GOVERNMENT OF ASSAM

STATE COUNCIL FOR TECHNICAL EDUCATION, ASSAM

Director of Technical Education, Assam.

DRAFT SYLLABUS OF 4th SEMESTER

Civil Engineering

COURSE STRUCTURE

Credit distribution & Marks

FOURTH SEMESTER

Sl. No	**Category of Course**	Code No.	Course Title	Hours per week			Credits	Marks
				L	T	P		
1.	Program core course	CEPC-401	Hydraulics	2	0	0	2	100
2.	Program core course	CEPC-402	Estimating, Costing and valuation	3	0	0	3	100
3.	Program core course	CEPC-403	Structural Mechanics-II	2	0	0	2	100
4.	Program core course	CEPC-404	Concrete Technology	3	0	0	3	100
5.	Program core course	CEPC-405	Hydraulics Lab	0	0	2	1	100
6.	Program core course	CEPC-406	Concrete Technology Lab	0	0	2	1	100
7.	Program Elective course	CEPE-###	*Program Elective-I	2	0	0	2	100
8.	Open Elective	OE-###	*Open Elective-II	2	0	0	2	100
9.	Minor Project	PR-401	Minor Project	0	0	4	2	100
10.	Internship-I **(4 weeks after 3rd Semester)**	SI-401	Summer Internship-I	0	0	0	2	100
	Total Credits						**20**	**1000**
***Program Elective-I Courses** (**Any one to be selected**)								
1.	Program Elective course	CEPE-401	Rural Construction Technology	2	0	0	2	100
2.	Program Elective course	CEPE-402	Precast and Prestressed Concrete	2	0	0	2	100
3.	Program Elective course	CEPE-403	Construction Management	2	0	0	2	100
***Open Elective-II Courses (Any one to be selected)**								
1.	Open Elective	OE-I-###	Next generation Technologies (Infosys Springboard)	2	0	0	2	100
2.	Open Elective	OE-T-402	Advanced plumbing (TATA Technologies)	2	0	0	2	100
3.	Open Elective	CEOE-403	Disaster Management	2	0	0	2	100
4.	Open Elective	OE-T-###	Internet of Things (TATA Technologies)	2	0	0	2	100
4.	Open Elective	OE-###	Any other course from other program approved by SCTE, Assam	2	0	0	2	100

Note: Mandatory Skill course (4 Credits) if any student wants to exit after completion of Second year (Fourth Semester) courses:

MARKS DISTRIBUTION

Fourth Semester

Sl. No	Course Code	Course Title	Theory				Practical				Total Marks (Course)	Pass marks (Course)
			IA		ESE		IA		ESE			
			Total Marks	Pass Marks	Total Marks	Pass Marks	Total Marks	Pass Marks	Total Marks	Pass Marks		
1.	CEPC-401	Hydraulics	40	16	60	24	-	-	-	-	100	40
2.	CEPC-402	Estimating, Costing and valuation	40	16	60	24	-	-	-	-	100	40
3.	CEPC-403	Structural Mechanics-II	40	16	60	24	-	-	-	-	100	40
4.	CEPC-404	Concrete Technology	40	16	60	24	-	-	-	-	100	40
5.	CEPC-405	Hydraulics Lab	-	-	-	-	60	24	40	16	100	40
6.	CEPC-406	Concrete Technology Lab	-	-	-	-	60	24	40	16	100	40
7.	CEPE-###	*Program Elective-I	40	16	60	24	-	-	-	-	100	40
8.	OE-###	*Open Elective-II	As specified in respective detailed syllabus								100	40
9.	PR-401	Minor Project	-	-	-	-	60	24	40	16	100	40
10.	SI-401	Summer Internship-I	-	-	-	-	-	-	100	40	100	40

DETAILED SYLLABUS

Semester-IV

1. COURSE TITLE:: HYDRAULICS

Course Title	:	**HYDRAULICS**
Course Code	:	CEPC-401
Semester	:	Fourth
Number of Credits	:	2 [L-2, T-0, P-0]
Prerequisites	:	NIL
Course Category	:	Program core course

LEARNING OBJECTIVES:

LO1	:	To understand parameters associated with fluid flow and hydrostatic pressure
LO2	:	To know head loss and water hammer in fluid flowing through pipes.
LO3	:	To learn different types of pumps and their uses.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Compute total hydrostatic pressure for different condition
CO2	:	Compute variation of pressure with depth
CO3	:	Compute head loss of fluid flow through pipes
CO4	:	Compute fluid flow parameters in open channel
CO5	:	Select relevant hydraulic pumps for different applications.

TEACHING SCHEME: (in hours/week)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	2	0

TEACHING SCHEME: (Total hours)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	0	30	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks
ESE		IA		ESE		IA		
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	100
60	24	40	16	--	--	--	--	

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1	Introduction	• Technical terms used in hydraulics – fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics – ideal and real fluid, application of hydraulics. • Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity. (No numerical)	3
2	Pressure measurement and hydrostatic pressure	• Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. • Measurement of Pressure by simple and differential Manometer (Simple problem) • Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on vertical immersed surfaces. (Simple problem)	6
3	Flow of Fluid	• Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number. • Discharge and its unit, continuity equation of flow. • Energy of flowing liquid: potential, kinetic and pressure energy. • Bernoulli's theorem: statement, assumptions, equation. • (Simple problem)	5
4	Flow through Pipes	• Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, • Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement. • Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. • Hydraulic gradient line and total energy line. • Discharge measuring device for pipe flow: Venturi meter and its working. • Discharge measurement using Orifice, Hydraulic Coefficients of Orifice. (Simple problem)	7
5	Flow through Open Channel	• Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radius for rectangular and trapezoidal channel section. • Determination of discharge by Chezy's equation and Manning's equation. • Conditions for most economical rectangular and	6

		trapezoidal channel section. • Discharge measuring devices: Triangular and rectangular Notches. • Velocity measurement devices: current meter, and Pitot's tube. • (Simple problem)	
6	Hydraulic Pump	• Concept of pump, Different types of pump- centrifugal, reciprocating and submersible pump construction and working. No numerical	3
Total contact hours			**30**

Table of Specification															
Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1	3	1		1	1	1					2				6
2	6	1	1	1		1	1		2		3				10
3	5	1	1	1	1	1	2		2	2	3				14
4	7	1	1	1	1	1	1		2	2	3				13
5	6	1	1	1		1	1		2		3				10
6	3	1			1	1				2	2				7
Total	30	6	4	5	4	6	5		8	6	16				60
Total Marks		**15**			**15**				**30**						**60**

