LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
(An Autonomous Institute)
DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATION[LR-23]
(W.e.f Academic Year 2026 – 27)

Course Structure
B.E. VII-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Wee	CIE	SEE	Duration in Hours	
Theory Course											
1	U23CE701	PCC	Estimation Costing and Specifications	3			3	40	60	3	3
2	U23CE702	PCC	Pre-stressed and Pre-Cast Concrete	3			3	40	60	3	3
3	U23CE703	PCC	Design of Steel Structures	3	1		4	40	60	3	4
4	-------	PEC	Professional Elective-III	3			3	40	60	3	3
5	-------	PEC	Professional Elective-IV	3			3	40	60	3	3
6	-------	OEC	Open Elective – III	3			3	40	60	3	3
Project											
7	U23CE7P3	PROJ	Mini Project			6	6	50	50	-	2
Skill Development Course											
8	U23CE7L1	ESC	Computer Aided Analysis and Design Laboratory			2	2	25	50	3	1
Total				18	1	08	27	315	460	27	**22.0**

L: Lecture (Hrs/Wk/Sem) **T**:Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination (Univ. Exam)
PEC: Professional Elective Courses **PCC**: Program Core Courses **OEC:** Open Elective Courses
PROJ: Project **ESC**: Engineering Science Courses **CE**: Civil Engineering

Note:
1. Each contacthour isa Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student complete the experiment.

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Professional Elective Courses

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U23CE505	PEC 1	Solid and Hazardous Waste Management	3	-	-	3	40	60	3	3
	U23CE506		Advanced Surveying	3	-	-	3	40	60	3	3
	U23CE507		Construction Project and Planning	3	-	-	3	40	60	3	3
2	U23CE604	PEC 2	Design of Hydraulic Structures	3	-	-	3	40	60	3	3
	U23CE605		Sustainable Construction Methods	3	-	-	3	40	60	3	3
	U23CE606		Urban Transportation Planning	3	-	-	3	40	60	3	3
3	U23CE704	PEC 3	Advanced Concrete Technology	3	-	-	3	40	60	3	3
	U23CE705		Traffic Engineering and Management	3	-	-	3	40	60	3	3
	U23CE706		Foundation Engineering	3	-	-	3	40	60	3	3
4	U23CE707	PEC 4	Groundwater Engineering	3	-	-	3	40	60	3	3
	U23CE708		Contract Management	3	-	-	3	40	60	3	3
	U23CE709		Air and Noise Pollution Control	3	-	-	3	40	60	3	3
5	U23CE801	PEC 5	GIS &Remote Sensing	3	-	-	3	40	60	3	3
	U23CE802		Advanced RCC Design	3	-	-	3	40	60	3	3
	U23CE803		Environmental Impact Assessment	3	-	-	3	40	60	3	3
6	U23CE804	PEC 6	Intelligent Transport Systems	3	-	-	3	40	60	3	3
	U23CE805		Repair and Rehabilitation of Structures	3	-	-	3	40	60	3	3
	U23CE806		Finite Elements Methods	3	-	-	3	40	60	3	3

Professional Electives with 6 Threads

S.No.	PE 1	PE 2	PE 3	PE 4	PE 5	PE6
1.	Solid and Hazardous Waste Management	Design Of Hydraulic Structures	Advanced Concrete Technology	Groundwater Engineering	GIS &Remote Sensing	Intelligent Transport Systems
2.	Advanced Surveying	Sustainable Construction Methods	Traffic Engineering and Management	Contract Management	Advanced RCC Design	Repair and Rehabilitation of Structures
3.	Construction Project and Planning	Urban Transportation on Planning	Foundation Engineering	Air and Noise Pollution Control	Environmental Impact Assessment	Finite Elements Methods

S. No.	Course Code	Category	Course Title
3	U23EE711	OEC 3	Introduction to Electrical Vehicles
	U23EE712		Design estimation and Costing of Electrical Systems
	U23CS711		Data Sciences
	U23IT705		Basics of Artificial Intelligence
	U23ME708		Renewable Energy Resources
	U23ME709		Cooling of Electronic Components
	U23CE710		**Environmental Systems****
	U23CE711		**Urban Transportation System****
	U23EC703		IOT and its protocols
	U23EC704		Television and Video Engineering
	U23MB702		Logistics Management
	U23MB703		Management of Start Up's
	U23SH701		Display Devices
	U23SH702		Comparative Study of Literature
	U23CD711		Database Security
	U23CM711		Basics of Cyber Security

S. No.	Course Code	Category	Course Title
4	U23EE804	OEC 4	Smart Building Systems
	U23EE805		Industrial Automation
	U23CS806		Basics of Machine Learning
	U23IT802		Cloud computing
	U23ME809		Automobile Engineering
	U23ME810		Power Plant Engineering
	U23CE807		**Green Building Technologies ** **
	U23CE808		**Environmental Impact Assessment****
	U23EC805		Fundamentals of Wireless Communication
	U23EC806		Fundamental Digital Design using Verilog HDL
	U23MB802		Entrepreneurship
	U23MB803		E - Marketing
	U23SH801		Corrosion Science and Technology
	U23SH802		Introduction To Philosophical Thoughts
	U23CD806		Data Visualization
	U23CM809		Fundamentals of Computer Vision

*Open Elective subjects not offered to the students of Civil Department.

Course Code	Course Title						Core / Elective
U23CE701	ESTIMATION COSTING AND SPECIFICATION						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
---	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Acquire knowledge on specifications and detailed estimation of building used in construction
2. To equip the students with current practices in detailed estimation of roads, culvert ant canals.
3. To learn the estimation of reinforcement quantities.
4. Learn to prepare rate analysis for various items of works in construction
5. Evaluate the actual value of land and buildings

Course Outcomes

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

1. Estimate the quantities of materials prepare a detailed estimate for different types of structures.
2. Prepare a detailed estimate for roads, culvert ant canals.
3. Compute and prepare bar bending schedules.
4. Prepare rate analysis for various quantities
5. Assess the value of land and buildings

UNIT – I

Specification: Definition, purpose and importance of specifications, Types of specification, general rules for the measurements and its units of different items of civil engineering work. Detailed Estimation of Buildings: Types of estimates, various methods of approximate estimate of buildings, Detailed estimate for Flat roof building (load bearing and RCC framed) - long and short wall method - centre line method.

UNIT – II

Detailed Estimation of Roads, Culvert and Canals: Detailed estimate of road works for WBM roads, Bituminous and CC road (including earth work), single cell rectangular box culvert and earth work of irrigation canals (cutting and banking).

UNIT – III

Estimation of Reinforcement Quantities: Estimation of steel quantities and preparation of bar bending schedule (BBS) - RCC framed works for Slabs, Beams and Columns, Footings (Rectangular, Isolated), Stair Case, Overhead rectangular tank and Retaining wall.

UNIT – IV

Rate analysis of civil work: Preparation of analysis of rates and theoretical requirements of materials as per the Telangana State Standard Data and Schedule of Rates, for major items of works of buildings, bituminous and concrete roads.

UNIT – V

Valuation of Buildings: Introduction, Basic elements - Market Value, Book Value, Salvage Value, Replacement Cost, Earning Value, Potential Value, Written Down Value, Different Methods of Valuation - Land and Building Method - Land tenure - Freehold Land and Leasehold Land, Land Valuation, Replacement Cost of Building, Depreciation, Value as per Land and Building Method.

