

Third Year CIVIL ENGINEERING – CBCS PATTERN

SEMESTER – V

Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME												
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK				
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min		
1	PCC-CV501	3	3	3	-	-	-	1	2	2		CIE	30	100	40	As per BOS Guidelines	25	10	2	50	20		
2	PCC-CV502	4	4	4	-	-	-	1	2	2		ESE	70						-	-	2	25	10
3	PCC-CV503	3	3	3	-	-	-	1	2	2		CIE	30	100	40				-	-	2	25	10
4	PCC-CV504	4	4	4	-	-	-	1	2	2		ESE	70						25	10	2	50	20
5	PCC-CV505	2	2	2	-	-	-	2	4	4		CIE	30	100	40				50	20	2	50	20
6	OEC-CV506	3	3	3	-	-	-	-	-	-		ESE	70						-	-	-	-	-
	TOTAL	19	19	19	-	-	-	6	12	12		500						100			200		

SEMESTER – VI

1	PCC-CV601	3	3	3	1	1	1	-	-	-		CIE	30	100	40	As per BOS Guidelines	-	-	2	25	10
2	HM-CV602	4	4	4	-	-	-	1	2	2		ESE	70				25	10	2	25	10
3	PCC-CV603	4	4	4	-	-	-	1	2	2		CIE	30	100	40		25	10	2	25	10
4	PCC-CV604	4	4	4	-	-	-	1	2	2		ESE	70				-	-	2	25	10
5	OEC-CV605	3	3	3	-	-	-	-	-	-		CIE	30	100	40		-	-	-	-	-
6	PCC-CV606	-	-	-	-	-	-	2	4	4		ESE	70				50	20	2	50	20
7	MC-CV607	-	-	-	-	-	-	1	2	2		-	-	-	-		-	-	2	50	20
8	*SI-CV707	-	-	-	-	-	-	-	-	-		-	-	-	-		-	-	-	-	-
	TOTAL	18	18	18	1	1	1	6	12	12		500					75	225			
TOTAL		37	37	37	1	1	1	12	24	24		1000				175		425			

CIE- Continuous Internal Evaluation
ESE – End Semester Examination

SEMESTER - V					
Sr. No	Code No.	Course (Subject Title)		Semester	Credits
1	PCC-CV501	WRE-I	Water Resource Engineering-I	5	4
2	PCC-CV502	DSS	Design of Steel Structures	5	5
3	PCC-CV503	EE-I	Environmental Engineering-I	5	4
4	PCC-CV504	GTE-I	Geotechnical Engineering-I	5	5
5	PCC-CV505	BPD	Building Planning and Design	5	4
6	OEC-CV506	OE-I	Open Elective-I	5	3
TOTAL					25

SEMESTER - VI					
Sr. No	Code No.	Course (Subject Title)		Semester	Credits
1	PCC-CV601	TOS	Theory of Structures	6	4
2	HM-CV602	EM	Engineering Management	6	5
3	PCC-CV603	EE-II	Environmental Engineering-II	6	4
4	PCC-CV604	GTE-II	Geotechnical Engineering-II	6	5
5	OEC-CV605	OE-II	Open Elective-II	6	4
6	PCC-CV606	SDD-I	Structural Design and Drawing-I	6	2
7	MC-CV607		SEMINAR	6	1
8	*SI-CV707	FT	Field Training	-	-
TOTAL					25

Water Resources Engineering – I

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
WRE - I (PCC-CV501)	03	--	02	04	ISE	--	--	50	20
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To impart the basic knowledge of importance of Hydrology & irrigation in water resources development.
2. To know various hydrometeorological parameters and their estimation.
3. To create awareness about floods, their estimation using various methods.
4. To understand the importance of irrigation in Indian agricultural industry considering cropping patterns.
5. To understand the principles of watershed management and water harvesting.

Course Outcomes:

After successful completion of this course students will be able to:

1. Apply the knowledge of estimation of hydrometeorological parameters.
2. Estimate direct runoff and peak discharge using hydrograph technique.
3. Apply different methods of efficient irrigation and water conservation.
4. Determine reservoir capacity based on crop water requirement.

SECTION I

Unit 1: Hydrology and Precipitation

6 hrs

- 1.1 Introduction of Hydrology: Definition, Importance and scope of hydrology, Hydrologic cycle.
- 1.2 Precipitation: Forms and types of precipitation, Methods of measurement, Rain-gauge Network, Determination of average precipitation over the catchment & its Numerical, Estimation of missing rainfall data, Graphical representation of rainfall - Mass rainfall curves, Double mass rainfall Curve, Rainfall Hyetograph.

Unit 2: Evaporation and Runoff

6 hrs

- 2.1 Evaporation: Process, factors affecting, Measurement, and Control of Evaporation.
- 2.2 Evapo-Transpiration: Process, factors affecting, Measurement.
- 2.3 Infiltration: Process, Factors affecting and measurement of Infiltration, Infiltration Indices & its Numerical.
- 2.4 Runoff: Classification, Factors affecting runoff, Determination of runoff-empirical equations, Rainfall runoff Co-relation.

Unit 3: Hydrograph and Floods

6 hrs

- 3.1 Hydrograph: Components of Storm hydrograph, Base flow and Separation of base flow, Direct runoff hydrograph, Unit hydrograph – theory, assumptions and limitations, Derivation and use of unit hydrograph, Conversion of UH of different durations using Principle of Superposition & S-curve hydrograph.

- 3.2 Floods: River gauging (Introduction Only), Estimation of peak flow-- empirical equations, rational method, Importance of --Design flood, Standard Project Flood, Maximum Probable Flood.

SECTION II

Unit 4: Ground Water Hydrology

6 hrs

- 4.1 Ground Water Hydrology: Occurrence, Distribution and Classification of Ground water, Darcy's law, Aquifer parameters— Permeability, specific yield, specific retention, porosity, storage coefficient, Transmissibility.
- 4.2 Hydraulics of Well: Under steady flow conditions in confined and unconfined aquifers.
- 4.3 Construction: Tube wells and Open wells. (Construction features only)

Unit 5: Irrigation and Minor Irrigation Works

6 hrs

- 5.1 Introduction to Irrigation: Definition and necessity of irrigation, ill-effects of irrigation, Systems of Irrigation- surface, sub-surface (Drip irrigation), sprinkler irrigation, Water logging and land drainage, Assessment of irrigation water.
- 5.2 Minor Irrigation Works: General layout, main components and functioning of –
1. Percolation tanks 2. K. T. Weir, 3. Bandhara irrigation 4. Lift irrigation

Unit 6: Water Requirements of Crops

6 hrs

- 6.1 Water Requirement of Crops: Principal crops and crop seasons, cropping pattern and crop rotation, Classes and availability of soil water, depth and frequency of watering, Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Numerical on Command area calculations and reservoir capacity based on crop water requirement.

