

SCHEME OF INSTRUCTIONS

of

B.E. CIVIL ENGINEERING (I to VIII Semesters)

With Effect from Academic Years 2024-2028

PROPOSED SCHEME FOR AFFILIATED COLLEGES



Estd.1917

DEPARTMENT OF CIVIL ENGINEERING UNIVERSITY COLLEGE OF ENGINEERING


CHAIRPERSON,
Board of Studies

Department of Civil Engineering
Osmania University, Hyderabad.


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Department of Civil Engineering
University College of Engineering (A)


PROFESSOR
Department of Civil Engineering
University College of Engineering (A)


SENIOR PROFESSOR
Department of Civil Engineering
University College of Engineering (Autonomous)
Osmania University, Hyderabad-500 007

Programme Educational Objectives (PEO):

PEO1: Impart basic knowledge in the field of Civil Engineering.

PEO2: Develop skills to analyze and provide viable solutions to various Civil Engineering problems.

PEO3: Enhance communication skills and encourage team work.

PEO4: Prepare Civil Engineering professionals with zeal for research, life-long learning, and work for sustainable development of society with ethics.

PROGRAM OUTCOMES (POs)

POs	Engineering Graduates will be able to:
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional engineering Solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Lifelong learning: Recognize the need for, and have the preparation and ability to engage in Independent and lifelong learning in the broadest context of technological change.

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MAPPING OF PEO'S WITH PO'S

S.No.	PEO Statement	M1	M2	M3
PEO 1	Impart basic knowledge in the field of Civil Engineering	3	2	2
PEO 2	Develop skills to analyze and provide viable solutions to various Civil Engineering problems.	3	3	2
PEO 3	Enhance communication skills and encourage team work.	2	2	1
PEO 4	Prepare Civil Engineering professionals with zeal for research, life-long learning, and work for sustainable development of society with ethics.	3	3	3

Rubrics

- 1 : Weakly mapped
 2 : Moderately mapped
 3 : Strongly mapped

PEO	Justification and rationale of the mapping
PEO 1	Mainly focuses on imparting basic knowledge in Civil Engineering to produce highly competent and capable professionals. Accordingly, the correlations are assigned.
PEO 2	Emphasis is on training to inculcate analytical skills to design various Civil Engineering problems. Hence, the correlations are allotted.
PEO 3	Focuses on personality development, character building and to work with peers. Therefore, the correlations are justified.
PEO 4	Equip with required skills to effectively tackle the real life problems of Civil Engineering in sustainable manner. Therefore, M1 to M3 are in good agreement.

SCHEME OF INSTRUCTION AND EVALUATION
B.E. (CIVILENGINEERING) w.e.f.AY 2024-25

I- Semester

SCHEME OF INSTRUCTION & EXAMINATION B.E (Group A-IT,CSE (AI),CSE(AI&ML),
CSE (DS) ECE, ETE,ME, CE) **SEMESTER-I**

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs / Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
Three Week Induction Program										
1	MC801PO	Indian Constitution	2	-	-	2	30	70	3	-
2	BS201MT	Matrices & Differential Calculus	3	1	-	4	30	70	3	4
3	BS202PH	Engineering Physics	3	1	-	4	30	70	3	4
4	ES302CS	Programming for Problem Solving	3	-	-	3	30	70	3	3
5	ES301EE	Basic Electrical Engineering	3	1	-	4	30	70	3	4
Practical/Laboratory Courses										
6	BS251PH	Engineering Physics Lab	-	-	3	3	25	50	3	1.5
7	ES351CS	Programming for Problem Solving Lab	-	-	3	3	25	50	3	1.5
8	ES353CE	Engineering Graphics	-	-	2x2	4	50	50	3	2
9	ES354EE	Basic Electrical Engineering Lab	-	-	2	2	25	50	3	1
Total			14	3	12	29	275	550	27	21

B.E(Group A-IT,CSE(AI),CSE(AI&ML),CSE(DS) ECE, ETE,ME, CE) SEMESTER-II

S. No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs / Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1	BS203MT	Mathematics-II	3	1	-	2	30	70	3	4
2	MC802CE	Environmental Sciences	2	-	-	2	30	70	3	-
3	MC803PY	Essence of Indian Traditional Knowledge	2	-	-	2	30	70	3	-
4	HS101EG	English	2	-	-	2	30	70	3	2
5	BS204CH	Engineering Chemistry	3	1	-	4	30	70	3	4
6	ES303CS	Scientific Programming	3	-	-	3	30	70	3	3
Practical/Laboratory Courses										
7	HS151EG	English Lab	-	-	2	2	25	50	3	1
8	BS252CH	Engineering Chemistry Lab	-	-	3	3	25	50	3	1.5
9	ES352ME	Engineering Workshop Practice	-	-	2x3	6	50	50	3	3
10	ES353CS	Scientific Programming Lab	-	-	2	2	25	50	3	1
Total			15	2	13	30	305	620	30	19.5

BS: Basic Science ES: Engineering Science MC: Mandatory Course L:

Lecture T: Tutorial P: Practical D: Drawing

CIE: Continuous Internal Evaluation SEE: Semester End Evaluation

III- Semester
**SCHEME OF INSTRUCTION AND EVALUATION
B.E. (CIVIL ENGINEERING) w.e.f. AY 2025-26 (R24)**

B.E. (CIVIL ENGINEERING) - WINTER 2023-24 (REL-7)

S.No	Code	Course Title	Scheme of Instructions			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory Courses										
1	BS 205 MT	Probability and Statistics	3	-	-	3	3	30	70	3
2	ES 302 CE	Engineering Mechanics	3	-	-	3	3	30	70	3
3	PC 302 CE	Building Materials and Construction Practices	3	-	-	3	3	30	70	3
4	PC 303 CE	Surveying and Geomatics	3	-	-	3	3	30	70	3
5	PC 304 CE	Strength of Materials-I	3	-	-	3	3	30	70	3
6	PC 305 CE	Fluid Mechanics-I	3	-	-	3	3	30	70	3
Practical / Laboratory Courses										
7	PC 351 CE	Building Drawing & Drafting Laboratory	-	-	2	2	3	25	50	1
8	PC 352 CE	Surveying and Geomatics Lab	-	-	2	2	3	25	50	1
9	PC 353 CE	Fluid Mechanics-I Lab	-	-	2	2	3	25	50	1
Total			18	-	6	24		255	570	21

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B.E. (CIVIL ENGINEERING) w.e.f. AY 2025-26 (R24)

IV- Semester

S.No	Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Evaluation			Credits
			L	T	P		Hrs	CIE	SEE	
Theory Courses										
1	HS 103CM	Finance and Accounting	3	-	-	3	3	30	70	3
2	PC 401 CE	Hydrology and Water Management	3	-	-	3	3	30	70	3
3	PC 402 CE	Strength of Materials-II	3	-	-	3	3	30	70	3
4	PC 403CE	Fluid Mechanics-II	3	-	-	3	3	30	70	3
5	PC 404 CE	Construction Engineering & Management	3	-	-	3	3	30	70	3
6	PC 405 CE	Engineering Geology	3	-	-	3	3	30	70	3
Practical / Laboratory Courses										
7	PC 451 CE	Strength of Materials Laboratory	-	-	2	2	3	25	50	1
8	PC 452 CE	Fluid Mechanics-II Laboratory	-	-	2	2	3	25	50	1
9	PC 453 CE	Engineering Geology Laboratory	-	-	2	2	3	25	50	1
		Survey Camp *								
Total			18	0	6	24		255	570	21

*Survey camp is to be conducted during summer vacation, to be evaluated in the V – Semester

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SCHEME OF INSTRUCTION AND EXAMINATION

B.E. (Civil Engineering) V-SEMESTER

S. No.	Course Code	CourseTitle	Scheme of Instruction			Contact Hrs / Wk		Scheme of Examination		Credits
			L	T	P			CIE	SEE	
Theory Courses										
1	PC 501CE	Geotechnical Engineering	3	-	-	3	3	30	70	3
2	PC502 CE	Water Resources Engineering – I	3	-	-	3	3	30	70	3
3	PC503 CE	Reinforced Cement Concrete	3	-	-	3	3	30	70	3
4	PC504 CE	Theory of Structures – I	3	-	-	3	3	30	70	3
5	PC505 CE	Concrete Technology	3	-	-	3	3	30	70	3
6	Professional Elective – I		3	-	-	3	3	30	70	3
Practical/Laboratory Courses										
7	PC551 CE	Geotechnical Engineering Laboratory	-	-	2	2	2	25	50	1
8	PC552 CE	Concrete Technology Lab	-	-	2	2	2	25	50	1
9	SD553 CE	Skill Development Course – I	-	-	2	2	2	50	-	1
10	PC 554 CE	Survey Camp Evaluation	One-week duration					50		1
			19	-	6	24	25	330	520	22

Professional Elective – I

S.No	Code	Course Title
1	PE 501 CE	Ground Water Hydrology
2	PE 502 CE	Traffic & Road Safety Engineering
3	PE 503 CE	Green Building Technologies
4	PE 504 CE	Advanced Sustainable Materials



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SCHEME OF INSTRUCTION AND EXAMINATION
B.E.(Civil Engineering) VI-SEMESTER

S. No	Code	Course Title	Scheme of Instruction			Contact Hrs. / Wk.	Scheme of Evaluation		Credits
			L	T	P		CIE	SEE	
THEORY COURSES									
1	PC601 CE	Theory of Structures – II	3	–	–	3	30	70	3
2	PC602 CE	Transportation Engineering	3	–	–	3	30	70	3
3	PC603 CE	Water Resources Engineering – II	3	–	–	3	30	70	3
4	PC604 CE	Design of Steel Structures	3	–	–	3	30	70	3
5	PC605CE	Environmental Engineering	3	–	–	3	30	70	3
6	Professional Elective – II		3	–	–	3	30	70	3
PRACTICAL / LABORATORY COURSES									
7	PC651 CE	Transportation Engineering Laboratory	-	-	2	2	25	50	1
8	PC 652CE	Environmental Engineering Laboratory	-	-	2	2	25	50	1
9	PW653 CE	Mini Project	-	-	4	4	25	50	2
10		Summer Internship*	4 weeks during summer vacations, evaluated in the 7 th – Semester						
			L	T	P		CIE	SEE	Credits
			19	-	12	31	255	570	22

Professional Elective – II

S.No	Course Code	Course Title
1	PE601 CE	Pre Engineering Buildings
2	PE602 CE	Geospatial Technology
3	PE603 CE	Urban Transportation & Planning
4	PE604CE	Environmental Impact Assessment

SCHEME OF INSTRUCTION AND EVALUATION
B.E. (CIVIL ENGINEERING) w.e.f. AY 2027-28

VII-Semester

S. No.	Course Code	Course Title	Scheme of Instruction			Contact hr/week	Scheme of Evaluation		Credits
			L	T	P		CIE	SEE	
1	PC701 CE	Estimation Costing and Specifications	3	-	-	3	30	70	3
2	HS 702 EG	English for Technical Communication	2	-	-	2	30	70	2
3	PC702CE	Foundation Engineering	3	-	-	3	30	70	3
4	PC703 CE	Design of Concrete Structures	3	-	-	3	30	70	3
5	Professional Elective- III		3	-	-	3	30	70	3
6	Open Elective- I		3	-	-	3	30	70	3
PRACTICALS									
7	PC751 CE	Estimation Costing and Specifications Laboratory	-	-	2	2	25	50	1
8	PC752 CE	Computer Application Laboratory	-	-	2	2	25	50	1
9	PW 761 CE	Major Project Phase-I	-	-	6	3	50	-	3
	PW 763 CE	Summer Internship	-	-	-	-	50	-	2
			17	-	10	24	325	520	24