Text Books:

1. Dutta, B.N. Estimating and Costing in Civil Engineering Theoryand Practice. UBS Publishers' DistributersPvt. Ltd., New Delhi. (2016).
2. Chakraborthi, M. Estimating, Costingand Specifications in Civil Engineering. Chakraborthi, Kolkata. (2002).
3. Jagjit Singh. Estimatingand Costing in Civil Engineering. Galgotia Publications, NewDelhi, (1996).

4. B. S. Patil,‖ Civil Engineering Contracts andEstimation‖, Orient Black swan Private Ltd; Fourth edition 2015.

Reference Books:

1. Gurcharan singh & Jagdish singh, ―Estimating Costing and Valuation‖, Standard Publishers Distributors,2012.
2. Kohli D.D. and Kohli R.C., AText Book of Estimating and Costing (Civil)S. Chand & Company,Limited, New Delhi, 2012.
3. Standard Scheduled Rates and Relevant BIS Codes (SP:27 &BIS: 1200)
4. Rangwala S.C., Elements of Estimatingand Costingin Civil Engineering, Charotar Publishing House, India,Gujarat,2011.
5. Rangwala S.C., "Valuations of Real Properties"
6. Banerjee D.N., "Principles and Practices of Valuation", Eastern Law House, V Edition, 1998.
7. Vazirani, V.N. and Chandola S.P., "Estimating and Costing", Khanna Publishers, New Delhi.

Course Code	Course Title						Core / Elective
U23CE702	Pre-stressed and Pre-Cast Concrete						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DRCS	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to:

1. **To introduce** the basic concept, materials, and methods used in prestressed concrete structures.
2. **To enable students** to analyze prestressed concrete members under various loading conditions using fundamental concepts.
3. **To equip students** with the ability to design prestressed concrete members for flexure and shear as per IS 1343.
4. **To impart knowledge** on estimation and control of deflections in prestressed members.
5. **To develop skills** in analyzing continuous beams and designing end blocks in accordance with codal provisions.

Course Outcomes

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

1. Recall the fundamental concepts and advantages of prestressed concrete.
2. Explain the properties of high-strength concrete and high-tensile steel used in prestressing.
3. Differentiate between pre-tensioning and post-tensioning methods.
4. Analyze different types of prestress loss including shrinkage, creep, and relaxation.
5. Calculate total losses in prestress for a given member considering all factors.

UNIT – I

Introduction to Prestressed Concrete: Concept of Prestressed Concrete – Materials used: High Strength Concrete and High Tensile Steel – Methods of Prestressing: Pre-tensioning and Post-tensioning – Common Systems of Prestressing.

Losses in Pre stress: Loss of Prestress due to Elastic Shortening, Friction, Anchorage Slip, Creep of Concrete, Shrinkage of Concrete, and Relaxation of Steel – Calculation of Total Loss in Prestress.

UNIT – II

Analysis of Prestress: Basic Assumptions – Analysis of Prestress and Resultant Stress – Pressure Line and Kern Points – Cable Profiles – Load Balancing Concept – Stress Diagrams due to Prestress, Dead Load, and Live Load.

UNIT – III

Design of Section for Shear: Shear Analysis and Principal Stresses – Modes of Failure – Limit State of Collapse for Shear – Design of Shear Reinforcement in Beams as per IS 1343 Codal Provisions.

Design of Section for Flexure: Analysis of Members at Ultimate Strength – Limit State Method of Design for Rectangular and I-Section Beams for Flexure using IS 1343:2012 Codal Provisions.

UNIT – IV

Deflections: Importance of Deflections – Factors Influencing Deflections – Codal Provisions – Short-Term and Long-Term Deflections of Prestressed Concrete Beams subjected to Uniformly Distributed Loads and Point Loads.

UNIT – V

Simply Supported Continuous Beams: Advantages and Disadvantages of Continuous Beams – Primary and Secondary Moments – Codal Provisions – Concordant Cable Profile – Analysis of Continuous Prestressed Concrete Beams.

End Block: Types of Anchorage Systems – Design of End Block as per Latest IS Codes.

Text Books:

1. Krishna Raju, N. "Pre stressed Concrete", Tata McGraw Hill Publishing Company, New Delhi 2006

2. . Prestressed Concrete by N.Rajasekharan; - Narosa publications

3. Rajagopalan N, "Pre - stressed Concrete", Narosa Publishing House, New Delhi

4. J.R. Libby, Modern prestressed concrete, CBS Publishers, 2007.

References:

1. Praveen Nagarajan, "Advanced Concrete Design", Person Publishers

2. P. Dayaratnam, "Pre stressed Concrete Structures", Scientific International Pvt. Ltd.

3. Lin T Y and Burns N H, 'Design of Pre - stressed Concrete Structures' , John Wiley and Sons, New York

4. Pundit G S and Gupta S P, "Pre - stressed Concrete", C B S Publishers, New Delhi

5. IS: 1343: Indian Standard code of practice for Pre stressed concrete, BIS, New Delhi.

6. Krishna Raju. N., "Pre-stressed Concrete - Problems and Solutions", CBS Publishers and Distributors, Pvt. Ltd., New Delhi.

7. H. Arthur, Nilson, Design of prestressed concrete, Wiley India Pvt.ltd, 2011.

Course Code	Course Title						Core / Elective
U23CE703	DESIGN OF STEEL STRUCTURES						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
--	3	1	--	--	40	60	4

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Know the IS code provisions as applicable for the designs.
2. Understand the material behavior and basics of design of steel structures.
3. Learn the design of various members along with the connections.
4. Explain the design principles of roof trusses

Course Outcomes

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

1. Learn IS code provisions and basics of design of steel structures.
2. Design the different types of bolted and welded connections.
3. Design tension members of an steel structure.
4. Design a laterally supported and unsupported steel beam.
5. Design a compression members and roof trusses

UNIT-I

Materials and Specifications:

Chemical composition of steel, types of Structural Steel, Residual stresses, Stress Concentration. **Basis of Structural Design**: Codes and Specifications, Design Philosophies, working Stress Method, Limit State Method.

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

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

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

UNIT-II

Working Stress Method: Permissible Stresses, Slenderness Ratio, and Net Area of Cross Section. **Design of Tension Members (Limit State Method)**: Types of Tension Members, Design of Strands, Slenderness Ratio, Modes of Failure, Factors Effecting Strength of Tension Members, Design of Tension Members (Angles, Other sections and Rods), Lug Angles, Tension Member Splice.

UNIT-III

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

UNIT-IV

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

UNIT-V

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

Text Books:

1. Subramanian. N, Design of Steel Structures, Oxford University Press, 2008.
2. Duggal S.K., Design of Steel Structures, 3rd Edition, Tata McGraw Hill Publishing, 2017.
3. Shiyekar M.R, Limit State Design in Structural Steel, 2nd Edition, PHI Learning Pvt. Ltd.,2013
4. Steel Structures, Design & Behavior, By Salmon and Johnson.

