



Shri ShamraoPatil (Yadavkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
 Yadav (Ichalkaranji)-416121, Dist. – Kolhapur
 (An Autonomous Institute)

Department: Civil Engineering

Rev: Course Structure /01/NEP/2024-25

Class: T.Y. B. Tech

Semester: V

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE3501	PCC	Environmental Engineering	03	-	-	03	10	10	30	50	100	03
23CE3502	PCC	Design of Steel Structure	03	-	-	03	10	10	30	50	100	03
23CE3503	PCC	Transportation Engineering	02	-	-	02	10	10	30	50	100	02
23CE3504	PCC	Environmental Engineering Laboratory	-	-	02	02	15	15	-	20	50	01
23CE3505	PCC	Transportation Engineering Laboratory	-	-	02	02	15	15	-	20	50	01
23CE3506	VSEC	Auto CAD Laboratory	-	-	02	02	25	25	-	-	50	01
23CEPEXX	PEC	PEC-I	03	-	-	03	10	10	30	50	100	03
23OECE31	OE	OE-III	03	-	-	03	10	10	30	50	100	03
23CEMDXX	MDM	From Basket	03	-	-	03	10	10	30	50	100	03
23CE3507	ELC	Mini Project	-	-	02	02	25	25	-	-	50	01
23CE3508	ELC	Industrial Training/ Field Training	-	-	-	-	-	-	-	50	50	Audit
23CE3509	MC	Constitution of India	01	-	-	01	25	25	-	-	50	Audit
23HSSM05	VEC	Aptitude skill- III	01	-	-	01	25	25	-	-	50	Audit
23HSSM06	VEC	Language skill-III	-	-	02	02	25	25	-	-	50	Audit
TOTAL			19	-	10	29	215	215	180	390	1000	21

Program Elective Courses – I

(Subject 1)	(Subject 2)	(Subject 3)
Site Administration and Control (23CEPE11)	Solid Waste Management (23CEPE21)	Advance Material and Techniques (23CEPE31)

Multidisciplinary Minor – III

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Construction Methods and Techniques (23CEMDA3)	Building Services (23CEMDB3)	Airport Engineering (23CEMDC3)

Open Elective – III

Sustainable Energy (23OECE31)

*Open Elective course will be offered to students of other programs and will not be offered to students of the same program



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Environmental Engineering

23CE3501	PCC	Environmental Engineering	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Impart knowledge of design components necessary for water treatment and supply.
CO2	Able to assess the different water quality parameters, their importance and limitations, and also
CO3	Acquire the knowledge of different methods and stages for water treatment and need for the supply of safe potable water supply.
CO4	Assess different wastewater constituents and different sources of wastewater generation.
CO5	Adopting advanced water and wastewater treatment techniques.
CO6	Plan proper method for the final disposal of treated wastewater.

Course Content:

Unit 1: Water Demand and Quality Importance of water, sources, types of demand, factors affecting population growth and water consumption, effect of water demand variation on design of water supply components. Water quality parameters: Physical, chemical and biological category, permissible limits under BIS, water-borne diseases.	[5]
Unit 2: Water Treatment Sedimentation – plain, flocculation and coagulation. Filtration - sand filtration – types, application, working, design. Disinfection - theory, types, application. Water distribution – types, hydraulic analysis.	[6]
Unit 3: Municipal wastewater Sources, components, characteristics of wastewater with thrust on COD, BOD. Sewage and Sewerage system – types, simple hydraulic design of sewers, Grey water – concept and treatment.	[5]
Unit 4: Municipal wastewater treatment Types of treatment - general layout of STP, screens, detritus tank, ASTP – function, design considerations, F/M, MLSS, MLVSS, SVI. Trickling Filter – types, design consideration, efficiency,	[7]
Unit 5: Nanotechnology in Water Quality and Wastewater Introduction to nanotechnology: Introduction, nanomaterials – microporous materials, carbon nanotubes, photocatalysts.	[7]





Nanotechnology based water treatment strategies – importance, types of nano materials used, and mechanisms for contaminants' removal. Application of nanotechnology - for reduced waste and improved energy efficiency.	
Unit 6: Wastewater disposal Dilution method – favorable conditions, parameters to be considered, Streeter-Phelps equation, Classification of rivers in India. Disposal on land – conditions, limitations, sewage sickness.	[4]

Text Books:

1. Garg S. K. "Water Supply Engineering", Khanna Publishers, New Delhi. Ed. 35
2. Birdie J. S. and Birdie G.S. "Water Supply Engineering and Sanitary Engineering" Dhanpa Rai Publications, 8th Ed. New Delhi.
3. E.W. Steel, "Water Supply and Sewerage", McGraw – Hill publishers.
4. Wiesner M., Bottero J-Y., Environmental Nano technology : Applications and Impacts of Nano materials Applications and Impacts of Nano materials, McGraw Hill Professional.
5. Pradeep T., Textbook of Nano science and Nanotechnology, McGraw Hill Education (India) Private Limited

Reference books:

1. Peavy and Rowe, " Environmental Engineering" , McGraw Hill Publishers, 4th Ed.2003
2. Sharma and Kaur, "Environmental Chemistry" , Goyal Publisher
3. Government of India, "Water Supply and Treatment Manual" .
4. Manual on Water Supply and Treatment, CPHEEO, Ministry of Jal Shakti/ Department of Drinking Water and Sanitation.



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Design of Steel Structures

23CE3502	PCC	Design of Steel Structures	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the principles of steel structure design
CO2	Analyze the connections in steel structures.
CO3	Analyze and design Tension and Compression members.
CO4	Analyze and design column and bases.
CO5	Design the beams in steel structures.
CO6	Explain the Limit state method of design.

Course Content:

Unit 1: Introduction Introduction to concepts of structural design. Idealization of real 3D structures in to 2D and 1D elements, Introduction to structural configurations advantages & disadvantages of steel structures, permissible stresses, factor of safety, methods of design, types of connections, various types of standard rolled sections, types of loads and load combinations.	[6]
Unit 2: Bolted and Welded connections Bolted and Welded connections: Analysis of axially & eccentrically loaded connections, Permissible stresses, Design of connections.(IS 800: 1984)	[5]
Unit 3: Tension & Compression members Tension members: Common sections, net effective area, load carrying capacity, connection using weld / bolts.(IS 800: 1984) Compression members: Common sections used, effective length and slenderness ratio, permissible stresses, load carrying capacity, connection using weld / bolt(IS 800: 1984)	[7]
Unit 4: Columns and Column Bases Columns: Simple and built-up section, lacing, battening, column subjected to axial force and bending moment, column splices.(IS 800: 1984) Column bases: Analysis and design of slab base, gusseted base, design of anchor bolt.(IS 800: 1984)	[6]
Unit 5: Beams Beams: Laterally supported & unsupported beams, design of simple beams, built up beams using flange plates, curtailment of flange plates, web buckling & web crippling, secondary and main beam arrangement, beam to beam connections.(IS 800: 1984)	[7]





Unit 6: Introduction to Limit State method

Introduction to Plastic Analysis, Hinge formation, Collapse mechanism, Introduction to provisions in IS 800-2007, Basis for Design, Classification of cross-Sections, Limit state of strength and Limit state of serviceability, Partial Safety Factors for Loads, Partial Safety Factors for Materials.

[5]

Note: Unit 1 to 5 are based on working stress method of design (IS 800: 1984), Unit 6 is based Limit state method of design (IS 800 2007)

Use of IS 800: 1984, IS: Handbook No.1 for Steel Section /Steel Table, SP 6(6) is permitted for theory examination.

Text Books:

1. Duggal S. K., "Design of Steel Structures", Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Dayaratnam P., "Design of Steel Structures", Wheeler Publishing, New Delhi
3. S. Ramamrutham, "Design Of Steel Structures" Dhanpatrai Publishing Co (p) Ltd
4. Gambhir, "Fundamentals of Structural Steel Design", Tata McGraw Hill Pub. Co. Ltd., New Delhi
5. Subramanian N., "Steel Structures: Design and Practice" Oxford Univ. Press, Delhi
6. Negi L.S., "Design of Steel Structures", McGraw Hill

Reference Books:

1. Publications of Bureau of Indian Standards, New Delhi, IS 800:1984
2. Publications of Bureau of Indian Standards, New Delhi, IS 800:2007
3. Vazirani & Ratwani, "Design of Steel Structures", Standard Book House, New Delhi
4. Duggal S. K., "Limit State Design of Steel Structures", Tata McGraw Hill Pub. Co. Ltd., New Delhi
5. Salmon and Johnson, "Steel Structures: Design and Behaviour", Harper and Row, New York
6. Steel Designers Manual



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Transportation Engineering

23CE3503	PCC	Transportation Engineering	2-0-0	2 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 2 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the basics of Transportation Engineering and various road development programmes in India
CO2	Illustrate the principles of Highway Alignment
CO3	Understand the importance of Highway geometrics design as per IRC standards
CO4	Identify different highway elements and the types of pavements
CO5	Illustrate the various traffic characteristics while designing a traffic in road
CO6	Explain the significance of railway elements, railway stations and yards in the railway

Course Content:

Unit 1: Highway Alignment Highway Alignment, Factors Controlling Alignment, Engineering Survey for Highway Alignment, Pavement Surface Characteristics, Camber, Width of Carriage Way, Medians, Kerbs, Road Margins	[4]
Unit 2: Geometric Design Geometric Design, Importance of Geometric Design, Design controls and criteria, Sight distances, Types of Sight Distances, Stopping Sight Distance(SSD), PIEV theory, Overtaking sight distance (OSD), Super elevation, Transition curve. Mechanical Widening, Related Numerical	[6]
Unit 3: Highway materials Road making materials-Soil, stone aggregates - classification, properties of aggregates, design of aggregate gradation. Bitumen, bitumen emulsions, cut backs and modified binders, Mix design - Marshall method and Superpave procedure	[4]
Unit 4: Traffic Engineering Traffic Engineering, Scope of traffic engineering, Traffic Characteristics, Traffic Volume Studies, Spot Speed Studies, Speed and Delay Studies, Origin and Destination Studies, Parking Studies, Accident Studies. traffic control – signal design, intersections and transport facilities	[6]
Unit 5: Railway Engineering Classification of Indian Railways, Gauge of Track, Factors affecting the choice of a Gauge, Sleepers, Ballast. Rails, Types of Rails, Classification of Stations; Classification of Yards.	[4]



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Unit 6: Railway operation, control, Maintenance

Points and crossings, Signaling and interlocking –Train movement control systems. , renewal of component parts and drainage, maintenance of track-alignment

[4]

Text books:

1. Khanna and Justo, “Highway Engineering” by (Nemchand & Bros., Roorkee)
2. Arora N. L., “Transportation Engineering”
3. Bindra and Arora, “Highway Engineering” by (Standard Publishers)
4. Vazirani V.N. and Chandola S.P., “Transportation Engineering” (Khanna Publishers)
5. Shahani P.B, “Road Techniques” (Khanna Publishers)
6. Kadiyali L.R, “Traffic Engineering and Transport Planning” (Khanna Publishers)
7. Rangwala, “Railway Engineering” (Charotar Publishing House)
8. Relevant IRC and IS Codes

Reference books:

1. Garber, N.J. and Hoel, L.A., “Traffic and Highway Engineering” (West Publishing)
2. Khistry, C.J. “Transportation Engineering – An Introduction” (Prentice Hall of India)
3. Agor R. Surface Transportation (Railways and Highways)” (Khanna Publishers, N. Delhi)



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Environmental Engineering Laboratory

23CE3504	PCC	Environmental Engineering Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hrs/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate quality parameters considered in water testing.
CO2	Conclude the status of water quality.
CO3	Define the wastewater characteristics and propose treatment
CO4	Define the measurement of air pollutants and demonstrate the air quality.