Term Work:

Assignments on the followings topics

1. Determination of average annual rainfall using Thiessens polygon & Isohyetal map method.
2. Consistency of rain gauge station by double mass rainfall curves.
3. Determination of evaporation Losses, effective rainfall hyetograph infiltration losses – Phi index calculation, Horton's infiltration curve.
4. To develop a unit hydrograph from a total runoff hydrograph resulting from isolated storms.
5. Alteration of base period of given unit hydrograph using method of superposition and S-curve technique.
6. Determination of well discharge in a confined/unconfined aquifer.
7. Layout of Percolation tank, K. T. Weir, Bandhara Irrigation, Lift Irrigation.
8. Estimating depth and frequency of irrigation on the basis on soil moisture regime concept.
9. Crop water requirement and irrigation command area calculations.
10. A brief report on introduction to GIS software in Water Resource Engineering.
11. Site visit & report on meteorological station.

Text Books:

1. "Irrigation Engineering" – S. K. Garg – Khanna Publishers, Delhi.
2. "Water Resources & Irrigation Engineering" – Dr. K. R. Arora, Standard Publisher.
3. "Irrigation, Water Resources and Water Power Engineering" – Dr P.N. Modi, Standard Book House.
4. "Irrigation and Water Power Engineering" – Dr. Punmia and Dr. Pande – Laxmi Publications, Delhi
5. "Engineering Hydrology" – Dr. K. Subramanya, -Tata McGraw Hill, New Delhi.
6. "Hydrology" – Dr. P. Jayarami Reddy, Laxmi Publications, New Delhi
7. "Engineering Hydrology" – Dr. Raghunath H.M. - New Age International Publishers.

8. "Watershed Management in India" – J. V. S. Murthy – Wiley Eastern Publications, Delhi.
9. "Irrigation Engineering" – Dahigaonkar, Asian Book Pvt Ltd.
10. "Irrigation Engineering" – S. R. Sahastrabudhe, Katson Publishers.

Reference Books:

1. "Hydrology and water resources" - R.K.Sharma, Dhanpatrai and sons, New Delhi.
2. "Theory and design of irrigation structures" - Varshney, Gupta and Gupta, vol. I and II and III, New Chand and Brothers.
3. "Irrigation Theory and practice" - Michael, Vikas Publications House.
4. "Water management" - Jaspal Sing, M.S.Acharya, Arun Sharma, Himanshu Publications.
5. "Design of M.I. and Canal Structure" - Satyanarayan and R. Murthy, Wiley Eastern Ltd, New Delhi.
6. "Irrigation Engineering" - Raghunath, Wiley Eastern Ltd, New Delhi.

Guidelines Regarding Question Paper Setting:

1. Q. No. 4 and Q. No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No. 5, 6, 7.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1	10
2.	2	10
3.	3	10
4.	1,2 & 3 (Compulsory)	15
5.	4	10
6.	5	10
7.	6	10
8.	4,5 & 6 (Compulsory)	15

Design of Steel Structures

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max	Min. for Passing	Max	Min. for Passing
DSS (PCC-CV502)	04	---	02	05	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To understand the behavior of elements of steel structure.
2. To understand the design concept of steel structure and its members by LSM.

Course Outcomes:

After successful completion of this course students will be able to:

1. Describe the design philosophy, behavior of steel structure and failure mechanism.
2. Analyze and design different types of bolted & welded connections.
3. Assess the strength of structural members as per Indian Standards.
4. Analyze and design members subjected to tension, compression and flexure.

SECTION- I

Unit 1: Introduction and Connections

8 hrs

- 1.1 Introduction: Design Philosophy, advantages and disadvantages of steel structures, types of steel structures, grades of structural steel, loads and load combinations, partial safety factors for load and materials for steel structures.
- 1.2 Connections: Bolted & welded- Analysis and Design of axially and eccentrically loaded bolted and welded connections.

Unit 2: Tension Members

8 hrs

- 2.1 Common sections, Net area, modes of failure, load carrying capacity.
- 2.2 Design of tension members.

Unit 3: Compression Members

8 hrs

- 3.1 Compression Members as Struts Common sections, economical sections, effective length, slenderness ratio, modes of failure, classification of cross section, behavior of compression member, load carrying capacity
- 3.2 Design of compression members- single and double angle.

SECTION- II

Unit 4: Column and Column Bases

8 hrs

- 4.1 Columns: Design of column subjected to axial and eccentric loading, design of lacing, battening system, column splices.
- 4.2 Column bases: Design of slab base & gusseted base subjected to axial and eccentric loading, design of concrete pedestal (dimensions only)

Unit 5: Beams**8 hrs**

- 5.1 Beam in flexure - Types of sections, behavior, design of laterally supported and unsupported Beams, rolled sections, built up beams/compound beams using flange plates, curtailment of flange plates,
- 5.2 Design for strength and serviceability
- 5.3 Web buckling & web crippling.

Unit 6: Gantry Girder**8 hrs**

- 6.1 Forces acting on gantry girder, commonly used sections
- 6.2 Design of gantry girder as laterally unsupported beam
- 6.3 Connection details

Term Work:

One assignment per unit with minimum four numerical in each assignment

Text Books:

- 1. "Limit State Design of Steel Structures" - Duggal S.K., Tata McGraw-Hill Education private Ltd., New Delhi, 2nd Edition 2014
- 2. "Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007" - Bhavikatti S. S., I K International Publishing House.
- 3. "Limit State Design in Structural Steel" - Shiyekar M. R., 2nd Edition, PHI Publisher
- 4. "Design of Steel Structures" - Dayaratnam, Wheeler Publications, New Delhi.
- 5. "Design of Steel Structures" – B. C. Punmia, A. K. Jain and Arun Kumar Jain, Laxmi Publication

Reference Books:

- 1. "LRFD Steel Design" - William T. Segui, PWS Publishing
- 2. "Design of Steel Structures" - Edwin H. Gaylord, Charles N. Gaylord James, Stallmeyer, Mc-Graw Hill
- 3. "Design of Steel Structures" - Mac. Ginely T.
- 4. "Design of Steel Structures" - Kazimi S. M. and Jindal R. S., Prentice Hall India.
- 5. "Design of Steel Structures" - Breslar, Lin Scalzi, John Willey, New York.
- 6. "Steel Structure" - Controlling Behaviour Through Design, Englekirk, WILEY.

I.S. Codes:

- 1. IS: 800 – 2007
- 2. IS: 875 (part I, II and III)
- 3. SP6 (1) & SP 6 (6),
- 4. IS: 816
- 5. IS: 808.

Guidelines Regarding Question Paper Setting:

- 1. IS: 800 – 2007 is permitted in examination.
- 2. Q. No. 1 and Q. No. 5 are compulsory.
- 3. Attempt any two questions from Q. No. 2, 3, 4 and any two questions from Q. No. 6, 7, 8

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1, 2, 3 - Theory	7
2.	1 - Problem	14
3.	2 - Problem	14
4.	3 - Problem	14
5.	4,5,6 - Theory	7
6.	4 - Problem	14
7.	5 - Problem	14
8.	6 - Problem	14

Environmental Engineering – I

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EE-I (PCC-CV503)	03	--	02	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To understand various sources of water with respect to quality and quantity of water.
2. To describe and design the various water treatment units.
3. To learn the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. To design the various components related to transmission and distribution of water.
5. To understand various water supply appurtenances.