Professional Elective-III

S.No	Code	Course Title
1	PE701CE	Prestressed Concrete
2	PE702 CE	Ground Improvement Techniques
3	PE703 CE	Finite Element Method
4	PE704CE	Intelligent Transport Systems

LIST OF OPEN ELECTIVES - I

- | | |
|---------------|--|
| 1) OE 701 CE | Green Building Technologies |
| 2) OE 702 CE | Essentials of Road Safety Engineering |
| 3) OE 701 EC | Verilog HDL |
| 4) OE 702 EC | Principles of Electronic Communication Systems |
| 5) OE 701 ME | 3D Printing Technology |
| 6) OE 702 ME | Finite Element Method |
| 7) OE 701 EE | Applications of Electrical Energy |
| 8) OE 702 EE | Electrical Safety Management |
| 9) OE 701 CS | Python Programming |
| 10) OE 702 CS | Cyber security |


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**SCHEME OF INSTRUCTION AND EVALUATION
B.E (CIVILENGINEERING) w.e.f.2027-28**

VIII-Semester

S. No.	CourseCode	CourseTitle	Schemeof Instruction			Contact hr/week	Schemeof Evaluation		Credits
			L	T	P		CIE	SEE	
1	ProfessionalElective– IV		3	-	-	3	30	70	3
2	PC801CE	Structural Engg. Steel Design	3	-	-	3	30	70	3
3	OPEN ELECTIVE –II		3	-	-	3	30	70	3
4	PW851CE	Major Project Phase-II	-	-	12	12	50	100	6
		Total	6	-	12	18	110	240	15

ProfessionalElective- IV

S.No	Code	CourseTitle
1	PE801 CE	Retrofitting and Rehabilitation of Structures
2	PE 802 CE	Airport & Railway Engineering
3	PE803 CE	Watershed Management
4	PE804 CE	Construction Equipment & Automation

LIST OF OPEN ELECTIVES -II

- OE 802 CE Air and Water Pollution
- OE 803 CS Information Security
- OE 804 CS Data Base Management Systems
- OE 805 EC Embedded Systems
- OE 807 EC Satellite Communication and Applications
- OE 808EE Optimization Techniques
- OE 809EE Non- Conventional Energy Sources
- OE 810ME Start-up Entrepreneurship
- OE 811 ME Nano-Technology



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Credit Summary

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	21	19.5	22	21	22	22	24	15	166.5

COURSE TYPE DISTRIBUTION OF CREDITS

S.No.	CourseType	I	II	III	IV	V	VI	VII	VIII	TOTAL
1	Humanities and Social Sciences (HS)	-	3	-	3	-	-	2	-	8
2	Basic Sciences(BS)	9.5	9.5	4	-	-	-	-	-	23
3	Engineering Sciences (ES)	11.5	7	3	-	-	-	-	-	21.5
4	Program Cores (PC)	-	-	15	18	18	17	11	3	82
5	Program Electives (PE)	-	-	-	-	3	3	3	3	12
6	Open Electives(OE)	-	-	-	-	-	-	3	3	6
7	Project/ Seminar / Internship	-	-	-	-	1	2	5	6	14
8	Mandatory Courses(MC)	-	-	-	-	-	-	-	-	0
	TOTAL	21	19.5	22	21	22	22	24	15	166.5



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FACULTY OF ENGINEERING

Scheme of Instructions & Evaluation

(AICTE Model Curriculum for the Academic Years 2024-2028)

and

Syllabi

B. E. V and VI Semesters

of

Four Year Degree Programme

in

Civil Engineering

(With effect from the academic year 2024-2028)



Dean, Faculty of Engineering
Osmania University, Hyderabad- 500 007

Shor

Deh

Professor

Senior Professor



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SCHEME OF INSTRUCTION AND EXAMINATION

B.E. (Civil Engineering) V-SEMESTER

S. No.	Course Code	CourseTitle	Scheme of Instruction			Contact Hrs / Wk		Scheme of Examination		Credits
			L	T	P			CIE	SEE	
Theory Courses										
1	PC 501CE	Geotechnical Engineering	3	-	-	3	3	30	70	3
2	PC502 CE	Water Resources Engineering – I	3	-	-	3	3	30	70	3
3	PC503 CE	Reinforced Cement Concrete	3	-	-	3	3	30	70	3
4	PC504 CE	Theory of Structures – I	3	-	-	3	3	30	70	3
5	PC505 CE	Concrete Technology	3	-	-	3	3	30	70	3
6	Professional Elective – I		3	-	-	3	3	30	70	3
Practical/Laboratory Courses										
7	PC551 CE	Geotechnical Engineering Laboratory	-	-	2	2	2	25	50	1
8	PC552 CE	Concrete Technology Lab	-	-	2	2	2	25	50	1
9	SD553 CE	Skill Development Course – I	-	-	2	2	2	50	-	1
10	PC 554 CE	Survey Camp Evaluation	One-week duration					50		1
			18	-	6	24	25	330	520	22

Professional Elective – I

S.No	Code	Course Title
1	PE 501 CE	Ground Water Hydrology
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PC501 CE	GEO-TECHNICAL ENGINEERING					
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks	

Course Objectives

1. Introduction of fundamental concepts of soil and classify based on engineering properties of soils.
2. Analyze the hydraulic behaviour of soils for geotechnical applications.
3. Apply stress and seepage principles to evaluate soil behaviour.
4. Evaluate the compaction and consolidation characteristics of soils.
5. Assess the shear strength and slope stability of soils for engineering practice.

Course Outcomes

After Completion of this course, the student will be able to

1. Identify and classify soils based on their engineering properties.
2. Calculate the hydraulic properties of soils, including capillarity and permeability.
3. Determine soil stresses and evaluate seepage using flow nets.
4. Explain the principles of soil compaction and consolidation using laboratory methods.
5. Analyze the shear strength of soils and assess slope stability.

UNIT – I

Origin & Classification of Soils: Soil as a pseudo-elastic three phase particulate medium
Physical Properties of soil: Weight ratios (Water content, Density, Unit weights, Specific Gravity); Volume ratios (void ratio, porosity, degree of saturation, relative density); Interrelationships, Laboratory tests for determination of Index properties. Classification and Identification of soils for general and engineering purposes as per IS: 1498-1970.

UNIT - II

Permeability of Soils: Darcy's law for flow through soils - validity of Darcy's Law - Factors affecting permeability - Laboratory tests for determination of co-efficient of permeability (constant head, variable head permeability tests) - Field tests (Pumping in and pumping out tests) - Equivalent permeability of stratified soils.

UNIT - III

Stress in Soils: Total, effective and neutral stress distribution in different ground conditions.

Seepage in Soils: Seepage flow, seepage pressure - Flow nets - Locating phreatic line in a homogeneous earthen dam using Kozeny's parabola - Computation of seepage quantity.

Quick Sand phenomena: Critical Hydraulic gradient, Remedial measures.

UNIT - IV

Compaction Process: Compaction Mechanism; factors affecting compaction. Laboratory determination of compaction characteristics-standard and modified Proctor tests- IS Light and Heavy compaction tests; compaction equipment, procedure and quality control.

Consolidation Process: Spring analogy - Void ratio and effective stress (e Vs $\log P$) relationship – Terzaghi's theory of one-dimensional consolidation - assumptions and derivation of GDE – Computation of magnitude of settlement and time rate of settlement.

UNIT – V

Shear Strength: Significance of Shear strength in soils - Mohr - Coulomb equation - shear parameters - Laboratory tests for determination of shear strength - Direct shear test, Tri-axial compression test, Un-confined compression test, Vane shear test, Factors affecting shear strength of cohesion-less and cohesive soils.

Stability of slopes: Stability of infinite and finite slopes, Swedish circle method, Stability of slopes of earth dams, Taylors Stability number.

Suggested Readings:

1. B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Soil Mechanics and Foundations*, 17th Edition (Latest Reprint), Laxmi Publications, 2021.
2. V. N. S. Murthy, *Soil Mechanics and Foundation Engineering*, 2nd Edition (Latest Reprint), CBS Publishers & Distributors, 2020.

Reference Books:

1. C. Venkataramaiah, *Geotechnical Engineering*, 4th Edition, New Age International Publishers, 2019.
2. K. R. Arora, *Soil Mechanics and Foundation Engineering*, 8th Edition, Standard Publishers Distributors, 2020.
3. B. M. Das and Khaled Sobhan, *Principles of Geotechnical Engineering*, 10th Edition, Cengage Learning, 2022.
4. Braja M. Das, *Advanced Soil Mechanics*, 5th Edition, CRC Press, 2021.



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PC502 CE		WATER RESOURCES ENGINEERING – I			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks

Course Objective:

1. Introduce the design principles of canal structures used in irrigation engineering.
2. Understanding of the planning and design of diversion headworks and their components.
3. Provide knowledge of seepage forces and failure mechanisms in permeable foundations.
4. Evaluate the design aspects and performance of different hydraulic regulatory structures.
5. Imparting knowledge regarding the different types of cross drainage structures

Course Out Comes:

On Completion of the course, the students will be able to:

1. Design canals based on Lacey's and Kennedy's theorem.
2. Analyze the design of storage and diversion hydraulic structures.
3. Apply seepage and uplift pressure principles in hydraulic structure design.
4. Evaluate the performance of hydraulic regulatory structures.
5. Design suitable cross-drainage structures for various hydraulic conditions.

UNIT – I

Canals: Alignment, classification of alluvium canals and their functions, Regime concept of Kennedy's and Lacey's theories, design of canals based on Kennedy's and Lacey's method, lining of canals, methods of lining and design of lined canals.

UNIT – II

Diversion Head works: Layout of diversion head works and its components- weirs and Barrages, divide wall, fish ladder, approach channel, scouring sluices, head regulator, river training works, types of weirs, design of vertical drop weir-weir wall, impervious aprons and inverted filter, silt control at the headworks.

UNIT – III

Seepage Forces: Causes of failure of structures on permeable foundations, piping, rupture of floor, undermining, remedial measures, computation of uplift forces by Bligh's theory, Khoshla's theory, analytical method, and significance of exit gradient.

UNIT – IV

Canal Falls: Definition, location, types of falls, design of trapezoidal notch fall, cylinder fall, vertical drop fall and glacis fall.

Regulators and Modules: Head regulator and cross regulators, canal escapes, canal outlets and modules-proportionality, sensibility and flexibility.

UNIT – V

Cross Drainage Works: Definition, classification, design of aqueducts, syphon aqueducts, super passages, and canal syphons, inlets and outlets-selection of cross drainage works.

Suggested Readings:

1. B. C. Punmia & P. B. Lal," Irrigation and Water Power Engineering", Laxmi Publications, New Delhi, edition 2016
2. Irrigation Engineering and Hydraulic Structures – S. K. Garg, Publisher: Khanna Publishers, Delhi, Latest Edition: 2017
3. P. N. Modi," Irrigation and Water Resources Engineering", Standard Book House publisher, edition 2017.

Reference Books

1. K. Subramanya, *Flow in Open Channels*, 5th Edition, McGraw Hill Education, 2019.
2. R. K. Sharma & T. K. Sharma, *Irrigation Engineering and Hydraulic Structures*, Oxford University Press, 2021.
3. US Bureau of Reclamation (USBR), *Design of Small Dams*, 3rd Edition (Reprinted), U.S. Department of the Interior, 2019.
4. Food and Agriculture Organization (FAO), *Irrigation and Drainage Papers*, Latest Editions, 2022.



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PC503CE		REINFORCED CEMENT CONCRETE				
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks	

Course Objectives:

1. Understand reinforced concrete materials, IS codes, and design loads.
2. Introduce the principles of Working Stress and Limit State methods.
3. Apply flexure, shear, torsion, and bond concepts in RCC members.
4. Develop knowledge of RCC slabs, staircases, columns, and footings.
5. Understand codal provisions for safe and economical RCC design.