Course Content:

Section 1: Test in Lab

1. To determine pH, alkalinity, chlorides, EC and turbidity.
2. To determine percentage available chlorine in bleaching powder, residual chlorine, chlorine demand and break-point chlorination.
3. To determine optimum dose of alum, total, dissolved, suspended and volatile solids.
4. Determination of fluoride and total iron.
5. Determination of sulphates and nitrates.
6. Determination of SVI, BOD and COD.
7. Determination of DO, total hardness, temporary, permanent, calcium and magnesium hardness.
8. Assessment of SPM.

Section 2: Site Visit

1. Report on visit to nearby WTP.
2. Report on visit to nearby STP.

Text Books

1. "Manual on Water and Wastewater Analysis", NEERI publication 5th edition
2. "Guide Manual: Water and Wastewater Analysis" Central Pollution Control Board publication. 2005.

Reference books:

1. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, 24th Ed.



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Transportation Engineering Laboratory

23CE3505	PCC	Transportation Engineering Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hr/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understating on various tests for characterization of aggregate for road construction.
CO2	Understating on various tests for characterization of bitumen for road construction.
CO3	Understanding the importance of different tests for engineering practice and its suitability as road

Course Content:

1. Aggregate Impact test to determine the resistance of aggregate to sudden shock
2. Crushing test on aggregate to measure the resistance of aggregate against crushing under gradually applied compressive load
3. Los Angles Abrasion test to measure the abrasion resistance of aggregate materials
4. Penetration test on bitumen to determine the consistency
5. Specific gravity test on bitumen
6. Softening point test on bitumen
7. Flash and Fire point test on bitumen
8. Ductility test to measure the adhesive properties of bitumen

Text books:

1. Khanna and Justo, "Highway Engineering" by (Nemchand & Bros., Roorkee)
2. Arora N. L., "Transportation Engineering"
3. Bindra and Arora, "Highway Engineering" by (Standard Publishers)
4. Vazirani V.N. and Chandola S.P., "Transportation Engineering" (Khanna Publishers)
5. Shahani P.B, "Road Techniques" (Khanna Publishers)
6. Kadiyali L.R, "Traffic Engineering and Transport Planning" (Khanna Publishers)
7. Rangwala, "Railway Engineering" (Charotar Publishing House)

Reference books:

1. IS 2386 (1963). Methods of test for aggregates for concrete. Bureau of Indian Standards. New Delhi
2. IS 1201-1209 (1978). Methods for Testing Tar and Bituminous Materials. Bureau of Indian Standards. New Delhi
3. IS 73 (2013). Paving Bitumen — Specification (Fourth Revision). Bureau of Indian Standards. New Delhi
4. MORTH (2013). Specifications of Road and Bridge Works (Fifth Revision). Indian Road Congress. New Delhi





Auto CAD Laboratory

23CE3506	PCC	Auto CAD Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hrs/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Describe use & commands of CAD for civil engineering.
CO2	Explain various components of building.
CO3	Illustrate use of layers of CAD.
CO4	Develop drawing for building by using CAD software.

Course Content:

1. Introduction to computer aided drafting
2. Practice exercises on CAD software by using different commands
3. Drawing of plans of Single storeyed buildings using software
4. Developing sections and elevations for Single storeyed building
5. Exercises on development of working of buildings.
6. Exercises on development of Municipal drawing of buildings.

Text Books

1. AutoCAD – George Omura
2. AutoCAD 2019 training guide AutoCAD

Reference books:

1. David Frey (BPB Sybex Publications)



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PEC-I

23CEPE11	PEC	Site Administration and Control	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the roles, responsibilities, and principles of site administration.
CO2	Plan, schedule, and manage resources effectively on construction sites.
CO3	Apply quality control measures to ensure high construction standards.
CO4	Identify and mitigate safety risks and ensure compliance with Indian safety standards.
CO5	Maintain effective communication and documentation for site management.
CO6	Use legal and financial aspects of site operations efficiently.

Course Content:

Unit 1: Introduction to Site Administration Roles and responsibilities of site administrators. Site organization and layout planning. Importance of documentation and record-keeping at the site. Coordination between contractors, subcontractors, and labor. Overview of Indian legal requirements for construction site administration (e.g., labor laws, Building & Other Construction Workers Act).	[6]
Unit 2: Construction Site Planning and Control Site logistics and material management. Resource allocation: Manpower, materials, and machinery. Time scheduling and work sequence planning (e.g., bar charts, Gantt charts). Traffic management within and around the construction site. Safety measures and compliance with Indian safety standards (NBC and IS codes).	[6]
Unit 3: Site Supervision and Quality Control Role of supervision in ensuring construction quality. Implementation of quality control plans and inspection protocols. Use of checklists and quality audits on-site. Common construction defects and corrective measures. Tools and techniques for real-time quality monitoring	[6]
Unit 4: Construction Safety and Risk Management Site safety regulations and standards as per Indian codes (IS 3764, IS 13416). Identification and mitigation of hazards: Electrical, fire, excavation, and machinery. Risk management: Assessment, prevention, and control. Role of personal protective equipment (PPE). Accident reporting, investigation, and corrective measures.	[6]
Unit 5: Communication and Documentation on Site Importance of effective communication between stakeholders. Site meetings: Agenda, minutes, and follow-ups. Preparation of daily, weekly, and monthly progress reports. Documentation of	[6]



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labor attendance, material usage, and equipment logs. Use of technology in documentation (BIM, site management software).	
Unit6: Legal and Financial Aspects of Site Administration Construction contracts: Types, clauses, and dispute resolution. Compliance with labor laws and statutory obligations in India. Financial management on-site: Budget control, billing, and payments. Handling claims, variations, and delays. Ethical practices in site administration.	[6]

Text Books:

1. Construction Project Management: Theory and Practice by Kumar Neeraj Jha.
2. Building Construction by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain.
3. Construction Management and Planning by B. Sengupta and H. Guha.
4. Site Management for Engineers by R. B. Cooke and P. M. Williams.

Reference Books:

1. Construction Planning and Management by P. S. Gahlot and B. M. Dhir.
2. Handbook of Construction Management by P. K. Joy.
3. Site Management and Administration by Derek Millett.
4. The National Building Code of India (BIS, latest edition).
5. Labour Laws and Other Statutory Obligations by H.L. Kumar.



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PEC-I

23CEPE21	PEC	Solid Waste Management	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Outline the functional elements of solid waste through management.
CO2	Identify and interpret the characteristics of MSW.
CO3	Organize the collection system and optimize the route for MSW transfer.
CO4	Demonstrate the knowledge on fundamental principles of present and emerging technologies for MSW treatment and value recovery.
CO5	Analyze different treatment processes for disposal and recovery under MSW.
CO6	Examine and understand biomedical and hazardous waste collection, transport and disposal.

Course Content:

Unit 1: Fundamentals of solid waste management Definition, Sources and types of solid waste, composition of solid waste, environmental impact of solid waste, factors affecting solid waste generation rate, physical and chemical characteristics of solid waste, sampling methods, functional elements of solid waste management	[6]
Unit 2: Storage and Collection of solid waste Storage of solid waste, types of solid waste collection services, types of collection system- hauled and stationary container system, tools and equipment used in collection, terms used- pick up time, haul time, off-site and on site time, time and frequency of collection, collection route and its layout, labor requirement, route optimization	[7]
Unit 3: Transportation of solid waste Need of transfer operation, transportation vehicles, transfer station- definition, necessity, location, advantages and disadvantages, operation and maintenance of transfer station	[5]
Unit 4: Processing of Solid Waste Purpose of processing solid waste, mechanical volume reduction and size reduction, component separation- air separation, Magnetic separation, screening, hand sorting, inertial separation, drying and dewatering	[6]
Unit 5: Disposal of Solid Waste Composting, factors affecting composting, types of composting, land filling- site selection criteria, landfilling methods, advantages and disadvantages, Incineration- process, products of incineration and their uses, advantages and disadvantages,	[6]





Pyrolysis and its types, leachate, leachate treatment and collection system, impact of open dumping	
Unit 6: Biomedical and Hazardous Waste Biomedical waste – Definition, sources, types, biomedical waste management technologies, biomedical waste management rule-2016 Hazardous waste- Definition, sources, types, Physico-chemical, Chemical and Biological Treatment of hazardous waste	[6]

Text Books:

5. Construction Project Management: Theory and Practice by Kumar Neeraj Jha.
6. Building Construction by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain.
7. Construction Management and Planning by B. Sengupta and H. Guha.
8. Site Management for Engineers by R. B. Cooke and P. M. Williams.

Reference Books:

6. Construction Planning and Management by P. S. Gahlot and B. M. Dhir.
7. Handbook of Construction Management by P. K. Joy.
8. Site Management and Administration by Derek Millett.
9. The National Building Code of India (BIS, latest edition).
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PEC-I

23CEPE31	PEC	Advance Materials and Techniques	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify and classify advanced materials used in modern construction.
CO2	Explain the application of composite materials and high-performance concrete.
CO3	Assess the benefits of modern construction techniques like prefabrication and 3D printing.
CO4	Evaluate sustainability and durability aspects of advanced materials.
CO5	Apply knowledge of smart materials for structural health monitoring.
CO6	Understand the use of nanotechnology and green materials in construction.

Course Content:

Unit 1: Advanced Construction Materials High-performance concrete (HPC) and self-compacting concrete (SCC), Fiber-reinforced concrete (FRC) and polymer concrete, Geopolymer concrete, Smart materials: shape memory alloys, piezoelectric materials, Properties and applications of carbon fiber, glass fiber, and aramid fiber	[6]
Unit 2: Composite Materials in Construction Definition and classification of composites, fiber-reinforced polymers (FRP), and their applications, Sandwich panels and laminated composites, High-strength structural plastics, Case studies on composite material applications.	[6]
Unit 3: Modern Construction Techniques Prefabrication and modular construction, 3D printing in construction, Precast and pre-stressed construction methods, Tunnel Formwork and Mivan formwork, Hybrid construction techniques.	[6]
Unit 4: Sustainable and Green Construction Materials Recycled aggregate concrete and its applications, Green building materials and energy-efficient construction techniques, Phase change materials for thermal regulation, Concepts of net-zero energy buildings.	[6]
Unit 5: Nanotechnology in Construction Nano materials: carbon Nano-tubes, Nano-silica, Nano-clay, Applications of nanotechnology in cement and concrete, Self-cleaning and self-healing materials, Water-repellent and fire-resistant coatings, Impact of nanotechnology on durability and sustainability.	[6]





Unit6: Smart and Intelligent Materials

Sensors and actuators in construction, Smart concrete and structural health monitoring systems, Bio-mimetic and bio-engineered construction materials ,Shape memory alloys and self-sensing materials, AI and robotics in modern construction.

