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

Department: Civil Engineering

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

Class: T.Y. B. Tech **Semester:** VI

Course Code	Course Type	Course	Teaching Scheme				Examination Scheme					Credits
			L	T	P	Total Hrs.	CAI	CAII	MSE	ESE	Total	
23CE3601	PCC	Design of Concrete Structure	03	-	-	03	10	10	30	50	100	03
23CE3602	PCC	Soil Mechanics	03	-	-	03	10	10	30	50	100	03
23CE3603	PCC	Transportation Engineering	02	-	-	02	10	10	30	50	100	02
23CE3604	PCC	Soil Mechanics lab	-	-	02	02	15	15	-	20	50	01
23CE3605	PCC	Transportation Engineering lab	-	-	02	02	25	25	-	-	50	01
23CE3606	VSEC	Structural Design And Drawing –I lab	-	-	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
23HSSM03	VEC	Aptitude skill- II	01	-	-	01	25	25	-	-	50	Audit
23HSSM04	VEC	Language skill-II	-	-	02	02	25	25	-	-	50	Audit
23CE3607	ELC	Project-I	-	-	02	02	25	25	-	50	100	02
TOTAL			**18**	**-**	**10**	**28**	**190**	**190**	**180**	**390**	**950**	**22**

Program Elective Courses – II

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

Program Elective Courses - III

(Subject 1)	(Subject 2)	(Subject 3)
Advanced Foundation Engineering (23CEPE13)	Tunnel & 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)

Design of Concrete Structure

23CE3601	PCC	Design of Concrete Structure	3-0-0	3 Credits

Teaching Scheme:	Examination 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:

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 flexural member
CO3	Analyze and design of axially and eccentrically loaded Column(Rectangular and Circular)
CO4	Design of isolated footing and combined footing.
CO5	Explain the concept of pre stressing.

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. Analysis and Design of Doubly Reinforced rectangular sections.	**[6]**
Unit 2: Limit state of collapse(flexure, shear and bond) a) Limit state of collapse (flexure): Analysis and Design of singly reinforced T and L beams. b) Limit state of collapse (shear and bond): Design of Shear reinforcement, Bond-types, Factors affecting bond Resistance, Check for development length.	**[6]**
Unit 3: Design of slabs & Column a) Design of slabs: Cantilever Slab, Simply supported One way slab, Two way slab with different support conditions as per IS:456-2000, Design of Simply Supported single flight and Dog legged staircase b) Analysis and Design of axially and eccentrically (uni-axial) loaded circular and rectangular columns.	**[7]**
Unit 4: Design of Footing Design of isolated rectangular column footing with constant depth subjected to axial load and moment, Design of combined rectangular footing.	**[7]**

Unit 5: Introduction to Prestresses Basic concept of prestressing. Historical development. Types and systems of prestressing. Analysis of rectangular and symmetrical I sections. Different cable profiles.	**[6]**
Unit 6: Design of Prestress a) Losses of prestress in Pre & Post tensioned members. Flexural strength of prestress concrete section b) Design of prestress concrete - rectangular sections for following criteria: (i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.	**[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.

Soil Mechanics

23CE3602	PCC	Soil Mechanics	3-0-0	3 Credits

Teaching Scheme:	Examination 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:

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 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]**

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

Transportation Engineering

23CE3603	PCC	Transportation Engineering	2-0-0	2 Credits

Teaching Scheme:	Examination 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 basics of Transportation Engineering and various road development programmers 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 engineering

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 4: 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]**
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"(KhannaPublishers)
7. Rangwala, "Railway Engineering"(Charotar Publishing House)
8. Relevant IRC and IS Codes

Reference books:

1. Garber, N.J.andHoel, 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)

Soil Mechanics Laboratory

23CE3604	PCC	Soil Mechanics Laboratory	0-0-2	1 Credits

Teaching Scheme:	Examination 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	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 [Willey Eastern Limited, New Delhi]

Transportation Engineering Laboratory

23CE3605	PCC	Transportation Engineering Laboratory	0-0-2	1 Credits

Teaching Scheme:	Examination 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	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"(KhannaPublishers)
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

Structural Design and Drawing –I Laboratory

23CE3606	**VSEC**	**Structural Design and Drawing –I Laboratory**	**0-0-2**	**1 Credits**

Teaching Scheme:	**Examination 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	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:

a. Roof truss, purlin and connections.
b. Gantry girder.
c. Column
d. Foundation.

2. Any one of following

A. Building Frames:

a. Secondary and main beams
b. Column and column bases
c. Beam- to- beam connection
d. Column- beam connection

B. Foot Bridge:

a. Influence lines
b. Cross beam
c. Main Truss
d. Raker
e. Joint details
f. Support details

C. Welded Plate Girder :

a. Design of cross section
b. Curtailment of flange plates
c. 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

PEC-II

23CEPE12	PEC	Sustainable Green Construction	3-0-0	3 Credits

Teaching Scheme:	Examination 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, geopolymer concrete, 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 interiors. Construction site safety and pollution control measures.	**[6]**

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).

PEC-II

23CEPE22	PEC	Railway and Airport	3-0-0	3 Credits

Teaching Scheme:	**Examination 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

PEC-II

23CEPE32	PEC	Disaster Management	3-0-0	3 Credits

Teaching Scheme:	**Examination 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]**
Unit6: Policies and Frameworks for Disaster Management in India Disaster Management Act, 2005.Role of NDMA, SDMA, and NIDM. International frameworks:	**[6]**

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.

PEC-III

23CEPE13	PEC	Advance Foundation Engineering	3-0-0	3 Credits

Teaching Scheme:	**Examination 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]**

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.

PEC-III

23CEPE23	PEC	Tunnel & Bridge Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination 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]**

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.

PEC-III

23CEPE33	PEC	Waste water Treatment	3-0-0	3 Credits

Teaching Scheme:	**Examination 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
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 sludge drying bed.	**[7]**

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

MDM-IV

23CEMDA4	MDM	Safety Management	3-0-0	3 Credits

Teaching Scheme:	Examination 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]**
Unit6: Safety Management Practices Safety organization and policies in construction projects. Training and communication for safety awareness. Safety management in subcontracting. Developing a safety culture: posters, publications	**[7]**

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

MDM-IV

23CEMDB4	MDM	Rehabilitation of RCC Structures	3-0-0	3 Credits

Teaching Scheme:	Examination 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 deficiencies.
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)

MDM-IV

23CEMDC4	MDM	Traffic Engineering	3-0-0	3 Credits

Teaching Scheme:	Examination 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, poission, 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 education. Components of ITS.	**[6]**

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 AVeeraragavan, 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. McShane & 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 PressLtd. 1996.