NB:R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	**Book Name**	**Author Name**	**Publishing House, Volume, ISBN**
1	Hydraulics and Fluid Mechanics	Modi, P. N.and Seth, S.M	Standard book house, Delhi.
2	Fluid Mechanics & Hydraulic Machines	S.S. Rattan	Khanna Book Publishing Co., New Delhi.
3	Hydraulics, Fluid Mechanics and Fluid Machines	Ramamrutham, and Narayan, R	Dhanpat Rai Publishing Company, New Delhi
4	Fluid Mechanics, Hydraulic machines	Khurmi R S, Hydraulics	S. Chand Publishers.
5	Fluid Mechanics	Rajput, R K	S Chand, New Delhi
6	Fluid Mechanics and Machinery,	Ojha, C S P, Berndtsson, R, and Chandramoulli P. N.	Oxford University Press, New Delhi

2. COURSE TITLE:: ESTIMATING, COSTING AND VALUATION

Course Title	:	**ESTIMATING, COSTING AND VALUATION**
Course Code	:	CEPC -402
Semester	:	Fourth
Number of Credits	:	3 [L:3, T:0, P:0]
Prerequisites	:	Student should have basic knowledge civil engineering drawing, calculation of area, volume of objects
Course Category	:	Program core course

LEARNING OBJECTIVES:

LO1	:	Understand basics of estimating and costing
LO2	:	Learn the specifications of various items of construction works
LO3	:	Learn to determine rate analysis for different items of construction
LO4	:	Learn to prepare estimate and cost of civil engineering works
LO5	:	Calculate earthworks involved in roads and canals
LO6	:	Interpret and use drawings and specifications for measurement purposes
LO7	:	Ability to determine the value of building or other engineering structure, land etc.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Prepare estimate of different Civil Engineering works.
CO2	:	Analyze the rates of different items of construction.
CO3	:	Understand legal and ethical aspects of costing and valuation
CO4	:	Calculate the approximate cost of Civil Engineering structures.
CO5	:	Assess value of the building, land and other structures

TEACHING SCHEME:(in hours/week)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
3	0	3	0

TEACHING SCHEME:(Total hours)

Theory			**Practical**
Lecture	Tutorial	**Total**	
45	--	45	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks
ESE		IA		ESE		IA		100
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	
60	24	40	16	--	--	--	--	

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1	Fundamentals of Estimating and Costing	**1.1** Estimating and Costing – Meaning, purpose, importance of estimating **1.2** Administrative approval, Technical Sanction and Budget provision. **1.3** Types of estimates – Approximate and Detailed estimate. Revised estimate, Supplementary estimate, Repair and maintenance estimate, renovation estimate. **1.4** Roles and responsibility of Estimator. **1.5** Checklist of items in load bearing and framed structure. **1.6** Units of measurement, Measurement book, Schedule of rates, Standard formats of Measurement sheet, Abstract sheet, Face sheet. **1.7** Rules of measurement and desired accuracy in measurements for different items of 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	6
2	Approximate Estimates	**2.1** Approximate estimate- Definition, Purpose. **2.2** Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Approximate quantity method (with simple numerical)	4
3	Detailed Estimate (RCC Building)	**3.1** Detailed Estimate- Definition and Purpose, **3.2** Data required for detailed estimate - Civil cost, water supply and sanitary Charges, electrification charges, Contingencies, Supervision charges, labor cess , GST **3.3** Procedure for preparation of detailed estimate- Taking out quantities, bill of quantities and Abstracting. **3.4** Methods of Detailed Estimate- Unit quantity method and total quantity method **3.5** Long wall and short wall method, Centre line method, partly centerline and partly cross wall method **3.6** Bar bending schedule for footing, column, beam, lintel, chajja and slab element	12
4	Estimate for Civil Engineering Works	**4.1** Earthwork - Quantities for roads, Embankment and canal by – Mean sectional area method, Mid sectional area method, ,Prismoidal formula method. **4.2** Detailed estimate for culvert, septic tank and soak pit	9
5	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, Task work of different skilled labour for different items.	8

		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 equipment. **5.7** Rate analysis of different items of work pertaining to roads.	
6	Valuation	**6.1** Definition, purpose and principles of valuation **6.2** Terms used in valuation **6.3** Mortgage-lease, freehold and leasehold properties, sinking fund, year's purchase **6.4** Depreciation –methods, determination of depreciation as per life of building **6.5** Methods of valuation	6
Total Contact Hours			**45**

Table of Specification

Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1	6	1	1	--	1	1	--	--	--	1	--	--	--	--	5
2	4	1	1	--	--	--	--	--	--	--	--	--	3	--	5
3	12	1	1	1	--	--	1	2	--	--	--	4	3	2	15
4	9	1	1	1	--	1	1	1	--	--	2	2	4	--	14
5	8	1	1	1	1	--	--	--	--	--	2	1	4	--	11
6	6	1	1	--		1	--	--	--	1	2	2	-	2	10
Total	45	6	6	3	2	3	2	3		2	6	7	17	3	60
Total Marks		**15**			**10**				**35**						**60**

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:**Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	Author Name	Book Name	Publishing House, Volume, ISBN
1	Datta, B.N	Estimating and Costing in Civil Engineering	,UBS Publishers Distributors Pvt. Ltd. New Delhi
2	Peurifoy, Robert L. Oberlender, Garold,	Estimating construction cost (fifth edition),	McGraw Hill Education,, New Delhi.
3	Rangwala, S.C.	Estimating and Costing	Charotar Publishing House PV LTD. Anand
4	Birdie,G.S.,	Estimating and Costing	Dhanpat Rai Publishing Company (P)Ltd. New Delhi.
5	Patil,B.S.,	Civil Engineering Contracts and Estimates	Orient Longman Mumbai
6	Chakraborti, M.,	Estimating and costing, specification and Valuation in civil engineering,	Monojit Chakraborti, Kolkata
7	Aggarwal, A.K Upadhyay	Civil Estimating, Costing &Valuation	SK Kataria and Sons
8	Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates. Manual of Specifications and Standards for DBFOT projects, EPC works		
9	DSR/APWD schedule of rates		

3. COURSE TITLE:: STRUCTURAL MECHANICS-II

Course Title	:	**Structural Mechanics-II**
Course Code	:	CEPC-403
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Engineering Mechanics, Structural Mechanics-I
Course Category	:	Program core course