[6]

Text Books:

1. P.K. Mehta & P.J.M. Monteiro – Concrete: Microstructure, Properties, and Materials
2. Chung Deborah D.L. – Composite Materials: Science and Applications
3. K.S. Jagadish, B. V. Venkatarama Reddy & K.S. Nanjunda Rao – Alternative Building Materials and Technologies
4. Gambhir M.L. – Concrete Technology
5. James K. Wight & James MacGregor – Reinforced Concrete: Mechanics and Design

Reference Books:

1. Sanjay Kumar Shukla – Advanced Civil Engineering Materials
2. P.C. Aïtcin – High-Performance Concrete
3. A.M. Neville & J.J. Brooks – Concrete Technology
4. M. S. Shetty – Concrete Technology: Theory and Practice
5. S. K. Duggal – Building Materials



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MDM-III

23CEMDA3	MDM	Construction Methods and Techniques	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the fundamental principles of prefabricated structures
CO2	Analyze the processes involved in modular construction practices
CO3	Evaluate the requirements for effective formwork
CO4	Assess new design trends and construction techniques in high-rise buildings
CO5	Examine conventional and advanced bridge construction techniques
CO6	Investigate advanced construction techniques that promote sustainability

Course Content:

Unit 1:Prefabricated Structures: Introduction to Prefabricated structures, Planning for pre-casting, Selection of equipment for fabrication, Transport and erection of prefabricated components, Quality measures, Design considerations of precast elements, Safety measure during erection.	[6]
Unit 2:Modular Construction Practices Introduction to Modular Construction, Modular coordination, Modular Standardization, Modular System Building, Limitation and Advantages of Modular Construction	[6]
Unit 3:Formwork Requirements of Formwork, Loads carried by Formwork, Types of Formwork: Timber, Steel, Modular shuttering, Slip forms, Scaffolding, Deep Excavation Methods.	[6]
Unit 4:High Rise Buildings New Design Trends in Geometrical Forms, Construction Techniques of High Rise Buildings, High Rise Construction Techniques, and Brick work, Selected High-Tech High-Rise Buildings.	[6]
Unit 5: Bridge construction techniques Introduction to Embankments and Foundations, Conventional Bridge Construction Techniques, Accelerated Bridge Construction, Prefabricated Bridge Construction	[6]
Unit 6: Advanced construction techniques Advanced construction techniques for better sustainability; Techniques for reduction of Green	[6]



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House Gas emissions in various aspects of Civil Engineering Projects

Text Books:

1. Robert L.Peurifoy, Clifford, J. Schexnayder, Robert Schmitt and AviadShapira, Construction Planning, Equipment, and Methods, McGraw-Hill Education, 2018, Ninth Edition.
2. S. C. Sharma, Construction Equipment and Management, Khanna Publishing, 2019, First Edition

Reference Books:

1. Cameron Andres, Ronald Smith and W. Woods, Principles and Practices of Commercial Construction, Pearson, 2018, Tenth Edition.
2. D. S. Vijayan, S. Arvindan and A. Paulmakesh, Construction Materials and Techniques, Notion Press, 2021, First Edition.
3. Edward Allen and Joseph Iano, Fundamentals of Building Construction: Materials and Methods, Wiley, 2019, Seventh Edition.



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MDM-III

23CEMDB3	MDM	Building Services	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the importance and classification of building services.
CO2	Apply water supply and drainage systems for buildings.
CO3	Implement efficient and safe electrical systems in buildings.
CO4	Plan and design fire protection systems as per national standards.
CO5	Apply the principles of HVAC systems to ensure indoor air quality and comfort.
CO6	Study of sustainable and smart building services for energy conservation and environmental impact.

Course Content:

Unit 1: Introduction to Building Services Definition and importance of building services. Classification: Mechanical, electrical, plumbing, fire safety, and HVAC systems. Coordination of building services with architecture and structural design. Overview of building regulations and standards in India (e.g., NBC).	[6]
Unit 2: Water Supply and Drainage Systems Water supply systems: Sources, storage, and distribution. Hot and cold water systems in buildings. Drainage systems: Sanitary drainage, storm water drainage, and rainwater harvesting. Wastewater treatment and recycling systems. Plumbing materials, fixtures, and fittings.	[6]
Unit 3: Electrical Systems in Buildings Basic electrical systems: Wiring, circuit breakers, and distribution boards. Illumination systems: Types of lights and lighting design principles. Power supply systems: Standby generators, UPS, and renewable energy integration. Earthing systems and protection against electrical hazards. Energy-efficient electrical systems.	[6]
Unit 4: Fire Protection Systems Principles of fire safety in buildings. Fire detection systems: Smoke detectors, heat sensors, and alarm systems. Fire suppression systems: Sprinklers, hydrants, and extinguishers. Evacuation planning and fire safety regulations (NBC and IS codes). Case studies of fire incidents and lessons learned.	[6]
Unit 5: HVAC (Heating, Ventilation, and Air Conditioning) Systems	[6]



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Principles of heating, ventilation, and cooling. Types of HVAC systems: Centralized and decentralized systems. Components of HVAC systems: Compressors, ducts, chillers, and fans. Indoor air quality and thermal comfort. Energy-efficient HVAC systems and renewable energy integration.	
Unit 6: Sustainable and Smart Building Services Concepts of green buildings and sustainable building services. Energy conservation and management in buildings. Smart building technologies: Automation, IoT, and Building Management Systems (BMS). Waste management in buildings. Case studies of sustainable and smart buildings in India.	[6]

Text Books:

1. Chatterton, David V. "Building Services Engineering." Routledge, 2013.
2. M.A. Aziz. "Building Services." McGraw Hill Education, 2017.
3. Singh, Gurucharan. "Water Supply and Sanitary Engineering." Standard Publishers, 2016

Reference Books:

1. Hall, Fred. "Building Services Handbook." Routledge, 2017.
2. Deolalikar, S.G. "HVAC and Building Services Design." Tata McGraw Hill, 2010.
3. Bureau of Indian Standards. "National Building Code of India 2016." BIS, 2016.
4. Kumar, Satish. "Energy Efficient Buildings in India." The Energy and Resources Institute (TERI), 2014.
5. Smith, Peter. "Sustainable and Resilient Building Services." Routledge, 2020.



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MDM-III

23CEMDC3	MDM	Airport Engineering	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the elements of airport and aircraft
CO2	Understand the fundamental principles of airport planning
CO3	Illustrate the various geometric design elements of Runway and taxiway
CO4	Enumerate the elements of terminals and systems of parking aircrafts
CO5	Describe the grading requirements and characteristics of airport drainage
CO6	Understand the importance of installing visual aids and runway lighting

Course Content:

Unit 1: Introduction History of aviation, development of Air transportation in India, Open sky policy, parts of aeroplane, aircrafts characteristics, aerodromes, airport classifications as per ICAO.	[4]
Unit 2: Airport Planning Importance of Airport Planning, Airport site selection, factor affecting the Airport Size, Airport obstruction, clear Zone, Turning zone, zoning laws, Airport Architecture, estimation of future air traffic, development of new airport, requirements of an ideal airport layout.	[6]
Unit 3: Runway and Taxiway Design Wind rose and orientation of runway ,wind coverage and crosswind component, factors affecting runway length, basic runway length, runway geometrics and runway patterns, Runway marking, taxiway geometric elements, layout, exit taxiway, Loading aprons, Holding aprons, Separation Clearance.	[8]
Unit 4: Terminal Area and Airport Pavement Terminal area elements and requirements, systems of air parking, gate position and capacity design aircraft parking, Hangars, Typical Airport layouts, maintenance and evaluation of airport pavement, Classification of Aircraft pavement as per ICAO	[6]
Unit 5: Grading and Drainage Airport grading importance and requirements, operations, airport drainage characteristics and requirements, surface drainage and its elements, Methods of sub surface drainage.	[6]
Unit 6: Air Traffic Control and Visual Aids Air traffic control objectives, control network and control aids, landing aids, airport markings, Elements of airport lighting, Runway Visibility.	[6]



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Text Books:

1. Robert Horonjeff, Francis X. McKelvey, William J. Sproule, Seth B. Young. Planning and Design of Airports. Tata McGraw Hill Pub. Co., New York
2. Richard de Neufville Amedeo R. Odoni. Airport Systems and Planning, Design and Management. Tata McGraw Hill Pub. Co., New York

Reference Books:

1. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros.,Roorkee
2. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
3. S.C.Rangwala and P.S.Rangwala. Airport Engineering, Charotar Publishing House Pvt. Ltd, Anand



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Mini Project-III

23CE3507	ELC	Mini Project III- Hackathon	0-0-2	01 Credit
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Teaching Scheme Practical: 2hrs/week	Evaluation Scheme: Continuous Assessment-I: - 25Marks Continuous Assessment-II: -25Marks
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Pre-Requisites: Mini Project, Mini Project II

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms where students will solve real world challenges. This Course focuses on the selection of methods/engineering tools/analytical techniques for problem solving.

Through this course, students will gain the understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills and responsibility

Course Outcomes: At the end of the course, students will be able to:

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the methods /tools used to develop the solution
CO4	Design / simulate the model/ project work
CO5	Describe the solution with help of a project report and presentation
CO6	Conclude the outcomes of project.

Course Contents:

Week 1: Survey Design-1 - Ensure case study group students have made necessary communication and done a preparatory visit. - Watch the lecture on survey design and study the notes. - Prepare a questionnaire and try it out with your group members as mock.	[2]
Week 2: Survey Design-2 - Review survey questionnaire prepared by case study groups. - Decide sampling strategy. - Prepare a detailed schedule for fieldwork	[2]
Week 3: Fieldwork - Data Collection: Collect quantitative data (e.g., statistics, usage metrics) and qualitative data (e.g., user stories, testimonials). - Use data collection tools like questionnaires, observation checklists, and digital analytics.	[2]



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• Ensure data accuracy and reliability through proper sampling and recording methods. • 25% Presentation has to be conducted by mentor/guide based on above activity.	
Week 4: Trails and Experimentation-1 • Initial Setup and Configuration • Concept Validation • Feasibility Testing	[2]
Week 5: Trails and Experimentation-2 • Prototyping • Functionality Testing	[2]
Week 6: Trails and Experimentation-3 • Bug Identification and Fixing • Integration Testing • Security Testing • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 7: Results • Coordinator has to check and verify below points in term of result: • Functional Performance • Accuracy and Precision • Efficiency • Safety	[2]
Week 8: Validation • Coordinator has to check and verify below points in term of validation: • Testing and Verification • Compliance with Standards • 75% Presentation has to be conducted by mentor/guide based on above activity.	[2]
Week 9: Integration Testing • Validate that the hardware integrates seamlessly with other systems or components as intended • Perform compatibility tests with software, other hardware, and network systems.	[2]
Week 10: Documentation and Reporting • Maintain comprehensive documentation of design, development, testing, and validation processes • Provide detailed reports on test results, issues found, and corrective actions taken.	[2]
Week 11: Final Presentation • 100% Presentation has to be conducted by mentor/guide based on above activity. • Prototype/Final Software solution is mandatory at the time of final presentation along with report	[2]
Week 12: Exhibition • Mini project exhibition will be schedule with interdepartmental evaluation.	[2]



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Internship/Field Training

23CE3508	ELC	Internship/Field Training	0-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: NA	End Semester Exam : 50 Marks

Pre-Requisite: Basics of Civil Engineering, Good written and Oral Communication.

Course outcome: At the end of the course, students will be able to:

CO1	Verify the Technical knowledge in real industrial situations.
CO2	Develop interpersonal communication skills.
CO3	Discuss activities and functions of the industry in which the Internship/training has done.
CO4	Write the technical report.

Course Description:-

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the **Fourth and Fifth semester**, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HoD/TPO/Principal of the college and submit the report along with the completion certification from the Industry/ Organization. The report will be evaluated during the **Sixth semester** by the department.

Guideline for Students:-

1. Arrive at work as per schedule, ready to work and stay for the agreed upon time.
2. Present yourself in a professional manner at all times, including being appropriately dressed at workplace.
3. Communicate any concerns with your supervisor and the internship/Training coordinator in a timely manner and respectfully.
4. Demonstrate enthusiasm and interest in what you are doing, ask questions and take the initiative as appropriate.
5. Complete and submit assigned tasks by designated timelines. Meet all deadlines.

Student's Diary/ Daily Log

The main purpose of writing daily diary is to cultivate the habit of documenting and to encourage the students to search for details. It develops the students' thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students.

The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working. The diary should also be shown to the Faculty Mentor. Student's Diary and Internship Report should be submitted by the students along with attendance record and an evaluation sheet duly signed and stamped by the industry to the SITCOE immediately



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after the completion of the training. It will be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Drawings, sketches and data recorded.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report

After completing the internship, the student should prepare a comprehensive report to indicate what he/she has observed and learned in the training period. Daily diary will also help to a great extent in writing the industrial report since much of the information has already been incorporated by the student into the daily diary. The competent authority should sign the training report. The Internship report should be evaluated on the basis of following criteria:

- Originality.
- Adequacy and purposeful write-up.
- Organization, format, drawings, sketches, style, language etc.
- Variety and relevance of learning experience.
- Practical applications, relationships with basic theory and concepts taught in the course.