Course Outcomes:

After completion of course student will be able to:

1. Understand the fundamentals of reinforced concrete materials, design loads, and relevant IS codes.
2. Analyze reinforced concrete beams for flexural behavior using Limit State principles.
3. Evaluate the performance of reinforced concrete members under shear, torsion, and bond.
4. Illustrate the design principles and detailing of reinforced concrete slabs and staircases.
5. Design reinforced concrete columns and footings for different loading conditions.

UNIT – I

Introduction: Materials used in reinforced concrete (Cement, sand, coarse aggregate, water and reinforcing bars). Introduction to Relevant IS codes (IS 456-2000, IS 875 part I to IV). Dead load, imposed load, wind load and earthquake load.

Working stress method: Design of RCC beams: Balanced, under-reinforced and over reinforced sections

Limit State Method of Design: Introduction to the design of Concrete Structures using Limit state method of design. Design philosophies. Partial safety factors for material strength and Loads. Limit State of Collapse and Limit State of Serviceability.

Limit state of Collapse – Flexure: Assumption made in Limit state of collapse- flexure. Stress blocks Parameters, Moment of Resistance of a singly reinforced section. Analysis and design of a singly reinforced section for flexure.

UNIT – II

Design of Doubly Reinforced Beams: Analysis and Design for flexure a doubly reinforced Rectangular section.

Design of T- Beams: Analysis and Design of Singly Reinforced T Beams for flexure Limit states of serviceability: Check for deflection and cracking.

UNIT – III

Limit State of Collapse – Shear & Torsion: Design of beam for Shear: Types of Shear failure of an R.C.C beam, Shear carrying capacity of a reinforced concrete Beam. Analysis and Design of a reinforced section for Shear.

Design of Beam for Torsion: Analysis of R.C.C beams for Torsion. Equivalent Shear and Equivalent Bending Moment. Design and detailing of R.C.C beam subjected to Torsion.

Design of Beam for Bond: Flexural Bond, Anchorage (Development) Bond, Check for Bond Failure.

UNIT – IV

Design of Slabs: Types of Slabs: Design of one way and two-way slabs - Simply supported and continuous slabs subjected to uniformly distributed loads, detailing of reinforcement, Check for serviceability of slabs.

Design of stair cases: Types of stairs: Design and detailing of dog-legged stair cases.

UNIT – V

Design of columns: Assumptions, Design of axially loaded circular, square and rectangular columns, Design of columns with uni-axial and bi-axial bending, interaction diagrams.

Design of footings: Design of isolated square, rectangular and circular footings and Design & Detailing of combined Rectangular RCC footings.

Suggested Readings:

1. David Darwin, Charles W. Dolan, Arthur H. Nilson, "*Design of Concrete Structures*", 15th Edition, McGraw Hill, 2016.
2. Krishna Raju N. and Pranesh R.N., *Reinforced Concrete Design*, New Age International Pvt.2003Ltd., 2003.
3. H. J. Shah, "*Reinforced Concrete (Elementary reinforced concrete)*", 11th Edition, Volume I, Charotar Publications, 2016.

Reference Books:

1. B. C. Punmia, "*Reinforced concrete structures*", 7th Edition, Laxmi Publications, 1992
2. A.K Jain, "*Reinforced Concrete- Limit State Design*", 7th edition, Nem Chand and Bros publications, 2012.
3. Neelam Sharma, "*Reinforced Cement Concrete Design*" S.K. Kataria and Sons publications 2017.

Relevant IS Codes:

1. S 456:2000 – Plain and Reinforced Concrete – Code of Practice, BIS, New Delhi.
2. SP 16 – Design Aids for Reinforced Concrete to IS 456:1978, BIS, New Delhi.
3. SP 24 – Explanatory Handbook on IS 456:1978, BIS, New Delhi.
4. SP 34 – Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi.
5. IS 875 (Parts 1–5):1987 – Code of Practice for Design Loads (Other Than Earthquake) for Buildings and Structures, BIS, New Delhi..


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PC504CE		THEORY OF STRUCTURES – I			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks

Course Objectives:

The objectives of this course are

1. Understand strain energy concepts and energy theorems for structural analysis.
2. Develop knowledge of static and kinematic indeterminacy.
3. Impart knowledge of indeterminate structure analysis under various loading conditions.
4. Understand the Slope-Deflection Method for structural analysis.
5. Introduce the Moment Distribution Method for indeterminate structures.

Course Outcomes:

On Completion of the course, the students will be able to:

1. Apply strain energy principles to analyze statically indeterminate structures.
2. Determine the degree of indeterminacy and analyze indeterminate trusses.
3. Analyze indeterminate beams under various loading conditions.
4. Evaluate continuous beams and portal frames using the Slope-Deflection Method.
5. Assess continuous beams and portal frames using the Moment Distribution Method

UNIT – I

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

UNIT – II

Analysis of Indeterminate Structures: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's theorem.

UNIT – III

Fixed Beams & Continuous Beams: Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support.

UNIT – IV

Slope-Deflection Method: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway.

UNIT – V

Moment Distribution Method: Introduction to moment distribution method- Application to continuous beams with and without settlement of Supports-Analysis of single bay storey portal frames without sway.

Suggested Readings:

1. V.N. Vazirani & M.M. Ratwani, "Analysis of Structures", , Khanna Publications, New Delhi. Vol-I&II (commonly used) Volumes, Reprint 2018
2. S S Bhavikatti, "Structural Analysis" Vikas Publishing House ,5th Edition, 2019.
3. T.S. Thandavamoorthy, "Analysis of Structures", Oxford University Press, New Delhi. 2nd Edition, 2016

Reference Books:

1. Structural analysis – Hibbler – Pearson education, : 10th Edition, 2017
2. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi. 2011 (Reprint 2018)
3. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, NewDelhi. ,2017
4. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.P Perumal – Laxmi publications , 2013
5. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers , 3rd Edition, 2015

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PC505CE	CONCRETE TECHNOLOGY				
Pre-requisites			L	T	P
			3	-	-
Evaluation	SEE	70 Marks	CIE		30 Marks

Course Objectives:

1. Understand the properties of the ingredients of concrete.
2. Develop knowledge of the behavior of fresh and hardened concrete.
3. Introduce the types and applications of concrete admixtures.
4. Impart knowledge of concrete mix design principles.
5. Familiarize students with special concretes and their engineering applications.

Course Outcomes:

After Completion of this course, the student will be able to

1. Identify the properties of concrete ingredients.
2. Explain the behavior of fresh and hardened concrete.
3. Differentiate the types and applications of concrete admixtures.
4. Design concrete mixes as per standard codes.
5. Classify special concretes based on their properties and applications.

UNIT – I

Cement: Portland cement- chemical composition- Hydration of cement and hydration products- Structure of hydrate cement- Heat of Hydration and Rate of hydration -Test on physical properties- Different grades of cement- Types of cements.

Aggregates: Classification of aggregate- Particle shape & texture- Bond, Strength & other mechanical properties of aggregate- Specific gravity, Bulk density, Porosity, adsorption & moisture content of aggregate- Bulking of sand- Deleterious Substance of aggregate- Soundness of aggregate- Alkali Aggregate reaction- Thermal properties- Sieve analysis- Fineness modulus- Grading curves- Grading of fine & coarse Aggregates- Gap graded aggregate- Maximum aggregate size.

UNIT – II

Fresh Concrete: Workability- Factors affecting workability- workability tests- Setting times of concrete- Effect of time and temperature on workability- Segregation & bleeding- Mixing and vibration of concrete- Steps in manufacture of concrete- revibration-curing –types of curing - water.

Admixtures: Types of admixtures-mineral and chemical admixtures-properties- dosages- applications and its effect on concrete, water reducing agents.

UNIT – III

Hardened Concrete: Water/Cement ratio- Abram's Law- Gel space ratio- effective water in the mix short term and long term properties of hardened concrete and stress strain curves of concrete.

Testing of Hardened Concrete: Compression tests- Tension tests- Flexure tests Non-destructive Testing Methods-Rebound hammer test-ultrasonic pulse velocity test **Elasticity** **Creep & Shrinkage**- Modulus of elasticity- Dynamic modulus of elasticity- Poisson 's ratio-

Creep of concrete- Factors influencing creep- Relation between creep & time- Nature of creep- Effects of creep- Shrinkage - types of shrinkage.

Durability of concrete – Factors affecting durability– effect of frost concreting in cold weather and hot weather concrete.

UNIT – IV

Mix Design: Factors in the choice of mix proportions- Durability of concrete- Quality Control of concrete- Statistical Quality control- Acceptance criteria- Proportioning of concrete mix - IS method of mix design – British and ACI method of mix design.

UNIT – V

Special Concretes: High strength concrete, Ferro cement mass concrete, light weight concrete, high density concrete, polymer concrete self-compacting concrete, Nano concrete recycled aggregate concrete, geopolymer concrete fiber reinforced concrete shotcrete, reactive powder concrete.

Suggested Readings:

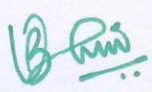
1. M.S. Shetty , *Concrete Technology* - S. Chand & Co., Revised Edition, 2006.
2. M.L. Gambir , *Concrete Technology* - Tata Mc. Graw Hill Publishers, New Delhi, 5th Edition, 2017.

Reference Books:

1. IS 10262:2019 – *Concrete Mix Proportioning – Guidelines*, BIS, New Delhi.
2. IS 456:2000 – *Plain and Reinforced Concrete – Code of Practice*, BIS, New Delhi.
3. IS 269:1989 – *Specification for Ordinary Portland Cement*, BIS, New Delhi.
4. IS 516:1959 – *Methods of Test for Strength of Concrete*, BIS, New Delhi.
5. IS 2386 (Part 1):1963 – *Methods of Test for Aggregates – Particle Size and Shape*, BIS, New Delhi.
6. IS 2386 (Part 2):1963 – *Methods of Test for Aggregates – Deleterious Materials*, BIS, New Delhi.


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SD551CE		SKILL DEVELOPMENT COURSE –I			
Pre-requisites		L	T	P	C
		-	-	2	1
Evaluation	SEE	-	CIE		50 Marks

Course Objectives

1. Understand and apply engineering drafting principles using AutoCAD for the preparation of civil engineering drawings.
2. Develop skills in quantity surveying, rate analysis, preparation of Bill of Quantities (BOQ), and cost estimation using digital tools.
3. Apply project planning and scheduling techniques using Work Breakdown Structure (WBS), Gantt Charts, CPM, PERT, and project management software such as MS Project or Primavera.
4. Enhance professional competencies through technical report writing; resume preparation, presentations, group discussions, interview skills, and professional ethics.
5. Integrate modern digital tools and emerging technologies to execute civil engineering projects and effectively communicate engineering solutions.

Course Outcomes

Upon successful completion of this course, students will be able to:

1. Prepare professional civil engineering drawings using AutoCAD by applying appropriate drafting standards and engineering practices.
2. Estimate quantities, prepare Bill of Quantities (BOQ), perform rate analysis, and develop cost estimates for civil engineering works using MS Excel.
3. Develop project schedules using WBS, Gantt Charts, CPM, and PERT with project management software such as MS Project or Primavera.
4. Demonstrate effective professional communication through technical report writing, presentations, resume preparation, group discussions, interview skills, and adherence to professional ethics.
5. Apply digital tools and emerging technologies to complete an integrated civil engineering mini project involving drafting, estimation, planning, documentation, and technical presentation.

List of Skill Development Experiments to be Conducted

1. Development and preparation of 2D building plans, elevations, and sections using AutoCAD software.
2. Quantity estimation of buildings using Centre Line and Long Wall–Short Wall methods, including Rate Analysis, Bill of Quantities (BOQ), and Cost Estimation using MS Excel.
3. Preparation of Work Breakdown Structure (WBS), Gantt Charts, CPM, and PERT schedules using MS Project/Primavera software.
4. Technical report writing, preparation of CV/Resume, presentation skills, group discussions, interview skills, and professional ethics.
5. Preparation of Building Information Modelling (BIM) models using Autodesk Revit, including creation of 3D building models and generation of plans, elevations, sections, and schedules.