LEARNING OBJECTIVES:

LO1	:	Calculate the slope and deflection of beams.
LO2	:	Calculate the critical load in column by using Euler's and Rankine's formula
LO3	:	Determine the stability of dam and retaining walls
LO4	:	verify forces in a framed structure
LO5		Explain shear stress, stress distribution diagram for various sections

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Solve for bending moment in fixed end and continuous beam
CO2	:	Solve for shear stress in beam sections of different shapes
CO3	:	Solve for slope and deflection in statically determinate beams
CO4	:	Solve for buckling load on columns
CO5	:	Solve for stresses in dams and retaining walls
CO6	:	Analyze the forces in simple truss

TEACHING SCHEME: (in hours/week)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	2	0

TEACHING SCHEME: (in hours)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	0	30	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks
ESE		IA		ESE		IA		
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	100
60	24	40	16	--	--	--	--	

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1.	Fixed beam & Continuous Beam	**1.1** Introduction, Advantages of fixed beam **1.2** Calculation of fixed end moment & Bending Moment diagram (point load & UDL only) **1.3** Analysis of continuous beam by slope deflection method (Simple numerical)	8
2.	Shear Stresses in Beams	**2.1** Concept of shear stresses in beams **2.2** Shear stress distribution in rectangular, circular, I and T sections for beams. (No derivation, numerical problems only)	4
3.	Slopes and deflection of beams	Slopes and deflections of simply supported beam and cantilever beam for point load and U.D.L only. (no derivation, simple numerical problems only)	4
4.	Column and struts	**4.1** Theory of columns- long and short columns, slenderness ratio **4.2** Effective length of column for different end condition **4.3** Buckling load or crippling load **4.4** simple numerical problems using Euler's and Rankine formula	4
5	Analysis of dam and retaining walls	**5.1** Forces acting on dam **5.2** Calculation of stress at the base of dams (rectangular dam or trapezoidal dam with on face vertical facing to water) **5.3** Conditions of Stability of dams **5.4** Retaining walls-angle of repose, earth pressure, Rankine's theory, forces on retaining wall- **5.5** Calculation of stress at the base of retaining walls	5
6	Analysis of truss	**6.1** Concept of a perfect, redundant and deficient frames **6.2** Analysis of perfect frame by method of joint (simple truss only)	5
Total Contact Hours			**30**

Table of Specification															
Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1	8	1	2	0	1	2	0	0	0	0	0	6	0	0	12
2	5	1	1	0	0	0	0	0	0	0	6	0	0	0	8
3	4	1	1	1	0	0	1	0	0	0	0	6	0	0	10
4	4	1	1	0	1	0	1	0	0	0	6	0	0	0	10
5	5	1	1	0	1	1	0	0	0	0	0	6	0	0	10
6	4	1	1	1	0	0	1	0	0	0	0	6	0	0	10
Total	**30**	6	7	2	3	3	3	0	0	0	12	24	0	0	60
Total Marks		**15**			**9**				**36**						**60**

NB:R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1	Strength of materials	S. Ramamuratham & R.Narayan	Dhanpat Rai& Sons
2	Strength of materials	Dr. R.K. Bansal	Laxmi Publication (P) Ltd
3	Strength of materials	M. Chakraborty	S K Kataria& Sons
4	Structural Mechanics	R.S.Khurmi	S. Chand Publishing
5	Mechanics of Structures-vol I and vol 2	S. B. Junnarkar	Charotar Publishing House,Anand
6.	Theory of structures	S. Ramamuratham & R.Narayan	Dhanpat Rai& Sons
7.	Structural Analysis		

4. COURSE TITLE:: CONCRETE TECHNOLOGY

Course Title	:	**Concrete Technology**
Course Code	:	CEPC-404
Semester	:	Fourth
Number of Credits	:	3 [L: 3, T: 0, P: 0]
Prerequisites	:	Basic Knowledge of Building Materials and Construction
Course Category	:	Program Core

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	To know the types of cement, minerals, aggregates and chemical admixtures.
LO2	:	To understand the properties of concrete and testing of concrete.
LO3	:	To understand the methodology of mix design.
LO4	:	To able to explain the sequential operations of concreting in given situation.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Identify the suitability of materials for the construction works
CO2	:	Summarize the behaviour of fresh and hardened concrete
CO3	:	Apply procedural steps as per codes for concrete mix proportioning
CO4	:	Describe concreting operations, formwork and causes of defects in concrete
CO5	:	Describe need for special concrete and their properties

TEACHING SCHEME: (IN HOURS/WEEK)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
3	--	3	0

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
45	0	45	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks	Pass Marks
ESE		IA		ESE		IA			
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	100	40
60	24	40	16	---	--	--	--		

DETAILED COURSE CONTENT:

Unit	Title	Contents	Hours
1.	Cement, Aggregates and Water	**1.1 Cement:** Physical properties of cement; different types of cement as per IS Codes, Hydration of cement. Significance of different tests on cements. Storage of cement and effect of storage on properties of cement. BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement. **1.2 Aggregates:** Requirements of good aggregate, Classification according to size and shape. • Fine aggregates: Properties, size, specific gravity, bulk density, water absorption, effect of bulking of sand in concrete, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand. • Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications. **1.3 Water:** Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456.	10
2.	Concrete Properties	**2.1 Concrete:** Different grades of concrete, provisions of IS 456. Water cement (w/c) ratio, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456. 2.2 **Properties of fresh concrete:** Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures. Minimum grade of concrete for different exposure conditions, minimum grade of concrete for R.C.C., Effect of shape and size of coarse aggregates on strength of concrete. **2.3 Properties of Hardened concrete**: Strength, Durability, Impermeability.	10
3.	Concrete Mix Design and Testing	**3.1 Concrete mix design**: Objectives, methods of mix design, study of mix design as per IS 10262 (only procedural steps). **3.2 Testing of concrete:** Significance of testing, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results. **3.3 Non- destructive testing**: Importance of NDT, Methods of NDT.	9
4.	Quality Control of	**4.1 Concreting Operations:** Batching, Mixing, Transportation, Placing, Compaction, Curing methods and Finishing of concrete.	8