Evaluation of Internship/Training

The student should be evaluated based on his training report and presentation, before an expert committee constituted by the concerned department as per norms. The evaluation will be based on the following criteria:

- Quality of content presented.
- Proper planning for presentation.
- Effectiveness of presentation.
- Depth of knowledge and skills.
- Attendance record, daily diary, departmental reports shall also be analyzed along with the Internship Report.



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Constitution of India

23CE3509	MC	Constitution of India	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1 hr/week	Continuous Assessment -I : 25 Marks
	Continuous Assessment -II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Define the meaning and features of Indian constitution and scheme of fundamental duties.
CO2	Illustrate federal structure of power, directive principles of state policy and emergency provisions in Constitution of India
CO3	Illustrate Amendment of the Constitutional Powers and emergency provisions in Constitution of India
CO4	Illustrate the local self-government and rights to certain freedom under article 19 and 21.

Course Content:

Unit 1: Introduction to constitution Meaning of the constitution law and constitutionalism, Historical perspective of the Constitution of India, Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights. The scheme of the Fundamental Duties and its legal status	[6]
Unit 2: Organization structures and their functions The Directive Principles of State Policy Its importance and implementation, Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India - The constitution powers and status of the President of India	[6]
Unit 3: Constitutional Powers Amendment of the Constitutional Powers and Procedure. The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency 167	[6]
Unit 4: Constitutional Schemes in India Local Self Government Constitutional Scheme in India, Scheme of the Fundamental Right to Equality, Scheme of the Fundamental Right to certain Freedom under Article 19. Scope of the Right to Life and Personal Liberty under Article 21	[6]

Text Books:

1. Constitution of India Published by Government of India Ministry of Law and Justice (Legislative Department), 2020
2. Textbook on The Constitution of India by SR Bhansali Constitution of India by Bakshi P M January 2014



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Aptitude Skills- III (Verbal Ability)

23HSSM05	VEC	Aptitude Skills- III	1-0-0	Audit
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Teaching Scheme	Evaluation Scheme:
Lecture: 1 hr/week	Continuous Assessment-I : 25Marks
	Continuous Assessment-II : 25Marks

Pre-Requisites: Aptitude Skills- I and II

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve the questions on ordering of words & Parts of Speech
CO2	Organize contents of Business Communications such as CV, emails and letters.
CO3	Solve the questions based on jumbled paragraphs and reading comprehension.
CO4	Solve the questions on spotting error and sentence correction.
CO5	Summarize proceedings of any event or conference.
CO6	Discuss about current and critical issues during group discussion.

Course Contents:

Unit 1	Parts of Speech, Punctuation Word Family (Using the same word as different Parts of Speech)	[2] [2]
Unit 2	Analogy, Letter Writing (Formal), E-Mail Writing, CV Writing	[2]
Unit 3	Reading Comprehension, Paragraph Jumbles	[2]
Unit 4	Spotting Errors (in different parts of sentence), Subject-Verb Agreement Sentence Correction, Sentence Completion	[2]
Unit 5	One Word Substitution, Narrating Events /Reports, Summary/ Precis Writing	[2]
Unit 6	Dialogue writing, Group Discussion, Interview Skills (Using formal notations & gestures etc.)	[2]

Text Books:

1. Raymond Murphy, Essential English Grammar with Answers, Murphy
2. Objective General English by R.S. Aggarwal, S Chand Publishing; Revised edition (15 March 2017)

Reference Books:

1. Rao and, D,V, Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition



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Language Skill-III

23HSSM06	VEC	Language Skill- III	0-0-2	Audit
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Teaching Scheme:	Evaluation Scheme:
Practical: 2hrs/week	Continuous Assessment-I : 25Marks Continuous Assessment-II : 25Marks

Pre-Requisites: Language Skill- I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop a program to read input and return output.
CO2	Develop a program using data types, String and variables
CO3	Develop a program using Unary, Binary and Ternary operator
CO4	Develop a program using Conditional and Logical statements.

1. Write a Python program to print "Hello, World!" Objective: Understand basic syntax, indentation, and output.	[2]
2. Write a program to demonstrate the use of different types of comments in Python. Objective: Single-line and multi-line comments.	[2]
3. Write a Python program that declares different types of variables and displays their data types using the type () function. Objective: Variables, data types, and type identification.	[2]
4. Write a program to demonstrate type casting and type conversion between int, float, and string. Objective: Type conversion, casting functions.	[2]
5. Write a Python script to perform string operations such as slicing, concatenation, upper (), lower (), and len (). Objective: String manipulation and built-in functions.	[2]
6. Write a program to demonstrate the use of all arithmetic, logical, and bitwise operators. Objective: Operator functionality.	[2]
7. Write a Python program to use membership and identity operators with examples. Objective: in, not in, is, is not.	[2]
8. Write a Python program using a ternary operator to find the larger of two numbers. Objective: Conditional (inline) expressions.	[2]
9. Write a program that takes user input for age and prints whether the person is a child, teenager, adult, or senior citizen using if-elif-else. Objective: Conditional statements and user input.	[2]



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10. Write a program to find the sum of the first 10 natural numbers using a while loop. Objective: Looping with while.	[2]
11. Write a Python script to display the multiplication table of a number using a for loop. Objective: Looping with for and range ().	[2]
12. Write a program that uses break, continue, and pass statements in appropriate looping scenarios. Objective: Loop control statements.	[2]
Text Books: 1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication 2. Murach's Python Programming. Aut.: Michael Urban, Joel Murach, murach's Publication.	
Reference Books: 1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2nd Edition. Author: K.A. Kambert	



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Shri ShamraoPatil (Yadavkar) Educational & Charitable Trust's
Sharad Institute of Technology College of Engineering
 Yadav (Ichalkaranji)-416121, Dist. – Kolhapur
 (An Autonomous Institute)

Rev: Course Structure /01/NEP/2024-25
Class: T.Y. B. Tech

Department: Civil Engineering
Semester: VI

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE3601	PCC	Design of Concrete Structure -I	03	-	-	03	10	10	30	50	100	03
23CE3602	PCC	Structural Analysis	03	-	-	03	10	10	30	50	100	03
23CE3603	PCC	Soil Mechanics	03	-	-	03	10	10	30	50	100	03
23CE3604	ELC	Water Resources Engineering	01	-	-	01	25	25	-	-	50	Audit
23CE3605	PCC	Soil Mechanics Laboratory	-	-	02	02	25	25	-	-	50	01
23CE3606	PCC	Water Resources Engineering Laboratory	-	-	02	02	15	15	-	20	50	01
23CE3607	VSEC	Structural Design and Drawing –I Laboratory	-	-	02	02	15	15	-	20	50	01
23CEPEXX	PEC	PEC –II	03	-	-	03	10	10	30	50	100	03
23CEPEXX	PEC	PEC –III	03	-	-	03	10	10	30	50	100	03
23CEMDXX	MDM	From Basket	03	-	-	03	10	10	30	50	100	03
23CE3608	ELC	Project-I	-	-	02	02	25	25	-	50	100	02
23HSSM07	VEC	Aptitude skill- IV	01	-	-	01	25	25	-	-	50	Audit
23HSSM08	VEC	Language skill-IV	-	-	02	02	25	25	-	-	50	Audit
TOTAL			20	-	10	30	215	215	180	390	1000	23

Program Elective Courses – II

(Subject 1)	(Subject 2)	(Subject 3)
Sustainable and Green Construction (23CEPE12)	Railways and Airport (23CEPE22)	Disaster Management (23CEPE32)

Program Elective Courses - III

(Subject 1)	(Subject 2)	(Subject 3)
Advanced Foundation Engineering (23CEPE13)	Tunnel and Bridge Engineering (23CEPE23)	Waste water Treatment (23CEPE33)

Multidisciplinary Minor – IV

Infrastructure Engineering (Basket A)	Architectural Aspect (Basket B)	Transportation Engineering (Basket C)
Safety Management (23CEMDA4)	Rehabilitation of RCC Structure (23CEMDB4)	Traffic Engineering (23CEMDC4)



M. N. Naveen

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Verified
Dr. S. V. Kumbhar



Design of Concrete Structure-I

23CE3601	PCC	Design of Concrete Structure- I	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Pre-Requisites: Strength of material

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the concept of RCC structural design.
CO2	Analyze and design of beam(Singly reinforced, Doubly reinforced and Flanged Beam)
CO3	Study the bond type, Significance of deflection and Design of shear reinforcement& torsion reinforcement for the beam.
CO4	Analyze and design of Slab(One Way, Two Way and stair case)
CO5	Analyze and design of axially and eccentrically loaded Column(Rectangular and Circular)
CO6	Design of isolated footing and combined footing.

Course Content:

Unit 1: Introduction to RCC Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Different design philosophies, various limits states, Characteristic strength and Characteristic load, Load factor, Partial safety factors. Limit state of collapse (flexure): Analysis and Design of singly reinforced rectangular sections.	[6]
Unit 2: Limit state of collapse (flexure) Limit state of collapse (flexure): Analysis and Design of Doubly Reinforced rectangular sections, Analysis and Design of singly reinforced T and L beams.	[6]
Unit 3: Limit State of Collapse(Torsion & Shear) A) Limit State of Collapse – Torsion Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion. B) Limit state of collapse (shear and bond): Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length. C) Limit state of serviceability: Cracking-classification and Types of Cracks, Causes, Mechanism, and IS recommendations.	[7]
Unit 4: Design of slabs A) Design of slabs: Cantilever Slab, Simply supported One way slab, Two way slab with different support conditions as per IS:456-2000	[7]



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B) Design of Simply Supported single flight and Dog legged staircase	
Unit 5: Design of column Analysis and Design of axially and eccentrically (uni-axial) loaded circular and rectangular columns, circular column with helical reinforcement.	[6]
Unit : 6 Design of Footing Design of isolated rectangular column footing with constant depth subjected to axial load and moment, Concept of combined rectangular footing.	[7]

Text books:

1. Limit state theory and Design –Karve and Shah , Structures publications , Pune.
2. Limit State Design of reinforced concrete P.C.Varghese, Prentice Hall, New Delhi.
3. Reinforced Concrete Design – Limit state - A.K. Jain Nem Chand brothers Roorkee.

Reference books:

1. IS 456-2000, Plain And Reinforced Concrete - Code Of Practice
2. IS 1343 (1980): Code of Practice for Prestressed Concrete
3. Reinforced Concrete Design- B.C. PunmiaLaxmi publications New Delhi.
4. Reinforced Concrete Design-M. L. Gambhir-Mcmillan India Ltd. New Delhi.



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Structural Analysis

23CE3602	PCC	Structural Analysis	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: Strength of material

Course Outcomes: At the end of the course, students will be able to:

CO1	Make a use of Euler's and Rankine's theory for analyzing column.
CO2	Determine the determinate beam using various techniques.
CO3	Formulate the static and kinematic indeterminacy.
CO4	Develop the Shear force and Bending Moment diagrams for indeterminate beams by Clapeyron's three moment theorems and moment distribution method.
CO5	Develop the Shear force and Bending Moments diagrams for indeterminate beams by slope deflection method.
CO6	Analyze the continuous beams and portal frames by Matrix method.