Course Outcomes:

After successful completion of this course students will be able to:

1. Describe the various sources of water with respect to quality and quantity of water.
2. Design the various water treatment units.
3. Illustrate the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. Describe the various components related to transmission and design of distribution of water.
5. Summarize the different water supply appurtenances.

SECTION I

Unit 1: Introduction to Water Supply Scheme

6 hrs

- 1.1 Introduction to water supply scheme: Data collection for water supply scheme, components and layout. Design period, factors affecting design period.
- 1.2 Quantity: Rate of water consumption for various purposes like domestic, industrial, institutional, commercial, fire demand and water system losses, factors affecting rate of demand, Population forecasting.
- 1.3 Quality: Water quality parameters, characteristics & significance in water treatment, drinking water quality standards- BIS, WHO Standards.
- 1.4 Water intake structures: General design considerations, types such as river intake, canal intake and reservoir intake, Concept of rising main and pumping station.

Unit 2: Water Treatment

6 hrs

- 2.1 Water treatment: Principles of water treatment processes. Introduction to different types of water treatment flow sheets.
- 2.2 Aeration: Principle and Concept, Necessity, Methods, Design of cascade aerator.
- 2.3 Coagulation & Flocculation- Theory, factors affecting, destabilization of colloidal particles, types of dosing of coagulants, selection of coagulants, jar tests, design of rapid mixer & flocculator, Theory of clariflocculator.

- 2.4 Sedimentation- Theory, types of settling, types of sedimentation tanks, principles & design, concept of tube & plate settler.

Unit 3: Water Treatment

6 hrs

- 3.1 Filtration- Mechanism, head loss development, negative head loss, Types of filters- Slow sand filter, Rapid sand filter & Pressure filter, Operation & design of slow sand & rapid sand filter.
- 3.2 Disinfection- Theory, factors affecting disinfection, types of disinfectants, types and methods of chlorination break point chlorination
- 3.3 Water softening processes - lime-soda process, ion exchange
- 3.4 Demineralization - Reverse osmosis, electro-dialysis

SECTION II

Unit 4: Distribution Reservoirs and Service Storages

6 hrs

- 3.1 Necessity, location, head requirement, capacity determination by analytical & graphical method.
- 3.2 Transmission of water, pumping & gravity mains, choice of pipe materials, forces acting on pressure pipes, leakage & pressure testing of pipes, corrosion types & control measures, thrust block concept,

Unit 5: Water Distribution Systems

6 hrs

- 5.1 Method of distributing water, layout pattern, basic system requirements for water distribution system
- 5.2 Methods of network analysis: equivalent pipe method, Hardy-Cross method, design problem.

Unit 6: Water Supply Appurtenances

6 hrs

- 6.1 Sluice valve, air relief valve, gate valve, non-return valve, scour valve, fire hydrants water meter, service connections, maintenance & leak detection of water distribution system.
- 6.2 Necessity of water audit, water audit in domestic sector, Concept of preparation of DPR.

Term Work:

- A. Analysis of any 10 of the following test parameters for water
1. pH
 2. Acidity
 3. Alkalinity
 4. Chlorides content
 5. Hardness – Total, temporary and permanent
 6. Turbidity
 7. Residual Chlorine
 8. Total dissolved solids through measurement of electrical conductivity
 9. Dissolved Oxygen
 10. Most Probable Number
 11. Optimum dose of alum by jar test.
 12. Fluorides & Nitrogen
 13. Iron and Manganese
- B. Design/analysis problems on water treatment unit & distribution system.
- C. Visit to a water treatment plant & visit report.

Text Books:

1. "Environmental Engineering" - Peavey, H.S. Rowe, D.R. and Tchobanoglous McGraw Hill Book Company.

2. “Water Supply and Pollution Control” - Viessman W. and Hammer M.J. Harper Collins College Publishers.
3. “Water and Waste Water Technology” - Hammer M.J. Prentice-Hall of India Private Ltd.
4. “Water and Wastewater Technology” - G.S. Birdie and J.S. Birdie
5. “Water Supply” - Duggal K.N., S. Chand and Company.
6. “Water Supply” - Garg S.K., Khanna Publishers.
7. “Water Supply and Waste water Disposal” - Fair and Gayes, John Wiley Publication.
8. “Water Supply Engineering” - B.C. Punmia, Ashok Jain, Arun Jain, Laxmi Publications

Reference Books:

1. Manual on Water Supply and Treatment- Government of India Publication.-1993
2. “Water and Waste Water Engineering” - Fair G. M, Geyer J. C, and Okun D. A, Vol. I & II”, John Wiley Publication, 1966.
3. “Water and Waste Water Technology”, Prentice Hall of India Private Limited, 1996. Hammer Structure of question paper for End Semester Evaluation

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

Geotechnical Engineering - I

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
GTE - I (PCC-CV504)	04	--	02	05	ISE	--	--	50	20
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To provide a coherent development to the students for the courses in sector of Geotechnical Engineering & Soil Improvement Techniques etc.
2. To present the foundations of many basic Engineering tools and concepts related Geotechnical Engineering.
3. To give an experience in the implementation of Engineering concepts which are applied in field of Geotechnical Engineering
4. To involve the application of scientific and technical principles of planning, analysis, design of foundation along with soil improvement techniques.

Course Outcomes:

After successful completion of this course, student will be able to:

1. Able to evaluate the Index and Engineering properties of soil
2. Understand the fundamental relationships in properties of soils
3. Evaluate the stress calculations in soil under different soil conditions
4. Understands the process and importance of compaction and consolidation
5. Know the shear strength of soil and its determination
6. Analyze the lateral pressure on vertical retaining walls

SECTION I

Unit 1: Soil Properties

10 hrs

- 1.1 Origin of soil, Soil structure, soil phase systems, weight volume relationship
- 1.2 Index properties of soil (Unit weights, water content, specific gravity, void ratio, porosity, air content, degree of saturation their relationships and significance)
- 1.3 Particle size distribution by sieve analysis and hydrometer analysis
- 1.4 Atter berg's consistency limits (Liquid limit, plastic limit, shrinkage limit), consistency indices, activity
- 1.5 IS classification of soil, Casagrande plasticity chart

Unit 2: Permeability and Seepage Analysis

6 hrs

- 2.1 Darcy's law and its validity, Factors affecting permeability
- 2.2 Determination of permeability of soil by constant head, variable head, permeability of stratified (layered) soil
- 2.3 Concept of total stress, pore pressure and effective stress, different forms of water
- 2.4 Seepage pressure, seepage force, seepage force per unit volume, Critical hydraulic gradient, quick sand condition, piping

- 2.5 Flow net construction and characteristics, applications of flow net, determination of seepage loss

Unit 3: Compaction and Consolidation

8 hrs

- 3.1 Concept of compaction, factors affecting compaction, Standard proctor test and modified proctor test as per IS 2720, dry density and moisture content relationship, zero air void line, placement water content
- 3.2 Field compaction control, Field compaction equipments with their suitability.
- 3.3 Concept of consolidation, factors affecting consolidation, Terzaghi's piston and spring analogy model, Terzaghi's theory of one dimensional consolidation, lab consolidation test to find coefficient of consolidation, Coefficient of volume change, Compression index, Coefficient of compressibility, NCC, UCC, OCC
- 3.4 Determination of coefficient of consolidation by square root of time fitting method and logarithm of time fitting method.