References:

1. Bhavikatti , S.S., Design of Steel Structures, 5th Edition, I.K. International Publishing HousePvt. Ltd. 2017.
2. P. Dayaratnam , Design of Steel Structures, S. Chand & Co. New Delhi, 2012
3. IS- 800-2007 "General Construction in steel - Code of Practice" Bureau of Indian Standards,New Delhi, India.
4. Design of Steel Structures by Gaylord & Gaylord.
5. Kazim S M A and Jindal R S, "Design of Steel Structures", Prentice Hall of India, New Delhi.
6. IS 875 (Part 1): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 1 Dead Loads - Unit Weights of Building Materialsand Stored Materials, Bureau of Indian Standards, New Delhi.
7. IS 875 (Part 2): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 2 Imposed Loads, Bureau of Indian Standards, New Delhi.
8. IS 875 (Part 3): latest version, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures Part 3 Wind Loads, Bureau of Indian Standards, New Delhi.

Course Code	Course Title						Core / Elective
U23CE704	Advanced Concrete Technology						PCE3
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Concrete Technology	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. **To understand** the microstructural aspects of concrete including hydration products, interfacial zones, and pore structure.
2. **To explain** the key durability issues in concrete and factors affecting its long-term performance.
3. **To apply** appropriate mix design methods and quality control techniques for different types of concrete.
4. **To analyze** advanced construction technologies like 3D printing, slip form construction, and precast techniques in concrete applications.
5. **To evaluate** fracture behavior in concrete structures using modern fracture mechanics models and tools.

Course Outcomes

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

1. Identify the constituents and phases in the microstructure of hardened concrete and special concretes.
2. Discuss durability challenges like corrosion, ASR, sulfate attack, and their mitigation in conventional and special concretes.
3. Design concrete mixes using ACI, DoE, and IS 10262:2019 methods for both normal and special concretes, ensuring quality compliance.
4. Analyze the suitability of advanced concrete technologies (shotcrete, 3D printing, MIVAN, underwater concrete) for various applications.
5. Evaluate fracture mechanisms in concrete using linear and nonlinear fracture models and propose solutions for structural cracking and failure.

UNIT-I

Introduction to Microstructure of Concrete – Hydration of Cement – Formation of C-S-H and $Ca(OH)_2$ – Aggregate Phase and Pore Structure – Types of Water in Concrete: Capillary Water, Adsorbed Water, Interlayer Water – Interfacial Transition Zone: Significance and Behavior – Relationship between Microstructure and Properties of Concrete – Variation of Microstructure with Age – Microstructural Characteristics of Special Concretes: High-Performance Concrete, Geopolymer Concrete, Ultra High-Performance Concrete.

UNIT-II

Durability of Concrete – Concept of Durability – Factors Affecting Durability – Reinforcement Corrosion – Fire Resistance – Freeze-Thaw Damage – Sulfate and Chloride Attack – Alkali-Silica Reaction – Creep and Shrinkage Effects – Concrete Deterioration in Marine Environment – Quality Control and Acceptance Criteria as per BIS Codes – Durability Considerations in Special Concretes: High Strength Concrete, Self-Compacting Concrete, Geopolymer Concrete, Self-Curing Concrete.

UNIT-III

Mix Design and Quality Control – Mix Design using ACI and British DoE Methods – Mix Design as per IS 10262:2019 – Mix Design for Special Concretes: SCC, GPC, High-Strength Concrete – Acceptance Criteria for Compressive and Flexural Strength – Factors Causing Variation in Concrete Quality – Importance and Benefits of Quality Control – Statistical Quality Control – Field and Laboratory Quality Assurance Methods.

UNIT-IV

Special Processes and Advanced Technologies in Concrete Construction – Sprayed Concrete (Shotcrete) – Underwater Concrete – Mass Concrete and Temperature Control – Slip Form Construction – Prefabrication Techniques – Precast Concrete: Types and Advantages – MIVAN Shuttering System – 3D Printing in Concrete Construction – Automation and Robotics in Concrete Technologies.

UNIT-V

Concrete Fracture Mechanics – Introduction to Fracture in Concrete – Linear Elastic Fracture Mechanics – Crack Tip Plastic Zone and CTOD – Fracture Process in Concrete – Nonlinear Fracture Mechanics – Fictitious Crack Model by Hillerborg – R-Curve Method – Size Effect Model – Two- Parameter Fracture Model – Applications in Structural Failures – Role of Fracture Mechanics in Concrete Design and Evaluation.

Text Books:

1. Advanced concrete technology", Zongjin Li JOHN WILEY & SONS, INC Publisher.
2. Job Thomas., " Concrete Technology", Cenage learning,
3. R. Santhakumar „ Concrete Technology", Oxford Universities Press, 2006
4. Shetty M. S., Concrete Technology", S. Chand & Co., 2006
5. Concrete Technology by M.L.Gambhir.–TataMc.GrawHillPublishers, New Delhi

References:

1. Mehta and Monteiro, „Concrete-Micro structure, Properties and Materials",
McGraw Hill Professional
2. Neville A. M. and Brooks J. J., Concrete Technology, Pearson Education, 2010
3. Lea, Chemistry of Cement and Concrete", Butterworth-Heinemann Ltd, 5e, 2017
4. Bungey, Millard, Grantham – Testing of Concrete in Structures- Taylor and Francis, 2006
5. Design of Concrete Mixes by N.KrishnaRaju, CBS Publications,2000.
6. Concrete: Micro Structure, Properties and Materials
byP.K.MehtaandP.J.Monteiro,.Mc.Gr aw-Hill Publishing
Company Ltd. New Delhi
7. Special Structural concretes by Rafat Siddique, Galgotia Publicatio

Course Code	Course Title						Core/ Elective
U23CE705	TRAFFIC ENGINEERING AND MANAGEMENT						PEC3
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Introduce fundamental knowledge of traffic engineering
2. Deal with traffic issues including safety, planning, design, operation and control.
3. Describe basic techniques for collecting and analyzing traffic data, diagnosing problems.
4. Understand the highway capacity and performance characteristics
5. Learn the concepts of traffic design and regulations.

Course Outcomes

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

1. Undertake various types of road traffic studies
2. Use of statistical concepts Applications in traffic engineering
3. Suggest preventive measures to avoid accidents by analyzing the traffic conditions at site.
4. Identify traffic stream characteristics and level of service
5. Design a pre-timed signalized intersection, and determine the signal splits

UNIT - I

Basic Aspects of Traffic Engineering Aim of traffic engineering, traffic stream components and characteristics, road user characteristics, vehicle characteristics, acceleration characteristics, measure of quality, measures of separation, relationship among traffic parameters and empirical relationships, mechanics of traffic flow, macroscopic approach, microscopic approach and human factors approach, discrete distributions, binomial distribution, Poisson's distribution, exponential distribution, exponential distribution, normal distribution.

UNIT - II

Traffic Studies, Measurement and Analysis; Volume studies, speed studies, parking studies, Accident studies. Travel forecasting principles and techniques, design hourly volumes and speed, origin and destination studies, presentation of data and analysis, testing of hypothesis relating to improvements.

UNIT - III

Capacity Analysis of Traffic Facilities; Uninterrupted facilities, interrupted facilities, Level of Service, quality of service as per HCM, factors affecting LOS, computation of capacity and LOS, Measure of effectiveness, highway capacity and performance characteristics, intersection design.

UNIT - IV

Traffic Control Devices and Environmental Control: Different methods of signal design – Redesign of existing signals including case studies – Signal coordination – Air and Noise pollution of different transport modes – Visual impacts – Impacts on land development -Technological approaches to improving environment.