Course Content:

Unit 1: Column Critical load and buckling of load, Euler's theory, Limitations of Euler's formula, Equivalent length for various end conditions, Rankin's theory Principal planes and stresses Principal planes and stresses in two dimensions, concept of principal planes and stresses by analytical and graphical method- Mohr's circle method Influence line diagram Concepts of influence lines-ILD for reactions, SF and BM for determinate beam	[6]
Unit 2: Slope and Deflection of beam Slope and deflection of determinate beam, double integration method, Maculay's method, Moment area method, Conjugate beam method.	[7]
Unit 3: Static and Kinematic Indeterminacy Classification of Structures, degrees of freedom, static and kinematic indeterminacy for beams, Determination of Static and Kinematic Indeterminacy, Consistent Deformation method and its numerical of continuous beams, propped cantilever (up to two degree of redundancy)	[6]



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Unit 4: Deflection of Beams: Clapeyron's Three Moment Theorem: Introduction , application to continuous beams (up to 2span) with different MI Moment Distribution Method: Introduction, application to continuous beams (up to 2span) with different MI and simple orthogonal portal frames (without sway)	[7]
Unit 5: Slope and Deflection Method Introduction, application to continuous beams (up to 2 span), Sinking of supports, Portal frame without sway analysis.	[6]
Unit 6: Matrix Method Flexibility Matrix Method: Flexibility coefficient, Development of flexibility matrix, applications to propped cantilever, fixed beam and continuous beam. (Degree of S.I. ≤ 2), Stiffness Matrix Method: Stiffness coefficient, Development of stiffness matrix, applications to beams and portal frames (Degree of K.I. ≤ 2)	[7]

Text Books:

1. Punmia B.C., "Structural Analysis", Laxmi Publications
2. Khurmi R.S., "Theory of Structures", S Chand, Delhi
3. Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, 3rd edition 2010
4. Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
5. Wang C.K., "Statically Indeterminate Structures", McGraw Hill

Reference Books

1. Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi
2. Hibbler R. C., "Structural Analysis", Pearson Publications, 9th Edition
3. Timoshenko and Young, "Theory of structures", McGraw Hill
4. Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH



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Soil Mechanics

23CE3603	PCC	Soil Mechanics	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Discuss various index properties, their interrelationship, characterization and classification of soil.
CO2	Estimate the permeability and seepage through soil mass by applying basic hydraulic flow principles.
CO3	Discuss compaction and methods to measure the field compaction.
CO4	Determine shear strength through laboratory processes under different drainage conditions, and evaluate stress distribution within the soil mass for various loading patterns.
CO5	Assess compaction and consolidation settlement of soil for given loading conditions
CO6	Determine earth pressure for earth retaining structure

Course Content:

Unit 1: Introduction to Soil Mechanics Index properties of soil: - Three phase soil system ,Terminology used in basic soil properties (Voids ratio, Porosity, Degree of saturation, Percentage air voids, air content, different densities & unit weights) and their interrelationship Soil consistency: - Atterberg's limits and their significance. Soil classification: - Soil classification based on particle size, Grain size distribution by mechanical & sedimentation analysis, I.S. classification system of soil, soil structure	[6]
Unit 2: Flow of water through soil Permeability – head, gradient and potential, Darcy's law and its validity, Factors affecting permeability, Field and laboratory methods of determining permeability, seepage pressure, Quicksand condition, critical hydraulic gradient, ,	[6]
Unit 3: Compaction and consolidation Theory of compaction, factors influencing compaction, compacted density. Laboratory Standard and Modified compaction test, Method and measurement of field compaction Consolidation: -Basic terminology, Terzaghi's theory of one-dimensional consolidation, consolidation test	[6]



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Unit 4: Shear Strength & Stress Distribution in Soil: Concept of shear, Coulomb's theory and failure envelope, Representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesion less in terms of total stress & effective stress, Peak and Residual shear strength, factors affecting shear strength.	[8]
Unit 5: Shear Test methods and Distribution in soil Different types of shear tests: - Unconsolidated Undrained (U-U), Consolidated Undrained (C-U), and Consolidated drained test (C-D). Box shear test, Triaxial compression test with pore pressures, Unconfined compression test. Stress Distribution in Soil: Boussineq's Equation for point load, Vertical pressure under uniformly loaded circular area and uniformly loaded rectangular area, Pressure bulb, and its significance	[6]
Unit 6: Earth pressure theory Earth pressure: Concepts, area of application, Earth pressure at rest, active and passive conditions. Rankin's and Coulomb's theory of earth pressure, Stability of slopes: Classification of slopes and their modes of failure, Landslides-causes and remedial measures	[4]

Text books:

1. Soil Mechanics and Foundation Engineering- B.C. Punmia [Laxmi Publications (Pvt) Ltd, New Delhi]
2. Basic and Applied Soil Mechanics (Revised Edition) – Gopal Rajan and Rao A.S.R. (New Age, New Delhi. 1998)
3. Soil Mechanics and Foundation Engineering - Dr. K. R. Arora, [Standard Publication]
4. Soil Mechanics and Foundation Engineering -V.N.S. Murthy [UBS publishers and distributors, New Delhi]
5. Geotechnical Engineering - C. Venkatachalam [New Age International (I) Ltd, New Delhi]

Reference books:

1. Soil Mechanics in Engineering Practice - Terzaghi and Peck, John Wiley and sons, New York
2. Fundamentals of Soil Mechanics - Taylor D.W, [John Wiley, New York]
3. Soil mechanics in theory and practice- Alam Singh [Asian Publishing House, Bombay]
4. Soil Testing -T.W. Lambe [Willey Eastern Limited, New Delhi]
5. Geotechnical Engineering by Shashi K. Gulati & Manoj Datta, Tata McGraw Hill



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Water Resources Engineering

23CE3604	ELC	Water Resources Engineering	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1 hrs/week	Continuous Assessment -I : 25 Marks
	Continuous Assessment -II : 25 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the components of the hydrological cycle and methods for measuring precipitation and other hydrological parameters.
CO2	Analyze groundwater flow characteristics using Darcy's Law and assess well performance in confined and unconfined aquifers for irrigation purposes.
CO3	Evaluate surface water flow using hydrographs, estimate flood discharge, and apply reservoir planning concepts including storage capacity estimation and sedimentation control
CO4	Explain various irrigation methods and calculate crop water requirements, as well as design canal systems using Kennedy's and Lacey's theories.
CO5	Explain the function of canal structures such as diversion head works, regulatory works, and distribution systems for effective water management
CO6	Demonstrate an understanding of integrated water resources planning and management, including multipurpose projects, national policies, water budgeting, and river interlinking.

Course Content:

Unit 1: Introduction to Water Resources Engineering Importance, Scope, and Development of Water Resources in India, Hydrological Cycle and Precipitation – Types, Measurement & Data Analysis, Other Hydrological Parameters – Evaporation, Infiltration, Runoff, and Stream flow Estimation	[2]
Unit 2: Groundwater Hydrology and Well Irrigation Occurrences and distribution of ground water, specific yield of aquifers, Darcy's law, permeability, safe yield of basin. Hydraulics of wells under steady flow condition in confined and unconfined aquifers, specific capacity of well, well irrigation: tube wells, open wells	[3]
Unit 3: Surface Water Flow and Reservoir Planning Hydrographs, Flood Estimation, and Routing Techniques, Reservoir Planning – Types, Storage Zones, and Capacity Estimation, Sedimentation in Reservoirs – Causes, Control Measures, and Trap Efficiency	[3]
Unit 4: Irrigation Engineering Methods of Irrigation – Surface, Subsurface, Sprinkler, and Drip, Water Requirements of Crops – Duty, Delta, Base Period, Crop Seasons, Canal Irrigation – Canal Design (Kennedy's and Lacey's Theories), Canal Losses	[3]
Unit 5: Canal Structures and Distribution Systems Diversion Head works – Weirs, Barrages, and Energy Dissipation, Canal Regulatory Works – Falls, Cross Regulators, Outlets, Escapes	[2]





Unit 6: Water Resources Planning and Management

[2]

Multipurpose Projects, Water Budgeting, National Water Policy, and Interlinking of Rivers

Text books:

1. "Irrigation Engineering& Hydraulic Structures" by S. K. Garg (Khanna Publishers, Delhi).
2. "Water Resources & Irrigation Engineering" by Dr. K. R. Arora (Standard Publisher).
3. "Irrigation, Water Resources and Water Power Engineering" by Dr P.N. Modi (Standard BookHouse).
4. "Irrigation and Water Power Engineering"by Dr. Punmia and Dr. Pande(Laxmi Publications,Delhi).
5. "Irrigation Engineering" by Raghunath(Wiley Eastern Ltd, New Delhi).

Reference books:

1. "Engineering Hydrology" by K. Subramanya(Tata McGraw Hill Publishers, New Delhi).
2. "Hydrology" by H.M. Raghunath (Wiley Eastern Publication, New Delhi).
3. "Irrigation Engineering and Hydraulics" by Sharma R.K (Oxford & IBH Publishing Co., New Delhi).
4. "Applied Hydrology" by Ven Te Chow(Tata McGraw Hill Publishers, New Delhi).
5. "Irrigation Engineering" by Dahigaonkar (Asian Book Pvt Ltd).
6. "Irrigation Engineering" by S. R. Sahastrabudhe (Katson Publishers).



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Soil Mechanics Laboratory

23CE3605	PCC	Soil Mechanics Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hr/week	Continuous Assessment -I : 25 Marks
	Continuous Assessment -II : 25 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify Index properties of soil
CO2	Experiment with soil to identify the coefficient of permeability.
CO3	Examine soil strength parameter

Course Content:

1. Specific gravity determination of coarse and fine grained soil by Pycnometer bottle method.
2. Particle size distribution- Mechanical sieve analysis and IS classification as per IS code.
3. Determination of Atterberg's consistency limits and their use in soil classification as per IS code.
4. Determination of coefficient of permeability by a) constant head b) variable head method
5. Field density determination: a) Sand replacement b) Core cutter method
6. Standard Proctor compaction test
7. Direct box shear test
8. Unconfined compression test
9. Tri-axial test

Project:

A group of five students should collect soil sample from different territory and perform any five tests (included in syllabus) on it. Prepare a report including proper evidences, result and conclusion.

Text books:

1. Soil Mechanics and Foundation Engineering- B.C. Punmia [Laxmi Publications (Pvt) Ltd, New Delhi]
2. Basic and Applied Soil Mechanics (Revised Edition) – Gopal Rajan and Rao A.S.R. (New Age, New Delhi. 1998)
3. Soil Mechanics and Foundation Engineering - Dr. K. R. Arora, [Standard Publication]
4. Soil Mechanics and Foundation Engineering -V.N.S. Murthy [UBS publishers and distributors, New Delhi]
5. Geotechnical Engineering - C. Venkatachalam [New Age International (I) Ltd, New Delhi]

Reference books:

1. Soil Mechanics in Engineering Practice - Terzaghi and Peck, John Wiley and sons, New York
2. Fundamentals of Soil Mechanics - Taylor D.W, [John Wiley, New York]
3. Soil mechanics in theory and practice- Alam Singh [Asian Publishing House, Bombay]
4. Soil Testing -T.W. Lambe [Wiley Eastern Limited, New Delhi]



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Water Resources Engineering Laboratory

23CE3605	PCC	Water Resources Engineering Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hr/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Analyze precipitation and hydrological parameters.
CO2	Evaluate surface and subsurface water flow.
CO3	Develop irrigation and water control structures
CO4	Analyze water resource planning and flood management

Course Content:

1. **Rainfall Analysis**- Arithmetic mean, Thiessen polygon, and Isohyetal methods
2. **Rainfall Intensity-Duration-Frequency** - Estimation using empirical formulas (e.g., Sherman's, Gumbel's)
3. **Runoff Estimation**- Rational method, Curve Number (SCS-CN) method
4. **Infiltration**- Estimation using Horton's and ϕ -index methods
5. **Evaporation**- Estimation using water budget and empirical equations (e.g., Meyer's equation)
6. **Stream flow Estimation**- Flow duration curve and stage-discharge relationship
7. **Darcy's Law Applications**- Seepage flow through soil strata, permeability calculation
8. **Discharge Calculation**- For wells in confined and unconfined aquifers under steady state
9. **Specific Yield & Specific Capacity**- Determination using drawdown and recovery data
10. **Well Irrigation Analysis**- Discharge and efficiency of open wells and tube wells
11. **Hydrograph Analysis**- Base flow separation, Unit Hydrograph derivation
12. **Flood Estimation**- Return period calculation using frequency analysis (Gumbel/Log-Pearson)
13. **Flood Routing Techniques**- Muskingum method and storage-indication method
14. **Reservoir Capacity Estimation**- Contour area method, mass curve and demand curve analysis
15. **Sedimentation**- Trap efficiency estimation using Brune's curve
16. **Duty, Delta, and Base Period**- Calculation for various crops
17. **Water Requirement of Crops**- Irrigation scheduling and net/gross irrigation requirement
18. **Canal Design Problems**- Using Kennedy's and Lacey's theories, Determination of hydraulic mean depth, area, velocity, and slope
19. **Canal Losses**- Estimation using empirical formulas for seepage and evaporation losses
20. **Weir and Barrage Calculations**- Discharge over weirs using broad-crested and sharp-crested equations
21. **Energy Dissipation**- Stilling basin design – calculation of tail water depth and jump height





