 hours
Self, on- line learning Mode through MOOCs /Spoken Tutorials / NPTEL / SWAYAM / FOSSEE etc.

Department Coordinator,
Curriculum Development,
Dept. of Civil Engineering

Head of Department
Dept. of Civil Engineering

In-Charge
Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code:AM19501				Course Title: Design of Reinforced Concrete & Steel Structures						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (3Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	04	--	08	60	20	20	--	25*	25	150

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR-Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

In this course, the student will study elements of RCC & Steel structures. They will be introduced to basic structural elements such as beams/tension members, columns/compression members along with the concepts of their designs.

Basic Principles of designing RCC shall be helpful for students in supervising and executing construction activities effectively. 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 sections, various grades and strength characteristics of steel are required. This will be useful for developing insight for the design concepts and will help student in effective supervision and quality control on site.

Course Outcomes: Student should be able to

CO1	Design of singly and doubly reinforced RCC beam.
CO2	Design of RCC beam for shear and development length.
CO3	Design of short and long RCC columns.
CO4	Design of steel tension and compression member.
CO5	Design of steel I and Channel sections.

Course Content Details:

Unit No	Topics / Sub-topics
1	Design of Reinforced Concrete Beams by Limit State Method: 1.1 Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456 1.2 Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section 1.3 Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis,

	<p>simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of Ast and Asc.</p> <p>Course Outcome: CO1 Teaching Hours : 14 hrs Marks: 14 (R-4, U-4, A-6)</p>
2	<p>Shear, Bond and Development length in Design of RCC member:</p> <p>2.1 Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement</p> <p>2.2 Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90° hook, Lapping of bars.</p> <p>2.3 Simple numericals on: Shear reinforcement, Adequacy of section for shear.</p> <p>2.4 Introduction to serviceability limit state check</p> <p>Course Outcome: CO2 Teaching Hours: 13 hrs Marks: 12 (R-4, U-4, A-4)</p>
3	<p>Design of axially loaded RCC Column :</p> <p>3.1 Definition and classification of column, Limit state of compression members, Effective length of column.</p> <p>3.2 Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.</p> <p>3.3 Design of axially loaded short column - Square, Rectangular, and Circular only.</p> <p>Course Outcome: CO3 Teaching Hours: 10 hrs Marks: 10 (R-2, U-4, A-4)</p>
4	<p>Design of Steel Tension and Compression Members (Limit State Method) :</p> <p>4.1 Types of sections used for Tension members.</p> <p>4.2 Strength of tension member by- yielding of section, rupture of net cross-section and block shear.</p> <p>4.3 Design of axially loaded single angle and double angle tension members with bolted and welded connections.</p> <p>4.4 Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress.</p> <p>4.5 Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).</p> <p>4.6 Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.</p> <p>Course Outcome: CO4 Teaching Hours: 15 hrs Marks: 14 (R-4, U-4, A-6)</p>
5	<p>Design of Steel beams (Limit State Method) :</p> <p>5.1 Standard beam sections, Bending stress calculations.</p> <p>5.2 Design of simple I and channel section.</p> <p>5.3 Check for shear as per IS 800.</p> <p>Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 10 (R-2, U-4, A-4)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Design of Reinforced Concrete Beams by Limit State Method	4	4	6	14
2	Shear, Bond and Development length in Design of RCC member	4	4	4	12
3	Design of axially loaded RCC Column	2	4	4	10

4	Design of Steel Tension and Compression Members (Limit State Method)	4	4	6	14
5	Design of Steel beams (Limit State Method)	2	4	4	10
Total		16	20	24	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	1,2	CO1, CO2	Draw cross section, strain diagram & stress diagram for singly reinforced section.	04
2	1,2	CO1, CO2	Draw cross section, strain diagram & stress diagram for doubly reinforced section.	04
3	3	CO3	Draw sketches of different types of column footings.	02
4	1,2,3	CO1, CO2, CO3	Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.	02
5	1,2,3	CO1, CO2, CO3	Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.	02
6	1,2,3	CO1, CO2, CO3	Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.	08
7	5	CO5	Design simply supported I section steel beam for udl.	06
8	4	CO4	Draw any five commonly used rolled steel sections and five built up sections.	02
9	4,5	CO4, CO5	Summarize the provisions of IS 800 required for the design of tension member in report form.	04
10	4,5	CO4, CO5	Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.	04
11	4	CO4	Draw sketches for single & double lacing of given built up columns.	02
12	4	CO4	Draw sketches for battening of given built up columns.	02
13	4,5	CO4, CO5	Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.	04
14	4,5	CO4, CO5	Design beams section for shear as per IS 800 provisions.	06
15		CO4, CO5	Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.	08
		Total		60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Limit State Theory and Design of Reinforced Concrete Structures	Shah, V. L., and Karve, S.R., Structures Publications, Pune,2014.	ISBN-10: 819037172X
2	Fundamentals of Reinforced Concrete	Sinha N.C., and Roy S.K., S. Chand & Co., New Delhi.	ISBN-10: 8121901278; ISBN-13: 978-8121901277
3	Reinforced Concrete Design Principles and Practice	Krishna Raju, and N. Pranesh, R.N., New Age International, Mumbai.	ISBN: 9788122414608, 8122414605
4	Limit State Design of Steel Structures	Shah, V. L., and Gore, V., Structures Publications, Pune.	ISBN : 4567170962, 1234567170961
5	Design of Steel Structures	Subramanian N., Oxford University Press.	ISBN-10: 0195676815
6	IS 456 : 2000 Plain and Reinforced Concrete	BIS	---
7	IS 800 : 2007 Steel Code	BIS	---

E-References:

1. <http://www.academia.edu>
2. <http://www.irjet.net>
3. <http://www.nitw.ac.in>
4. <http://www.slideshare.net>
5. <http://link.springer.com>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	--	2	2	3	3	2	--
CO2	3	3	3	--	2	2	3	3	2	--
CO3	3	3	3	--	2	2	3	3	2	--
CO4	3	3	3	--	2	2	3	3	2	--
CO5	3	3	3	--	2	2	3	3	2	--

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm

3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. S.D.Deshpande	Principal	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: CE19501				Course Title: Estimation & Costing						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (3Hrs)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	02	--	06	60	20	20	--	--	25	125

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

This is a core technology course which will enable the students to learn core facts, concepts, principles & procedures in Estimating & Costing. With this knowledge and skill, students will be able to prepare estimate before start of construction and systematically procure materials during execution using specifications for ensuring appropriate type of construction process & 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	Select modes of measurements for different items of works.
CO2	Prepare approximate estimate of a civil engineering works.
CO3	Prepare detailed estimate of a civil engineering works.
CO4	Calculate quantity of earthwork.
CO5	Justify rate for given items of work using rate analysis techniques.