UNIT - V

Design, Regulation and Management of Traffic Engineering Facilities: Control of traffic movements through time sharing and space sharing concepts – Design of channelizing islands, T, Y, skewed, staggered, roundabout, mini roundabout and other forms of at-grade crossings including provision for safe crossing of pedestrians and cyclists – Grade separated intersections: Warrants and design features – Bus stop location and bus bay design – Road lighting – Regulations on vehicles, drivers and traffic – Planning and design of traffic management measures: one-way streets, reversible lanes and roadways, turn regulation, transit and carpool lanes – Planning and design of pedestrian facilities – Traffic calming.

Text Books:

1. Shane, W.R., Roess, R.P. and Prassas, E.S., Traffic Engineering. Prentice Hall, Englewood Cliffs, 1997.
2. Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C.,2000.
3. Daganzo, C.R, Fundamentals of Transportation and Traffic Operations, Pergamon, Elsevier Science Inc., New York,1997.

Suggested Readings:

1. Salter, R.J., Traffic Engineering: Worked Examples, Macmillan, London,1989.
2. Pignataro, L.J., Traffic Engineering: Theory and Practice, Prentice Hall, Englewood lifts,1973.
3. Wohl, M. and Martin, B.V, Traffic System Analysis for Engineers and Planners, McGraw Hill,New York,1983.
4. Drew, D.R., Traffic Flow Theory, McGraw Hill, New York,1964

Course Code	Course Title						Core/ Elective
U23CE706	FOUNDATION ENGINEERING						PEC3
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Soil mechanics	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Learn the definition, necessity, types and suitability of different foundation systems.
2. Understand the procedures of geotechnical design of foundations.
3. Understand the necessity and usage of different foundation construction related aspects.
4. Learn about different methods of geotechnical investigations and its role in selection and

Course Outcomes

After completion of this course students will be able to

1. understand the principles and methods of Geotechnical Exploration
2. Analyze the stability of finite and infinite slopes using various methods
3. Examine the earth pressure theories and stability of retaining walls.
4. Analyze the capacity and settlement of shallow foundations.
5. Analyze the capacity and settlement of pile foundations.

UNIT – I

Soil Exploration: Soil exploration, objectives, depth of exploration, significant depth, methods of exploration, various methods of exploration, test pits, types of samples, types of samplers, design of samplers, borings, various methods of boring, geophysical methods, seismic refraction method, electrical resistivity method, penetration tests, standard penetration test, static cone penetration test

UNIT – II

Stability of Slopes: Introduction and types of slopes, slope failure and its types, stability analysis of infinite slopes, stability analysis of finite slopes, total stress analysis/ Swedish circle method/Bishop's method/ Friction circle method/ Taylor's stability chart.

UNIT – III

Earth Pressure Theories: Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.

Retaining Walls: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.

UNIT – IV

Shallow foundation: Types of foundations, terminology, types of failures-General shear failure/Local shear failure/Punching shear failure, determination of ultimate bearing capacity, Rankine's theory/Terzaghis's theory/Skempton's theory/Meyerhoff's theory, Effect of type of shear failure/ shape of the footing/water table, Plate load test, corrections for plate load test, under pinning.

UNIT – V

Pile Foundations: Necessity – types based on load transfer mechanism/ material/ method of installation / functional use – Estimation of vertical load carrying capacity of a single pile – static formulae / Dynamic formulae / Pile load tests – Pile groups – necessity– efficiency of Pile groups - estimation of group capacity – Negative Skin friction.

Text Books:

1. Joseph E.Bowles, "Foundation analysis and Design", McGraw-Hill Publications, 2001.
2. Das, Braja M. "Principles of Foundation Engineering", cengage Publications, 2013
3. Arora, K.R., "Soil Mechanics & Foundation Engineering" Standard Publications, 2009.
4. Varghese, P.C,. "Foundation Engineering", PHI Publications, 2005
5. Bikash Chandra Chatyopadhay, Joyantha Maity Foundation Engineering 2014

References:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & A. S. R. Rao, Newage International Publishers,2016.
2. Soil Mechanics and Foundation Engineering by V. N. S. Murthy, CBS Publishers and Distributors, 2007.

Course Code	Course Title						Core/ Elective
U23CE707	GROUNDWATER ENGINEERING						PEC4
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Hydrology & WR Engineering	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Introduction to well hydraulics problems and perspectives of ground water
2. Knowledge about various investigations related to ground water
3. Quality and management of ground water

Course Outcomes

After completion of this course students will be able to

1.Understand the porous medium properties that control groundwater flow and transport, including porosity, hydraulic conductivity and compressibility.
2. Apply groundwater flow equations to confined and unconfined aquifers.
3.Understand Surface and Subsurface investigations for ground water
4. Derive effective hydraulic conductivity for various cases of heterogeneous subsurface formations.
5.Understand about groundwater quality recharge and salt water intrusion.

UNIT –I

Well hydraulics and well construction, geo-physical explorations, groundwater quality and management of groundwater resources; Problems and perspectives regarding groundwater in India;

UNIT –II

Hydrogeology: Darcy's Equation; flow characteristics; general flow equations; unsaturated flow; Well Hydraulics: Steady and unsteady radial flows in aquifers; partially penetrating wells; multiple well systems; characteristic well losses; specific capacity,

UNIT –III

Surface and Subsurface investigations (Geologic methods; remote sensing; geophysical explorations; electrical resistivity and seismic refraction)

UNIT –IV

`Water Wells, Construction; completion, development, protection and rehabilitation of wells;

UNIT-V

Groundwater quality; Groundwater Management: Basin management, investigations, conjunctive use, modeling, artificial recharge; Saline water intrusion

Text Books:

1. D.K.Todd, Ground Water Hydrology, John Wiley & Sons, Inc., USA.
2. H.M.Ragunath, Ground Water, Wiley Eastern Limited, New Delhi.
3. K.P.Karnath, Ground Water Ananment, Development and Management, Tata McGraw Hill Publishing Company New Delhi.

References:

1. Walton, Ground Evaluation and Management, McGraw Hill.
2. Bouwer, Ground Water Hydrology McGraw Hill.

Course Code	Course Title						Core/ Elective
U23CE708	CONTRACTS MANAGEMENT						PEC4
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
---	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. To make students understand various contracts, their suitability and the procurement process involved in construction projects.
2. Acquire knowledge on various types of contracts used in construction.
3. To make the student understand the process of tendering.
4. To make student capable of understanding and reviewing various provisions included in the contract for effective management of the projects.
5. To make the student understand various contract management processes involved in construction projects.

Course Outcomes

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

1. Understand the fundamentals of legal systems in construction Contracts.
2. Develop a comprehensive contract management plan incorporating contract selection, stakeholder identification, and risk management strategies.
3. Analyze complex project requirements to determine the optimal contract form and performance parameters.
4. Administer construction contracts to manage and resolve disputes through effective negotiation and mediation techniques.
5. Analyze and apply contract law principles to ensure effective construction contract management and minimize potential disputes.

UNIT – I

Introduction to Construction Contracts: Definitions and different type of construction contracts: Lump sum contracts, fixed price contracts, Percentage rate contracts, Cost plus contracts, Target contracts, Design-Build contracts. Condition of Contract, Parties to a Contract, Contract Formation, Advantages and disadvantages of Construction Contract.