- 22. **Canal Regulation Works-** Discharge computations in outlets and escapes
- 23. **Water Budgeting-** Monthly/yearly inflow-outflow balance sheet for a watershed
- 24. **Reservoir Operation-** Simulation of reservoir operation under different demand conditions
- 25. **Project Evaluation-** Estimation of water savings and increased yield from multipurpose projects
- 26. **Interlinking Rivers-** Basic estimation of water transfers, volumes, and feasibility components (introductory level)

Text books:

1. "Irrigation Engineering& Hydraulic Structures" by S. K. Garg (Khanna Publishers, Delhi).
2. "Water Resources & Irrigation Engineering" by Dr. K. R. Arora (Standard Publisher).
3. "Irrigation, Water Resources and Water Power Engineering" by Dr P.N. Modi (Standard BookHouse).
4. "Irrigation and Water Power Engineering" by Dr. Punmia and Dr. Pande(Laxmi Publications, Delhi).
5. "Irrigation Engineering" by Raghunath(Wiley Eastern Ltd, New Delhi).

Reference books:

1. "Engineering Hydrology" by K. Subramanya(Tata McGraw Hill Publishers, New Delhi).
2. "Hydrology" by H.M. Raghunath (Wiley Eastern Publication, New Delhi).
3. "Irrigation Engineering and Hydraulics" by Sharma R.K (Oxford & IBH Publishing Co., New Delhi).
4. "Applied Hydrology" by Ven Te Chow(Tata McGraw Hill Publishers, New Delhi).
5. "Irrigation Engineering" by Dahigaonkar (Asian Book Pvt Ltd).
6. "Irrigation Engineering" by S. R. Sahastrabudhe (Katson Publishers).



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Structural Design and Drawing –I Laboratory

23CE3606	VSEC	Structural Design and Drawing –I Laboratory	0-0-2	1 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical: 2 hr/week	Continuous Assessment -I : 15 Marks Continuous Assessment -II : 15 Marks End Semester Exam : 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Analysis and design of industrial building with all connection.
CO2	Analysis and design building/Bridge/Plate girder.
CO3	Draw the detailed section for steel structure.

Course Content:

The lab work shall consist of structural analysis, design and detailing of the following structures along with necessary drawings.

1. Industrial Shed:

- Roof truss, purlin and connections.
- Gantry girder.
- Column
- Foundation.

2. Any one of following

A. Building Frames:

- Secondary and main beams
- Column and column bases
- Beam- to- beam connection
- Column- beam connection

B. Foot Bridge:

- Influence lines
- Cross beam
- Main Truss
- Raker
- Joint details
- Support details

C. Welded Plate Girder :

- Design of cross section
- Curtaiment of flange plates
- Stiffeners and connections.

Note: - Analysis results of the first problem shall be compared with the results by any standard software package





Text books:

1. Duggal S. K., “Design of Steel Structures”, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Gambhir, “Fundamentals of Structural Steel Design”, Tata McGraw Hill Pub. Co. Ltd., New Delhi
3. Dayaratnam P., “Design of Steel Structures”, Wheeler Publishing, New Delhi
4. Subramanian N., “Steel Structures: Design and Practice” Oxford Univ. Press, Delhi

Reference books:

1. Publications of Bureau of Indian Standards, New Delhi, IS 800:1984, 2007, IS 875 (Part I to V)
2. Vazirani & Ratwani, “Design of Steel Structures”, Standard Book House, New Delhi
3. Duggal S. K., “Limit State Design of Steel Structures”, Tata McGraw Hill Pub. Co. Ltd., New Delhi
4. Salmon and Johnson, “Steel Structures: Design and Behaviour”, Harper and Row, New York
5. Steel Designers Manual



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PEC-II

23CEPE12	PEC	Sustainable and Green Construction	3-0-0	3 Credits
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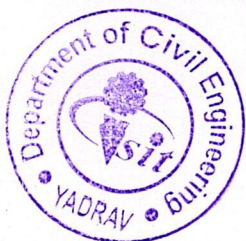
Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the principles and importance of sustainability in construction.
CO2	Apply green building certifications and standards in construction projects.
CO3	Evaluate and select sustainable materials and techniques.
CO4	Implement energy and water-efficient strategies in construction practices.
CO5	Adopt pollution control measures and sustainable construction practices.
CO6	Analyze case studies and future trends to design innovative sustainable solutions.

Course Content:

Unit 1: Fundamentals of Sustainable Construction Definition, scope, and significance of sustainable construction. Environmental impacts of construction activities. Introduction to Sustainable Development Goals (SDGs). Indian regulatory frameworks and policies (ECBC, NBC, and other green construction policies).	[6]
Unit 2: Green Building Standards and Certifications Introduction to green buildings: Definition, features, and components. Overview of Indian and international certification systems: GRIHA, IGBC, LEED, and BREEAM. Concepts of Life Cycle Assessment (LCA) and Carbon Footprint. Energy-efficient designs and renewable energy integration. Water conservation techniques: Rainwater harvesting and grey water recycling.	[6]
Unit 3: Sustainable Construction Materials and Techniques Sustainable construction materials: Bamboo, fly ash, recycled concrete, geopolymers, etc. Low-carbon and waste-reducing construction methods. Smart materials for sustainable construction. Prefabricated and modular construction. Waste management and recycling in construction.	[6]
Unit 4: Energy and Resource Efficiency Passive design strategies: Orientation, ventilation, and thermal mass. Energy-efficient HVAC and lighting systems. Integration of renewable energy systems (solar, wind, geothermal). Strategies for reducing energy demand in buildings. Water conservation techniques: Rainwater harvesting, grey water recycling, and low-flow fixtures.	[6]
Unit 5: Green Practices and Pollution Control Topics: Sustainable site selection and planning. Environmental Impact Assessment (EIA). Use of Building Information Modeling (BIM) for sustainability. Indoor air quality and sustainable	[6]



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interiors. Construction site safety and pollution control measures.

Unit6: Case Studies and Emerging Trends

Case studies of sustainable buildings in India (e.g. Suzlon One Earth, Infosys Pocharam Campus). Challenges in implementing sustainable practices. Emerging trends: Net-zero energy buildings, smart cities. Circular economy in construction.. Challenges and future of sustainable construction in India. Policy initiatives and incentives for green construction in India.

[6]

Text books:

1. Sustainability in Construction Engineering by J. P. Chaudhary.
2. Green Building and Sustainable Development by Arvind Krishan and Simos Yannas.
3. Environmental Science and Engineering by Anubha Kaushik and C. P. Kaushik.
4. Building Materials by P.C. Varghese.
5. Building Construction by B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain.

Reference books:

1. Sustainable Construction: Green Building Design and Delivery by Charles J. Kibert.
2. Handbook of Green Building Design and Construction by Sam Kubba.
3. Sustainable Building Design Manual (Vol. 1 & 2) by TERI (The Energy and Resources Institute).
4. Green Buildings: Concepts and Cases by Ashish Rakheja and Ajay Mathur.
5. Energy-efficient Buildings in India by Mili Majumdar (TERI Press).



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PEC-II

23CEPE22	PEC	Railway and Airport	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Know about railway track components, their materials, size, function and importance
CO2	Carry out geometric design of railway track
CO3	Recognize about various components railway tracks, stations, yards, signaling, interlocking and
CO4	Identify the term used in airport and its classification, survey conducted for site selection
CO5	Planning and design of airport
CO6	To understand grading and drainage of airport

Course Content:

Unit 1: Introduction to Railway Permanent way and railway track components, different gauges in India, conning of wheels, Functions of various Components - Rails, Sleepers and Ballast, Rails - types of rails, rail sections, defects in rails, creep of rails, rail fixtures and fastenings, rail joints and welding of rails, sleepers – types, spacing and density, Ballast – types, advantages and disadvantages	[8]
Unit 2: Geometric design in railway Geometric design of railway track: gradients, grade compensation, speed of trains on curves, super elevation, cant deficiency, negative super elevation, curves, widening on curves. Track layouts, Switches, Tongue Rails, Crossings, coning	[5]
Unit 3: Railway station Facilities Railway stations-requirements, facilities, classifications, platforms, loops, sidings. Railway yards – types, equipment in yards. Signaling and control system – objectives, classification, Interlocking of signals and points	[5]
Unit 4: Introduction to Airport Engineering Airport Authority, agencies, Functions of AAI, Terms in airport terminology, component parts of aeroplane, Introduction and classifications of aerodrome, airport survey objectives, types. Advantages and limitation of air transport, factors affecting site selection of airport	[6]
Unit 5: Airport Planning and Design Airport classifications, Airport size, Airport obstruction, zoning laws, regional planning, environmental considerations, orientation of runways, Runway design, length, correction to basic length of runway, geometric design of runways, hangers and taxiway, airport capacity	[6]





Unit 6: Airport Grading and Drainage

Airport grading-importance, operations, airport drainage aims, functions, special characteristics, basic requirements, Design of drainage - surface and subsurface drainage systems

[6]

Text books:

1. K. P. Subramanian, "Highway Railways airport and harbour Engineering", SCITECH Publications (India) Pvt. Ltd. Chennai
2. Rangwala., " Airport Engineering", Charotar Publishing House Pvt.Ltd., Anand, Gujrat.
3. Bindra and Arora, " Highway Engineering", Standard Publishers
4. Vazirani V.N. and Chandola S.P., " Transportation Engineering", Vol I and Vol II Khanna Publishers, New Delhi

Reference books:

1. Alonzo Def. Quinn, Design and Construction of Ports and Marine Structure, McGraw - Hill Book Company, New York
2. Ashford N. and Wright P.H., Airport Engineering, John Wiley and Sons, Inc., New York
3. Horonjeff R and Mackelvey F.X., Planning and Design of Airports fourth Intl.edition, McGraw Hill Book Co., New Delhi
4. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros., Roorkee
5. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi



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PEC-II

23CEPE32	PEC	Disaster Management	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the principles and concepts of disaster management and their application.
CO2	Analyze the causes, impacts, and mitigation strategies of natural and man-made disasters.
CO3	Assess disaster risks and develop community-based disaster preparedness plans.
CO4	Apply technology, including GIS and remote sensing, for disaster management.
CO5	Evaluate policies, frameworks, and case studies for effective disaster response and recovery.
CO6	Identify and implement disaster mitigation and response strategies in real-world scenarios.