Course Content Details:

Unit No	Topics / Sub-topics
1	Fundamentals of Estimating and Costing: 1.1 Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. 1.2 Types of estimates – Approximate and Detailed estimate. 1.3 Types and Uses of Estimates: Revised estimate, Supplementary estimate, Revised & Supplementary Estimate, Repair and maintenance estimate. 1.4 Roles and responsibility of Estimator. 1.5 Checklist of items in load bearing and framed structure. 1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet. 1.7 Modes of measurement and desired accuracy in measurements for different items of

	<p>work as per IS:1200. 1.8 Rules for deduction in different category of work as per IS:1200. 1.9 Description / specification of items of building work as per PWD /DSR. Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 12 (R- 6, U-4, A-2)</p>
2	<p>Approximate Estimates: 2.1 Approximate estimate - Definition, Purpose. 2.2 Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals) 2.3 Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects. Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 12 (R-2, U- 4, A- 6)</p>
3	<p>Detailed Estimate : 3.1 Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of detailed estimate- Taking out quantities and Abstracting. 3.2 Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals) 3.3 Long wall and Short wall method, Centre line method. 3.4 Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements. 3.5 Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc. 3.6 Prime cost, Provisional sum, Provisional quantities, Bill of quantities. Course Outcome: CO3 Teaching Hours:14 hrs Marks: 14 (R- 2, U- 6, A- 6)</p>
4	<p>Estimate for Civil Engineering Works: 4.1 Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. 4.2 Detailed estimate for septic tank, Community well. Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 10 (R- 2 ,U- 4, A- 4)</p>
5	<p>Rate Analysis: 5.1 Rate Analysis: Definition, purpose and importance. 5.2 Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit. 5.3 Procedure for rate analysis. 5.4 Task work- Definition, types. Task work of different skilled labour for different items. 5.5 Categories of labours, their daily wages, types and number of labours for different items of work. 5.6 Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments. 5.7 Preparing rate analysis of different items of work pertaining to buildings. Course Outcome: CO5 Teaching Hours: 12 hrs Marks: 12 (R- 2, U- 4, A- 6)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Fundamentals of Estimating and Costing	6	4	2	12
2	Approximate Estimates	2	4	6	12

3	Detailed Estimate	2	6	6	14
4	Estimate for Civil Engineering Works	2	4	4	10
5	Rate Analysis	2	4	6	12
Total		14	22	24	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	01	CO1	Prepare the list of items to be executed with units for detailed estimate of a given structure	02
2	01	CO1	Study of items with specification given in the DSR (for any 5 items).	02
3	02	CO2	Prepare approximate estimate for the given civil engineering works.	02
4	03	CO3	Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR. (1BHK building with staircase)	06
5	03	CO3	Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item from DSR along with face sheet.(1BHK building with staircase)	05
6	03	CO3	Calculate the reinforcement quantities from the given set of drawings for a room size of 3m X 4m with bar bending schedule (footing, column, beam, lintel with chajja, slab)	05
7	04	CO4	Prepare quantity of earthwork of road of 500m.	04
8	05	CO5	Prepare rate analysis for the given 5 items of works.	04
Total				30

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Estimating and Costing in Civil Engineering	Datta, B.N. UBS Publishers Distributors Pvt. Ltd. New Delhi.	ISBN-10: 8174767703; ISBN-13: 978-8174767707
2	Estimating construction cost (fifth edition)	Peurifoy, Robert L. Oberlender, Garold. McGraw Hill Education, New Delhi.	ISBN-13: 978-0071150842
3	Estimating and Costing	Rangwala, S.C. Charotar Publishing House PVT. LTD., Anand.	ISBN : 9789385039058 896
4	Estimating and Costing	Birdie, G.S. Dhanpat Rai Publishing Company(P) Ltd. New Delhi.	ISBN-10: 9384559512; ISBN-13: 978-9384559519

5	Estimating and costing, specification and valuation in civil engineering	Chakraborti, M. Monojit Chakraborti, Kolkata.	ISBN-10: 818530436X ISBN-13 : 978- 8185304366
6	PWD Schedule of Rates.		
7	Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.		

E-References:

1. <http://www.nap.edu>
2. <http://www.darshan.ac.in>
3. <http://www.sanfoundry.com>
4. <http://www.cmu.edu>
5. www.yb.tl
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	--	--	1	1	1	3	--
CO2	3	3	3	--	--	1	2	1	3	--
CO3	3	3	3	--	--	1	2	1	3	--
CO4	3	3	3	--	--	1	2	1	3	--
CO5	3	3	3	--	--	1	2	--	3	--

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. S. M. Male	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code:CE19502				Course Title: Contracts, Accounts & Valuation						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	02	--	06	60	20	20	--	25*	--	125

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

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 sectors. The student calculate rent and prepare valuation of a civil structures.