	Concrete	**4.2 Forms for concreting:** Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456. **4.3 Defects in concrete**: Identification of defects and methods of removing defects.	
5.	Admixture in concrete and Special Concrete	**5.1 Admixture in concrete:** Purpose, properties and application for different types of admixtures such as accelerating admixtures, retarding admixtures, water reducing admixture, air entraining admixture, plasticizers and super plasticizers. **5.2 Mineral Admixtures:** Flyash, Blast furnace slag, its use, properties and effects. **5.3 Special Concrete:** Properties, advantages and limitation of the following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete and self-compacting concrete, light weight concrete.	8
Total Contact Hours			**45**

Table of Specification

Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1.	10	1	--	--	2	2	2	--	3	4	--	--	--	--	14
2.	10	1	2	--	3	2	--	--	2	4	--	--	--	--	14
3.	9	2	2	--	--	--	2	--	--	4	--	7	--	--	17
4.	8	1	2	1	--	1	--	--	--	2	--	--	--	--	7
5.	8	1	2	--	--	1	--	--	--	--	4	--	--	--	8
Total	45	6	8	1	5	6	4	--	5	14	4	7	--	--	60
Total Marks		**15**			**15**				**30**						**60**

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1.	Concrete Technology	Gambhir,M.L.	TataMcGrawHillPublishingCo.Ltd.,NewDelhi,ISBN-13: 978-1-259-06255-1
2.	Concrete Technology	Shetty, M.S	S.ChandandCo.Pvt.Ltd.,RamNagar,NewDelhi-110055 ISBN: 978-8-121-90003-4
3.	Concrete Technology	Neville,A.M.and Brooks, J.J.	PearsonEducationPvt.Ltd.,NewDelhiISBN978-0-273- 73219–8
4.	Concrete Technology	JobThomas	CENAGE Publication ISBN-13:978-81-315-2668-2

5. COURSE TITLE: HYDRAULICS LAB

Course Title	:	**Hydraulics Lab**
Course Code	:	CEPC 405
Semester	:	Fourth
Number of Credits	:	1 [L: 0, T: 0, P: 2]
Prerequisites	:	NIL
Course Category	:	Program Core Course

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	To understand parameters associated with fluid flow and hydrostatic pressure.
LO2	:	To know head loss and water hammer in fluid flowing through pipes.
LO3	:	To learn different types of pumps and their uses.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Experiment with hydrostatic pressure measuring instruments
CO2	:	Experiment with different instruments for measuring flow through pipes
CO3	:	Experiment with different instruments for measuring velocity and discharge in open channel

TEACHING SCHEME: (IN HOURS/WEEK)

Theory			**Practical (credit)**	
Lecture	Tutorial	Total credits	Practical	Credits
0	0	0	2	1

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
0	0	0	30

EXAMINATION SCHEME:

Theory				Practical				Total Marks	**Pass Marks**
ESE		IA		ESE		IA			
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	100	40
---	---	---	--	40	16	60	24		

LIST OF PRACTICALS TO BE PERFORMED:

Sl no	Practical to be performed
1	Measurements of pressure and pressure head by Piezometer,
2	Measurement of pressure difference by U-tube differential manometer
3	Verification of Bernoulli's theorem
4	Determination of resultant pressure and its position for a given situation of liquid in a tank.
5	Determination of type of flow using Reynold's apparatus.
6	Use Friction factor Apparatus to determine friction factor for a given pipe
7	Determination of minor losses in pipe (any two)
8	Calibrate Venturimeter to find out the discharge in a pipe.
9	Calibrate the Orifice to find out the discharge through a tank.
10	Use Pitot tube to measure the velocity of flow of water in open channel.
11	Use Current meter to measure the velocity of flow of water in open channel.
12	Use triangular notch to measure the discharge through open channel.
13	Use Rectangular notch to measure the discharge through open channel.

REFERENCE BOOK LIST:

Sl No.	Book Name	Author Name	Publisher
1.	Fluid Mechanics	R.K. Bansal	Lakshmi Publications
2.	Hydraulics, Fluid Mechanics and Hydraulics Machines	K.R. Arora	Standard Publishers & Distributors, New Delhi
3.	Hydraulics, Fluid Mechanics and Hydraulic Machines	Dr. JagadishLal	Metropolitan Book Company- New Delhi
4.	Journals/ manuals shall be referred		

6. COURSE TITLE:: CONCRETE TECHNOLOGY LAB

Course Title	:	**Concrete Technology Lab**
Course Code	:	CEPC-406
Semester	:	Fourth
Number of Credits	:	1 [L: 0, T: 0, P: 2]
Prerequisites	:	Knowledge of Building Materials and Concrete
Course Category	:	Program core course

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	Impart knowledge to identify the physical properties of cement and coarse aggregate by performing laboratory tests.
LO2	:	To enable students to prepare concrete of desired compressive strength and specifications by maintaining the quality of concrete.
LO3	:	Acquire knowledge of proportioning of ingredients of concrete for design mix.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Test different properties of cement
CO2	:	Test physical properties of fine and coarse aggregate
CO3	:	Prepare concrete of desired compressive strength and specification

TEACHING SCHEME: (Hours/Week)

Theory			**Practical**	
Lecture	Tutorial	Total credits	Practical	Credits
0	0	0	2	1

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
0	0	0	30

EXAMINATION SCHEME:

Theory				Practical				Total Marks	**Pass Marks**
ESE		IA		ESE		IA			
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	100	40
---	---	---	--	40	16	60	24		

LIST OF PRACTICALS TO BE PERFORMED:

Sl. No.	Description
1	Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.
2	Determine specific gravity, standard consistency, initial and final setting times of cement.
3	Determine soundness of cement.
4	Determine compressive strength of cement.
5	Determine bulk density of fine and coarse aggregates.
6	Determine impact value of aggregate
7	Determine crushing value of aggregate
8	Determine abrasion value of aggregate
9	Determine elongation and flakiness index of coarse aggregates
10	Determine workability of concrete by slump cone test and compacting factor test
11	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days as per BIS code.
12	Demonstration of Non-Destructive Testing (NDT) equipment.

REFERENCE BOOK LIST:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1.	Concrete Technology	Gambhir,M.L.	TataMcGrawHillPublishingCo.Ltd.,NewDelhi,ISBN-13: 978-1-259-06255-1
2.	Concrete Technology	Shetty, M.S	S.ChandandCo.Pvt.Ltd.,RamNagar,NewDelhi-110055 ISBN: 978-8-121-90003-4
3.	Concrete Technology	Neville,A.M.and Brooks, J.J.	PearsonEducationPvt.Ltd.,NewDelhiISBN978-0-273-73219–8
4.	Laboratory Manual in Concrete Technology	Sood H.,Kulkarni P.D., Mittal L.N.	CBS Publishers, NewDelhi.