Course Content:

Unit 1: Introduction to Disaster Management Definition, concepts, and classification of disasters. Understanding risk, hazard, vulnerability, and capacity. Disaster management cycle: Prevention, mitigation, preparedness, response, and recovery. Impact of disasters on life, property, environment, and economy.	[6]
Unit 2: Natural Disasters Types of natural disasters: Earthquakes, floods, cyclones, tsunamis, droughts, and landslides. Causes, effects, and mitigation strategies. Role of climate change in disaster frequency and intensity. Case studies of natural disasters in India.	[6]
Unit 3: Man-Made Disasters Industrial and chemical accidents, nuclear disasters, biological hazards. Urban disasters: Fires, building collapses, and road accidents. Terrorism, cyber-attacks, and environmental degradation. Mitigation and preparedness strategies for man-made disasters.	[6]
Unit 4: Disaster Preparedness and Risk Assessment Risk identification, hazard mapping, and vulnerability analysis. Early warning systems and disaster forecasting. Role of GIS, remote sensing, and ICT in disaster management. Community-based disaster preparedness and planning.	[6]
Unit 5: Disaster Response, Recovery, and Mitigation Emergency response and rescue operations. Coordination between agencies: NDMA, SDMA, and local bodies. Post-disaster rehabilitation and reconstruction: Structural and non-structural mitigation measures.	[6]
Unit 6: Policies and Frameworks for Disaster Management in India Disaster Management Act, 2005. Role of NDMA, SDMA, and NIDM. International	[6]



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frameworks: Sendai Framework for Disaster Risk Reduction. Case studies of disaster management success stories in India.

Text books:

1. Sharma, Vinod K. "Disaster Management." Medtech, 2013.
2. Gupta, Harsh K. "Disaster Management." Universities Press, 2003.
3. Goyal, S.L. "Disaster Management." Deep & Deep Publications, 2008.

Reference books:

1. Coppola, Damon P. "Introduction to International Disaster Management." Butterworth-Heinemann, 2015.
2. Carter, W. Nick. "Disaster Management: A Disaster Manager's Handbook." Asian Development Bank, 1992.
3. Singh, Rajesh K. "Natural Hazards and Disaster Management." Sarup & Sons, 2006.
4. Alexander, David. "Principles of Emergency Planning and Management." Oxford University Press, 2002.



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PEC-III

23CEPE13	PEC	Advance Foundation Engineering	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks
	Continuous Assessment -II : 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Show the skill for planning subsurface investigation of soil.
CO2	Demonstrate the knowledge on shallow foundation under different loading conditions.
CO3	Illustrate the concept of pile foundation and application under different ground conditions.
CO4	Interpret the application of retaining wall.
CO5	Able to exhibit the knowledge of ground improvement techniques under different site requirements.
CO6	Apply the fundamentals of RCC as applied to advanced foundation.

Course Content:

Unit 1: Subsurface Exploration Introduction, Soil Exploration Planning, Boring and Sampling Methods, Water Table Assessment, Introduction to various Field Tests – Vane Shear Test, CPT, PMT	[6]
Unit 2: Foundation Analysis Shallow foundations, Methods of finding Bearing Capacity of Soil for footings, Foundation under eccentric and inclined loading, foundation on slope, tilted base, settlement estimation methods on footings and rafts, beam concept on elastic foundation.	[6]
Unit 3: Pile Foundation Introduction, types of Piles, Pile capacity in sand and clay, Pile capacity in rocks, Pile settlement, Group piles.	[5]
Unit 4: Retaining Walls Gravity and Cantilever, Stability, Introduction to Mechanically stabilized Retaining Walls.	[5]
Unit 5: Ground Improvement Introduction to Ground Improvement Techniques, Approach to different Methods – Compaction, Blasting, Pre-Compression, Sand Drains, Pre-fabricated Vertical drains, Chemical Stabilization.	[6]
Unit 6: Caissons and Legal aspects Caisson's foundation – Application, capacity and construction methods, Shoring and underpinning. Legal aspects of foundation engineering, Report submission on soil exploration.	[6]



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Text books:

1. Braja M. Das, "Principles of Foundation Engineering" PWS Publishing USA, 1999.
2. Bowles J.E. "Foundation Analysis and Design", 1997, 5th Ed. McGraw-Hill, Singapore.
3. Dr. K.R. Arora "Soil Mechanics & Foundation Engineering", Standard Publisher Distribution.
4. Murthy V.N.S. "Geotechnical Engineering: Principle and Practices of Soil Mechanics and Foundation Engineering", Marcel Dekker, Inc. New York.
5. Ranjan G. and Rao A.S.R. "Basics and Applied Soil Mechanics", New Age International.

Reference books:

1. Winterkorn and Fang " Foundation Engineering Handbook"
2. Temlinson M.J. "Foundation Design and Construction". ELBS Publication.
3. Muni Budhu "Soil Mechanics and Foundation", Johan Wiley and Sons Inc.
4. Woodward J. and Tomlinson M. " Pile Design and Construction Practice". 1994.



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PEC-III

23CEPE23	PEC	Tunnel and Bridge Engineering	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand principles and basics of tunnel engineering.
CO2	Identify different methods of tunneling in soft and hard rocks.
CO3	Justify the necessity of tunnel lighting, ventilation and safety
CO4	Understand principles and basics of Bridge engineering.
CO5	Understand load and forces of Bridge engineering.
CO6	Decide the selection of a foundation and maintenance in bridge engineering.

Course Content:

Unit 1: Tunnel Introduction Advantages and disadvantages of tunnel with respect to open cuts, tunnel alignment, Classification of tunnel, site investigation for tunnels, Setting out of tunnel, size and shape of a tunnel	[6]
Unit 2: Method of Tunneling methods of tunneling in hard rock's - full face method - heading and bench method - drift method, different methods of tunneling in soft soils including compressed air and shield tunneling.	[6]
Unit 3: Tunnel lighting, ventilation, and safety Shafts in tunnels, lining of tunnels, drainage - pre drainage and dewatering in tunnels, permanent drainage, ventilation, methods of ventilation, Tunnel lighting and types, permanent ventilation, safety measures.	[6]
Unit 4: Bridge Introduction Classification of bridges, selection of site, Bridge Hydrology: determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth, design problems on above topics	[6]
Unit 5: Standard specification for bridges IRC loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design.	[6]
Unit 6: Components of Bridge Types of bridge foundations, Bridge piers, Abutments, Wing walls, bearings. Construction and maintenance of bridges—Introduction; Recent trends in bridges.	[6]



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Text Books:

1. S.P. Bindra, Principles and Practice of Bridge Engineering, Edition 5 (1996), Dhanpat Rai & Sons, New Delhi
2. R Srinivasan, Tunnel engineering, Charotar Pub. House Pvt. Ltd.
3. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi (1996)
1. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd, 1980

Reference Books:

1. Ponnuswamy, Bridge Engineering, Delhi.
2. V N Gharpure, Bridge Engineering.
3. Highway and Bridge Engineering – B.L. Gupta, Amit Gupta Standard publishers Distributors, Delhi.



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PEC-III

23CEPE33	PEC	Waste water Treatment	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Review the knowledge on biological wastewater treatment.
CO2	Identify the sewage characteristics and design various sewage treatment plants.
CO3	Discuss municipal water and wastewater treatment system design and operation.
CO4	Apply environmental treatment technologies and design processes for treatment of industrial waste water.
CO5	Illustrate different sludge handling and treatment system.
CO6	Illustrate effective wastewater land treatment process.

Course Content:

Unit 1: Introduction to Wastewater Treatment Introduction of wastewater, its types and various sources, Necessity of treatment of waste water Introduction to Preliminary treatment: screening and grit removal units, oil and grease removal, Primary treatment, Introduction to Secondary treatment: Activated sludge process, trickling filter, SBR, MBBR.	[7]
Unit 2: Low cost wastewater treatment methods Principles of waste stabilization pond, oxidation pond, aerobic & anaerobic Lagoons. Septic tank and Imhoff tank	[4]
Unit 3: Industrial Waste Water Treatment Sources of Pollution: Sugar industry, textile, dairy, tannery, Edible oil, electroplating industries Pre and Primary Treatment: Equalization, Proportioning, Neutralization, Oil Separation by Floatation, Treatment Methods- UASB, Chemical Precipitation, trickling filter, SBR, MBBR.	[7]
Unit 4: Nitrogen and Phosphorous Removal Nitrification and De-nitrification, Phosphorous removal, Disposal of treated Waste	[6]
Unit 5: Sludge Processing Concept of Up flow Anaerobic Sludge Blanket system. Sludge processing: Sludge mass-volume relationship, Process fundamentals of Thickening, Stabilization, Conditioning, and Dewatering. Concept of gravity thickener, belt press and	[7]



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sludge drying bed.

Unit6: Land Treatment Processes

Land treatment systems: Processes, Removal mechanisms of nutrients, effect on land, conditions for land treatment.

[5]

Text Books:

1. Manual on sewerage and sewage Treatment-Government of India Publication
2. Masters G.M., "Introduction to Environmental Engineering and Science"
3. Metcalf & Eddy, "Waste Water Engineering Treatment & Disposal", Tata McGraw Hill, 1982
4. Garg S.K., "Sewage Disposal and Air Pollution Engineering", KhannaPublishers
5. Rao M.N.&Datta, Waste water treatment
6. EhalersVictor& Earnest W Steel, Municipal and Rural sanitation

Reference Books:

1. Peavey, Rowe D.R. and Tchobanoglous, "Environmental Engineering", McGraw-Hill Book Co.
2. Viessman and Hammer, "Water Supply and Pollution Control", Harper Collins College Pub.
3. Hammer M.J., "Water and Waste water Technology", Prentice-Hall of India Private Limited



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MDM-IV

23CEMDA4	MDM	Safety Management	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the principles and need for safety management in construction and industrial settings.
CO2	Identify common hazards and implement safety measures in various construction activities.
CO3	Understand the legal framework governing safety in India, including relevant acts and codes.
CO4	Develop skills for accident prevention, reporting, and investigation.
CO5	Design safe work environments, including site arrangements and temporary works.
CO6	Develop a culture of safety through management, communication, and education.

Course Content:

Unit 1: Introduction to Safety Management Definition, objectives, and importance of safety management. Need for safety in Indian construction and industrial sectors. Types of hazards in construction and their impacts. Safety management process and components.	[5]
Unit 2: Safety Regulations and Standards in India Overview of Indian safety legislation: Building & Other Construction Workers (RE&CS) Act, 1996, Factories Act, 1948, Contract Labor (R&A) Act, 1970, Indian Standards on construction safety. National Building Code (NBC) provisions.	[6]
Unit 3: Hazard Identification and Risk Management Types of hazards in construction and industrial works: Excavation, scaffolding, demolition, blasting, confined spaces, etc. Risk assessment techniques and tools. Accident causation theories and prevention strategies.	[6]
Unit 4: Site Safety and Welfare Provisions Safe storage and stacking of materials. Temporary works and equipment safety (scaffolding, ladders, cranes). Toolbox meeting, Welfare facilities (first aid, restrooms, and emergency facilities). Health hazards: chemical, biological, and physical.	[6]
Unit 5: Accident Investigation and Reporting Accident reporting and investigation procedures. Root cause analysis and corrective actions. Cost of accidents (direct and indirect). Safety audits and checklists.	[6]
Unit 6: Safety Management Practices Safety organization and policies in construction projects. Training and communication for	[7]





safety awareness. Safety management in subcontracting. Developing a safety culture: posters, publications

Text Books:

1. "Construction Safety Management" by Jimmie W. Hinze – Focus on principles and practices.
2. "Industrial Safety Management" by L.M. Deshmukh – Covers industrial safety concepts in the Indian context.
3. Construction Safety Management. K.N. Vaid,
4. Construction Safety, Security & Loss Prevention, James B.Fullman,
5. Linger L, Modern Methods of Material Handling.