Course Outcomes: Student should be able to

CO1	Understand various types of contract and when they are used.
CO2	Suggest the relevant type of contract for the given civil engineering work.
CO3	Prepare the typical Tender document for the given civil engineering work.
CO4	Decide type of payment for the executed work.
CO5	Justify the rent fixation and valuation of given civil structure.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Procedure to execute the work :</p> <p>1.1 Administrative approval, Technical sanction, budget provision, expenditure sanction.</p> <p>1.2 Methods for carrying out works- contract method, departmental method -rate list method, piece work method, day's work method, employing labours on daily wages basis.</p> <p>Course Outcome: CO1 Teaching Hours : 8 hrs Marks: 04 (R-4, U-0, A-0)</p>
2	<p>Contracts :</p> <p>2.1 Definition of contract, objects of contract, requirements of contract, overview of Indian Contract Act.</p> <p>2.2 Types of engineering contract with advantages, disadvantages and their suitability - Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract.</p>

	<p>2.3 Introduction of FIDIC Conditions of contract.</p> <p>2.4 Classification of contractor on basis of financial limits, Requirement of documents for registration of contractor.</p> <p>2.5 Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 14 (R-6, U-6, A-2)</p>
3	<p>Tender and Tender Documents :</p> <p>3.1 Definition of tender, necessity of tender, types of tender- Local, Global, Limited.</p> <p>3.2 E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial).</p> <p>3.3 Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice.</p> <p>3.4 Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award.</p> <p>3.5 Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid.</p> <p>3.6 Tender documents – Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc.</p> <p>3.7 Terms related to tender documents – contract conditions- time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause(escalation), defect liability Period, liquidated Damages.</p> <p>3.8 Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.</p> <p>Course Outcome: CO3 Teaching Hours:16 hrs Marks: 16 (R- 6, U- 6, A- 4)</p>
4	<p>Accounts :</p> <p>4.1 Various account forms and their uses – Measurement Books, E- Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.</p> <p>4.2 Mode of Payment to the contractor and its necessity -Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Retention money, E - payment.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 12 (R- 6 ,U- 6, A- 0)</p>
5	<p>Introduction to Valuation :</p> <p>5.1 Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Characteristics of Value, Factors Affecting Value.</p> <p>5.2 Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.</p> <p>5.3 Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method.</p> <p>5.4 Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage – Mortgage deed, precautions to be taken while making mortgage.</p> <p>Course Outcome: CO5 Teaching Hours: 14 hrs Marks: 14 (R- 4, U- 4, A- 6)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Procedure to execute the work	4	0	0	04
2	Contracts	6	6	2	14
3	Tender and Tender Documents	6	6	4	16
4	Accounts	6	6	0	12
5	Introduction to Valuation	4	4	6	14
Total		26	22	12	60

List of experiments:

Sr. No.	Unit No	COs	Title of the Experiments	Hours
1	01	CO1	Assignment on procedure of execution of construction work.	03
2	02	CO2	Assignment on types of contracts.	02
3	02	CO2	Assignment on class of Contractor's registration with limits and procedure of registration, documents required and upgradation as Contractor in PWD.	06
4	02	CO2	Assignment on BOT	04
5	03	CO3	Collection of any five tender notices.	02
6	03	CO3	Drafting of tender notice for Government and Private work.	04
7	04	CO4	Assignment on Intrim payment, Secured Advance, Advance Payment, Petty Advance, Running Bill & Final Bill, Mobilization Advance.	03
8	05	CO5	Numericals on rent fixation and capitalized value of property.	06
Total				30

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Estimating and Costing in Civil Engineering	Datta, B.N. UBS Publishers Distributors Pvt. Ltd. New Delhi.	ISBN-10: 8174767703; ISBN-13: 978-8174767707
2	Construction Management and Contract Practices	Raina, V. K., Shroff Publishers & Distributers Pvt. Ltd.	ISBN: 9789352137220
3	Estimating and Costing	Rangwala, S.C. Charotar Publishing House PVT. LTD., Anand.	ISBN : 9789385039058 896
4	Estimating and Costing	Birdie, G.S. Dhanpat Rai Publishing Company(P) Ltd. New Delhi.	ISBN-10: 9384559512; ISBN-13: 978-

			9384559519
5	Estimating and costing, specification and valuation in civil engineering	Chakraborti,M. Monojit Chakraborti, Kolkata.	ISBN-10: 818530436X ISBN-13 : 978- 8185304366
6	Civil Engineering Contracts and Estimates	Patil, B. S.,Orient Longman, Mumbai	ISBN-10: 9788173719578

E-References:

1. <http://www.nap.edu>
2. <http://www.darshan.ac.in>
3. <http://www.sanfoundry.com>
4. <http://www.cmu.edu>
5. www.yb.tl
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	--	--	1	1	--	1	--
CO2	3	3	3	--	--	1	2	--	1	--
CO3	3	3	3	--	--	1	2	--	1	--
CO4	3	3	3	--	--	1	2	--	1	--
CO5	3	3	3	--	--	1	2	--	3	--

Industry Consultation Committee:

Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. P. A. Pisal	Lecturer in Civil Engg.	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: CE19503				Course Title: Irrigation Engineering						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
03	--	--	03	60	20	20	--	--	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

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 programme.

Course Outcomes: Student should be able to

CO1	State importance of irrigation, advantages, disadvantages in Indian context.
CO2	Discuss methods of water application to crops and types of crops in Maharashtra and evaluate duty and delta relation for crops.
CO3	Calculate the storage capacity of reservoirs.
CO4	State types of dams, spillway structures and their suitability conditions and identify different forces acting on gravity dam and conditions of stability of dam.
CO5	Describe types of canals, canals structures and cross drainage works and functions of regulating and cross drainage.
CO6	Classify different irrigation systems.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Introduction to Irrigation engineering and Hydrology</p> <p>1.1 Irrigation Engineering: Definition, necessity of irrigation, Different Irrigation engineering systems, National Water Policy.</p> <p>1.2 Hydrology: Concept of hydrology, Hydrologic cycle, Definition of rain fall, rainfall intensity.</p> <p>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.</p> <p>1.4 Runoff: Definition, Factors affecting Run off, Computation of runoff Using Inglis formula, Stranges and Bennie's tables.</p>