6. Development of thematic maps and integration of GPS, Total Station, and GIS data using GIS software for civil engineering applications.
7. Hands-on exposure to emerging construction technologies including Ready Mix Concrete (RMC), precast construction, modular construction, green buildings, smart materials.
8. Study and implementation of Quality Control, construction safety measures, safety audit practices, and site inspection procedures.
9. Preparation of project documentation, audit reports, technical case studies, and industry-based engineering reports.
10. Hands-on modelling and analysis of civil engineering structures using STAAD.Pro and ETABS softwares.
11. Preparation of project planning, quantity estimation, cost analysis, and technical documentation for a simple civil engineering project.
12. Integrated application of AutoCAD, MS Excel, MS Project/Primavera, BIM tools, and technical presentation for a complete civil engineering work.

Suggested Readings:

1. M. G. Shah, C. M. Kale and S. Y. Patki, Building Drawing, Tata McGraw-Hill Education, Latest Reprint Edition, 2019.
2. B. N. Dutta, Estimating, Costing and Valuation, UBS Publishers & Distributors Pvt. Ltd., 20th Edition, 2020.
3. P. S. Gahlot and B. M. Dhir, Construction Planning and Management, New Age International Publishers, 2nd Edition, 2017.
4. K. K. Chitkara, Construction Project Management: Planning, Scheduling and Controlling, McGraw Hill Education, 3rd Edition, 2019.
5. M. G. Shah, C. M. Kale and S. Y. Patki, Civil Engineering Drawing, Dhanpat Rai Publications, Latest Edition, 2021.

Suggested Online Resources:

1. Autodesk Education & AutoCAD Learning Portal, Autodesk, 2025.
2. NPTEL (National Programme on Technology Enhanced Learning) – Courses on AutoCAD, Construction Planning and Management, Quantity Surveying, and Project Management, Latest Course Offerings, 2025.
3. Bureau of Indian Standards (BIS) e-Standards Portal, Latest Indian Standards and Amendments, 2025.
4. Microsoft Learn – Microsoft Excel Documentation and Training, Microsoft Learn, 2025.


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PC551CE	GEOTECHNICAL ENGINEERING LABORATORY				
Pre-requisites		L	T	P	C
		-	-	2	1
Evaluation	SEE	50 Marks		CIE	25 Marks

Course Objectives:

1. Understand the basic properties of soils.
2. Introduce standard geotechnical laboratory tests.
3. Impart knowledge of soil engineering properties.
4. Develop practical skills in soil testing.
5. Familiarize students with advanced geotechnical tests.

Course Outcomes:

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

1. Determine soil index properties.
2. Evaluate soil engineering properties.
3. Interpret soil test results.
4. Perform standard geotechnical tests.
5. Analyze advanced geotechnical test applications

LIST OF EXPERIMENTS**A. DETERMINATION OF INDEX PROPERTIES:**

- 1a) Determination of Specific Gravity of soil solids using Density bottle method.
- 1b) Determination of Specific Gravity of Soil Solids using Pycnometer method
2. Determination of water content using Pycnometer method
- 3a) Determination of Liquid limit using Casagrande's standard Liquid Limit device
- 3b) Determination of Liquid limit using Cone Penetration apparatus
- 3c) Determination of Plastic limit and Shrinkage limit
4. Sieve Analysis for plotting Particle size distribution curve.
5. Determination of Field Density using Sand Replacement Method

B. DETERMINATION OF ENGINEERING PROPERTIES:

6. Determination of Compaction Characteristics
- 7a) Determination of Co-efficient of Permeability by Constant Head Permeameter test
- 7b) Determination of Co-efficient of Permeability by Variable Head Permeameter test
- 8a) Determination of shear strength, parameters by Direct Shear Test
- 8b) Determination of shear strength Cohesive soils by Unconfined Compression test
- 8c) Determination of shear strength by conducting Vane Shear Test

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C. DEMONSTRATION OF TEST PROCEDURE:

9. Consolidometer test
10. Tri-axial compression Test
11. Laboratory Plate Load Test
12. Reverse Osmosis Test
13. Quick Sand Model
14. Cyclic Tri-axial Test Facility

Note: At least ten experiments should be conducted in the Semester

Suggested Readings:

1. Braja M. Das, *Soil Testing Laboratory Manual*, 8th Edition, Oxford University Press, 2016.
2. K. R. Arora, *Soil Mechanics and Foundation Engineering* (Geotechnical Engineering), 11th Edition, Standard Publishers Distributors, 2021.
3. Gopal Ranjan and A. S. R. Rao, *Basic and Applied Soil Mechanics*, 3rd Edition, New Age International Publishers, 2016.
4. V. N. S. Murthy, *A Textbook of Soil Mechanics and Foundation Engineering*, CBS Publishers & Distributors, 2020.
5. Bureau of Indian Standards (BIS), IS 2720 (Parts 1–41): Methods of Test for Soils, Latest Revisions and Amendments, BIS, New Delhi.


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PC552CE	CONCRETE TECHNOLOGY LAB				
Pre-requisites		L	T	P	C
		-	-	2	1
Evaluation	SEE	50 Marks	CIE	25 Marks	

Course Objectives:

1. Understand the properties of cement, aggregates, and concrete.
2. Introduce standard laboratory tests on construction materials.
3. Impart knowledge of fresh and hardened concrete properties.
4. Develop practical skills in material testing.
5. Familiarize students with standard testing procedures and IS codes.

Course Outcomes:

At the end of the semester student should be able to

1. Determine the properties of cement.
2. Evaluate the properties of aggregates.
3. Perform tests on fresh concrete.
4. Assess the strength of hardened concrete.
5. Interpret laboratory test results as per IS standards.

I. Test on Cement

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement.
5. Compressive strength of cement.

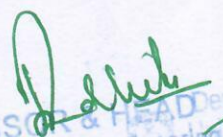
II. Test on Aggregate

1. Sieve Analysis and grading of aggregates
2. Specific gravity of aggregates
3. Bulking of sand.
4. Bulk and compact densities of fine and coarse aggregates.

III. Test on Fresh & Hardened Concrete

1. Slump Cone test
2. Compaction Factor Test
3. Compressive strength of concrete
4. Split tensile strength of concrete
5. Flexural strength of concrete


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Reference Books:

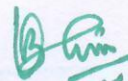
1. A.R. Shanthakumar — *Concrete Technology*— Oxford Publishers , 2nd Edition, 2018
2. M.S. Shetty and A. K .Jain — *Concrete Technology* , S. Chand Publishing, Revised Edition, 2018
3. M.L. Gambhir — *Concrete Manual*, Dhanpat Rai & Sons, 2017
4. IS 10262: 2019 — *Concrete Mix Proportioning — Guidelines* (Second Revision)
5. IS 456 (2000): — *Plain and Reinforced Concrete - Code of Practice*”



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PC 561 CE		SURVEY CAMP			
Pre-requisites		L	T	P	C
		-	-	-	1
Evaluation	SEE	CIE		50 Marks	

Course Objectives:

1. Field exercises with modern surveying equipment's like Total station
2. All aspects of executing and plotting of field surveys
3. Work in team and make effective presentations

Course Outcomes:

After completing this course, the student will be able to:

1. Apply surveying knowledge and tools effectively for projects
2. Develop knowledge of practical application of different survey works
3. Develop their leadership qualities as well as ability to work in teams.
4. Create a report on topics based on work done during the survey camp

Course Content:

A one-week Survey Camp (6 days, 36 hours) shall be conducted after the completion of the Surveying Laboratory course. The camp is intended to provide students with practical exposure to **planning, organizing, conducting, and processing field surveys** using conventional and modern surveying techniques. Students shall undertake field measurements, maintain field books, perform data reduction, prepare plans/maps, and submit a survey report. The Survey Camp shall be **evaluated for 1 credit** by a committee consisting of the **Head of the Department** and **2–3 senior faculty members** based on field performance, survey records, data processing, and viva voce.

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Professional Elective-I

PE501 CE	GROUND WATER HYDROLOGY				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives:

1. Grasp the properties of Ground water and solve for problems on steady flows.
2. Explain the various methods used to calculate parameters of unsteady flow.
3. Describe various geophysical exploration methods and selection of sites
4. Interpret the various artificial methods of ground water recharge, sea water intrusion and its control.
5. Explain conjunctive use of ground water, different ground water analog models.

Course Outcomes:

1. Assess the ground water parameters and flow characteristics, equations
2. Interpret various equations for unsteady radial flow to a well.
3. Understand different methods of geophysical explorations
4. Evaluate the methods of artificial recharge of ground water.
5. Analyse various ground water analog models and hydrologic balance equations

UNIT – I

Introduction: Ground water in the hydrologic cycle, vertical distribution of ground water. Types of aquifers – unconfined, confined and leaky aquifers, porosity, void ratio, storage coefficient, permeability, transmissivity, specific yield, safe yield. General equation of ground water flow, steady unidirectional flow, steady radial flow to a well in unconfined and confined aquifers. Steady flow with uniform recharge.

UNIT – II

Unsteady Radial Flow to a well: Non equilibrium equation for pumping tests, Theis method of solution, Cooper Jacob method, Chow 's methods of solution, law of times, well flow near aquifer boundaries. Image wells, multiple well systems, partially penetrating wells, steady radial flow in leaky artesian aquifer. Well completion and well development.

UNIT – III

Geophysical Exploration: Surface investigations of ground water – Electrical Resistivity method, seismic refraction method, gravity and magnetic methods, geologic methods, Dowsing. Subsurface Investigations – Test Drilling, resistivity logging, potential logging, Interpretation of logs and selection of site as a well.

UNIT – IV

For the Academic year 2026-2028

Artificial Recharge of Ground Water: Methods of recharge, water spreading, sewage discharge, Recharge through pits and shafts, Recharge through well, Induced recharge. Sea water intrusion in coastal aquifers; occurrence, Ghyben-Herzberg relation, space of fresh – salt

water interface, length of the intruded sea water wedge, prevention and control of sea water intrusion.

UNIT – V

Ground Water Basin Management: Conjunctive use of surface and ground waters, Hydrologic balance equation. Ground water analog models-sand models, electric analog models, viscous flow models, mathematical modelling.

Suggested Readings:

1. David Keith Todd and Larry W. Mays, *Groundwater Hydrology*, 3rd Edition, John Wiley & Sons, 2005. (This remains the latest edition and is still the standard reference.)
2. H. M. Raghunath, *Ground Water*, 3rd Edition, New Age International Publishers, 2011.

Reference Books:

1. K. R. Karanth, *Groundwater Assessment, Development and Management*, McGraw Hill Education (India), 2013 (Latest Available Edition).
2. Herman Bouwer, *Groundwater Hydrology*, McGraw-Hill International Edition, 1978).


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PE502 CE		TRAFFIC AND ROAD SAFETY ENGINEERING			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks

Course Objectives:

1. Understand the fundamentals of traffic engineering and safety.
2. Impart knowledge of traffic safety analysis and accident investigation.
3. Introduce road safety principles in geometric and urban design.
4. Develop knowledge of traffic management and safety measures.
5. Familiarize students with road safety audits and ITS.

Course Outcomes:

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

1. Explain traffic engineering and safety concepts.
2. Analyze traffic accidents and safety data.
3. Evaluate road safety and geometric design.
4. Assess traffic management strategies.
5. Recommend road safety improvement measures.