UNIT – II

Tendering: Definitions of tendering, tender form, tender documents, notice inviting tenders, work order. EOI, RFQ & RFP, Prequalification process, Project Delivery Methods: BOT, SBOO, BOOT, Tender submission and evaluation, Public Private Partnership (PPP), Detailed Project Report (DPR), Tender rejection, Contract agreement & contract documents.

UNIT – III

Contracts Clauses: Definitions of contract Clauses, General conditions & special conditions, Contract Documents, Contract conditions for payments, Time delay, Scope changes, Extra claims, Dispute Resolution, Termination of contracts, Insurance and Indemnity, Performance Bonds and Guarantees, Review and Conclusion, subcontracting.

UNIT – IV

Contract Administration: Elements of contract management, Major stake holders in construction contracts, Contract administration; Duties and responsibilities of parties, Stake holder agreements, Contract risk management, Management reporting, Dispute resolution mechanisms: Negotiation, Mediation.

UNIT – V

Legal Issues in Contract: Definition and legal issues in contract, Essential requirement of a contract as per Indian Contract Act 1872, Characteristics of a good contract, Legal enforceability of contract, Breach & termination of contracts, Major stake holders in construction contracts, Overview of Activities in Contract Management.

Text Books:

1. Keith Collier, "Construction Contracts" Reston Publishing Company, Inc, Reston, Verginia.
2. Patil, B.S., "Building and Engineering Contracts" Mrs. S.B. Patil, Pune.
3. John Murdoch & Will Hughes, Construction Contracts - Law and Management" Spon Press, Taylor & Francis Group.
4. Gajerai, G.T., "Lawrelating to Building and Engineering Contracts in India" Butterworths
5. Joseph T. Bockrath, Contracts and the Legal Environment for Engineers and Architects, McGraw Hill, 2000

Reference Books:

1. Govt of India, Central Public Works Department, "CPWD Works Manual 2003."
2. Govt of India, Central Public Works Department, "CPWD 7/8: General Conditions of Contracts."
3. V. K. Raina, Raina's Construction and Contract Management Vol.1 (Second Edition), SPD Publishers, 2009
4. JimmieHinze, Construction Contracts, Mc Graw Hill,2001.
5. Kwaku,A.,Tenah,P.E.JoseM.Guevara,P.E.,FundamentalsofConstructionManagementandOrganisation,Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
6. Patil.B.S ,Civil Engineering Contracts and Estimates, Universities Press (India) Private Limited,2006.
7. Indian Contract Act 1892

Course Code	Course Title						Core / Elective
U23CE709	Air and Noise Pollution Control						PEC-4
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives:

1. Understand the Air pollution Concepts

2. Identify the source of air pollution

3. Know Air pollution Control devices

4. Distinguish the Air quality monitoring devices

5. Identify the Causes of indoor air pollution

Course Outcomes:

At the end of the course the student will be able to

1. Identify sampling and analysis techniques for air quality assessment

2. Describe the plume behavior for atmospheric stability conditions

3. Apply plume dispersion modeling and assess the concentrations

4. Design air pollution controlling devices

5. Identifying the causes of indoor air pollution and changes in indoor air quality-control

UNIT-I

Air Pollution: Definition of Air Pollution - Sources & Classification of Air Pollutants - Effects of air pollution - Global effects – Ambient Air Quality and standards – Monitoring air pollution, Sampling and analysis of Pollutants in ambient air- Stack sampling, Air sampling and pollution measurement methods

UNIT-II

Meteorology and Air Pollution: Factors influencing air pollution, Wind rose, Mixing Depths, Lapserates and dispersion - Atmospheric stability, Plume behavoiur, Plume rise and dispersion, Prediction of air quality, Box model - Gaussian model - Dispersion coefficient - Application of tall chimney for Pollutant dispersion.

UNIT-III

Control of Particulate Pollutants: Properties of particulate pollution - Particle size distribution –Control mechanism- Dust removal equipment–Working principles and operation of settling chambers, cyclones, wet dust scrubbers, fabric filters & ESP.

UNIT-IV

Concepts of Pollution Control: Particulate emission control - settling chambers, cyclone separation, Wet collectors, scrubbing, fabric filters, electrostatic precipitators, selection criteria for equipment, Removal of gaseous pollutants by adsorption, absorption, reaction and other methods.

UNIT-V

Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes.

Text Books:

1. Air Pollution, M.N.Rao and H V N Rao, Tata Mc Graw Hill Publishers
2. Air Pollution Control Engineering, Noel, D. N.,Tata McGraw Hill Publishers,1999.

References:

1. Air Pollution Control Engineering, Nevers, McGraw-Hill, Inc., 2000.
2. Fundamentals of Air Pollution, Dr.B.S.N.Raju, Oxford & I.B.H.
3. Air Pollution and Health, T. Holgate, HillelS. Koren, Jonathan M.Samet, Robert L.
4. Environmental Pollution Control Engineering, Rao, C.S., Wiley Eastern Ltd., New Delhi, 1996
5. Air Pollution and Control Technologies, Anjaneyulu, D.Allied Publishers, Mumbai, 2002.

Course Code:	Course Title:					Core/Elective
U23CE7P3	**Mini Project**					**Core**
Prerequisite	**Contact Hours per Week**			**CIE**	**SEE**	**Credits**
	L	**T**	**P**			
Internship	**-**	**-**	**6**	**50**	**50**	**2**

Course Objectives

The objectives of this course Is to impart knowledge of and problem-solving skills in

1. Enhance practical and professional skills.
2. Familiarize tools and techniques of systematic literature survey and documentation.
3. Expose the students to industry practices and teamwork
4. Encourage students to work with innovative and entrepreneurial ideas and its implementation.
5. Make students evaluate different solutions based on economic and technical feasibility

Course Outcomes

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

1. Formulate a specific problem and give valuable and economical solution
2. Develop model/models either theoretical/practical/numerical form.
3. Solve, interpret/correlate the results and discussions
4. Conclude the results obtained Write the documentation in standard format

Guidelines:

1. As part of the curriculum in the VII-semester of the programme each student shall do a mini project, generally comprising about three to four weeks of prior reading, twelve weeks of active research, and finally a presentation of their work for assessment.

2. Four students will be allotted to one faculty supervisor for mentoring.

3. Mini projects should present students with an accessible challenge on which to demonstrate competence in research techniques, plus the opportunity to contribute something more original.

4. Mini projects shall have inter-disciplinary/ industry relevance, which can be implemented practically.

5. The students can select a mathematical modelling based/Experimental investigations or Numerical modelling.

6. All the investigations should be clearly stated and documented with the reasons/ explanations/ Justifications.

7. The mini-project shall contain a clear statement of their search objectives, background of work, literature review, techniques used, prospective deliverables, and detailed discussion on results, conclusions and reference.

8. Project Review Committee: Supervisor and a minimum of two faculty members.

9. There shall be Continuous Internal Evaluation (CIE)for 50 marks and End Semester Examination for 50 marks.

10. Below mentioned Guide lines for awarding the marks both applicable for CIE & SEE

Guidelines for awarding the marks:		
1	Contents and relevance	10
2	Presentation skills	10
3	Preparation of PPT slides	05
4	Questions and answers	05
5	Report in a prescribed format	20
Total Marks		**50**

Course Code	Course Title						Core / Elective
U23CE7L1	Computer Aided Analysis and Design Laboratory						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
	-	-	-	2	25	50	1

Course Objectives

The objectives of this course is to:

1. To understand the application of software in Civil engineering.
2. To Analyze and Design of structural members using Staad pro.
3. To Use software knowledge for solving Building Structural related problems.
4. To introduce the civil engineering-based software Staad pro.