7 (A). COURSE TITLE:: RURAL CONSTRUCTION TECHNOLOGY

Course Title	:	**Rural Construction Technology**
Course Code	:	CEPE:401
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Basic knowledge and identification of different construction materials used in civil engineering construction.
Course Category	:	Program Elective course

LEARNING OBJECTIVES:

LO1	:	Encouraging the rural people for using low cost locally available material in construction activity.
LO2	:	Impart knowledge in rural areas for low cost environment friendly houses.
LO3	:	Encouraging rural people for using low cost materials and technology in water supply and sanitation thereby upgrading the standard of living and maintain proper hygiene of rural people.
LO4	:	Imparting knowledge for use of weather friendly road materials in rural areas.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Illustrate appropriate technology, plan and programme for rural development
CO2	:	Illustrate low cost housing materials and methods for rural housing
CO3	:	Illustrate low cost water supply and sanitation methods for rural areas
CO4	:	Illustrate low cost methods and guidelines for rural roads

TEACHING SCHEME: (in hours/week)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	2	-

TEACHING SCHEME: (in hours)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	-	30	-

EXAMINATION SCHEME:

Theory				Practical				Total Marks
ESE		IA		ESE		IA		100
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	
60	24	40	16	-	-	-	-	

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1	Appropriate Technology	• Introduction • Concept of appropriate technology. • Scopes, development plans; various approaches to rural development planning, Significance of rural development. • Rural development programme/projects	4
2	Rural Housing	• Low cost construction material for housing • Composite material- ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls. • Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rattrap bond for walls; Panels for roof, ferro-cement flooring/roofing units. • Biomass - types of fuels such as firewood, agricultural residues, dung cakes. • Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, • Financial provisions, sources of renewable energy. • Working of gobar gas and bio gas plants.	10
3	Water Supply and Sanitation for Rural Areas	• Sources of water: BIS & WHO water standards. • Quality, Storage and distribution for rural water supply works. • Hand pumps-types, installation, operation, and maintenance of hand pumps. • Conservation of water - rainwater harvesting, drainage in rural areas. • Construction of low cost latrines: Two pit pour flush water seal, septic tank etc. • Shanker- Baloram type latrine. Latrine attached to individual type bio-gas plant. soak pit • Low cost community and individual Garbage disposal systems, Ferro-cement storage tanks.	10
4	Rural Roads	• Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases. • Guidelines for Surfacing of Rural Road as per relevant IRC codes. • Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.. • Maintenance of rural roads	6
Total Contact Hours			**30**

Table of Specification															
Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1	4	1	1	-	1	1	-	-	2	1	-	-	-	-	7
2	10	2	2	1	2	2	2	-	2	2	5	-	-	-	20
3	10	2	2	1	2	2	2	-	2	1	6	-	-	-	20
4	6	1	2	1	1	2	-	-	2	-	4	-	-	-	13
Total	30	6	7	3	6	7	4		8	4	16				60
Total Marks		**15**			**17**				**28**						**60**

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	**Book Name**	**Author Name**	**Publishing House, Volume, ISBN**
1	Hand Book Of Low Cost Housing	A.K . Lal	
2	Appropriate Technology	Dr. Mohammad Omar Farooq.	
3	Appropriate Technology In Resource Conservation and Recovery	Gunnerson, Charles G.	
4	Appropriate Technology Manifesto: Shifting the Force of Production to Empower People and Protect the Planet.	John Trimble (Author), Mammo Muchie (Editor)	
5	Construction Technology	Subir K Sarkar, Subhajit Saraswati.	

7 (B). COURSE TITLE:: PRECAST AND PRESTRESSED CONCRETE

Course Title	:	**Precast and Prestressed Concrete**
Course Code	:	CEPE-402
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Basic knowledge on RCC Basic knowledge on the principles of structural mechanics Basic knowledge in concrete design
Course Category	:	Program Elective Course

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	Define precast concrete and pre-stressed concrete, explaining the key differences between them.
LO2	:	Identify the different types of pre-stressing tendons and their applications.
LO3	:	Apply design principles for precast concrete elements, including detailing for connections and transfer of loads.
LO4	:	Identify common applications of precast concrete elements, such as walls, floors, beams, columns, and bridge decks.
LO5	:	Understand the impact of pre-stressing on crack control and deflection in concrete structures.

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Select the relevant precast concrete element for a given type of construction
CO2	:	Apply the design principles of prefabricatd building using precast/prefabricated components
CO3	:	Apply the principles of prestressing, post-tensioning, losses in prestress for evaluation of prestressed members
CO4	:	Identify quality issues in precast concrete production, prefabricated element assembling, prestressed concrete construction

TEACHING SCHEME: (IN HOURS/WEEK**)**

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	0	0

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	0	30	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks
ESE		IA		ESE		IA		100
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	
60	24	40	16	-	-	-	-	

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1.	Precast concrete Elements	• Definition and Overview, Advantages and disadvantages of precast concrete members • Non-structural Precast elements - Paver blocks, Fencing Poles, Transmission Poles, Manhole Covers, Hollow and Solid Blocks, kerb stones as per relevant BIS specifications • Structural Precast elements – tunnel linings, Canal lining, Box culvert, bridge panels, foundation, sheet piles • Testing of Precast components as per BIS standards	6
2.	Prefabricated building	• Precast Structural Building components such as slab panels, beams, columns, footings, walls, lintels and chajjas, staircase elements, • Prefabricated building using precast load bearing and non load bearing wall panels, floor systems - Material characteristics, Plans & Standard specifications • Modular co-ordination, modular grid, and finishes • Prefab systems and structural schemes and their classification including design considerations • Joints – requirements of structural joints and their design considerations • Manufacturing, storage, curing, transportation and erection of above elements, equipment needed	6
3.	Prestressed Concrete	• Principles of pre-stressed concrete and basic terminology. • Applications, advantages and disadvantages of prestressed concrete • Materials used and their properties, Necessity of high-grade materials • Types of Pre-stressing steel -Wire, Cable, tendon, Merits-demerits and applications	6
4.	Methods and systems of prestressing	• Methods of prestressing – Internal and External pre-stressing, Pre and Post tensioning- applications • Systems for pre tensioning – process, applications, merits and demerits - Hoyer system • Systems for post-tensioning - process, applications, merits and demerits - Freyssinet system, Magnel Blaton system,	8