SECTION II

Unit 4: Stress Distribution in Soil

6 hrs

- 4.1 Boussinesq theory assumptions and application to point load, strip load, circular sections, Pressure distribution diagrams on horizontal and vertical plane, Radial shear stress
- 4.2 Isobars and pressure bulbs, Use of Newmark's charts, Westergaard theory assumptions and application to uniformly loaded rectangular area.
- 4.3 Contact pressure for different footings in different soils, Equivalent point load method for stress calculation, Approximate method (2V:1H) method for stress calculation

Unit 5: Shear Strength of Soil

10 hrs

- 5.1 Concept of shear stress and shear strength, Mohr-Coulomb's theory and failure envelopes for different types of soils such as C-soil, ϕ -soil, and C- ϕ soils, representation of stress on Mohr's circle
- 5.2 Terzaghi's total stress and effective stress approach, Factors affecting shear strength of cohesive and cohesionless soils
- 5.3 Determination of shear strength of soil by Direct shear test, Triaxial compression test, under UU, CU & CD conditions, Unconfined compression test and vane shear test, Sensitivity, Skempton pore water pressure parameters

Unit 6: Earth Pressure Theory

8 hrs

- 6.1 Concept of earth pressure, Plastic equilibrium, earth pressure at rest, active and passive condition, its practical applications.
- 6.2 Rankine's earth pressure theory for cohesionless soils under dry, partially and fully submerged condition, horizontal back fill with surcharge, total lateral force on wall
- 6.3 Bell-Rankine's theory for cohesive soils under dry, partially and fully submerged condition, tension cracks in soil, Critical height, Coulomb's wedge theory for earth pressures

Term Work:

- A. Perform at least ten experiments from the following:
1. Determination of specific gravity by pycnometer/density bottle method
 2. Determination of water content by oven drying method & Pycnometer method
 3. Particle size distribution by dry sieve analysis
 4. Particle size distribution by hydrometer analysis
 5. Determination of consistency limits (LL, PL, SL)
 6. Determination of field density by core cutter method
 7. Determination of field density by sand replacement method

8. Determination of MDD & OMC by standard/Modified proctor test
9. Determination of coefficient of permeability by variable head method/Constant head method
10. Determination of shear strength parameters of soil by using direct shear test
11. Determination of shear strength of soil using Triaxial, Unconfined and Vane shear Test (Any one)

B. One assignment per unit with minimum four numerical in each assignment

Text Books:

1. "Soil Mechanics and Foundation Engineering" - B. C. Punmia, Laxmi Publication
2. "Soil Mechanics and Foundation Engineering" - K. R. Arora, Standard Publisher
3. "Soil Mechanics and Foundation Engineering" - V. N. S. Murthy, Marcell Decker
4. "Basic and Applied soil Mechanics" - A. S. R. Rao and Gopal Ranjan, New age International Publication
5. "Geotechnical Testing and Instrumentation" - Alam Singh, CBS Publisher
6. "Geotechnical Engineering" - C. Venkatramaiah, New age International Publication
7. "Geotechnical Engineering" - Purushottam Raj

Reference Books:

1. "Soil Mechanics" - Terzaghi and Peak, Jony Willey and Sons, New York
2. "Soil Testing" - T. W. Lambe, Willey Eastern Ltd, New Delhi

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1 - Theory and Problem	12
2.	2 - Theory and Problem	11
3.	3 - Theory and Problem	12
4.	4 - Theory and Problem	11
5.	5 - Theory and Problem	12
6.	6 - Theory and Problem	12

Building Planning and Design

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
BPD (PCC-CV505)	02	--	04	04	ISE	--	--	50	20
					CIE	--	--	--	--
					ESE	--	--	50	20

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To study dimensions and space requirements for various elements of the building in relation to human body measurements.
2. To study Planning, designing of various public buildings considering principles of planning and Building Bye- Laws and regulations.
3. To study procedures for preparing perspective drawings of various objects as well as buildings.
4. To study Architectural composition and terms.

Course Outcomes:

After successful completion of this course students will be able to:

1. Specify dimensions and space requirements for various elements of the building in relation to human body measurements.
2. Plan, design public building considering principles of planning and Building Bye- Laws and regulations.
3. Prepare the submission and working drawings of public building.
4. Illustrate the procedures for preparing perspective drawings of various objects as well as buildings.
5. Apply knowledge of architectural composition and terms for betterment of aesthetic view.

Unit 1: Introduction

2 hrs

- 1.1 Dimensions & space requirement in relation to body measurements
- 1.2 Human body figures and its applications in space design of service elements.

Unit 2: Planning and Design

14 hrs

Site selection, site layout for various types of building such as:

- 2.1 Educational buildings: Younger age range, middle age range
- 2.2 Building for health - health centers, hospitals
- 2.3 Assembly buildings- recreational halls, cinema theatres, restaurants, hotels, clubs
- 2.4 Business and mercantile buildings- shops, banks, markets and malls
- 2.5 Industrial buildings- factories, workshops, cold storages
- 2.6 Office buildings- administrative buildings, corporate office
- 2.7 Buildings for transportation- Bus stations, railway / metro stations

Unit 3: Perspective Drawings

6 hrs

- 3.1 Elements of perspective drawings

3.2 Parallel perspective and angular perspectives of different objects and small buildings

Unit 4: Nature of Architecture

2 hrs

4.1 Architectural composition and terms such as mass, space, proportion, symmetry, balance, contrast, pattern.

Term Work:

1. Sheet for human body dimensions for space design (different human body figures, dimensions and their relevant applications)
2. Visit to a building complex and a report based on that.
3. Planning and designing of a public building project (Max. five students group) for which drawings shall be prepared covering scope of:
 - i) Municipal drawing
 - ii) Layout plan showing site development details (Internal roads, parking, secondary structures for allied services)
 - iii) Working drawings with suitable scale (Furniture, electrification, plumbing)
 - iv) Elevation treatment.
4. Perspective view of the buildings planned above.
5. Line plan of buildings on graph paper of at least five remaining types of buildings not covered in 2.
6. Two exercises on parallel and angular perspective of simple objects.
7. Report for the building project stated in 2, including necessary sketches and design details.
8. Minimum one exercise of preparing a plan and elevation on CAD.

Text Books:

1. "Building Drawing with an integrated approach to Built-Environment" - Shah, Kale and Patki, Tata Mcgraw Hill publication.
2. "Principles of Building Drawing" – M.G.Shah and C.M.Kale, Macmillan India ltd.
3. "Planning and Designing Building" – Y.S.Sane, Modern Publication House, Pune

References Books:

1. "Building Planning" – Kumar Swami, Charotar Publication
2. "Civil Engineering Drawing" – M.Chakaborty, UBS publication.