	<p>1.5 Maximum Flood Discharge (MFD): Concept of MFD, Computation of MFD by Inglis and Dicken's formula.</p> <p>1.6 Yield, dependable yield and calculation of yield.</p> <p>1.7 Simple numerical problems.</p> <p>Course Outcome: CO1 , Teaching Hours :4 hrs Marks: 06 (R-4, U-2, A-0)</p>
2	<p>Water requirement of crops :</p> <p>2.1 Cropping seasons and crops in Maharashtra.</p> <p>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.</p> <p>2.3 Duty &Delta, Relation between duty &delta, factors affecting duty, Methods of improving duty.</p> <p>2.4 Time factor, capacity factor.</p> <p>2.5 Determination of water requirements &capacity of canal.</p> <p>2.6 Assessment of irrigation water.</p> <p>2.7 Numerical problems on water requirement of crops.</p> <p>Course Outcome: CO2 , Teaching Hours :8 hrs Marks: 08 (R- 4, U-4, A-0)</p>
3	<p>Reservoir planning :</p> <p>3.1 Investigating survey for reservoir planning and data collection.</p> <p>3.2 Area capacity curves- Construction and uses.</p> <p>3.3 Silting of reservoir, rate of silting, factors affecting silting, sediment control.</p> <p>3.4 Evaporation from reservoir, method of reducing evaporation.</p> <p>3.5 Fixing Control levels and respective storage in reservoir. Simple numerical problems on Fixing Control levels.</p> <p>Course Outcome: CO3 , Teaching Hours :6 hrs Marks: 08 (R- 2, U-0, A-6)</p>
4	<p>Dams and Spillways :</p> <p>4.1 Definition, types - gravity dam (masonry and concrete), earthen dam, choice of type of a dam.</p> <p>4.2 Earthen Dam: Components and their function, typical cross section, seepage through embankment and foundation, seepage control through 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.</p> <p>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.</p> <p>4.4 Definition, purpose, components parts, types of spillways - with &without gates, ogee spillway, bar spillway Conditions favouring each type.</p> <p>4.5 Energy dissipation below spillways, stilling basin.</p> <p>4.6 Spillway crest gates - Radial and vertical lift gates.</p> <p>Course Outcome: CO3 , Teaching Hours :12 hrs Marks: 18 (R- 2,U-4,A-12)</p>
5	<p>Canal :</p> <p>5.1 Classification of canals according to alignment and position in the canal network.</p> <p>5.2 Canal alignments - ridge canal, contour canal, side slope.</p> <p>5.3 Cross section of canal in embankment and cutting, partial embankment and</p>

	<p>cutting, balancing depth. Design of most economical canal section.</p> <p>5.4 Canal lining - Purpose, material used and its properties. Advantages of canal lining</p> <p>5.5 CD works- Aqueduct , siphon aqueduct, super passage, level crossing</p> <p>5.6 Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets. Canal maintenance.</p> <p>Course Outcome: CO4 , Teaching Hours : 8hrs Marks: 10 (R- 2, U-2, A- 6)</p>
6	<p>Diversion Head works and Minor and Micro Irrigation :</p> <p>6.1 Layout of diversion head works - component parts and their function - weir or barrage, divide wall, pocket, scouring sluices, silt excluder, silt Extractor, fish ladder.</p> <p>6.2 Weirs - Functions, site selection, types - sloping weir, vertical drop weir, K.T. Weir, situation favoring its Construction.</p> <p>6.3 Barrage - Components and their functions, layout of typical barrage, situation favouring Construction of barrage.</p> <p>6.4 Comparison between weir & barrage.</p> <p>6.5 Bandhara-Construction and working Advantages and disadvantages of bandhara irrigation, layout and component parts, solid and open bandhara.</p> <p>6.6 Percolation Tanks – Need, selection of site, construction</p> <p>6.7 Lift irrigation scheme-Components and their functions ,lay out</p> <p>6.8 Drip and Sprinkler Irrigation- Need, components, Layout, operation and Maintenance.</p> <p>Course Outcome: CO6 , Teaching Hours :7 hrs Marks: 10 (R- 6,U-4, A-0)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction to Irrigation engineering and Hydrology	04	02	--	06
2	Water requirement of crops	04	04	--	08
3	Reservoir planning	02	--	06	08
4	Dams and Spillways	02	04	12	18
5	Canals	02	02	06	10
6	Diversion Head works & Minor and Micro Irrigation	06	04	--	10
Total		20	16	24	60

References/ Books:

Sr. No.	Name of Book	Author, Publisher, Edition and Year Of publication Author	ISBN
1	Irrigation Engineering and water power engineering	B.C Punmia,Pande B.B.Lal,Laxmi Publication,Ltd,12th Edition, Aug 1992 Distributors	ISBN-13: 978-8131807637

2	Irrigation and water power engineering	S.K Garg,Khanna Publication,Delhi-6	ISBN:8174090479
3	The Fundamental principles of Irrigation Engineering	Priyani V. B.,Charotkar Book Stall,Anand ,fifth edition	ISBN-13: C076000000005
4	Text book of Irrigation Engineering	Dahigaonkar J. G,Wheeler Publishing Allahabad	ISBN: 8185614458

E-References :

1. <http://www.maharashtrawaterpolicy.com>
2. <http://nptel.ac.in>
3. <http://wrd.maharashtra.gov.in>
4. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	3	2	1	3	1
CO2	2	3	3	3	2	3	2	1	3	1
CO3	2	3	3	3	2	3	2	1	3	1
CO4	2	3	3	3	2	3	2	1	3	1
CO5	2	3	3	3	2	3	2	1	3	1
CO6	2	3	3	3	2	3	2	1	3	1

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3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Smt.Meera Anserwadekar	Sr. Lecturer in Civil Engg.	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of _____

Head of Department
Department of _____

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: AM19502				Course Title: Prestressed & Precast Concrete						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	--	--	04	60	20	20	--	--	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

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 specialize the engineering students in the subject of "Prestressed & Precast Concrete".