		Gifford Udall system. • Prestressing force in Cable, Loss of prestress during the tensioning process - loss due to friction, length effect, wobbling effect and curvature effect, , Loss of pre-stress at the anchoring stage. • Loss of pre-stress occurring subsequently: losses due to shrinkage of concrete, creep of concrete, elastic shortening, and creep in steel, • BIS recommendations for percentage loss in case of Pre and Post tensioning.	
5.	Quality Control and Inspection	• Precast Concrete Production: Quality Checks • Prestressed Concrete: Quality Control Measures • Non-destructive Testing • Safety Protocols during Manufacturing and Erection • Risk Assessment and Mitigation	4
Total Contact Hours			30

Table of Specification															
Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1.	6	1	2	--	2	2	--	--	4	--	--	--	--	--	11
2.	6	1	2	--	--	2	--	--	3	3	--	--	--	--	11
3.	6	2	2	--	2	2	--	--	2	4	--	--	--	--	14
4.	8	2	2	--	2	2	--	--	3	2	3	--	--	--	16
5.	4	1	--	--	2	2	--	--	3	--	--	--	--	--	8
Total	30	7	8	--	8	10	--	--	15	9	3	--	--	--	60
Total Marks		**15**			**18**				**27**						**60**

NB:R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1.	Prestressed Concrete Analysis and Design	Dr. Y.R.M Rao, J.P.Annie& P. Easwary	S.K. Kataria& Sons
2.	Precast Concrete Structure	Kim S. Elliot	CRC Pr I Lic; 2nd Edition
3.	Precast Concrete Technology	Niranjan Kumar Jha	Blue Rose Publishers
4.	Prestressed Concrete: Analysis and Design Practice of Members	Karuna Moy Ghosh	Prentice-Hall of India Pvt. Ltd
5.	Limit State Design of Reinforced Concrete	Varghese, P. C	Prentice Hall India Learning Private Limited, Delhi
6.	R.C.C. Design and Drawing	Neelam Sharma	S.K. Kataria& Sons
7.	Reinforced Concrete- Limit State Design	Ashok K. Jain	Laxmi Publications (P) Ltd.
8.	IS:1343-2012: code of practice for forPrestressed Concrete	--	BIS
9.	IS 10505-1983: Code of practice for construction of floors and roofs using precast concrete waffle units	--	BIS
10.	IS 15916- 2020: Code of practice for building design and erection using prefabricated concrete	--	BIS

7 (C). COURSE TITLE:: CONSTRUCTION MANAGEMENT

Course Title	:	Construction Management
Course Code	:	CEPE-403
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	NIL
Course Category	:	Program Elective course

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	To explain the significance, objectives and functions of construction management, types of construction, resources for construction industry and stages in construction
LO2	:	To discuss the different types of contracts, contract documents, specifications, important conditions of contract and arbitration
LO3	:	To understand the process of construction planning and scheduling and to prepare material, equipment, labour and final schedules
LO4	:	To differentiate between PERT and CPM, develop and analyze network techniques for construction management and identify the critical path
LO5	:	To describe the principles and types of organizations, communication, leadership and human relations, site organization, temporary services and job layout
LO6	:	To demonstrate cost-time analysis and cost optimizationin network planning
LO7	:	To understand the need for and stages of inspection and quality control in construction industry
LO8	:	To learn the importance of safety and different safety measures needed in the construction industry
LO9	:	To understand the trade unions and acts related to construction industry

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Describe construction contracts and specifications
CO2	:	Explain stages of planning, schedule preparation, and bar-chart preparation
CO3	:	Apply network techniques in construction management
CO4	:	Identify the principle and type of organisation in construction management
CO5	:	Explain quality control, safety measures needed and labour laws in construction management

TEACHING SCHEME: (IN HOURS/WEEK)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	2	0

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	0	30	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks	**Pass Marks**
ESE		IA		ESE		IA		100	40
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks		
60	24	40	16	---	--	--	--		

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1.	Introduction	• Significance of Construction Management • Objectives and Functions of Construction Management • Types of Construction • Resources for Construction Industry • Stages in Construction • Construction Team • Engineering Drawings	3
2.	Construction Contracts and Specifications	• Introduction • Types of Contracts • Contract Document, Specifications • Important Conditions of Contract • Arbitration	3
3.	Construction Planning	• Introduction • Stages of Planning • Scheduling • Preparation of Material, Equipment, Labour and Final Schedules • Development of bar charts, Merits & limitations of bar chart.	4
4.	Network Techniques in Construction Management	• Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the events. • 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, • Programme Evaluation and Review Technique (PERT) • Critical Path Method (CPM) • Simple Problems on Network Development and Analysis • Resource Allocation	10
5.	Organizing Construction	• Principles of Organization • Communication, Leadership and Human Relations	4

		• Types of Organizations • Organization for a Construction Firm • Site Organization • Temporary Services • Job Layout -Factors , Preparation of layout	
6.	Inspection and Quality Control	• Need for Inspection and Quality Control • Principles of Inspection • Enforcement of Specifications • Stages of Inspection and Quality Control • Technical Services and Inspection Team • Testing of Structures • Statistical Analysis	3
7.	Safety in Construction	• Importance of Safety • Causes of Accidents, Remedial and Preventive Measures • Labour Laws and Acts pertaining to Civil construction activities	3
Total Contact Hours			30

Table of Specification

Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1.	3	1	1	--	1	1	--	--	--	--	--	--	--	--	4
2.	3	1	1	--	1	1	--	--	--	--	--	--	--	--	4
3.	4	1	1	--	1	1	--	--	--	2	3	--	--	--	9
4.	10	1	2	--	2	1	--	--	--	3	3	3	2	3	20
5.	4	1	1	--	1	1	--	--	--	2	2	--	--	--	8
6.	3	1	1	--	1	1	--	--		1	2	--	2	--	9
7.	3	1	1	--	1	1	--	--	--	2	--	--	--	--	6
Total	30	7	8	--	8	7	--	--	--	10	10	3	4	3	60
Total Marks		**15**			**15**				**30**						**60**

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl. No.	Book Name	Author Name	Publishing House, Volume, ISBN
1.	Construction Planning and Management	P.S. Gahlot, B.M. Dhir	New Age International (P) Limited, Publishers, Reprint: 2014, ISBN: 978-81-224-0411-1
2.	Construction Planning and Management	Dr. Satish Kumar Jain, Devansh Jain	Scientific International Publishing House,ISBN: 9789356251908
3.	Project Planning and Control with PERT and CPM	Dr. B. C. Punmia, K. K. Khandelwal	Laxmi Publisher

8 (A). COURSE TITLE:: NEXT GENERATION TECHNOLOGIES (Infosys Springboard)

Course Title	:	**Next generation Technologies**
Course Code	:	OE-I-###
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Basic knowledge of creative ideas and innovation
Course Category	:	Open Elective

Online Course Link: …….