Course Outcomes

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

1. Demonstrate the software skills to solve civil engineering related analysis and design
2. Make use of software tool to analyze and design of RCC beams using limit state design
3. Develop computer programs for structural engineering problems
4. Analyze and solve problems related to hydraulic structures using software
5. Solve the bearing capacity and other geotechnical related problems using software.
6. Make use of Civil Engineering software STAAD PRO for analysis and design of basic elements of structure

List of Experiments to be performed:

1. Demonstration and explanation on basic commands used in Staad.pro
2. Analysis & Design determinate structures using software.
3. Analysis and design of fixed beam using STAAD Pro.
4. Analysis and design of Continuous beam using STAAD Pro
5. Analysis & Design of Plane Frames using STAAD Pro.
6. Analysis & Design of space frames subjected to DL & LL.
7. Analysis and design of simple steel truss using STAAD Pro.
8. Analysis and design of residential building subjected to all loads (DL, LL, WL, EL).
9. Design of RCC Slabs (One-Way and Two-Way) Using STAAD.Pro
10. Analysis and Design of Multi Story Building

List of Software Required

1. Staad.pro - Licensed version.

Text Books:

1. P. Kumar Mehta and Paulo JM Monterio, „Concrete Microstructure properties and materials", Tata McGraw-hill Education, 2009.
2. CBRI, Building materials and components, India, 1990
3. https://www.finesoftware.eu/geotechnical-software/engineering-manuals/

References:

1. Gerostiza C.Z., Hendrikson C. and Rehat D.R., "Knowledge based process planning for construction and manufacturing", Academic Press Inc., 1994
2. Koncz T., "Manual of precast concrete construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
3. "Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009
4. SP 36 (Part-II): 1987 Compendium of Indian Standard on Soil Engineering: Part-I & II (Laboratory & Field) testing of soils Civil Engineering purposes.

Course Code	Course Title						Core / Elective
U23CE710	Environmental Systems						OEC-3
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Analyze the physical, chemical and biological processes in environmental systems.
2. Formulate and solve governing equations for pollutant transport.
3. Analyze the engineering transport system.
4. Plan and analyze treatment systems.

Course Outcomes

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

1. Identify an appropriate method of treatment process.
2. Design of treatment units for population growth.
3. Identify the appropriate transport systems.
4. Design and analysis of treatment systems.

UNIT – I

Basic concepts of mole and mass concentration: notations and conventions, Review of mass balance concepts. Diffusive transport: Diffusion and Fick's first law, Calculation of molecular diffusion coefficients in air and water.

UNIT– II

Constitutive transport equation: Derivation of general transport equation and special forms i.e. continuity and NS equations and similarity between equations of mass momentum and heat dispersion laws. Theories of mass transport: Two film theory, penetration and surface renewal theory, Boundary layer theory. Mass transport correlations.

UNIT– III

Transport in sheared reactors: Fluid shear and turbulence, transport in steady sheared fluids, turbulent sheared fluids, shear rates in mixed reactors. Particles and fractals: Introductions, particle size spectra, solid particles and fractal aggregate geometries, measuring and calculating fractal dimensions from particle size distributions.

UNIT– IV

Coagulation in natural and engineered systems: Introduction, general coagulation equations, factors affecting the stability of aquasols, coagulation kinetics, fractal coagulation models.

UNIT – V

Finite Differences: Finite difference and Finite volume procedures for solutions of partial differential equations of Mass, Momentum and Energy transport phenomenon.

Text Books:

1. Environmental Transport Processes, Bruce E. Logan, 2nd Ed., Wiley, 2012
2. Introduction to chemical transport in the environment, John S. Gulliver, Cambridge University Press, 2007
3. V. M. Eulersand E. W. Steel, "Municipal and Rural Sanitation", 6th Ed., McGraw Hill Book Company, 1965
4. F. B. Wright, "Rural Water Supplyand Sanitation", 3rd Revised edition, McGraw-Hill Inc.,US, 1977

References:

1. Diffusion: Masstransfer in fluid systems, E.L. Cussler, 3rd Ed., Cambridge University Press, 2007.
2. Chemo dynamics and Environmental Modeling S. Trapp and M. Matthies, , Springer, 1998
3. Mathematics of Diffusion, Crank, J., 2nd Edition, Oxford University Press, 1975
4. Manual of water supplyand treatment, 3rd edition, CPHEEO, GOI, New Delhi.
5. "Manual on Water Supplyand Treatment", Ministryof Urban Development, New Delhi.
6. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C", Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

Course Code	Course Title						Core/ Elective
U23CE711	Urban Transportation System						OEC-3
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Transportation Engineering	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Todiscuss various urban transportation systems planning process and its components.
2. To understand a varietyof travel surveys and data collection procedures.
3. To understand Concept of trip generation and trip distribution.
4. Toreview different travel demand forecasting models.
5. To understand computer application in Transportation planning.

Course Outcomes

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

1. Applythe fundamental knowledge for forecasting and creating the transportation infrastructure facilities scientifically and ethically by collecting the appropriate sample data.
2. Identify the procedures for collecting the traffic related data for generating and validating transport demand models.
3. Applyfour stage transportation demand modeling bycreating mathematical models to understand the travel pattern and behavior of road users.
4. Applythe mathematical knowledge in solving the transportation planning related problems byanalyzing transportation data.
5. Evaluate highway projects byusing different economic methods and understand the role of computer applications in transportation planning.

UNIT - I:

Introduction to concepts of transportation planning process, interdependence of the land use and traffic, systems approach to transportation planning, stages in transportation planning, surveyand analysis of existing conditions, forecast analysis of future conditions and plan synthesis, evaluation, program adoption and implementation.

UNIT - II:

Transportation Surveys – Introduction, definition of the studyarea, zoning, types of surveys, home interview, commercial vehicle, taxis, roadside interview, registration number of vehicle plate, tags on vehicles, mass transport, and analyzing the data from samples.

UNIT - III:

Trip Generation – Introduction and definition, trip purpose, factors governing trip production and attraction rates, regression methods – multiple linear regression analysis. Trip Distribution – concepts of trip distribution, methods of trip distribution, uniform (constant) factor method, average factor method, Fratar method, Furness method, advantages and disadvantages of growth factor methods, the gravity model.

UNIT - IV:

Modal split – General considerations, factors affecting modal split, modal split in the transportation planning process. Traffic assignment – purpose of traffic assignment, general principles, assignment techniques, all or nothing assignment, multiple route assignment, capacity restraint assignment, diversion curves.

UNIT - V:

Economic evaluation of highway projects – need, basics principles, methods - benefit cost ratio, net present value, First year rate of return and internal rate of return – comparison, Computer applications in Transportation planning, Potential areas of Highway Expansion.

Text Books:

1. B. G. Hutchinson, "Principles of Urban Transport Systems Planning", McGraw –Hill, Newyork, 1974.
2. C. S. Papacostas and P. D. Prevedouros, "Transportation Engineering and Planning", Pearson education India,2015.