Course Outcomes: Student should be able to

CO1	Select the relevant precast concrete element for a given type of construction.
CO2	Use relevant components for prefabricated structures.
CO3	Justify the relevance of prestressed element in a given situation.
CO4	Select relevant methods / systems for given construction work.
CO5	Propose suitable cable profile for the given prestressed concrete members.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Precast concrete Elements :</p> <p>1.1 Advantages and disadvantages of precast concrete members</p> <p>1.2 Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications</p> <p>1.3 Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles</p> <p>1.4 Testing of Precast components as per BIS standards</p> <p>Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 10 (R-4, U-6, A-0)</p>
2	<p>Prefabricated building :</p> <p>2.1 Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements.</p>

	<p>2.2 Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications</p> <p>2.3 Modular co-ordination, modular grid, and finishes</p> <p>2.4 Prefab systems and structural schemes and their classification including design considerations</p> <p>2.5 Joints – requirements of structural joints and their design considerations</p> <p>2.6 Manufacturing, storage, curing, transportation and erection of above elements, equipment needed</p> <p>Course Outcome: CO2 Teaching Hours: 14 hrs Marks: 14 (R-4, U-6, A-4)</p>
3	<p>Introduction to Prestressed Concrete :</p> <p>3.1 Principles of pre-stressed concrete and basic terminology.</p> <p>3.2 Applications, advantages and disadvantages of prestressed concrete</p> <p>3.3 Materials used and their properties, Necessity of high-grade materials</p> <p>3.4 Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications</p> <p>Course Outcome: CO3 Teaching Hours: 8 hrs Marks: 10 (R-4, U-4, A-2)</p>
4	<p>Methods and systems of prestressing :</p> <p>4.1 Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning-applications</p> <p>4.2 Systems for pre tensioning – process, applications, merits and demerits - Hoyer system</p> <p>4.3 Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system, Gifford Udall system.</p> <p>4.4 Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, (Simple Numerical problems to determine loss of pre-stress), Loss of pre-stress at the anchoring stage.</p> <p>4.5 Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, (Simple Numerical problems to determine loss of pre-stress).</p> <p>4.6 BIS recommendations for percentage loss in case of Pre and Post tensioning.</p> <p>Course Outcome: CO4 Teaching Hours: 14 hrs Marks: 14 (R-4, U-6, A-4)</p>
5	<p>Analysis and design of Prestressed rectangular beam section :</p> <p>5.1 Basic assumptions in analysis of pre-stressed concrete beams.</p> <p>5.2 Cable Profile in simply supported rectangular beam section – concentric, eccentric straight and parabolic</p> <p>5.3 Effect of cable profile on maximum stresses at mid span and at support</p> <p>5.4 Numerical problems on determination of maximum stresses at mid spans with linear (concentric and eccentric) cable profiles only.</p> <p>5.5 Simple steps involved in Design of simply supported rectangular beam section (No numerical problems)</p> <p>Course Outcome: CO5 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Precast concrete Elements	4	6	--	12
2	Prefabricated building	4	6	4	12

3	Introduction to Prestressed Concrete	4	4	2	10
4	Methods and systems of prestressing	4	6	4	12
5	Analysis and design of Prestressed rectangular beam section	4	4	4	12
Total		20	26	14	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Pre-stressed Concrete	Krishna Raju, N., Pre-stressed Concrete, Tata McGraw Hill, New Delhi.	ISBN : 0074622099, 9780074622094
2	Pre-stressed Concrete	Shrikant B. Vanakudre, Prestressed Concrete, Khanna Publishing House, New Delhi	ISBN-10: 938617331X; ISBN-13: 978-9386173317
3	Pre Cast and Pre Stress Technology: Process, Method and Future Technology	Marzuki, Nor Ashikin, Pre Cast and Pre Stress Technology: Process, Method and Future Technology, Createspace Independent Publication.	ISBN-10: 1499353391; ISBN-13: 978-1499353396
4	Handbook on Precast Concrete buildings.	Indian Concrete Institute.	ISBN, 8192062341, 9788192062341
5	IS 12592 Precast Concrete Manhole Cover and Frame	BIS, New Delhi.	--
6	IS 15658 Precast concrete blocks for paving - Code of Practice	BIS, New Delhi.	--
7	IS 15916 Building Design and Erection Using Prefabricated Concrete - Code of Practice	BIS, New Delhi.	--
8	IS 15917 Building Design and Erection Using Mixed/Composite Construction - Code of Practice	BIS, New Delhi.	--
9	IS 458 Precast Concrete Pipes (with and without reinforcement) — Specification	BIS, New Delhi.	--

E-References:

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2. <http://www.precast.org>
3. <http://www.indianconcrete.org>
4. <http://nitterhouseconcrete.com>

5. <http://precastblocks.com>
6. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	--	2	--	3	1	2	--
CO2	3	3	3	--	2	--	3	1	2	--
CO3	3	3	3	--	2	1	3	--	2	--
CO4	3	3	3	--	2	1	3	--	2	--
CO5	3	3	3	--	2	--	3	1	2	--

Industry Consultation Committee:

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2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. S.D.Deshpande	Principal	Govt. Polytechnic Mumbai

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Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: CE19505				Course Title: Construction Management						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	--	--	04	60	20	20	--	--	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

Rationale :

The Civil Engineer has to plan, manage and execute civil engineering works. He has to manage different resources. He should have knowledge of basic management and basic management process related to civil engineering field. The functions of construction management typically include the following: Specifying project objectives, scope, budgeting, scheduling, setting performance requirements, and selecting project participants.