8 (B). COURSE TITLE:: ADVANCED PLUMBING (TATA TECHNOLOGIES)

Course Title	:	**Advanced plumbing**
Course Code	:	OE-T-402
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Basic knowledge Water supply
Course Category	:	Open Elective

COURSE OUTCOME:

After the end of the course, students will be able to:

CO1	:	Learners will understand and apply basic industrial safety practices, including fire safety; safe tool handling, plumbing standards, and fundamentals of fire sprinkler systems.
CO2	:	Learners will acquire the skills to identify and operate core plumbing components and instruments, interpret standard plumbing symbols and schematics, and perform basic checklist development, cost estimation, and diagnostic measurements using modern tools.
CO3	:	Learners will develop the skills to select appropriate piping systems, execute modern pipe cutting, jointing, bending, and installation techniques for water, SWR, drainage, and venting systems, and perform sanitary fixture installation, pressure testing, and leakage detection using industry-standard tools.
CO4	:	Able to Install and configure diverse water systems, including portable water supplies, solar heating, water harvesting, and sprinkler systems, using appropriate joining criteria for varied pipe materials.
CO5	:	Learners will understand the principles of domestic and municipal water supply connections, sewer linkage, and rainwater harvesting systems, and gain the skills to Develop Bills of Materials (BOM) and cost estimations to create business proposals, also demonstrate ability to manage a plumbing startup or industrial project.

TEACHING SCHEME: (IN HOURS/WEEK)

Lecture	Tutorial	Practical	Total credits
1	0	2	2

TEACHING SCHEME: (IN HOURS)

Lecture	Tutorial	Practical	Total
15	0	30	45

EXAMINATION SCHEME:

Theory						Practical				Marks	
Internal Assessment(IA)				ESE		PA		PT			
TA	HACT	Total	Pass	Total	Pass	Total	Pass	Total	Pass	Total	Pass
3	13	16	6	24	10	36	14	24	10	100	40

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours (T+P)
1.	Introduction to Industrial Safety Practices	Fire Extinguishers & its Types Safely handling Tools & Equipment Introduction to Plumbing SOPs, standards, and Government Norms. Basic knowledge of Fire Sprinklers & its types.	3(1+2)
2.	Introduction to Plumbing	Basics of Plumbing & its Terminology Various components in the Plumbing (Pipes, fittings, sanitary wares, tools etc.) Introduction to different types of Taps and Valves (diverter) Creation of Plumbing Check lists and its cost estimation Standard symbols used in plumbing drawing and its importance. Making of schematic diagram of plumbing for water supply. Importance of Wall chaser machine and Telescopic pipe cutter. Concept of Deburring tool, introduction to water meter, infrared thermometer, and Gas (Any Hydrocarbon based) Leak Detector instrument Concept and application guidelines of Sink auger Advance laser distance meter	9(3+6)
3.	Pipework and Plumbing System Installation	Types of pipes and their selection criteria (PVC, Composites, Soil-Waste-Rainwater, CPVC, etc.) Comparison of modern pipe and fitting systems with traditional laying and jointing methods. Introduction to type of pipe bends/clamps & pipe bending concept for water flow. Method PVC pipe Cutting and Jointing, etc. SOP of Plumbing for various types of cold and hot water pipe system Fitting and fixing CPVC, using different joint techniques etc. Concept and installation of drainage, venting systems, SWR pipes and waste system plumbing, including single and double stack methods. Sanitary wares Installation process (such as Toilets,	12(4+8)

		sinks, Jacuzzi etc) Pressure testing machine and its components. Water leakage detection and repair techniques Use of drain or cockup Rods	
4.	Faucets and their Installation	Introduction to different types of faucets. Selection criteria of faucet. New sensor-based faucet Guideline for Installation of sensor based faucet Repair and replacement techniques of sensor based faucet. Advancements in terms of water efficiency and integration of electronic devices.	9(3+6)
5.	Service Connections and Water Connections	Service connections and water supply systems, including municipal connections, water meters, and pipe-to-tank arrangements in multistory buildings. Connecting house sewer lines through chambers to mains Rainwater harvesting design and filter column for bore-well recharge or underground storage. Calculation of rainwater & design of rainwater filter Column. Water Closet – Floor & Wall Mounting Units and need of water seal for every closet. Solar water heating system, its Installation, and connections. Pressure boosting pump, its functions & applications, connecting to supply pipe Basic knowledge of types of water tank, Maintenance, hygiene, cleaning and safety precautions.	12(4+8)
Total Contact Hours			**45**

COURSE PRACTICALS

CO1 – Industrial Safety and Fundamentals

- Practical 1: Prepare list for Plumbing Safety standard and create a Do's and Don'ts chart.

CO2– Plumbing Practices with Modern Tools and Standards

- Practical 2: List different components used in plumbing and explain its functions.
- Practical 3: Make a list of wall chaser machine components and machine application.
- Practical 4: Draw plumbing layout by using standard symbols for residential building.

CO3 – Modern Plumbing Installation and Testing

- Practical 5: Cut different types of PVC pipes using various cutting tools at different angles.

- Practical 6: Change the direction of pipe using elbow 90 degree and 45 Degree.
- Practical 7: Study methods to detect leakage of water in the pipe distribution network and to repair using various tools.
- Practical 8:Cleaning clogs in sink and bathroom drains using sink auger.
- Practical 9: Make the standard installation procedure of kitchen sink and sanitary ware.
- Practical 10: Make a list of components in ranger bathtub and make its plumbing connection diagram.
- Practical 11: Draw the diagram of wastewater plumbing showing all its components.

CO4 – Installing and Configuring Diverse Water Systems

- Practical 12: Draw the diagrams of drainage system, sinks and faucets showing all its components and list the applications of it.
- Practical 13: Select faucets as per the different applications of plumbing system and Study installation of touchless faucets.
- Practical 14: Assemble and disassemble the touchless faucets to perform the basic troubleshooting and replacement of batteries.