Open Elective – I (Energy & Environment)

(Offered by Faculty of Civil Engineering to All Faculties)

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
OE - I (OEC-CV506)	03	--	--	03	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

Course Objectives:

1. To study energy needs, demand and various renewable alternatives.
2. To understand potential of renewable energy resources.
3. To study technologies to harness the energy.
4. To understand advantages, limitations of resources and energy management.

Course Outcomes:

After successful completion of this course students will be able to:

1. Compare conventional and renewable energy resources
2. Identity scope and potential of renewable energy
3. Analyze suitability of renewable energy resource.
4. Explain energy management principles and strategies

SECTION I

Unit 1: Introduction

5 hrs

- 1.1 Global energy, environmental resources
- 1.2 Energy needs
- 1.3 Indian scenario- Energy consumption, needs and crisis

Unit 2: Renewable Sources of Energy

9 hrs

- 2.1 Biogas-types & factors affecting, community biogas plant
- 2.2 Solar energy – Introduction, utilization methods, merits, demerits & potential
- 2.3 Wind energy- Site selection criteria, potential & scope
- 2.4 Tidal energy- Site suitability, types

Unit 3: Non-Renewable Sources of Energy

4 hrs

- 3.1 Energy from coal & oil- introduction, merits & demerits
- 3.2 Natural gas & geothermal energy- introduction, merits & demerits
- 3.3 Relevance to other branches- Green building

SECTION II

Unit 4: Environmental Impacts

5 hrs

- 4.1 Global Warming
- 4.2 Green house effect
- 4.3 Acid rain

Unit 5: Environmental Impact Assessment (E.I.A.)

6 hrs

- 5.1 Objectives

5.2 General E.I.A. process

5.3 Capability & limitations

Unit 6: Energy Audit and Management

7 hrs

6.1 Definition & objectives

6.2 Types & General guidelines for energy audit

6.3 Principles of energy management, energy planning

NOTE: One assignment on each unit.

Text Books:

1. “Non-Conventional Energy Sources” - G. D. Rai, Khanna Publishers, 5th Edition, 2014.
2. “Solar Energy and Non-Conventional Energy Sources” - Dr. V. M. Domkundwar, Dhanpar Rai & Co. Ltd., 1st Edition, 2010.
3. “Non-Conventional Energy Sources” - R. K. Singal, Katson Publication, 2nd Edition, 2009

Reference Books:

1. “Renewable Energy Resources” - Jhon Twidell and Tony Weir, Routledge Publication, 2nd Edition, 2005.
2. “Solar Energy” - Dr. S. P. Sukhatme, McGraw Hill Publication, 2nd Edition, 2005.
3. “ Non-Conventional Resources of Energy” - G. S. Sawhney, PHI Publication, 5th Edition, 2010.

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1.	1	11
2.	2	12
3.	3	12
4.	4	11
5.	5	12
6.	6	12

Theory of Structures

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
TOS (PCC-CV601)	03	01	--	04	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To impart principles of elastic structural analysis and behavior of indeterminate structures.
2. To analyze indeterminate structures by using different methods.
3. To compare suitability of different methods.
4. To make aware of the limitations of the methods of solution and their outcomes.

Course Outcomes:

After successful completion of this course students will be able to:

1. Understand the concept of determinacy and indeterminacy.
2. Apply various techniques of structural mechanics to solve indeterminate structures.
3. Analyze indeterminate structures by using various approaches.
4. Know the limitations of the methods of solution and their outcomes.

SECTION I

Unit 1: Introduction and Consistent Deformation Method

6 hrs

- 1.1 Concept of determinacy and indeterminacy, Degrees of freedom and structural redundancy, Methods of analysis. (No numerical).
- 1.2 Consistent deformation method: propped cantilever with uniform section, fixed beam.

Unit 2: Clapeyron's Theorem

6 hrs

Clapeyron's theorem of three moments, application to

- 2.1 Continuous beams
- 2.2 Sinking of supports
- 2.3 Beams with different M.I.

Unit 3: Energy Theorems

6 hrs

Castiglione's theorem and unit load method (Degree of S.I. ≤ 2), application to

- 3.1 Statically indeterminate beam
- 3.2 Truss (lack of fit and temperature variation effect)

SECTION II

Unit 4: Slope Deflection Method

6 hrs

Slope deflection equation, Modified slope deflection equation (Degree of K.I. ≤ 2), application to

- 4.1 Beams, sinking of supports
- 4.2 Portal frames without sway

Unit 5: Moment Distribution Method**6 hrs**Moment distribution method (Degree of S.I. ≤ 2), application to

- 5.1 Beam
- 5.2 Sinking of supports
- 5.3 Portal frames without and with sway.

Unit 6: Matrix Methods**6 hrs**

- 6.1 Flexibility Method: Flexibility coefficients, development of flexibility matrix, compatibility equations, application to propped cantilever, fixed beam, continuous beam (Degree of S.I. ≤ 2)
- 6.2 Stiffness Method: Stiffness coefficients, development of stiffness matrix, equilibrium equations, applications to beams and portals (Degree of K.I. ≤ 2)

Term Work:

One assignment per unit with minimum four numerical in each assignment

Text Books:

- 1. "Structural Analysis" - Bhavikatti, Vikas Publishing House Pvt, Ltd.
- 2. "Analysis of Structures" - Vazirani and Ratwani, Vol. I & II, Khanna Publishers
- 3. "Mechanics of Structures" - S. B. Junnarkar, H.J. Shah, Vol-I & II, Charotar Publishers.
- 4. "Structural Analysis: Matrix approach - Pandit and Gupta.
- 5. "Structural Analysis" - L.S. Negi and R.S. Jangid, Tata Mc-Graw Hills Publishing House, New Delhi

Reference Books:

- 1. "Basic Structural Analysis" - C.S. Reddy, Tata McGraw Hill Publishing House, New Delhi.
- 2. "Structural Analysis" - Devdas Menon, Narosa Publishing House.
- 3. "Basic Structural Analysis" - K.U. Muthu, Azmi Ibrahim, M. Vijyan, Maganti Janadharn. I.K. International Publishing House Pvt. Ltd.
- 4. "Matrix analysis of structures" - Gere & Weaver.
- 5. "Indeterminate structural analysis" - C.K. Wang

Guidelines Regarding Question Paper Setting:

- 1. Section I - Q. No. 1 to 4 and Section II - Q. No. 5 to 8
- 2. Q. No. 1 & 5 is compulsory question based on entire theory of section I and section II respectively.
- 3. Solve any two questions out of remaining three questions in each section

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1, 2, 3 - Theory	07
2	1 - Problem	14
3	2 - Problem	14
4	3 - Problem	14
5	4,5,6 - Theory	07
6	4 - Problem	14
7	5 - Problem	14
8	6 - Problem	14

Engineering Management

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical(Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EM HM-CV602	04	--	02	05	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

Course Objectives:

1. To introduce management theories.
2. To learn project management tools.
3. To understand Resource management.
4. To get acquainted with financial management.