Course Outcomes: Student should be able to

CO1	Understand the contract management.
CO2	Prepare and understand the nuances of executing the site layout.
CO3	Prepare networks and bar charts for the given construction project.
CO4	Understand the intricacies of disputes, related arbitration and settlement laws.
CO5	Apply safety measures at construction projects.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Construction industry and management:</p> <p>1.1 Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization.</p> <p>1.2 Agencies associated with construction work- owner, promoter, builder, designer, architects.</p> <p>1.3 Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.</p> <p>Course Outcome: CO1 Teaching Hours : 12 hrs Marks: 12 (R- 6, U-6, A-0)</p>

2	<p>Site Layout: 2.1 Principles governing site layout. 2.2 Factors affecting site layout. 2.3 Preparation of site layout. 2.4 Land acquisition procedures and providing compensation.</p> <p>Course Outcome: CO2 Teaching Hours: 10 hrs Marks: 10 (R-2, U-4, A-4)</p>
3	<p>Planning and scheduling: 3.1 Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart. 3.2 Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. 3.3 CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path, 3.4 Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration. 3.5 Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity. 3.6 Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in)</p> <p>Course Outcome: CO3 Teaching Hours:16 hrs Marks: 20 (R-4, U-6, A-10)</p>
4	<p>Construction Contracts and Specifications: 4.1 Types of Construction contracts. 4.2 Contract documents, specifications, general special conditions. 4.3 Contract Management, procedures involved in arbitration and settlement (Introduction only)</p> <p>Course Outcome: CO4 Teaching Hours:14 hrs Marks: 10 (R-6, U-4, A-0)</p>
5	<p>Safety in Construction: 5.1 Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. 5.2 Labour Laws and Acts pertaining to Civil construction activities (Introduction only)</p> <p>Course Outcome: CO5 Teaching Hours: 8 hrs Marks: 8 (R-2, U-4, A-2)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Construction industry and management	6	6	0	12
2	Site Layout	2	4	4	10
3	Planning and scheduling	4	6	10	20
4	Construction Contracts and Specifications	6	4	0	10
5	Safety in Construction	2	4	2	8
Total		20	24	16	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Construction Engineering and Management	Sharma S. C. and Deodhar S. V. Khanna Book Publishing, New Delhi	ISBN: 978-81-7409-272-4
2	B.M Construction planning and management	Gahlot,P.S. and Dhir New Age International (P) Ltd. Publishers, New Delhi.	ISBN 10 8122404111 ISBN 13 9788122404111
3	Construction planning and management	Shrivastava, U.K. Galgotia Publication Pvt Ltd. New Delhi	ISBN : 817515246X, 9788175152465
4	The A To Z of Practical Building Construction and its Management	Mantri, S. Satya Prakashan New Delhi	ISBN-10: 9351921417; ISBN-13: 978-9351921417
5	Industrial Engineering and management	Khanna, O.P. Dhanpat Rai New Delhi	ISBN-10: 818992835X

E-References:

1. <http://libguides.ac.uk>
2. <http://project-management.com>
3. <http://www.transit.dot.gov>
4. www.inampro.nic.in
5. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2	--	--	3	3	--	3	--
CO2	3	2	2	2	--	3	3	--	3	--
CO3	3	3	3	3	--	3	3	--	3	--
CO4	3	3	3	--	--	3	3	--	3	--
CO5	3	3	--	--	--	3	3	--	3	--

Industry Consultation Committee:

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Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: AM19503				Course Title: Advanced Geotechnical Engineering						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
TH	PR	TU	Total	TH (2Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	--	--	04	60	20	20	--	--	--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term

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 course is a must for civil engineering students.

Course Outcomes: Student should be able to

CO1	Identify types of rocks and sub soil strata of earth.
CO2	Interpret the physical properties of soil related to given construction activities.
CO3	Use the results of permeability and shear strength test for foundation analysis.
CO4	Interpret soil bearing capacity results.
CO5	Compute optimum values for moisture content for maximum dry density of soil through various tests.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Overview of Geology and Geotechnical Engineering :</p> <p>1.1 Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth, Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks.</p> <p>1.2 Importance of soil as construction material in Civil engineering structures and as foundation bed for structures.</p> <p>1.3 Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam.</p> <p>Course Outcome: CO1 Teaching Hours : 10 hrs Marks: 10 (R-4, U-4, A-2)</p>

2	<p>Physical and Index Properties of Soil :</p> <p>2.1 Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.</p> <p>2.2 Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.</p> <p>2.3 Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.</p> <p>Course Outcome: CO2 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p>
3	<p>Permeability and Shear Strength of Soil :</p> <p>3.1 Definition of permeability, Darcy’s law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems).</p> <p>3.2 Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test –laboratory methods.</p> <p>Course Outcome: CO3 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p>
4	<p>Bearing Capacity of Soil :</p> <p>4.1 Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi’s analysis and assumptions, effect of water table on bearing capacity.</p> <p>4.2 Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131.</p> <p>4.3 Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine’s theory and assumptions made for non-cohesive Soils.</p> <p>Course Outcome: CO4 Teaching Hours: 12 hrs Marks: 12 (R-4, U-4, A-4)</p>
5	<p>Compaction and stabilization of soil :</p> <p>5.1 Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content(OMC), maximum dry density(MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ramming and vibration. Suitability of various compaction equipments- smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.</p> <p>5.2 Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction</p> <p>5.3 Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.</p> <p>Course Outcome: CO5 Teaching Hours: 14 hrs Marks: 14 (R-4, U-4, A-6)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Overview of Geology and Geotechnical Engineering	4	4	2	10
2	Physical and Index Properties of Soil	4	4	4	12
3	Permeability and Shear Strength of Soil	4	4	4	12
4	Bearing Capacity of Soil	4	4	4	12
5	Compaction and stabilization of soil	4	4	6	14
Total		20	20	20	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Soil Mechanics and Foundation Engineering	Punmia, B.C., Laxmi Publication, Delhi.	ISBN 81-7008-791-0
2	A text book of soil mechanics and foundation Engineering	Murthy, V.N.S., CBS Publishers & Distributors Pvt. Ltd., New Delhi.	ISBN 10: 8123913621 ISBN 13: 9788123913629
3	Geotechnical Engineering (Soil Mechanics)	Ramamurthy, T.N. & Sitharam, T.G., S Chand and Company LTD., New Delhi.	ISBN 10: 812192457X ISBN 13: 9788121924573
4	Soil Mechanics and Foundation Engineering	Raj, P. Purushothama, Pearson India, New Delhi.	ISBN:8131790819
5	Geotechnical Engineering	Kasamalkar, B. J., Pune Vidyarthi Griha Prakashan, Pune.	ISBN 9788170087915