UNIT – I

Fundamentals of Traffic Engineering and Road Safety: Introduction to Traffic Engineering; Components of Transportation System; Road User Characteristics; Vehicle Characteristics; Traffic Stream Characteristics; Speed, Flow, Density and Occupancy; Fundamental Relationships; Highway Capacity; Level of Service (LOS); Road Safety Scenario in India; Safe System Approach; Human Factors Affecting Road Safety.

UNIT – II

Traffic Engineering Studies and Accident Analysis: Traffic Volume Studies; Spot Speed Studies; Travel Time and Delay Studies; Origin–Destination Studies; Parking Studies; Pedestrian Studies; Accident Data Collection; Accident Analysis; Black Spot Identification; Statistical Analysis of Accident Data; Condition Diagram; Collision Diagram; Crash Investigation; Computer Applications in Traffic Analysis.

UNIT – III

Traffic Control Devices and Road Safety Measures: Traffic Signs; Road Markings; Delineators; Road Studs; Traffic Islands; IRC Standards; Traffic Signals; Signal Warrants; Fixed-Time Signal Design; Webster Method; Signal Coordination; Street Lighting; Safety Barriers; Guard Rails; Crash Cushions; Pedestrian Crossings; Cycle Tracks; Traffic Calming Measures.

UNIT – IV

Road Safety Audit and Traffic Management: Principles of Road Safety Audit; Stages of Road Safety Audit; Audit Procedures; Audit Checklists; Safety Inspection; Hazard Identification.

Engineering Countermeasures; Traffic Management during Road Works; One-Way Streets; Channelization; Rotary Intersections; Roundabouts; Parking Management; Sustainable Urban Mobility; Non-Motorized Transport (NMT).

UNIT – V

Intelligent Transportation Systems (ITS) and Emerging Technologies: Introduction to Intelligent Transportation Systems (ITS); ITS Architecture; Advanced Traffic Management Systems (ATMS); Intelligent Signal Control; Variable Message Signs (VMS); CCTV Surveillance; Automatic Number Plate Recognition (ANPR); Emergency Response Systems; Incident Management; Disaster Management on Highways; Connected and Autonomous Vehicles; AI Applications in Traffic Management; Smart City Transportation; Environmental Impacts of Transportation.

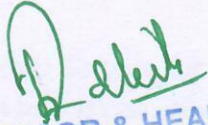
Suggested Readings:

1. L. R. Kadiyali, *Traffic Engineering and Transport Planning*, Khanna Publishers, 9th Edition, 2025.
2. Roger P. Roess, Elena S. Prassas, William R. McShane, *Traffic Engineering*, Pearson Education, 5th Edition, 2022–2024.
3. Nicholas J. Garber and Lester A. Hoel, *Traffic and Highway Engineering*, Cengage Learning, Enhanced 5th Edition, 2020.
4. S. K. Khanna and C. E. G. Justo (with A. Veeraragavan), *Highway Engineering*, Nem Chand & Bros., 10th Edition, 2018.
5. Louis J. Pignataro, *Traffic Engineering: Theory and Practice*, Prentice Hall, First Edition, 1973).

Reference Books:

1. IRC Codes and Special Publications, Indian Roads Congress (IRC), New Delhi, 2024.
2. Highway Capacity Manual (HCM), 7th Edition, Transportation Research Board (TRB), 2022.
3. AASHTO Green Book, 7th Edition, American Association of State Highway and Transportation Officials (AASHTO), 2018.
4. Austroads Guide to Road Safety, Austroads, Sydney, 2026.
5. WHO Global Status Report on Road Safety, World Health Organization (WHO), Geneva, 2023.


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PE503 CE	GREEN BUILDING TECHNOLOGIES				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives:

1. Understand the principles of green building technologies.
2. Explain sustainable site planning and resource conservation.
3. Apply energy-efficient and water-efficient building practices.
4. Evaluate green building materials and rating systems.
5. Understand waste management and indoor environmental quality.

Course Outcomes:

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

1. Explain green building concepts and rating systems.
2. Apply sustainable site planning and water conservation methods.
3. Analyze energy-efficient building practices.
4. Select sustainable materials and waste management techniques.
5. Evaluate indoor environmental quality and sustainable building performance.

UNIT-I

Introduction to Green Buildings: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT-II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc.

Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT-III

Energy Efficiency: Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy.

Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

Building materials: Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials.

Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT-V

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

Suggested Readings:

1. Varun, Sharma A., *Green Building Design: Principles and Practices*, CRC Press, 2022.
2. Indian Green Building Council (IGBC), *IGBC Green Homes Rating System*, Latest Version, 2023.
3. GRIHA Council, *GRIHA Rating System Manual*, Version 2023.
4. G. D. Rai, *Non-Conventional Energy Resources*, 6th Edition, Khanna Publishers, 2022.
5. TERI, *Sustainable Building Design Manual*, Volumes 1 & 2, TERI Press, Updated Edition, 2021.

Reference Books

1. Charles J. Kibert, *Sustainable Construction: Green Building Design and Delivery*, 5th Edition, Wiley, 2022.
2. Bureau of Indian Standards (BIS), National Building Code (NBC) of India 2016 (Latest Amendments), BIS, New Delhi, 2023.
3. Bureau of Energy Efficiency (BEE), *Energy Conservation Building Code (ECBC) 2017 – User Guide*, Latest Edition, 2021.
4. ASHRAE, ASHRAE Standard 90.1-2022 – *Energy Standard for Buildings Except Low-Rise Residential Buildings*, 2022.
5. World Green Building Council (WorldGBC), *Advancing Net Zero Buildings*, Latest Publications, 2023.


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PE504 CE		ADVANCED SUSTAINABLE MATERIALS			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks		CIE	30 Marks

Course Objectives:

The objectives of this course are:

1. Understand the concept of sustainability and sustainable construction materials.
2. Study eco-friendly, recycled, and innovative construction materials.
3. Learn the environmental impact and life-cycle performance of construction materials.
4. Understand the application of sustainable materials in green buildings.
5. Familiarize students with green building rating systems and future sustainable technologies.

Course Outcomes:

On completion of the course, the students will be able to:

1. Explain the principles of sustainable materials and life cycle assessment.
2. Evaluate the properties and applications of sustainable cementitious and concrete materials.
3. Analyze the use of recycled and waste materials in construction.
4. Assess innovative construction materials for sustainable infrastructure.
5. Select suitable sustainable materials for green building applications and energy-efficient construction.

UNIT – I

Introduction to Sustainable Materials: Sustainability concepts, sustainable development, green building materials, Life Cycle Assessment (LCA), embodied energy, carbon footprint, circular economy, environmental impact of construction materials.

UNIT – II

Sustainable Cementitious Materials: Supplementary Cementitious Materials (SCMs), fly ash, GGBS, silica fume, rice husk ash, geopolymers concrete, high-performance concrete, self-compacting concrete, ultra-high-performance concrete (UHPC).

UNIT – III

Recycled and Alternative Materials: Recycled aggregates, construction and demolition waste, plastic waste in concrete, rubberized concrete, recycled steel, recycled glass, industrial by-products in construction, durability and quality considerations.

UNIT – IV

Innovative Construction Materials: Bamboo, engineered timber, Cross-Laminated Timber (CLT), hempcrete, ferrocement, Fiber Reinforced Polymer (FRP), aerated concrete blocks, smart materials, self-healing concrete.

UNIT – V

Green Building Applications: Energy-efficient building materials, thermal insulation materials, cool roofs, Building Integrated Photovoltaics (BIPV), green building rating systems

(LEED, GRIHA, IGBC), nanomaterials, phase change materials (PCM), future trends in sustainable construction.

Suggested Readings:

1. Mike Montoya, *Green Building Fundamentals*, Pearson Education, 2nd Edition, 2010.
2. Charles J. Kibert, *Sustainable Construction – Green Building Design and Delivery*, John Wiley & Sons, 2nd Edition, 2008.

Reference Books:

1. Jason F. McLennan, *The Philosophy of Sustainable Design*, Ecotone Publishing Co., 2004.
2. Regina Leffers, *Sustainable Construction and Design*, Prentice Hall, 2009.
3. M. S. Shetty, *Concrete Technology*, S. Chand Publications, Latest Edition,

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SCHEME OF INSTRUCTION AND EXAMINATION
B.E.(Civil Engineering) VI-SEMESTER

S. No	Code	Course Title	Scheme of Instruction			Contact Hrs. / Wk.	Scheme of Evaluation		Credits
			L	T	P		CIE	SEE	
THEORY COURSES									
1	PC601 CE	Theory of Structures – II	3	–	–	3	30	70	3
2	PC602 CE	Transportation Engineering	3	–	–	3	30	70	3
3	PC603 CE	Water Resources Engineering – II	3	–	–	3	30	70	3
4	PC604 CE	Design of Steel Structures	3	–	–	3	30	70	3
5	PC605CE	Environmental Engineering	3	–	–	3	30	70	3
6	Professional Elective – II		3	–	–	3	30	70	3
PRACTICAL / LABORATORY COURSES									
7	PC651 CE	Transportation Engineering Laboratory	-	-	2	2	25	50	1
8	PC 652CE	Environmental Engineering Laboratory	-	-	2	2	25	50	1
9	PW653 CE	Mini Project	-	-	4	4	25	50	2
10		Summer Internship*	4 weeks during summer vacations, evaluated in the 7 th – Semester						
			L	T	P		CIE	SEE	Credits
			19	-	12	31	255	570	22

Professional Elective – II

S.No	Course Code	Course Title
1	PE601 CE	Pre Engineering Buildings
2	PE602 CE	Geospatial Technology
3	PE603 CE	Urban Transportation & Planning
4	PE604CE	Environmental Impact Assessment

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PC601CE	THEORY OF STRUCTRES-II				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objective:

The objectives of this course are:

1. Introduce the analysis of two-hinged and three-hinged arches under loading and temperature effects.
2. Impart the Moment Distribution Method for beams and portal frames.
3. Develop understanding of Kani's Method for beams and frames.
4. Understand the Flexibility Method for indeterminate structures.
5. Familiarize students with the Stiffness Method for structural analysis.

Course Outcomes:

On Completion of the course, the students will be able to:

1. Analyze the behavior and response of arch structures.
2. Apply the Moment Distribution and Substitute Frame Methods for frame analysis.
3. Evaluate beams and frames using Kani's Method.
4. Determine the response of beams and frames using the Flexibility Method.
5. Analyze beams and frames using the Stiffness Method

UNIT I

Arches: Three hinged and Two hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of Temperature-Determination of horizontal thrust bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

UNIT-II

Moment Distribution Method for Frames: -Analysis of single bay single storey portal frame including side sway –Substitute frame analysis by two cycle method.

UNIT – III

Kani's Method: -Analysis of continuous beams with and without settlement of supports -Single bay single storey portal frames with and without side sway.

UNIT-IV

Flexibility Method: Flexibility methods- Introduction- Application to continuous beams including support settlements— Analysis of Single bay single storey portal frames without and with side sway.

UNIT – V

Stiffness Method: Stiffness methods- Introduction-application to continuous beams including support settlements- Analysis of Single bay single storey portal frames without and with side sway.

Suggested Readings:

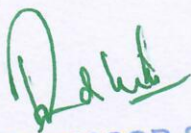
1. Vazrani & Ratwani, *Analysis of structures*, Khanna Publications. Vol. I & II, 2018
2. D S Prakash Rao, "Structural Analysis" A Unified Approach", Universities Press, 2012.
3. S. Ramamrutham, *Theory of structures*, Dhanpat Rai Publications, New Delhi (earlier Jain Book Depot editions) 9th Edition, 2014.

Reference Books :

1. R.S.Khurmi, *Structural analysis*, S.Chand Publishing, New Delhi. Edition: 2010 (Reprint 2018)
2. by K.U.Muthuet al. "Basic Structural Analysis", I.K. International Publishing House Pvt.Ltd, 2013.
3. Gupta S P, G S Pundit and R Gupta, *Theory of Structures*, Vol II, Tata McGrawHill Publications company Ltd., 2011, vol.II.