References:

1. L.R. Kadiyali **"Traffic Engineering and Transportation Planning"** Khanna Publishers, 2011.
2. Sarkar, Pradip Kumar, Maitri, Vinay, Joshi, G.J. "Transport Planning: Principles, Practice and Policies"PHILearning, 2017.
3. KhannaS.K., JustoC.E.G., Veeraraghavan., **"HighwayEngineering**",10thEdition, NemChand&Bros,2015.
4. R. Srinivasa Kumar, **Transportation Engineering** (Railways, Airport,) Universities Press, 2014.

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF CIVIL ENGINEERING
SCHEME OF INSTRUCTION & EXAMINATION[LR-23]
(W.e.f Academic Year 2026 – 27)

Course Structure
B.E. VIII-Semester (Tentative)

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/D	Contact Hours/Wee	CIE	SEE	Duration in Hours	
Theory Course											
1	--	PEC	Professional Elective-V	3			3	40	60	3	3
2	--	PEC	Professional Elective-VI	3			3	40	60	3	3
3	--	OEC	Open Elective – IV	3			3	40	60	3	3
Project											
4	U23CE8P4	PROJ	Project			16	8	50	150	-	8
5	U23CE8P5	PROJ	Comprehensive viva-voce	4			4	100	-	3	2
Total				13		16	21	270	330	--	**19.0**

L: Lecture (Hrs/Wk/Sem) **T**: Tutorial (Hrs/Wk/Sem) **P**: Practical **D**: Drawing (Hrs/Wk/Sem)
CIE: Continuous Internal Evaluation **SEE**: Semester End Examination (Univ. Exam)
PEC: Professional Elective Courses **OEC:** Open Elective Courses **PROJ:** Project
CE: Civil Engineering

Note:
1. Each contact hour is a Clock Hour.
2. The duration of the practical class is three hours, however it can be extended wherever necessary, to enable the student to complete the experiment

LORDS INSTITUTE OF ENGINEERING AND TECHNOLOGY
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SCHEME OF INSTRUCTION & EXAMINATION[LR-23]

Professional Elective Courses

S. No.	Course Code	Category	Course Title	Scheme of Instructions				Scheme of Examination			CREDITS
				L	T	P/ D	Contact Hours/Week	CIE	SEE	Duration in Hours	
Theory Course											
1	U23CE505	PEC 1	Solid and Hazardous Waste Management	3	-	-	3	40	60	3	3
	U23CE506		Advanced Surveying	3	-	-	3	40	60	3	3
	U23CE507		Construction Project and Planning	3	-	-	3	40	60	3	3
2	U23CE604	PEC 2	Design of Hydraulic Structures	3	-	-	3	40	60	3	3
	U23CE605		Sustainable Construction Methods	3	-	-	3	40	60	3	3
	U23CE606		Urban Transportation Planning	3	-	-	3	40	60	3	3
3	U23CE704	PEC 3	Advanced Concrete Technology	3	-	-	3	40	60	3	3
	U23CE705		Traffic Engineering and Management	3	-	-	3	40	60	3	3
	U23CE706		Foundation Engineering	3	-	-	3	40	60	3	3
4	U23CE707	PEC 4	Groundwater Engineering	3	-	-	3	40	60	3	3
	U23CE708		Contract Management	3	-	-	3	40	60	3	3
	U23CE709		Air and Noise Pollution Control	3	-	-	3	40	60	3	3
5	U23CE801	PEC 5	GIS &Remote Sensing	3	-	-	3	40	60	3	3
	U23CE802		Advanced RCC Design	3	-	-	3	40	60	3	3
	U23CE803		Environmental Impact Assessment	3	-	-	3	40	60	3	3
6	U23CE804	PEC 6	Intelligent Transport Systems	3	-	-	3	40	60	3	3
	U23CE805		Repair and Rehabilitation of Structures	3	-	-	3	40	60	3	3
	U23CE806		Finite Elements Methods	3	-	-	3	40	60	3	3

S. No.	Course Code	Category	Course Title
3	U23EE711	OEC 3	Introduction to Electrical Vehicles
	U23EE712		Design estimation and Costing of Electrical Systems
	U23CS711		Data Sciences
	U23IT705		Basics of Artificial Intelligence
	U23ME708		Renewable Energy Resources
	U23ME709		Cooling of Electronic Components
	U23CE710		**Environmental Systems****
	U23CE711		**Urban Transportation System****
	U23EC703		IOT and its protocols
	U23EC704		Television and Video Engineering
	U23MB702		Logistics Management
	U23MB703		Management of Start Up's
	U23SH701		Display Devices
	U23SH702		Comparative Study of Literature
	U23CD711		Database Security
	U23CM711		Basics of Cyber Security

S. No.	Course Code	Category	Course Title
4	U23EE804	OEC 4	Smart Building Systems
	U23EE805		Industrial Automation
	U23CS806		Basics of Machine Learning
	U23IT802		Cloud computing
	U23ME809		Automobile Engineering
	U23ME810		Power Plant Engineering
	U23CE807		**Green Building Technologies ****
	U23CE808		**Environmental Impact Assessment****
	U23EC805		Fundamentals of Wireless Communication
	U23EC806		Fundamental Digital Design using Verilog HDL
	U23MB802		Entrepreneurship
	U23MB803		E - Marketing
	U23SH801		Corrosion Science and Technology
	U23SH802		Introduction To Philosophical Thoughts
	U23CD806		Data Visualization
	U23CM809		Fundamentals of Computer Vision

*Open Elective subjects not offered to the students of Civil Department.

Course code	Course Title						Core / Elective
U23CE801	GIS &Remote Sensing						PEC-5
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Know the concept of Geographical Information System (GIS), coordinate system GIS Data and its types
2. Understand the students managing the spatial Data Using GIS
3. Understand Implementation of GIS interface for practical usage.
4. Develop maps based on queries using GIS software's
5. Know the concepts of Remote Sensing, its interpreting Techniques and concepts of Digital images

Course Outcomes

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

1. Define common coordinate systems and projections in a map and types of data in GIS
2. Explain the theoretical and practical considerations required for preparing a GIS-database
3. prepare, manipulate, display and analyse spatial data, synthesise and present high quality GIS-based outputs in a report format
4. Describe the fundamental theory and concepts of the remote sensing.
5. Apply the principles and techniques of GIS and remote sensing in preparation of map

UNIT – I

Introduction to GIS: Introduction, History of GIS, GIS Components, GIS Applications in Real life, The Nature of geographic data, Maps, Types of maps, Map scale, Types of scale, Map and Globe, Coordinate systems, Map projections, Map transformation, Geo-referencing.

Unit-II

Spatial Database Management System: Introduction: Spatial DBMS, Data storage, Database structure models, database management system, entity-relationship model, normalization. Data models and data structures: Introduction, GIS Data model, vector data structure, raster data structure, attribute data, geo-database and metadata.

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS. Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT- III:

Spatial Data input and Editing: Data input methods – keyboard entry, digitization, scanning, conversion of existing data, remotely sensed data, errors in data input, Data accuracy, Micro and Macro components of accuracy, sources of error in GIS. Spatial Analysis: Introduction, topology, spatial analysis, vector data analysis, Network analysis, raster data analysis, Spatial data interpolation techniques.

UNIT- IV:

Concepts of Remote Sensing Basics of remote sensing: Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology & units, energy resources, energy interactions with earth surface features & atmosphere, atmospheric effects, satellite orbits, Sensor Resolution, types of sensors. Remote Sensing Platforms and Sensors, IRS satellites.