E-References:

- <http://www.masterportal.com>
- <http://www.nptel.ac.in>
- <http://www.adv-geosolutions.com>
- <http://easyengineering.net>
- <http://wwwen.uni.lu>
- <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping (CIVIL ENGINEERING)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	--	--	2	1	3	--	1	--
CO2	3	3	2	3	2	1	3	--	1	--
CO3	3	3	3	3	2	1	3	--	1	--

CO4	3	3	3	3	3	1	3	--	1	--
CO5	3	2	3	3	3	1	3	--	1	--

Industry Consultation Committee:

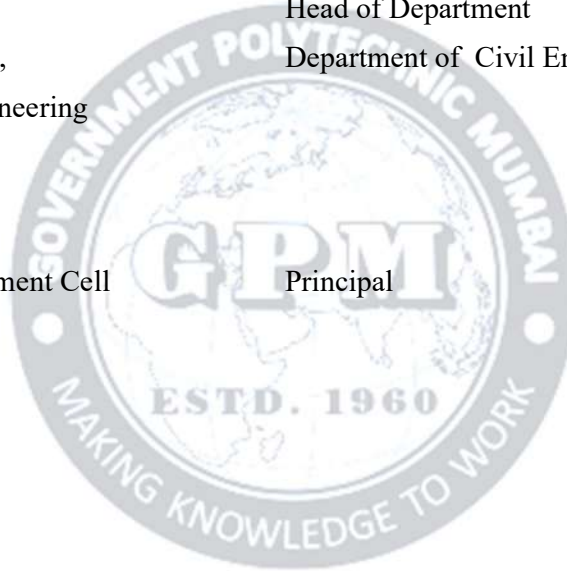
Sr. No	Name	Designation	Institute/Organisation
1	Mr. Rohan Deokar	Deputy Engineer	MMRDA
2	Mr. Sanjay Kulkarni	Surveyor and Consultant	SRKulkarni Pvt.Firm
3	Mr. K.V. Kelgandre	Sr. Lecturer in Civil Engg.	K.J. Somaiya Polytechnic
4	Ms. S.D.Deshpande	Principal	Govt. Polytechnic Mumbai

Coordinator,
Curriculum Development,
Department of Civil Engineering

Head of Department
Department of Civil Engineering

I/C, Curriculum Development Cell

Principal



Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: CE19505				Course Title: Solid Waste Management						
Compulsory / Optional: Optional										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
04	--	--	04	60	20	20	--		--	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

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 including Bio-medical waste, E-waste etc. 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 where ever applicable.

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	Classify the Solid Wastes.
CO2	Decide collection method and transportation of MSW
CO3	Use best disposal method for MSW
CO4	Use best collection and disposal method for Bio-medical waste.
CO5	Use best collection and disposal method for E-waste and Industrial waste.
CO6	Use best practices to avoid health hazards to peoples involved in process of SWM

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Introduction.</p> <p>1.1 Definition of Solid waste. Types of waste- Domestic, Commercial, Industrial, Market, Agricultural, Bio-medical and E-waste.</p> <p>1.2 Sources of solid waste. Classification of solid waste- Hazardous and non-hazardous.</p> <p>1.3 Characteristics of solid waste- Physical and Chemical.</p> <p>1.4 Impact of solid waste on environment.</p> <p>1.5 Solid waste management techniques, solid waste management hierarchy, solid waste prevention and reduction.</p>

	<p>1.6 Factors affecting on solid waste generation.</p> <p>Course Outcome: CO1 , Teaching Hours : 10 Marks: 10 (R-4, U-6, A- --)</p>
2	<p>Storage, Collection and Transportation of Municipal Solid Waste.</p> <p>2.1 Storage of municipal solid waste. Collection methods of municipal solid waste. Tools and equipment's used for storage and collection.</p> <p>2.2 Transportation of municipal solid waste. Vehicles used for transportation of waste.</p> <p>2.3 Role of rag pickers in waste management.</p> <p>2.4 Organization pattern of solid waste management.</p> <p>Course Outcome: CO2 Teaching Hours :10 Marks:12 (R-4 , U-4 , A-4)</p>
3	<p>Disposal of Municipal Solid Waste</p> <p>3.1 Composting of solid waste, Principle of composting process, Factors affecting on composting process.</p> <p>3.2 Methods of composting- i) Manual composting ii) Mechanical composting iii) Vermi composting concept.</p> <p>3.3 Land fill method of disposal- Factors for site selection, Land filling methods, Advantages and dis advantages of land fill method.</p> <p>3.4 Incineration of solid waste- Types of incinerators, Advantages and dis advantages of incineration process.</p> <p>Course Outcome:CO3 Teaching Hours :10 Marks: 10 (R-2 , U-4 , A-4)</p>
4	<p>Bio-Medical Waste Management</p> <p>4.1 Definition of Bio-medical waste.</p> <p>4.2 Sources and generation of Bio-medical waste.</p> <p>4.3 Classification of Bio-medical waste.</p> <p>4.4 Collection and management technologies.</p> <p>Course Outcome:CO4 Teaching Hours : 10 Marks:10 (R- 2, U-4, A-4)</p>
5	<p>E-Waste and Industrial Waste Management</p> <p>5.1 Definition of E-waste.</p> <p>5.2 Varieties of E-waste, Dangers of E-waste.</p> <p>5.3 Recycling and disposal of E-waste.</p> <p>5.4 Definition of Industrial waste. Varieties of industrial waste.</p> <p>5.5 Collection and disposal of industrial waste.</p> <p>5.6 Control measures and Recycling of industrial waste.</p> <p>Course Outcome:CO5 Teaching Hours :12 Marks:10 (R- 2 , U-4 , A-4)</p>
6	<p>Health Aspect and Public Involvement in SWM</p> <p>6.1 Health aspect during handling and processing.</p> <p>6.2 Health problems during time of segregation, reuse, recovery, recycling of solid waste.</p> <p>6.3 Public involvement and participation in solid waste management.</p> <p>Course Outcome: CO6 Teaching Hours:08 Marks: 08 (R- 2 , U-6 , A-)</p>