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PC602 CE		TRANSPORTATION ENGINEERING			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives

1. Introduce the fundamentals of highways and their classification as per IRC standards.
2. Impart knowledge of traffic studies, analysis, and traffic control design.
3. Develop an understanding of pavement materials and pavement design principles.
4. Familiarize students with the fundamentals of railway engineering.
5. Introduce the concepts and design principles of airport engineering.

Course Outcomes

After completing this course, the student will be able to:

1. Identify basic elements of highway alignment and design of highway geometrics
2. Carry out traffic studies and implement traffic regulation and control measures.
3. Characterize pavement materials, design flexible & rigid pavements as per IRC
4. Explain various elements of railway engineering and design various elements
5. Explain the basic operations of airport engineering and design of runways

UNIT – I

Highway Development and Planning: Classification of roads, Highway development in India, Current Road projects in India, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, and PMGSY.

Requirements and factors controlling highway alignment, Engineering Surveys for highway alignment.

Geometric Design of Highways: Cross sectional elements - camber, sight distances - stopping distance and overtaking sight distance.

Design of Horizontal Alignment: Super elevation, extra widening and transition curves-
Design of Vertical Alignment: Gradient, grade compensation, summit and valley curves.

UNIT – II

Traffic Engineering: Traffic characteristics, volume, speed, density, headways and relationship among them. Traffic volume studies, spot speed studies, speed and delay studies, Origin & Destination studies, highway capacity and level of service. Types of intersections, Rotary, Design of two-phase isolated traffic signal by Webster and IRC method.

UNIT – III

Pavement Material Characterization: Aggregates – physical and chemical properties of aggregates. Types of paving binders – bitumen, tar, cutback, emulsion, modified binders, grading of bituminous binders – penetration grading, viscosity grading and performance grading.

Pavement Design: Types of pavements, factors to be considered for pavement design, CBR test, Design of Flexible pavement and Design of Rigid pavement as per relevant IRC codes-Analysis of stresses in rigid pavements – Westergaard's wheel load stress equations. Temperature, frictional



and warping stresses. Introduction to construction joints, expansion joints, contraction joints for jointed plain cement concrete pavements. Functions of dowel and tie bars.

UNIT – IV

Introduction to Railway Engineering: Different types of gauges, Permanent way component parts and its functions. Rails – various types and functions, creep of rails, creep measurement, coning of wheels, track fittings and fastenings, various types and functions of sleepers and ballast, subgrade preparation.

UNIT – V

Airport Engineering: Introduction to air transportation, airplane component parts and aircraft characteristics. Typical airport layouts, airport classification as per landing take-off and dimensions. Factors for airport site selection.

Runway orientation, basic runway length, correction for elevation, temperature and gradient.

Suggested Readings

1. Khanna, S. K., Justo, C. E. G., and Veeraraghavan, A. (2016), *Highway Engineering*, 10th Ed., Nem Chand & Bros., New Delhi.
2. Chandra, S., and Agarwal, M. M. (2013). *Railway Engineering*, 2nd Ed., Oxford University Press, New Delhi.
3. Khanna, S. K., Arora, M. G., and Jain, S. S. (1999). *Airport Planning and Design*, 6th Ed., Nem Chand & Bros., New Delhi.

Reference Books:

1. Kadiyali, L. R. (2016). *Traffic Engineering and Transportation Planning*, Khanna Publishers, New Delhi.
2. Brockenbrough, R., and Boedecker, K. Jr. (2003) *Highway Engineering Hand Book*, 2nd Ed., McGraw-Hill Professional.
3. Srinivasa Kumar, R. (2013). *Pavement Design*, Orient Blackswan Pvt. Ltd., New Delhi.
4. Srinivasa Kumar, R. (2014) *Transportation Engineering (Railways, Airport, Docks Harbour)*, Universities Press, New Delhi.


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PC603 CE	WATER RESOURCES ENGINEERING-II				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objective:

The objectives of this course are:

1. Introduce the principles of reservoir planning and storage analysis.
2. Impart knowledge of the planning and design of gravity dams.
3. Develop an understanding of earth dam design and seepage control.
4. Familiarize students with spillways and energy dissipation systems.
5. Introduce the fundamentals of water power engineering and hydropower plants.

Course Outcomes:

On Completion of the course, the students will be able to:

1. Analyze reservoir capacity, yield, and sedimentation.
2. Evaluate the stability and design of gravity dams.
3. Design earth dams with suitable seepage control measures.
4. Select and design spillways and energy dissipators for hydraulic structures.
5. Explain the principles and classification of hydropower plants..

UNIT – 1

Reservoir Planning: Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass in flow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams: Reservoir sedimentation; Life of reservoir; Reservoir sediment control.

UNIT-II

Dams: Classification of dams, selection of site for a dam, physical factors governing the selection of types of a dam.

Gravity dams : Forces acting on a gravity dam, modes of failure and criteria for structural stability of gravity dams, principal and shear stresses, gravity method of stability analysis, elementary and practical profiles of a gravity dam, high and low gravity dams, functions, and types of galleries in gravity dams, foundation treatment for gravity dams.

UNIT-III

Earth Dams: Types of earth dams, causes of failure of earth dams, criteria for the safe design of an earth dam, computation of seepage from flow net, phreatic line in an earth dam (for

homogeneous sections with and without filter cases), design of earth dams to suit available materials, embankment and foundation seepage control measures.

UNIT-IV

Spillways: Different types of spillways, energy dissipation below spillways, different types of spillway crest gates, stilling basin appurtenances (descriptive details only).

Energy Dissipators: Design of different types (1-7) of energy dissipation arrangements as per USBR guidelines.

UNIT-V

Water Power Engineering: Development of hydro power in India; Classification of hydel plants: runoff river plants, storage plants and pumped storage plants; low, medium and high head schemes.

Suggested Readings:

1. Dr. B.C. Punmia & Dr. Pande B.B. Lal, *Irrigation and Water Power Engineering* Laxmi Publications pvt. Ltd., New Delhi, 17th Edition, 2016
2. S. K. Garg *Irrigation Engineering and Hydraulic Structure*, Khanna Publishers, Delhi. 24th Edition, 2017

Reference Books:

1. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers, 2018
2. Irrigation, Waterpower and Water Resources Engineering by K R Arora; Standard Publishers Distributors, New Delhi, 2015
3. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers 2012.


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PC604 CE		DESIGN OF STEEL STRUCTURES			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks		CIE	30 Marks

Course Objectives:

1. Understand the properties of structural steel and design philosophies.
2. Impart knowledge of steel connections and member design.
3. Develop skills in the design of steel beams and columns.
4. Familiarize students with column bases and crane girders.
5. Apply the principles of roof truss design..

Course Outcomes:

After completion of the course the student will be able to:

1. Apply steel design principles and loading standards.
2. Design bolted and welded connections.
3. Design steel tension, compression, and flexural members.
4. Evaluate columns, column bases, and crane girders.
5. Design roof trusses, purlins, and their connections.

UNIT – I

Materials and Specifications: Chemical composition of steel, types of Structural Steel Residual stresses, Stress Concentration.

Basis of Structural Design: Codes and Specifications, Design Philosophies, working Stress Method, Limit State Method.

Loading and Load Combinations: Characteristic Loads, Dead Loads, Imposed Loads, Earthquake Loads, Wind Loads and Load Combinations. Partial safety factors for materials and loads.

Bolted Connections (Limit state method): Bolted Connections, Behavior of Bolted Joint: Design Strength of Ordinary Black Bolts, Design Strength of High Strength Friction Grip Bolt: Pin Connections, Simple Connections and Eccentric Connections.

Welded Connections (Limit State Method): Advantages of Welding, Types of Welds and Joints, Simple Connections and Eccentric Connections.

UNIT – II

Design of Tension Members (Limit State Method): Types of Tension Members, Design of Strands, Slenderness Ratio, Modes of Failure, Factors Effecting Strength of Tension Members, Design of Tension Members (Angles, Other sections and Rods), Lug Angles, Tension Member Splice.

UNIT – III

Design of Beams (Limit State Method): Types of Beams, Section Classification, Lateral Stability of Beams, Buckling of Real Beams, Behavior of Beams in Bending, Design of Laterally Supported and Unsupported Beams, Design of Compound Beams, Shear Strength of Beams, Maximum Deflection, Web Buckling and Web Crippling.

Crane and Gantry girders: Basic Principles, Limit state design of single bay portal with crane including detailing.

UNIT – IV

Design of Compression Members (Limit State Method): Introduction, Possible Failure Modes, Behavior of Compression Members, Elastic Buckling of Slender Compression Members, Behavior of Real Compression Members, Sections of Compression Members, Effective Length, Design of Compression Members with Single Section and Built-up Sections (Symmetric in both directions), Lacing and Battening, Column Splices. Design of Column Bases (Limit state method): Design of Slab Base and Gusseted Base for Column.

UNIT – V

Design of Roof Trusses (Limit State Method): Types of Trusses, End Bearings, Spacing of Trusses and Purlins, Estimation of Loads with different Roof Coverings, Self-weight of Truss, Wind Effects, Design of Purlins for Dead Load, Imposed Load and Wind Loads. Detailed and Design of Roof Trusses including Joints and Supports (only Angular Trusses).

Suggested Readings:

1. Subramanian, N., —*Design of Steel Structures*”, Oxford University Press, 2018
2. Duggal S.K., —*Design of Steel Structures*”, 3rd Edition, Tata McGraw Hill Publishing, 2017.

Reference Books:

1. Bhavikatti, S.S., “*Design of Steel Structures*”, 5th Edition, I.K. International Publishing House Pvt. Ltd. 2017.
2. P. Dayaratnam, “*Design of Steel Structures*”, S. Chand & Co. New Delhi, 2012.
3. IS- 800-2007, General “*Construction in steel - Code of Practice*”, Bureau of Indian Standards, New Delhi, India.
4. SP 06- (1) -1964 – “ *Hand Book for Structural Engineers*” Bureau of Indian Standards, New Delhi, India.


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PC605 CE		ENVIRONMENTAL ENGINEERING			
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives:

1. Understand water supply systems and treatment principles.
2. knowledge of water distribution and network design.
3. Acquire Develop the fundamentals of sewage collection and treatment.
4. Understand wastewater treatment and sanitation systems.
5. Apply environmental engineering principles in water and wastewater management.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Estimate water demand and design water supply systems.
2. Analyze and design water treatment units.
3. Design sewerage and wastewater conveyance systems.
4. Analyze wastewater treatment and sludge management systems.
5. Evaluate environmental pollution and sustainable wastewater practices.

UNIT – I

Water Supply: Need for planned water supply schemes, water demand for industrial and agricultural water requirements, sources of water, water quality requirements for different beneficial uses, population forecast, water treatment through aeration, coagulation flocculation, and sedimentation.

UNIT – II

Water Treatment: Filtration, Disinfection, and Softening, methods of layout of distribution pipes, design of distribution by Hardy Cross method for simple networks, various types of pipes and valves used in water supply systems.

UNIT – III

Sewage: Domestic and storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage: Sewers shapes, design of sewerage systems, operation and maintenance of sewers, sewage pumping, sewer appurtenances.

UNIT – IV

River cleaning plans: Self-purification of streams, BOD and COD concepts, wastewater treatment, aerobic and anaerobic treatment system, suspended and attached growth systems, quality requirements of recycled water for various purposes. Principles of Septic Tank.

UNIT – V

Advanced WWT concepts: Theory and design concepts of Activated Sludge process,

Mechanically Aerated Lagoons, Sequencing Batch Reactor (SBR), waste stabilization ponds, basic concepts of bio-remediation.