Reference Books:

1. Peavey, Rowe D.R. and Tchobanoglous, "Environmental Engineering", McGraw-Hill Book Co.
2. Viessman and Hammer, "Water Supply and Pollution Control", Harper Collins College Pub.
3. Hammer M.J., "Water and Waste water Technology", Prentice-Hall of India Private Limited



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MDM-IV

23CEMDB4	MDM	Rehabilitation of RCC Structures	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the causes of deterioration in concrete structures and the methods used for condition assessment.
CO2	Analyze the causes of deterioration and failure in concrete structures and evaluate the condition of existing structures.
CO3	Apply appropriate retrofitting techniques and materials to address specific structural
CO4	Evaluate seismic retrofitting techniques and their effectiveness in improving the performance of structures under seismic loads

Course Content:

Unit 1: Introduction Introduction and Definition for Repair, Retrofitting, and rehabilitation, Introduction to Structural Deterioration, Causes of deterioration, Distress in Structures, Causes and Prevention	[5]
Unit 2: Assessment and Diagnosis Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive and semi destructive testing systems	[6]
Unit 3: Materials and Techniques for Retrofitting Materials Used in Retrofitting: Fiber-reinforced polymers (FRP), High-performance concrete (HPC) and mortar Epoxy resins and adhesives Corrosion inhibitors and protective coatings Retrofitting Techniques: External bonding of FRP laminates, Shotcreting and guniting, Jacketing (concrete, steel, and FRP), Section enlargement and external post-tensioning, Selection of Retrofitting Materials and Techniques Factors influencing material and technique selection Cost-effectiveness and durability considerations	[7]
Unit 4: Strengthening Techniques Strengthening of Beams: Flexural and shear strengthening using FRP, Use of steel plates and external post-tensioning, Case studies and design examples Strengthening of Columns: Confinement using FRP wraps and steel jackets, Increasing axial and shear capacity, Design considerations and case studies Strengthening of Slabs and Walls: Strengthening of one-way and two-way slabs, Retrofitting of shear walls and diaphragms, Practical applications and challenges	[7]





Unit 5: Seismic Retrofitting Introduction to Seismic Retrofitting: Seismic vulnerability of existing structures, Principles of seismic retrofitting, Code provisions and guidelines (e.g., IS 13920, FEMA, ACI) Seismic Retrofitting Techniques: Base isolation and energy dissipation devices, Strengthening of joints and connections, Use of shear walls and bracing systems, Case Studies of Seismic Retrofitting, Lessons learned from past earthquakes.	[5]
Unit 6: Repair and Protection of Concrete Structures Repair of Cracks and Defects, Crack injection techniques, Patching and surface repairs, Durability considerations in repair Corrosion Protection: Cathodic protection and electrochemical methods, Use of corrosion inhibitors and coatings, Prevention of reinforcement corrosion Protection against Environmental Effects: Waterproofing and moisture control, Protection against chemical attacks, Thermal insulation and fire protection	[6]

Text Books:

1. Repair and Rehabilitation of Structures, Author: Dr. P. C. Varghese, McGraw Hill Education (India).
2. Concrete Technology: Theory and Practice, M. S. Shetty, Publisher: S. Chand Publishing
3. Maintenance and Rehabilitation of Structures, Dr. V. K. Raina, New Age International Publishers
4. Design of Reinforced Concrete Structures, N. Krishna Raju, CBS Publishers & Distributors
5. Earthquake Resistant Design of Structures, Pankaj Agarwal and Manish Shrikhande, Pearson Education India

Reference Books:

1. Concrete Structures: Protection, Repair, and Strengthening, A. M. Neville and J. J. Brooks, Pearson Education
2. IS 456:2000 - Plain and Reinforced Concrete - Code of Practice, Bureau of Indian Standards (BIS)
3. IS 13920:2016 - Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces, Bureau of Indian Standards (BIS)
4. IS 15988:2013 - Seismic Evaluation and Strengthening of Existing Reinforced Concrete Buildings, Bureau of Indian Standards (BIS)
5. IS 13311 (Part 1 & 2):1992 - Non-Destructive Testing of Concrete, Bureau of Indian Standards (BIS)



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MDM-IV

23CEMD4	MDM	Traffic Engineering	3-0-0	3 Credits
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Teaching Scheme:	Evaluation Scheme:
Lecture: 3 hrs/week	Continuous Assessment -I : 10 Marks Continuous Assessment -II : 10 Marks Mid Semester Exam : 30 Marks End Semester Exam : 50 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Identify the characteristics of traffic stream, driver behaviors and vehicular
CO2	Understand the various methods of traffic surveys and the interpretation of traffic data
CO3	Describe several statistical and photographic methods for Analysis and Interpretation of Traffic
CO4	Identify various traffic signs and road marking
CO5	Design the traffic signals as per IRC and Webster's method
CO6	Understand the parameters of road accident in terms of traffic safety and traffic management

Course Content:

Unit 1: Introduction Introduction, objectives, scope; Driver behaviour and Mixed traffic characteristics of India; PIEV Theory; Macro and microscopic parameters; Relationships among traffic parameters; Traffic flow theory; Characteristics of uninterrupted and interrupted traffic flow facilities; Traffic flow modeling; Capacity and Level-of-service.	[4]
Unit 2: Traffic studies Traffic volume, speed, travel time and delay studies; Parking study; Origin & Destination Survey, Accident studies, Manual & Mechanical methods, Photographic techniques in Traffic surveys.	[6]
Unit 3: Analysis and Interpretation of Traffic Studies Statistical method: mean, standard deviation and variance, poisson, binomial distribution, Normal distribution of traffic datas, Histogram and cumulative frequency curves of speed studies, time mean speed and space mean speed.	[8]
Unit 4: Traffic sign and road markings Importance of signs and markings, Types of traffic signs: Prohibitory sign, warning sign, Mandatory sign, overhead sign, Location, height and maintenance of traffic sign, Types of road markings, Parking space limits, object markings	[6]
Unit 5: Traffic signals Types of intersection; Unsignalized, Signalized and rotary intersection; Conflicts at intersection; Signal time and phase diagram; Signal design as per Webster's and IRC method; Introduction to Intelligent Transportation System for traffic management, enforcement and	[6]



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education. Components of ITS.

Unit 6: Traffic safety and management

Accident situation in India, Collection of accident data, Collision and condition diagram, pedestrian safety, Traffic management measures and their influence in accident prevention, Scope of traffic management measures, Restrictions of turning movements,

[6]

Text Books:

1. S K Khanna and CEG Justo and A Veeraragavan, Highway Engineering, Nem Chand and Bros.
2. C Jotin Khisty and B Kent Lall, Transportation Engineering: An Introduction, Prentice Hall of India Pvt. Ltd, New Delhi-110001, 2002
3. P. Chakroborty and A. Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2003.
4. Pignataro L. J., Traffic Engineering – Theory and Practice, Prentice Hall, 1973.
5. L. R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2000.

Reference Books:

1. Roger P. Roess, William R. Mc Shane & Elena S. Prassas, Traffic Engineering, Prentice-Hall, 1990.
2. Highway Capacity Manual (HCM), Transportation Research Board, USA, 2000.
3. Wohl M. and Martin B. V., Traffic System Analysis, McGraw-Hill Book Company, 1967.
4. Salter. R.I and Hounsell N.B, Highway Traffic Analysis and design, Macmillan Press Ltd. 1996.



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Mega Project Phase- I

23CE3608	ELC	Mega Project Phase- I	0-0-2	2 Credits
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Teaching Scheme:	Evaluation Scheme:
Practical : 2hr/week	Continuous Assessment -I : 25 Marks Continuous Assessment -II : 25 Marks End Semester Exam : 50 Marks

In Mega Project Phase-I, the students are expected to complete 50% of the total project by the end of semester VI. After completion of expected project work, they are expected to submit the consolidated report including the work done in phase-I.

The report shall be comprehensive and presented typed on A4 size sheets and **spiral bound**. The number of copies to be submitted is number of students plus one. The assessment would be carried out by the panel of examiners (Guide and Project Evaluation Members) for both, term work and oral examinations.



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Aptitude Skills- IV (Verbal Ability)

23HSSM07	VEC	Aptitude Skills- IV	1-0-0	Audit
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Teaching Scheme:	Evaluation Scheme:
Lecture: 1 hrs/week	Continuous Assessment-I : 25Marks Continuous Assessment-II: 25 Marks

Pre-Requisites: Aptitude Skills-I, II and III

Course Outcomes: At the end of the course, students will be able to:

CO1	Solve the problems on system of equation
CO2	Solve the problems on seating arrangement
CO3	Solve the logical reasoning problems
CO4	Solve the critical analysis problems
CO5	Solve the problems of Data interpretation
CO6	Solve the problems permutations and combinations

Course Contents:

Unit1: System of equations Quadratic equations, Surds and indices, solution of equations, Ages,	[2]
Unit2: Seating Arrangements Linear seating Arrangement, Circular seating arrangement, Complex seating arrangement	[2]
Unit 3: Logical Reasoning Numerical based on sense of direction, Blood relations, Odd man Out	[2]
Unit 4: Critical analysis Clocks and Calendar based problems, Crypt arithmetic, heights and distances	[2]
Unit 5: Data Interpretation Table form, Bar form, Line for Pi-chart form	[2]
Unit6: Permutation and combination Permutation and combinations	[2]

Text Books:

1. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations", S.Chand Publisher; 2016 edition.
2. Quantitative Aptitude for CATTMH Publications
3. Vedic Maths Made Easy By Dhaval Bhatiya Jaico Publication House.

Reference Books:

1. Rao N,D,V, Prasada, Wren & Martin High School English Grammar and Composition Book, S Chand Publishing, 2017
2. Murphy, Intermediate English Grammar with Answers, Cambridge University Press; Second edition
3. RS Aggarwal, Objective General English, S. Chand Publisher; 2016 edition



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Language Skill- IV

23HSSM08	VEC	Language Skill- IV	0-0-2	Audit
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Teaching Scheme:	Evaluation Scheme:
Practical : 2hr/week	Continuous Assessment-I : 25Marks Continuous Assessment-II: 25 Marks

Pre-Requisites: Language Skill - I, II and III

Course Outcomes: At the end of the course, students will be able to:

CO1	Make use of Function in Python Programming.
CO2	Make use of Python collections.
CO3	Make use of classes and its object in python.
CO4	Make use of file and its handling functions.

Course Contents:

1. Write a Python program to define a user-defined function that takes a number as input and returns whether it is even or odd. Call the function and display the result. o Concepts: Function definition, arguments, returns value.	[2]
2. Create a Python program to define and call a function with default arguments and keyword arguments. o Concepts: Function calling, argument types.	[2]
3. Write a Python program using a lambda function to compute the square, cube, and factorial of a given number. o Concepts: Lambda function basics	[2]
4. Write a Python program to demonstrate list operations such as creation, adding items, removing an item, slicing, and sorting. o Concepts: List constructor, change, remove, sort, list comprehension	[2]
5. Write a Python program to demonstrate the use of tuples and sets. Perform operations such as checking membership, adding/removing elements (set), and iterating. o Concepts: Tuple immutability, set operations.	[2]
6. Write a Python program to create a dictionary of employees with their ID as key and name as value. Perform operations like adding a new entry, updating existing, and deleting one. o Concepts: Dictionary operations, loop through dictionary.	[2]
7. Write a Python program to create a class Student with attributes name, roll no, and a method display (). Create an object and access its members. o Concepts: Class, object, method access.	[2]



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8. Create a class with an __in it__() constructor to initialize data members and a destructor to display a message when the object is deleted. ○ Concepts: Constructor, destructor.	[2]
9. Write a program to demonstrate single inheritance where a class Vehicle is inherited by a class Car. Use super () to access base class methods. ○ Concepts: Inheritance, super ().	[2]
10. Write a Python program to open a text file in write mode and write your personal information (name, age, and department). Then, read and display the content of the file. ○ Concepts: File open, write, read, file modes.	[2]
11. Write a program to read a file line by line using read line () and count the number of characters in each line. ○ Concepts: File reading, character offset.	[2]
12. Create a program to open a file in append mode and add new content. Use exception handling to manage file not found or access errors. ○ Concepts: File handling with exception management.	[2]
Text Books: 1. Python Projects (Author: Laura Cassell, Alan Gauld) Wrox publication 2. Murach's Python Programming. Aut. : Michael Urban, Joel Murach, murach's Publication.	
Reference Books: 1. Fundamentals of Python (First Program) Cengage MINDTAP Publication 2 nd Edition. Author: K.A. Kambert	



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