Course Outcomes:

After successful completion of this course students will be able to:

1. Understand importance of management in construction.
2. Use the Project planning and management tools in Construction.
3. Evaluate and draw project network for estimating time and cost.
4. Know the techniques of Material Management.
5. Explore and understand the concepts of Economics in construction.
6. Know the advance concepts in management.

SECTION I

Unit 1: Management Introduction

6 hrs

- 1.1 Importance ,Contribution by Henry Fayol and F.W.Taylor
- 1.2 Functions of management w.r.t its influence in construction management
- 1.3 Introduction to Decision Making and Decision Tree.

Unit 2: Project Management and Network Analysis

10 hrs

- 2.1 Phases of Project Management, Bar Chart, Gantt Chart.
- 2.2 Work Breakdown Structure.
- 2.3 CPM Network: Time Estimate, Floats, Critical Path. Network Compression and Updating

Unit 3: PERT

8 hrs

- 3.1 Introduction, Time estimates, floats, Project Duration. Precedence Network(intro).
- 3.2 Study of Project Management Software.

SECTION II

Unit 4: Resource Management

8 hrs

- 4.1 Objectives, Functions, Inventory Control, ABC Analysis, EOQ analysis. HML, VED, SDE.
- 4.2 Resource Allocation, Smoothing and leveling (Concept).

Unit 5: Engineering Economics

10 hrs

- 5.1 Types of interests, Time value of Money, Equivalence.

5.2 Economic Comparison Methods: Present Worth Method, EUAC Method, Capitalized cost Method.

5.3 Investment Criteria: Net Present Value, Rate of Return, Benefit Cost Ratio, Pay Back Period Method, Break Even Analysis (Concept).

Unit 6: Advances in Management

6 hrs

6.1 Work Study and Method Study (Concept), ISO 9000

6.2 Site Layout, Safety in Construction: Personal Protective Equipment.

Term Work:

1. One assignment per unit with minimum four questions in each assignment
2. Planning and scheduling of any construction project by using Project management software.

Text Books:

1. "Project planning and Control with PERT and CPM" - B.C.Punmia, Laxmi Publication.
2. "PERT & CPM: Principles and Application" - Srinath L.S, Affiliated East west press
3. "Construction Engineering and Management" - Dr. S. Seetharaman, Umesh Publications
4. "Financial Management" – Prasanna Chandra, TATA McGraw Hill.
5. "Industrial Engineering and Production Management - Martand Telsang, S.Chand Publication.
6. "Work Study" - O. P. Khanna, Dhanapat Rai Publication.

Reference Books:

1. "Engineering Management" – Stoner, Pearson Publication.
2. "Construction Project Management" – K.K.Chitkara, TATA McGraw Hill.
3. "Project Cost Control in Construction" - Roy Pilcher, Blackwell Scientific Publications.
4. "Principles of Construction Management - Roy Pilcher, TATA McGraw Hill.
5. "Engineering Economics" - Layland Blanck and Torquin, TATA McGraw Hill.
6. "Engineering Economics" - Paneerselvam, PHI Publications. .
7. "Industrial Engineering and Management" - O.P. Khanna, Dhanapat Rai Publication.
8. "Operations Research and Engineering Management" - S.D. Sharma, KEDAR NATH RAM NATH

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	11
2	2	12
3	3	12
4	4	12
5	5	12
6	6	11

Environmental Engineering – II

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
EE - II PCC-CV603	04	--	02	05	ISE	--	--	25	10
					CIE	30	12	--	--
					ESE	70	28	25	10

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To describe wastewater, its sources, characteristics and collection systems.
2. To design the various treatment processes for wastewater treatment and low cost treatment methods.
3. To interpret various methods of wastewater disposal.
4. To explain various aspects of solid waste management.
5. To outline the effects of air pollution and its control measures.

Course Outcomes:

After successful completion of this course students will be able to:

1. Explain sources, characteristics and methods of wastewater collection.
2. Design the primary and secondary wastewater treatment units and describe low cost wastewater treatment units.
3. Understand various methods of wastewater disposal
4. Explain the necessity and importance of solid waste management.
5. Describe air pollution, its effect and controlling techniques.

SECTION I

Unit 1: Waste Water Treatment

8 hrs

- 1.1 Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal waste water, Problems on B.O.D. calculations, Quantity of storm water.
- 1.2 Sewerage system, Types, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and Sludge pumping.

Unit 2: Primary and Secondary Treatment

8 hrs

- 2.1 Screening, comminuting, Grit removal, Oil and Grease trap Primary settling tank.
- 2.2 Secondary Treatment-Activated sludge process, Process, design and operating parameters of ASP, modification of ASP, Operational problems, Concept of trickling filter.

Unit 3: Sludge Treatment and Disposal

8 hrs

- 3.1 Concept of anaerobic digestion, types of reactors.
- 3.2 Low cost wastewater treatment methods-Principles of waste stabilization pond. Design and operation of oxidation pond, Operation of aerobic & anaerobic Lagoons, Oxidation ditch, Septic tank.

SECTION II

Unit 4: Stream Pollution

8 hrs

- 4.1 Self Purification, DO sag curve, Streeter Phelps's Equation, Stream classification
- 4.2 Disposal of waste water methods, effluents standards for stream and land disposal as per MPCB and CPCB standards

Unit 5: Solid Waste Management

8 hrs

- 5.1 Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques
- 5.2 Methods of treatment of solid waste-Composting, Incineration, Pyrolysis and Sanitary land filling.

Unit 6: Air Pollution Noise Pollution and EIA

8 hrs

- 6.1 Air Pollution: Definition, Sources and classification of pollutants, Effects. Control of industrial air pollution- Settling Chamber, Bag filter, Cyclone separator, Scrubbers, Electrostatic precipitators. Air quality standards
- 6.2 Noise Pollution: Noise characteristics and measurements, Levels of noise and standards, control.
- 6.3 Environmental Impact Assessment: Concept, outline and details of EIA, report preparation.

Term Work:

- A. Characterization of municipal waste water (Any five of the following):
 - 1. pH
 - 2. Alkalinity
 - 3. Solids
 - 4. Chlorides
 - 5. DO
 - 6. BOD
 - 7. COD
 - 8. Sulphates
 - 9. Oil & grease
 - 10. Volatile acids
- B. Design/analysis problems on sewerage system and treatment system
- C. Visit to sewage treatment plant & visit report.

Text Books:

- 1. "Environmental Engineering" – H. S. Peavey, D.R. Rowe and Thobanoglous, McGraw Hill Book Company
- 2. "Water Supply and Pollution Control" - Viessman W. and Hammer M.J., Harper Collins College Publishers.
- 3. "Waste Water Engineering Treatment & Disposal" - Metcalf & Eddy, Tata McGraw Hill
- 4. "Sewage Disposal and Air Pollution Engineering" - Garg S.K., Khanna Publishers
- 5. "Waste Water Supply Engineering" - B. C. Punmia, Laxmi Publication
- 6. "Solid Waste Management in Developing Countries" - Bhide A.D. and Sundersen B.B., Indian National Scientific Documentation Centre, New Delhi
- 7. "Air Pollution" - Rao M.N. and Rao H.V.N., Tata McGraw Hill

Reference Books:

- 1. "Manual on Sewerage & Sewage Treatment" Ministry of Urban Development Govt. of India Msy-2000. 35 PDOP-4-59-85-97, Ministry of Urban development
- 2. "Water and Waste Water Technology" - Hammer M.J, Prentice-Hall of India Private Ltd.