Suggested Specifications Table (Theory):

Unit No	Topic Title	Distribution of Theory Marks			
		R Level	U Level	A Level	Total Marks
1	Introduction	4	6	--	10
2	Storage, Collection and Transportation of Municipal Solid Waste	4	4	4	12
3	Disposal of Municipal Solid Waste	2	4	4	10
4	Bio-Medical Waste Management	2	4	4	10
5	E-Waste and Industrial Waste Management	2	4	4	10
6	Health Aspect and Public Involvement in SWM	2	6	--	08
Total		16	28	16	60

References/ Books:

Sr. No.	Title	Author, Publisher, Edition and Year Of publication	ISBN
1	Solid Waste Management	Dr. A.D.Bhide, Indian National Scientific Documentation Centre, New Delhi.	
2	Solid Waste Management	George Tchobanoglous, McGraw Hill Education Private Ltd. New Delhi	ISBN:10:0071356231
3	Solid Waste Management	K.Sasikumar, PHI Learning	ISBN 13:9788120338692
4	Environmental Studies	D.L.Manjunath, PEARSON Publication	ISBN 13:978- 8131709122
5	Environmental Pollution	Khopkar S.M., New Age International Limited	ISBN:8122415075, 9788122415070
6	Environmental Studies	Anindita Basak, PEARSON Publication	ISBN:8131785688, 9788131785683
7	Prospect and Perspectives of Solid Waste Management	B.B.Hosetti, NEW AGE International Limited	ISBN 13:9788171324934

E-References:

- a. www.mpcb.gov.in
- b. www.cpcb.gov.in
- c. www.britanica.com
- d. www.downtoearth.org.in
- e. En.wikipedia.org
- f. <http://www.nationallibrary.gov.in>

CO Vs PO and CO Vs PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	3	1	1	3	2	2	3	3
CO2	3	3	3	3	2	2	2	2	3	2
CO3	3	3	2	3	2	3	2	2	3	2
CO4	3	3	3	3	2	3	2	2	3	2
CO5	3	3	3	3	2	3	2	2	3	2
CO6	3	2	3	3	2	3	2	2	3	3

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Coordinator,
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I/C, Curriculum Development Cell

Principal

Programme : Diploma in Civil Engineering (Sandwich Pattern)										
Course Code: CE19506				Course Title: Project						
Compulsory / Optional: Compulsory										
Teaching Scheme and Credits				Examination Scheme						
L	P	TU	Total	TH (2 Hrs 30 min)	TS1 (1 Hr)	TS2 (1Hr)	PR	OR	TW	Total
--	4	--	04	--	--	--	--	50*	50	100

Abbreviations: L- Theory Lecture, P-Practical, TU-Tutorial, TH- Theory Paper TS1 & TS2- Term Tests, PR- Practical, OR-Oral, TW: Term Work (progressive assessment) , * Indicates assessment by External Examiner else internal practical skill test , # indicates Self, on- line learning Mode, @ indicates on line examination
 Note: For Minimum passing marks under various heads, refer, examination rule AR 26. Two practical skill test are to be conducted. First skill test at mid term and second skill test at the end of the term.

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: Student should be able to

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	Work independently as a leader as well as member of a team.
CO5	Prepare and present report prepared.

Course Content Details:

Unit No	Topics / Sub-topics
1	<p>Project Work: The students will select a topic related to any course in the curriculum, design various nits 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.</p> <p>Following is the list of some Civil Engineering suggestive areas for selection of project.</p> <ol style="list-style-type: none"> 1. Campus Development. 2. Bridge/Fly over/Sky walk. 3. Junction planning for city roads/planning for congested road areas/Parking studies. 4. Municipal Solid waste management. 5. Bio-Medical waste management. 6. Recycling of resources. 7. Concrete Mix design. 8. Structural audit of an existing building. 9. Manufacturing of Pre-cast concrete products. 10. Non- conventional sources of energy.

	<p>12. Transfer of technology to villages. 13. Planning and design for residential building/commercial complex. 14. Planning and design of water treatment plant for a given data. 15. Planning and design of water supply scheme for given lay-out. 16. Planning and design of sewage treatment plant for a given data. 17. Planning and design of sanitary scheme for given lay-out. 18. Lift Irrigation scheme. 19. Micro Irrigation- Drip/Sprinkler Irrigation. 20. Water shed development of small catchments. 22. Recent developments and new technologies in Civil Engg. 23. Entrepreneurship development.</p> <p>The project report shall contain the following as the case may be-</p> <p>a. Drawings b. Design c. Test results d. Detailed estimate of project e. Photographs</p>
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I/C, Curriculum Development Cell

Principal

CE 19507 Entrepreneurship (NPTEL)

The course structure and content covers, over a period of 12 weeks, the following 15 modules

Module 1: Entrepreneurial Journey

Module 2: Entrepreneurial Discovery

Module 3: Ideation and Prototyping

Module 4: Testing, Validation and Commercialisation

Module 5: Disruption as a Success Driver

Module 6: Technological Innovation and Entrepreneurship – 1

Module 7: Technological Innovation and Entrepreneurship – 2

Module 8: Raising Financial Resources

Module 9: Education and Entrepreneurship

Module 10: Beyond Founders and Founder-Families

Module 11: India as a Start-up Nation

Module 12: National Entrepreneurial Culture

Module 13: Entrepreneurial Thermodynamics

Module 14: Entrepreneurship and Employment

Module 15: Start-up Case Studies