Suggested Readings:

1. Fair. G. M. and Geyer. J. C. "Water and Wastewater Engineering", Vol. I and II, John Wiley & Sons Inc., New York, 2017.
2. White. J.B. "Wastewater Engineering", Edward Arnold. London, 2018.

Reference Books:

1. Hammer. M. J. and Hammer. M. J. Jr., "Water and Wastewater Technology", Pearson Education India, New Delhi, 8th Edition, 2019
2. Metcalf & Eddy. "Wastewater Engg; Treatment, Disposal Reuse", Tata McGraw- Hill Publishing Company Limited, New Delhi, 5th Edition, 2014
3. Sasi Kumar, K & Sanoop Gopi Krishna., "Solid Waste Management", PHI Publishers, 2018
4. Gilbert, M. Masters, —Introduction to Environmental Engineering and Sciencel, Pearson Education New Delhi, 3rd Edition, 2019.



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PC651CE	TRANSPORTATION ENGINEERING LABORATORY				
Pre-requisites	Transportation Engineering	L	T	P	C
		3	-	-	1
Evaluation	SEE	50 Marks	CIE	25 Marks	

Course Objectives:

1. Understand the testing of road aggregates and bitumen.
2. Develop skills in traffic studies.
3. Familiarize with pavement evaluation tests.
4. Apply transportation engineering software.

Course Outcomes

1. Perform tests on aggregates and bitumen.
2. Conduct and analyze traffic studies.
3. Evaluate pavement performance.
4. Apply transportation engineering software

List of Experiments:**A) Tests on Road Aggregate**

1. Aggregate crushing value test
2. Los Angeles abrasion test
3. Aggregate impact value test
4. Aggregate shape test (flakiness & elongation)
5. Specific gravity and Water Absorption

B) Tests on Bitumen

6. Penetration Test.
7. Ductility Test
8. Softening point test
9. Specific gravity test
10. Viscosity test
11. Flash and fire point test

C) Experiments on Traffic

12. Traffic Volume study (a) at mid-section (b) at intersection
13. Spot speed study
14. Speed and delay study
15. Origin and Destination Study

D) Miscellaneous Tests (Demonstration Only)

16. Marshall stability test
17. Determination of C.B.R.
18. Benkelman beam test
19. Bitumen extraction test
20. Exposure to Latest Software in the field of Transportation Engineering

Note: At least ten experiments should be conducted in the Semester

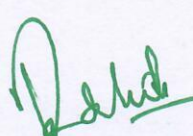
Reference Manuals:

1. Highway Materials Testing Laboratory Manual, Nem Chand & Bros., New Delhi, 2019.
2. Laboratory Manual for Highway Engineering, CBS Publishers & Distributors, 2021.

Reference Codes

1. IRC:37-2018 – Guidelines for the Design of Flexible Pavements, IRC, New Delhi, 2018.
2. IRC:SP:72-2015 – Flexible Pavements for Low Volume Rural Roads, IRC, New Delhi, Latest Reprint 2021.
3. IS 2386 (Parts I–VIII) – Methods of Test for Aggregates for Concrete, BIS, New Delhi, Latest Reprint 2021.
4. ASTM Standards – Transportation Materials and Testing, ASTM International, 2024.
5. AASHTO Specifications – Transportation Materials and Testing Methods, 44th Edition, 2024.


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PC652CE	ENVIRONMENTAL ENGINEERING LAB				
Pre-requisites	Environmental Engineering Lab	L	T	P	C
		3	-	-	1
Evaluation	SEE	50 Marks	CIE	25 Marks	

Course Objectives:

1. Understand the analysis of water quality parameters.
2. Develop skills in water and wastewater testing.
3. Familiarize with standard environmental laboratory methods.
4. Apply laboratory techniques for water quality assessment.

Course Outcomes

1. Perform standard water quality tests.
2. Analyze physical and chemical characteristics of water.
3. Evaluate water and wastewater quality using laboratory methods.
4. Interpret test results for environmental engineering applications.

List of Experiments

1. a) Determination of total dissolved solids
b) Determination of total suspended solids
c) Determination of fluorides
2. Determination of pH and EC
3. Determination of total hardness
4. Determination of alkalinity
5. Determination of chlorides
6. Determination of residual chlorine
7. Determination of Dissolved oxygen (D.O)
8. Determination of residual chlorine
9. Determination of optimum alum dosage
10. Determination of BOD
11. Determination of COD
12. Determination of turbidity in water sample using nephelo turbidity meter.

Suggested Readings

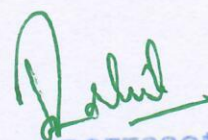
1. S. K. Garg, *Environmental Engineering*, Vol. I & II, Khanna Publishers, 2022.
2. M. L. Davis, *Water and Wastewater Engineering*, McGraw-Hill, 2019.
3. CPHEEO, *Manual on Water Supply and Treatment*, 2019.
4. CPHEEO, *Manual on Sewerage and Sewage Treatment*, 2020.

Reference Codes / Manuals

1. APHA, *Standard Methods for the Examination of Water and Wastewater*, 24th Edition, 2023.
2. IS 3025 – *Methods of Test for Water and Wastewater*, BIS.
3. IS 10500:2012 – *Drinking Water Specification*, BIS.
4. CPCB, *Water Quality Monitoring Guidelines*, 2023.




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PROFESSIONAL ELECTIVES-II

PE 601 CE	PRE-ENGINEERED BUILDINGS				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	60 Marks	CIE	40 Marks	

Course Objectives

The objectives of this course are:

1. Understand the concepts and advantages of Pre-Engineered Buildings.
2. Learn the framing systems and components of PEB.
3. Understand the analysis of loads on PEB structures.
4. Learn the design of PEB members and connections.
5. Develop knowledge of PEB fabrication, erection, and maintenance.

Course Outcomes

On completion of the course, the students will be able to:

1. Introduce the concepts, applications, and components of Pre-Engineered Buildings.
2. Familiarize students with PEB framing systems and structural components.
3. Develop knowledge of load analysis and design standards for PEB.
4. Impart the principles of designing PEB members and connections.
5. Highlight fabrication, erection, quality control, and sustainable construction practices.

UNIT – I

Introduction to Pre-Engineered Buildings: Introduction to Pre-Engineered Buildings (PEB), historical development, comparison between Conventional Steel Buildings (CSB) and Pre-Engineered Buildings (PEB), advantages of PEB including economy, speed of construction, flexibility in expansion and architectural freedom, applications of PEB in industrial buildings, warehouses, commercial complexes, aircraft hangars and showrooms, components of PEB including primary framing, secondary framing, bracing systems, roof and wall cladding.

UNIT – II

Framing Systems and Architectural Features: Primary framing systems—rigid frames, multi-span rigid frames, clear-span buildings, lean-to buildings, tapered built-up members and uniform steel sections. Secondary framing systems—Z-purlins, C-purlins, girts, eave struts and cold-formed steel sections. Building accessories—mezzanine floors, crane runway beams, fascias, canopies, gutters, skylights, louvers, insulation systems, turbo ventilators and ridge ventilators.

UNIT – III

Loads and Load Combinations: Dead loads—self-weight of structural members, roof

sheeting, wall cladding and accessories. Live loads on roofs as per IS 875 (Part 2). Wind loads—design wind speed, wind pressure calculations, internal and external pressure coefficients, wind loading as per IS 875 (Part 3). Introduction to seismic loading as per IS 1893. Load combinations for strength and serviceability according to IS 800:2007.

UNIT – IV

Design Principles and Connections: Limit State Design philosophy for steel structures, design concepts of tapered built-up members, web and flange thickness variations, bending, shear and axial strength of members, serviceability requirements, vertical deflection and lateral drift limits. Structural connections including base plate connections, anchor bolts, rigid knee and ridge connections, purlin-to-rafter connections, bracing connections, welded joints and High Strength Friction Grip (HSFG) bolted connections.

UNIT – V

Fabrication, Erection and Maintenance: Fabrication of built-up steel members, cutting, welding, surface preparation, painting and galvanizing. Site preparation, erection sequence, lifting and handling of structural members, temporary bracing and alignment. Quality control, fabrication tolerances, welding inspection, corrosion protection, maintenance of roofing and cladding systems, leak prevention, inspection procedures, sustainability, recyclability of steel and energy-efficient green building concepts.

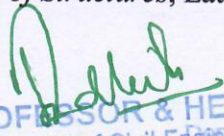
Suggested Readings:

1. N. Subramanian, *Design of Steel Structures*, 2nd Edition, Oxford University Press, 2023.
2. S. K. Duggal, *Limit State Design of Steel Structures*, 4th Edition, McGraw Hill Education (India), 2020.

Reference Books:

1. N. Subramanian, *Steel Structures: Design and Practice*, Oxford University Press, 2021.
2. S. Ramamrutham and R. Narayanan, *Design of Steel Structures*, Dhanpat Rai Publications, 2021 (Latest Reprint).
3. Bureau of Indian Standards (BIS), *IS 800:2007 – General Construction in Steel – Code of Practice*, Latest Reprint, 2021.
4. Bureau of Indian Standards (BIS), *IS 875 (Part 1): 2015 – Dead Loads, Part 2: 2015 – Imposed Loads, Part 3: 2015 – Wind Loads*, 2015.
5. Bureau of Indian Standards (BIS), *IS 1893 (Part 1): 2016 – Criteria for Earthquake Resistant Design of Structures*, Latest Reprint, 2021.


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PE602 CE	GEOSPATIAL TECHNOLOGY				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives

The objectives of this course are:

1. Understand the principles of Remote Sensing and satellite systems.
2. Develop knowledge of digital image processing and image analysis.
3. Learn the fundamentals of GIS and spatial analysis.
4. Understand GNSS/GPS surveying and positioning techniques.
5. Apply geospatial technologies in Civil Engineering..

Course Outcomes

On completion of the course, the students will be able to:

1. Explain the principles of Remote Sensing and satellite data.
2. Apply image processing and interpretation techniques.
3. Analyze spatial data using GIS tools.
4. Apply GNSS/GPS techniques for surveying and mapping.
5. Use geospatial technologies to solve Civil Engineering problems.

UNIT – I

Foundations of Remote Sensing : Introduction to Remote Sensing, history and development, components of Remote Sensing, active and passive remote sensing systems, electromagnetic radiation (EMR), electromagnetic spectrum, atmospheric windows, interaction of EMR with atmosphere and earth surface features, spectral signatures of soil, water and vegetation, satellite platforms, satellite orbits (sun-synchronous and geostationary), sensor characteristics, spatial, spectral, radiometric and temporal resolutions, overview of LANDSAT, SPOT, IRS and Sentinel satellite series.

UNIT – II

Digital Image Processing and Interpretation: Digital image fundamentals, image structure, pixel values, metadata, visual image interpretation elements including tone, texture, pattern, shape, size, shadow, site and association, image rectification, image registration, geo-referencing, image enhancement techniques, contrast stretching, spatial filtering, supervised and unsupervised image classification, preparation of Land Use/Land Cover (LULC) maps.

UNIT – III

Geographic Information Systems (GIS): Introduction to GIS, components of GIS including hardware, software, data, people and methods, vector and raster data models, topology, comparison of raster and vector models, spatial database concepts, data capture through digitization and scanning, coordinate systems, map projections, Universal Transverse Mercator (UTM) and Geographic Coordinate System (GCS), attribute database management, vector

overlay analysis, buffering, raster analysis, Digital Elevation Models (DEM) and Shuttle Radar Topography Mission (SRTM).

UNIT – IV

Global Navigation Satellite Systems (GNSS/GPS): Introduction to GPS, GLONASS, Galileo and NavIC, space, control and user segments, positioning principles, trilateration, pseudo-ranging, carrier phase measurements, sources of positioning errors including atmospheric delays, multipath and satellite geometry (GDOP), Differential GPS (DGPS), Real-Time Kinematic (RTK) surveying and applications in Civil Engineering surveying.