3. “Manual on Municipal Solid Waste Management” - Ministry of Urban Development Govt. of India.

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	11
2	2	12
3	3	12
4	4	12
5	5	12
6	6	11

Geotechnical Engineering II

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
GTE - II PCC-CV604	04	--	02	05	ISE	--	--	25	10
					CIE	30	10	--	--
					ESE	70	30	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. Know Various concepts of different soil/rock strata and use of this data for interpretation of bearing capacity
2. Understand the importance and basics of foundation engineering in the civil engineering projects.
3. Evaluate the load bearing capacity and settlement of foundations by classical theories.
4. Analyze the geotechnical aspects of shallow and deep foundations
5. Understand the concepts of the stability of slopes and study various methods of evaluating the stability of slopes.
6. Know the modern foundation techniques.

Course Outcomes:

After successful completion of this course students will be able to:

1. Use engineering science principles to develop foundation engineering knowledge.
2. Apply foundation engineering knowledge in the civil engineering projects.
3. Calculate bearing capacity theoretically as well as practically.
4. Calculate settlement and design shallow and deep foundation
5. Apply basics concepts of slope stability on field.
6. Apply modern foundation techniques.

SECTION I

Unit 1: Soil & Rock Exploration

8 hrs

- 1.1 Necessity, Planning, No & depth of bore holes, Exploration Methods- auger boring (hand and continuous flight augers), and wash boring, rotary drilling, percussion drilling.
- 1.2 Soil sampling- disturbed and undisturbed, Rock drilling and sampling, types of sampler.
- 1.3 Mechanical properties of rock, behaviour of rocks in uniaxial compression, tensile strength of rocks
- 1.4 Types of rock failure Core barrels, Core boxes, core recovery, Rock Quality Designation

Unit 2: Bearing Capacity Evaluation

8 hrs

- 2.1 Definitions, Modes of failure, Terzaghi's bearing capacity theory, Meyerhof's bearing capacity, I.S. Code method of bearing capacity evaluation & computation (IS 6403)
- 2.2 Effect of various factors on bearing capacity (Size & Shape, Depth, WT)
- 2.3 Bearing capacity evaluation from Plate load test, S.P.T. (By I.S. Code method), static cone penetration test and Menards pressure meter tests with detailed procedure.

Unit 3: Shallow Foundation and Foundation Settlement**8 hrs**

- 3.1 Types and their selection, minimum depth of footing, Assumptions & limitations of rigid design analysis. Design of Isolated, combined, strap footing (Rigid analysis), Raft foundation (elastic analysis), floating foundations (R.C.C. Design is not expected)
- 3.2 Immediate settlement- computations from I.S. 8009- 1976 (Part I) approach, consolidation
- 3.3 Settlement computations, Concept of total settlement, differential settlement and angular distortion.

SECTION II**Unit 4: Pile Foundation****8 hrs**

- 4.1 Classification and their uses, single pile capacity evaluation by static and dynamic methods for cohesive and cohesion less soil, pile load test. Negative skin friction
- 4.2 Group action piles, spacing of piles in group, Group efficiency.
- 4.3 Under reamed piles – equipment, construction and precautions.

Unit 5: Well Foundations, Cofferdam and Ground Improvement Techniques**8 hrs**

- 5.1 Element of wells, types, methods of construction, tilt and shift, remedial measures.
- 5.2 Pneumatic caissons: sinking method- Sand island method, Caisson disease. Types and material used for sheet piling
- 5.3 Common types of cofferdams, Braced cofferdam.
- 5.4 Stone columns, Vibroflotation, Preloading technique, Civil engineering application of geo synthetics, geo textile & geomembrane

Unit 6: Analysis of Slope Stability**8 hrs**

- 6.1 Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil
- 6.2 Taylor's stability number, Swedish slip method, method of slices and concept of Friction circle method, Landslide

Term Work:

- 1. Minimum one assignment on each unit with theory and minimum four numerical, (wherever applicable)
- 2. Any software based project **OR** Foundation site visit with report

Text Books:

- 1. "Soil Mechanics in Engineering Practice" -Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, Wiley India Pvt. Ltd
- 2. "Basic and Applied Soil Mechanics" - Gopal Ranjan and A S Rao, G. K. Publications Pvt. Ltd.
- 3. "Soil Mechanics and Foundation Engineering" - V. N. S. Murthy, B. S. Publications (3rd Edition)
- 4. "Soil Mechanics and Foundation Engineering" - B. C. Punmia, Laxmi Publishing Co., New Delhi.
- 5. "Geotechnical Engineering" - Dr. B. J. Kasmalkar, Pune Vidyarthi Griha Prakashan.

Reference Books:

- 1. "Engineering Properties of Soils And Their Measurements" - Joseph E Bowles, McGraw Hill Publications
- 2. "Soil Mechanics" - Lambe and Whitman, S. Chand Publications (SI Version).
- 3. "Geotechnical Engineering Principle and Practice" - Donald P Coduto, McMillan Press (PHI).
- 4. "Geotechnical Engineering" - P Purushothma Raj, McGraw Hill Publication (4th Edition).

5. “Foundation Design Manual” - Dr. N.V. Nayak. Dhanpat Rai and Sons

Guidelines Regarding Question Paper Setting:

1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	11
2	2	12
3	3	12
4	4	12
5	5	11
6	6	12

Open Elective-II (Soil and Water Conservation Techniques)

(Offered by Faculty of Civil Engineering to All Faculties)

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
OE - II (OEC-CV605)	03	--	--	03	ISE	--	--	--	--
					CIE	30	12	--	--
					ESE	70	28	--	--

ISE: In Semester Evaluation

CIE: Continuous Internal Evaluation

ESE: End Semester Examination

Course Objectives:

1. To understand the concept of soil and water conservation.
2. To apply the knowledge of conservation for societal benefit.
3. To evaluate the specific needs of soil and water conservation in given area.

Course Outcomes:

After successful completion of this course students will be able to:

1. Understand methods of soil and water conservation.
2. Develop an integrated model for sustainable natural conservation.
3. Explain the groundwater exploration techniques and its artificial recharge.
4. Analyze the needs for protection of banks and preservation of soil.

SECTION I

Unit 1: Introduction

4 hrs

- 1.1 Concept of soil erosion and water conservation
- 1.2 Principles of Soil Erosion – causes, types, agents, factors affecting, mechanics of soil erosion.

Unit 2: Soil Conservation Methods

9 hrs

- 2.1 Introduction, Erosion due to water,
- 2.2 Terraces for Water Erosion Control-Terraces and their Design, Bench Terracing, Types of Bench Terraces, Alignment of Bench Terraces,
- 2.3 Bunding Methods- Measures for Water Erosion Control, Bunds (Contour Bunds, Graded Bunds), Construction of Bunds
- 2.4 Gully Erosion - Classification of Gullies, Principles of Gully Control, Gully Control Measures;
- 2.5 Maintenance of Bench Terraces, bunding and gully.