CO5 – Plumbing Operations, Costing, and Project Management

- Practical 15: Design different components of water heater, water sprinklers, solar water heating systems, rainwater harvesting system, and water meter with its applications.
- Practical 16: Prepare installation of Water Closet – Floor & Wall Mounting Units concept and need of water seal for every closet.
- Practical 17: Prepare a SOPs for repair and maintenance of plumbing for domestic plumbing system. For example, cleaning to remove chock up, debris and other contaminations etc.
- Practical 18: Case studies of plumbing system.
- Practical 19: Mini Project

8 (C). COURSE TITLE: DISASTER MANAGEMENT

Course Title	:	Disaster Management
Course Code	:	CEOE-403
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	NIL
Course Category	:	Open Elective

LEARNING OBJECTIVES: Following are the Learning Objectives of this course:

LO1	:	To explain the basic concept and necessity of disaster management of disaster management, and the various terms associated with it
LO2	:	To discuss the different types of natural and man-made disasters and their causes and impact, predictability, warning and monitoring, preparedness and response and mitigation measures
LO3	:	To discuss the roles and responsibilities of civil engineers in prevention, preparedness and mitigation of disasters
LO4	:	To create awareness as to how to respond to a disaster
LO5	:	To discuss the phases, framework, laws and policies that exist in India with regard to disaster management
LO6	:	To conceptualize the application of GIS and Remote Sensing Technology in disaster management and introduce to Incident Command System (ICD)

COURSE OUTCOME: After the end of the course, students will be able to:

CO1	:	Explain the concept and necessity of disaster management, Disaster Management Plan or Emergency Operation Plan for disaster management
CO2	:	Identify different types of natural and man-made disasters and their causes and impact, predictability, warning and monitoring, preparedness and response and mitigation measures
CO3	:	Apply various response activities and methods and frame the recovery plan
CO4	:	Explain the roles and responsibilities of stake holders in disaster management
CO5	:	Explain the application of GIS and Remote Sensing Technology in disaster management and introduce to Incident Command System (ICD)

TEACHING SCHEME: (IN HOURS/WEEK)

Theory			**Practical (credit)**
Lecture	Tutorial	Total credits	
2	0	2	0

TEACHING SCHEME: (IN HOURS)

Theory			**Practical**
Lecture	Tutorial	**Total**	
30	0	30	0

EXAMINATION SCHEME:

Theory				Practical				Total Marks	**Pass Marks**
ESE		IA		ESE		IA		100	40
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks		
60	24	40	16	---	--	--	--		

DETAILED COURSE CONTENT:

Unit	Chapter Title	Contents	Hours
1.	Introduction	Understanding Disaster Management (DM); Definition of Disaster; Necessity of Studying DM; Basic Terms-Hazard, Vulnerability and Risk and Understanding their Inter-relationship; Types of Vulnerability	2
2.	Natural Disasters	Understanding Natural Disasters; Causes and Impact, Predictability, Warning and Monitoring, Preparedness and Response and Mitigation of Natural Disasters – Floods, Droughts, Cyclones, Earthquakes, Landslides, Avalanches, Volcanic Eruptions; Case Studies; Heat and Cold Waves; Climate Change: Global Warming, Sea Level Rise, Ozone Depletion	12
3.	Man-Made Disasters	Understanding Man-Made Disasters; Nuclear Disasters; Chemical Disasters; Biological Disasters; Building Fire; Coal Fire; Forest Fire; Oil Fire; Pollution; Deforestation; Road, Rail, Air and Sea Accidents	6
4.	Prevention, Preparedness and Mitigation	Introduction; Role of Civil Engineers in Prevention, Preparedness and Mitigation of Disasters; Disaster Risk Reduction (DRR);DM plan or Emergency Operation Plan (EOP); Developing and writing the DM plan or EOP	3
5.	Disaster Response and Recovery	Response and Recovery: Terminology; Aims of Disaster Response, Disaster Response Activities; Modern Methods of Disaster Response; The Recovery Plan	3
6.	Disaster Education and Public Awareness	Necessity; Disaster Management in India - Phases, Framework, Laws and Policies; Roles and Responsibilities of Stake holders; Safety of Homes, Schools, Hospitals and Work Places	2
7.	Role of Technology in Disaster Management and Risk Management	Risk and Emergency Management System -Application of GIS and Remote Sensing Technology; Introduction to Incident Command System (ICD)	2
Total Contact Hours			30

Table of Specification															
Units	Allotted Hours	Objective			Short Answer Type				Long Answers Type						Total Marks
		R	U	AP	R	U	AP	AN	R	U	AP	AN	E	C	
1.	2	2	1	--	1	1	--	--	--	--	--	--	--	--	5
2.	12	1	1	--	1	2	--	--	4	4	--	--	--	--	13
3.	6	1	1	--	2	1	--	--	4	5	--	--	--	--	14
4.	3	1	1	--	1	1	--	--	2	2	3	--	--	--	11
5.	3	1	1	--	--	1	--	--	--	3	--	--	--	--	6
6.	2	1	1	--	1	1	--	--	--	--	--	--	--	--	4
7.	2	1	1	--	1	1	--	--	--	3	--	--	--	--	7
Total		8	7	--	7	8	--	--	10	17	3	--	--	--	60
Total Marks		**15**			**15**				**30**						**60**

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

REFERENCE BOOK LIST:

Sl. No.	Book Name	Author Name	Publishing House, Volume, ISBN
1.	Disaster Management	S.C. Sharma	Khanna Publishing House, 2019, ISBN 13:978-93-55380-34-0
2.	Disaster Management	Ghosh G.K.	APH Publishing Corporation, 2006, ISBN: 9788131300176
3.	Handbook of Disaster Management	Singh B.K.	Rajat Publication, 2017, ISBN: 9788178803555
4.	Disaster Management in India	A.K. Singh	New Royal Book Company, 2007, ISBN: 978-81-89267-46-9

7 (D). COURSE TITLE:: INTERNET OF THINGS (TATA TECHNOLOGIES)

Course Title	:	**Internet of Things**
Course Code	:	OE-T-###
Semester	:	Fourth
Number of Credits	:	2 [L: 2, T: 0, P: 0]
Prerequisites	:	Basic knowledge in computer
Course Category	:	Open Elective

REFERENCE BOOK LIST:

As per TATA Technologies curriculum