UNIT – V

Applications of Geospatial Technology in Civil Engineering: Applications of Remote Sensing, GIS and GNSS in Water Resources Engineering including watershed delineation, runoff estimation using SCS-CN method, groundwater potential zone mapping and flood hazard mapping, applications in Transportation Engineering including route alignment, traffic monitoring and infrastructure asset management, applications in Urban and Environmental Engineering including urban sprawl analysis, smart city planning, solid waste disposal site selection and Environmental Impact Assessment (EIA).

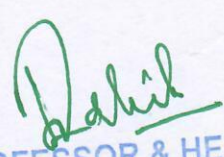
Suggested Readings:

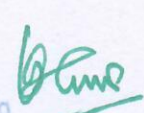
1. M. Anji Reddy, *Remote Sensing and Geographical Information Systems*, 4th Edition, BS Publications, 2018.
2. M. Anji Reddy, *Textbook of Remote Sensing and Geographical Information Systems*, BS Publications, 2020.
3. Kanetkar, T. P. and Kulkarni, S. V., *Surveying and Levelling*, Vol. II (Higher Surveying), 25th Edition, Vidyarthi Griha Prakashan, 2021.

Reference Books :

1. Thomas M. Lillesand, Ralph W. Kiefer and Jonathan W. Chipman, *Remote Sensing and Image Interpretation*, 8th Edition, Wiley, 2023.
2. P. A. Burrough, R. A. McDonnell and Christopher D. Lloyd, *Principles of Geographical Information Systems*, 4th Edition, Oxford University Press, 2019.
3. George B. Korte, *The GIS Book: Concepts and Applications of Geographic Information Systems*, 6th Edition, McGraw-Hill Education, 2020.
4. Paul Bolstad, *GIS Fundamentals: A First Text on Geographic Information Systems*, 6th Edition, XanEdu Publishing Inc., 2022.
5. George Joseph and C. Jeganathan, *Fundamentals of Remote Sensing*, 3rd Edition, Universities Press, 2018.


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PE603 CE	URBAN TRANSPORTATION PLANNING				
Pre-requisites		L	T	P	C
		3	-	-	3
Evaluation	SEE	70 Marks	CIE	30 Marks	

Course Objectives

The objectives of this course are to impart knowledge of:

1. Introduce the principles of urban transportation planning.
2. Develop knowledge of travel surveys and data collection.
3. Understand travel demand forecasting models.
4. Familiarize students with trip distribution and mode choice models.
5. Impart the fundamentals of route assignment models.

Course Outcomes

After completing this course, the student will be able to:

1. Explain the principles and components of urban transportation planning.
2. Conduct travel surveys and analyze transportation data for urban mobility planning.
3. Apply travel demand forecasting techniques using trip generation, distribution,
4. Understand concept of Trip distribution and Mode Split analysis.
5. Explain various issues related to trip assignment model.

UNIT – I

Introduction: Transport and socioeconomic activities - Historical Development of Transport - Role of transportation in the economic development of nations, overview of transport modes, growth trends - Fundamentals of transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems - Emerging future trends in Transportation Systems.

UNIT – II

Data Collection and Travel Surveys: Collection of data - design of survey format - organization of surveys and analysis - study area definition, zoning system, types and sources of data, road side interview method, home interview survey, in-vehicle surveys, sampling, types, various techniques, expansion factors, logical checks, use of secondary sources of data, planning variables, vehicles ownership, projection of data and statistical techniques.

UNIT – III

Travel Demand Forecasting: Various trends, overall planning process, short and long term planning, travel attributes, traffic analysis zones, trip generation, category analysis, concept of gravity

model, trip distribution, model split and trip assignment and land use transportation interaction.

UNIT – IV

Trip Distribution: Gravity Model of Trip Distribution - Calibration of Gravity Model - Growth Factor method, - Uniform factor method - average factor method - time series models - aggregate and disaggregate models. Mode Split Analysis: Influencing Factors - Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model - Disaggregate Mode-Choice Model, Logit Model of Mode Choice - Binary Choice Situations - Multinomial Logit Model - Model calibration.

UNIT – V

Route Assignment: Description of transport network, Route Choice Behavior, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment.

Suggested Readings:

1. Juan de Dios Ortúzar and Luis G. Willumsen, *Modelling Transport*, 5th Edition, John Wiley & Sons, 2021.
2. B.S. Papacostas and P. D. Prevedouros, *Transportation Engineering and Planning*, 3rd Edition, Pearson Education, 2015.
3. Y. H. Khisty and B. Kent Lall, *Transportation Engineering: An Introduction*, 3rd Edition, Pearson Education, 2018.

Reference Books:

1. L. R. Kadiyali and N. B. Lal, *Traffic Engineering and Transport Planning*, 9th Edition, Khanna Publishers, 2019.
2. Michael D. Meyer and Eric J. Miller, *Urban Transportation Planning: A Decision-Oriented Approach*, 2nd Edition (Latest Reprint), McGraw-Hill Education, 2017.
3. Ashish Verma and T. V. Ramanayya (Editors), *Public Transport Planning and Management in Developing Countries*, CRC Press, 2014.
4. Roger P. Roess, Elena S. Prassas and William R. McShane, *Traffic Engineering*, 5th Edition, Pearson Education, 2019.
5. Indian Roads Congress (IRC), IRC:SP:43 – Guidelines on Low-Cost Traffic Management Techniques for Urban Areas, Latest Reprint, 2021.

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PE604CE		ENVIRONMENTAL IMPACT ASSESSMENT				
Pre-requisites			L	T	P	C
			3	-	-	3
Evaluation	SEE	70 Marks	CIE		30 Marks	

Course Objectives:

1. Understand the basic concepts and principles of Environmental Impact Assessment (EIA).
2. Learn EIA methodologies and environmental risk assessment.
3. Understand Environmental Management Plan (EMP), Environmental Impact Statement (EIS), and environmental auditing.
4. Study environmental legislation, environmental clearance procedures, and ISO 14001.
5. Appreciate stakeholder participation and sustainable development in civil engineering projects.

Course Outcomes:

After completing the course, students will be able to:

1. Prepare basic EIA, EMP, and EIS reports.
2. Identify environmental impacts and risks of civil engineering projects.
3. Select suitable EIA methodologies.
4. Understand environmental legislation and clearance procedures.
5. Explain the role of public participation and environmental audits.

UNIT – I

Introduction to Environmental Impact Assessment: Introduction to Environmental Impact Assessment (EIA), objectives and elements of EIA, stages of EIA, Initial Environmental Examination (IEE), environmental baseline data, environmental parameters, and stakeholder participation in the EIA process.

UNIT – II

EIA Methodologies: Introduction to EIA methodologies, criteria for selection of EIA methods, ad-hoc method, matrix method, network method, overlay method, cost-benefit analysis, Environmental Impact Statement (EIS), and Environmental Management Plan (EMP).

UNIT – III

Environmental Impact Assessment of Civil Engineering Projects: Assessment of environmental impacts on land, soil, surface water, groundwater, air, and biological environment, impact prediction and significance, mitigation measures, and applications of Remote Sensing and GIS in Environmental Impact Assessment.

PW653CE		MINI PROJECT			
Pre-requisites		L	T	P	C
		-	-	4	2
Evaluation	SEE	50 Marks	CIE		25 Marks

Course Objectives:

The course is taught with the objectives of enabling the student to:

1. Identification of the research problem
2. Discussion and critical appraisal of literature review.
3. Discussion of Methodology for the research problem

Course Outcomes:

On completion of this course, the student will be able to :

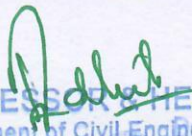
1. Identify Civil Engineering problems by reviewing latest literature.
2. Study different techniques and analyze the systems.
3. Provide appropriate solutions for the identified problem & submission of the comprehensive report

Course Content

1. Mini Project will have CIE Evaluation. The evaluation includes Presentation containing identification of the problem based on the literature review on the topic referring to latest literature available.
2. CIE presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions highlighting individuals' contribution. Continuous assessment of Mini Project will be monitored by the departmental committee. It should encompass components, devices, with which functional familiarity is introduced.
3. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
4. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within first week of the semester.
5. The student is expected to work on design, development and testing of the proposed work as per the schedule.
6. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.


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UNIT – IV:

For the academic year 2026-2027

Environmental Audit and Environmental Legislation: Environmental audit, objectives, types, stages, audit report preparation, Environmental Protection Act, Water (Prevention and Control of Pollution) Act, Air (Prevention and Control of Pollution) Act, Wildlife Protection Act, and case studies related to civil engineering projects.

UNIT – V

Environmental Clearance and ISO 14001: EIA Notification, environmental clearance procedures, preparation and evaluation of EIA reports, Environmental Management System (EMS), ISO 14001 and ISO 14000 concepts, and case studies on industrial and infrastructure projects.

Suggested Readings:

1. Canter, L. W., *Environmental Impact Assessment*, 2nd Edition, McGraw-Hill Education, 2018.
2. R. R. Barthwal, *Environmental Impact Assessment*, 4th Edition, New Age International Publishers, 2020.
3. Anji Reddy, M., *Textbook of Environmental Impact Assessment*, BS Publications, 2019.

Reference Books

1. Judith Petts, *Handbook of Environmental Impact Assessment*, Volume 1 & 2, Blackwell Science, Latest Reprint, 2018.
2. John Glasson, Riki Therivel and Andrew Chadwick, *Introduction to Environmental Impact Assessment*, 5th Edition, Routledge, 2024.
3. Riki Therivel, *Strategic Environmental Assessment in Action*, 2nd Edition, Routledge, 2019.
4. Lawrence, D. P., *Environmental Impact Assessment: Practical Solutions to Recurrent Problems and Contemporary Challenges*, 3rd Edition, Wiley, 2020.
5. Bureau of Indian Standards (BIS), *IS/ISO 14001:2015 – Environmental Management Systems – Requirements with Guidance for Use*, Latest Reprint, 2021.

Relevant Acts and Guidelines

1. Government of India, *Environmental (Protection) Act*, 1986 (Latest Amendments).
2. Ministry of Environment, Forest and Climate Change (MoEFCC), *EIA Notification*, 2006 (including amendments up to 2023)
3. Central Pollution Control Board (CPCB), *Guidelines for Environmental Impact Assessment and Environmental Management*, 2022.



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SUMMER INTERNSHIP				
Pre-requisites		L	T	P
		-	-	-
Evaluation	4 Weeks, Evaluation will be done in the VII-Sem			

Course Objectives:

- To expose the students in understanding the real-life practical problems and technologies.
- To provide an opportunity to integrate various aspects of learning reference of practical problems.
- To enhance the confidence of the students by interaction with field professionals

Course Outcomes: Student will be Able to

1. Design or develop a simple software suitable to industry
2. Complete the task or realize a prescribed target within a limited scope.
3. Learn to find alternate viable solutions for a given problem based on criteria.
4. Learn new software suitable for Civil Engineering problems.
5. Learn field constraints and also documentation of technical report.

Summer Internship is introduced as part of the curricula to encourage students to work on problems of interest to industries or in a consulting organization. A batch of two or three students will be attached to Industry/ R & D Organization / National Laboratory / Consultants / Project offices/ Executing Agencies /Departments/ Private Builders for a period of SIX weeks. This will be during the summer vacation followed after the completion VI semester course. Faculty member (s) will be acting as an internal guide(s) for the batches to mentor and monitor the progress and also interacts with the Industry guide (s) as per the need.

After the completion of the internship, students need to submit a brief technical report on the project executed and present the work through a seminar talk to be organized by the Department. The performance of the student will be judged by internal guide (s) followed by presentation before the committee constituted by the Department. One faculty member will coordinate the overall activity of Summer Internship.

**Students have to undergo summer internship of 4 Weeks duration at the end of semester VI and evaluation will be done in VII semester.*

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