Unit 3: Stream Bank Erosion and Protection

5 hrs

- 3.1 Introduction; Susceptible Area to Stream Bank Erosion, Process of Stream Bank Erosion; Bank Scour; Mass Failure
- 3.2 Impacts of Stream Bank Erosion; Causes of Stream Bank Erosion; Control Measures for Stream Bank Erosion
- 3.3 Objectives and methods of River Training works.

SECTION II

Unit 4: Water Harvesting Structures

5 hrs

- 4.1 Importance of Water Harvesting; Types of Water Harvesting;
- 4.2 Water Harvesting Technique; Runoff vs. Flood Water Harvesting,
- 4.3 Performance of WHS - Check dams, Nala bund, MI tank, Percolation tank

Unit 5: Modeling of Watershed Process

5 hrs

- 5.1 Watershed Model and Modeling; Benefits of Watershed Modeling; Watershed Models;
- 5.2 Case Study-Watershed; Modelling for Soil and Water Conservation.

Unit 6: Groundwater Conservation

8 hrs

- 6.1 Introduction, Sources of ground water, Porosity and Permeability, Types of aquifers, Zones of ground water,
- 6.2 Ground water regulations, Ground water conservation techniques, Artificial recharge systems, Causes, effects and solutions of ground water depletion.

NOTE: One assignment on each unit.

Text Books:

- 1. "Soil and Water Conservation Engineering" - Dr. R. Suresh; Standard Publications
- 2. "Hydrology and Soil Conservation Engineering including Watershed Management" - Ghanshyam Das; PHI
- 3. "Watershed Management" - GVS Murthy; New Age international Publication.

Reference Books:

- 1. "Principles of Soil Conservation and Management" - Hamberto Blanco and Rattan Lal, Springer
- 2. "Manual of Soil and Water Conservation Practices" - Gurmial Singh, C. Venkatraman, G. Sastry, B. P. Singh
- 3. "Soil Erosion Research Methods" - R. Lal, Lib. Of Congree Catloing in Publication Data.
- 4. "Soil and Water Conservation in Semi-arid Area" - Norman W. Handsom; United Book Prints
- 5. "Groundwater Hydrology" - D.K. Todd, Wiley Publication

Guidelines Regarding Question Paper Setting:

- 1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
- 2. All questions are compulsory.
- 3. Internal optional question are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

Question No.	Based on Unit No.	Marks
1	1	12
2	2	12
3	3	11
4	4	12
5	5	12
6	6	11

Structural Design and Drawing - I

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
SDD - I (PCC-CV606)	--	--	04	02	ISE	--	--	50	20
					CIE	--	--	--	--
					ESE	--	--	50	20

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To analyze and design steel structures.
2. To prepare the working drawing for various structural elements.

Course Outcomes:

After successful completion of this course students will be able to:

1. Analyze and design different types of bolted & welded connections
2. Demonstrate the knowledge of common sections subjected tension and compression members & its design,
3. Analyze and design of steel column, flexural members and its elements.
4. Aware of application of software in structural analysis and design.
5. Prepare the working drawing as per requirement of project execution.

Term Work:

Detailed structural design and drawing of the following steel structure along with necessary drawings by limit state method analysis. (Max group size should not exceed four students)

1. Design of industrial building including roof truss, purlin, bracings, gantry girder, column, column base and connections. Preparing of all working drawings.
2. Analysis and Design of building frame manually and by using any FEM based software. Preparing of all working drawings.

Text Books:

1. "Limit State Design of Steel Structures" - Duggal S.K., Tata McGraw-Hill Education private Ltd., New Delhi, 2nd Edition 2014
2. "Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007" - Bhavikatti S. S., I K International Publishing House.
3. "Limit State Design in Structural Steel" - Shiyekar M. R, 2nd Edition, PHI Publisher
4. "Design of Steel Structures" - Dayaratnam, Wheeler Publications, New Delhi.
5. "Design of Steel Structures" – B. C. Punmia, A. K. Jain and Arun Kumar Jain, Laxmi Publication

Reference Books:

1. "LRFD Steel Design" - William T. Segui, PWS Publishing
2. "Design of Steel Structures" - Edwin H. Gaylord, Charles N. Gaylord James, Stallmeyer, Mc-Graw Hill
3. "Design of Steel Structures" - Mac. Ginely T.
4. "Design of Steel Structures" - Kazimi S. M. and Jindal R. S., Prentice Hall India.

5. “Design of Steel Structures” - Breslar, Lin Scalzi, John Willey, New York.
6. “Steel Structure” - Controlling Behaviour Through Design, Englekirk, WILEY.

I.S. Codes:

1. IS: 800 – 2007
2. IS: 875 (part I, II and III)
3. SP6 (1) & SP 6 (6),
4. IS: 816
5. IS: 808.

Third Year B.Tech. (Civil) Semester - VI

Seminar

Course	Teaching Scheme				Evaluation Scheme				
	L	T	P	Credit	Scheme	Theory (Marks)		Practical (Marks)	
						Max.	Min. for passing	Max.	Min. for passing
Seminar MC-CV607	--	--	2	1	ISE	--	--	50	20
					CIE	--	--	--	--
					ESE	--	--	--	--

ISE: In Semester Evaluation CIE: Continuous Internal Evaluation ESE: End Semester Examination

Course Objectives:

1. To understand, develop research ability & present the knowledge gained from curriculum/field etc.
2. To study the recent trends, technological innovations in civil engineering & interdisciplinary areas.
3. To enhance presentation skills.

Course Outcomes:

After successful completion of this course students will be able to:

1. Summarize the present status and make literature review on the selected topic with current issues to give a state of an art of technological progress in the past through technical report.
2. Deliver seminar presentation using modern tools highlighting the distinguishing features of the studies conducted.
3. Prepare the technical report of seminar work in given format.

Term Work:

1. Selection of topic from curriculum / field in civil engineering / interdisciplinary areas on current issue.
2. Minimum three presentations at follows,
 - a. Synopsis presentation
 - b. Literature review presentation
 - c. Final presentation
3. Preparation of final report in hard and soft format.

Text Books:

Relevant text books for selected topic of seminar.

Reference Books:

Relevant reference books, journal publications, conferences publications, magazines, open web site sources for selected topic of seminar.

***Guidelines about Field Training (SI-CV707): -**

1. On site/office field training for 2 weeks during winter and 3 weeks during summer vacation of T.Y. B.Tech.
2. College has to provide field book containing 35 pages about daily report of field training to students.
3. Each page of field book should contain the signature of site supervisor/office engineer.
4. College has to allot site/office to students and students should strictly do the field training at allotted site/office.
5. After successful completion of field training students should bring satisfactory report from allotted firm.
6. The evaluation of field training should be done in semester VII under course Field Training having course code SI-CV707.
7. If possible external practicing examiner should be called for evaluation of term work of Field Training.