UNIT- V:

Remote Sensing Data Interpretation Visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of soil, water and vegetation. Concepts of Digital image processing, image enhancements, qualitative & quantitative analysis and pattern recognition, classification techniques and accuracy estimation.

Remote Sensing and GIS Applications: Applications of Remote Sensing and GIS in Land Use Land Cover Mapping, Flood Susceptibility Mapping, Groundwater Potential Zoning.

TEXT BOOKS

1. Remote Sensing and GIS by Basudeb Bhatta, Oxford University Press, 2nd Edition, 2011.
2. Introduction to Geographic Information systems by Kang-tsung Chang, McGraw Hill Education (IndianEdition), 7th Edition, 2015.
3. Fundamentals of Geographic Information systems by Michael N. Demers, 4th Edition, Wiley

Publishers,2012.
4. Chor Pang Lo and Albert K.W. Yeung, "*Concepts and Techniques of Geographic Information systems*"Pearson, 2016.

REFERENCE BOOKS

1. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W. Kiefer, Wiley Publishers,7th Edition, 2015.
2. Geographic Information systems – An Introduction by Tor Bernhardsen, Wiley India Publication, 3rd Edition,2010.
3. Advanced Surveying: Total Station, GIS and Remote Sensing by Satheesh Gopi, R. Sathi Kumar, N. Madhu,Pearson Education, 1st Edition, 2007.
4. Textbook of Remote Sensing and Geographical Information systems by M. Anji Reddy.
5. Michael N. Demers, "*Fundamentals of Geographic Information systems*", John Willey Publishers, 2012.
6. Remote Sensing and Image Interpretation by Thomas M. Lillesand and Ralph W.

Kiefer, WileyPublishers, 7th Edition, 2015.

Course Code	Course Title						Core / Elective
U23CE802	ADVANCED RCC DESIGN						PEC5
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
DRCS	3	--	--	--	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Understand the design concepts of concrete structures like deep beams and shear walls.
2. Understand the design principles and methods for Bunkers and Silos.
3. Learn the various types of R.C.C bridges and their design procedures.

Course Outcomes

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

1. Analyse and design an Intze water tank, a canonical bottom water tank and a deep beam
2. Apply the concepts of shear walls in selection of their design parameters
3. Analyse and design square and circular bunkers and cylindrical silos.
4. Analyse and Design the R.C.C Deck type bridge.
5. Analyse and Design a Tee Beam bridge for IRC Loading

UNIT-I

Water Tanks: Analysis and Design of Intze Water Tank, and Circular Water Tank with Canonical bottom.

Deep Beams: Introduction, Analysis and design of Deep Beam for flexure. Shear in deep Beams.

UNIT-II

Shear walls: Introduction, classification of shear walls, types of loads, introductory analysis and design concepts.

UNIT-III

Bunkers and Silos: Introduction - Design principles and theories Code provisions - design of square and circular bunkers - design of cylindrical silos. IS specifications.

UNIT-IV

Design of RCC Slab Bridges: IRC loadings, Elastic Design and Detailing of RC bridge deck slab using effective width methods.

UNIT-V

Design of RCC T Beam Bridges: Use of Pigaud's curves for the design of slab. Design and detailing of Cross beams and Tee Beam of a Tee beam bridge.

Text Books:

1. Krishna Raju, N., ―Design of Bridges‖, Oxford & IBH Publishing; 5th edition, 2019
2. Praveen Nagarajan, ―Design of Concrete Bridges: As per latest IRC Codes‖, Wiley Publishing, 2020
3. P.C. Vargese, ―Advanced Reinforced Concrete Design,‖ PHI publishing, 2005 7. Pankaj Agarwal and Manish Shrikhande, ―Earthquake Resistant Design of Structures,‖ PHI publishing, 2006.

References:

1. David Darwin, Charles W. Dolan, Arthur H. Nilson, ―Design of Concrete Structures‖, 15th Edition, McGraw Hill, 2016.
2. Krishna Raju, N., ―Structural Design and Drawing: Reinforced Concrete‖, Universities Press, 2009.
3. Johnson Victor, D., ―Essentials of Bridge Engineering‖, Oxford & IBH Publishing, 2019.

Course Code	Course Title						Core / Elective
U23CE803	Environmental Impact Assessment						PEC-5
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Describe the ideas behind environmental impact assessments and how to use them in projects.
2. Enumerate and describe a variety of indicators, including socioeconomic, aquatic, terrestrial, and indicators of subsystems, and be able to choose indicators for environmental impact assessments.
3. Describe the effects on the environment of components related to transportation.
4. Capable of providing examples of environmental impact assessment approaches

Course Outcomes

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

1. Give an explanation of environmental imbalances, indicators, and the EIA concept.
2. Determine and characterize the natural and man-made environments that will be impacted bythe planned developments and/or are likely to have a negative influence on the project.
3. Determine the adverse effects and suggest mitigating or providing infrastructure.
4. Analyze the environmental effects of different advancements.
5. Provide an overview of the methods used to conduct environmental impact assessments.

UNIT- I

The Need for EIA: Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000)

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions - Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for control of noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Life cycle analysis, Methodology, Management, Flow of materials-cost criteria-case studies.

UNIT-V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007

2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

3. Environmental Impact Assessment, Canter, L.W., McGraw Hill Pub. Co., 1997

4. Environmental Impact Assessment- Theory and Practice, Wathern.P., Routledge Publishers, London, 2004.

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.

2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996.

3. Environmental Impact Assessment & Management, Hosetti, B. B., Kumar A, Eds, Daya Publishing House, 1998

4. UNESCO, Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development, UNESCO/UNEP, Paris, 1987

5. EIA Notification 2016

Course Code	Course Title						Core / Elective
U23CE804	**Intelligent Transportation Systems**						**PEC6**
Prerequisite	Contact Hours per Week				**CIE**	**SEE**	Credits
	L	**T**	**D**	**P**			
Transportation Engineering	**3**	**-**	**-**	**-**	**40**	**60**	**3**

Course Objectives:

The objectives of this course is to

1. Understand ITS & ATIS
2. Know the functional areas of ITS such as ATMS, CVO, AVCS and APTS, ARTS
3. Study of ITS architecture and its applications
4. Appreciate the technological requirements for ITS.
5. Gain knowledge of ITS standards and specifications.

Course Outcomes:

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

1. Plan and specify the requirements using ITS
2. Plan and management aspects for ITS
3. Prepare architecture and application for ITS
4. Illustrate the functional areas of ITS and their user needs and services
5. Explain the overview of ITS in-highway incident management systems

UNIT – I

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

UNIT – II

Telecommunications in ITS–Importance of telecommunications in the ITS system, Information Management, Traffic Management Centre (TMC). Vehicle – Road side communication – Vehicle Positioning System.

UNIT – III

Functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

UNIT – IV

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

UNIT – V

Automated Highway Systems -Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. Traffic and incident management systems – ITS and sustainable mobility, travel demand management, electronic toll collection.

Text Books:

1. Chowdhury, M. A., Sadek, A. and Boston, M.A., ―Fundamentals of Intelligent Transportation Systems Planning‖, Artech House, Inc., USA, 2003
2. Joseph, S.S., ―Perspectives on Intelligent Transportation Systems‖, Springer publishers, USA, 2008.
3. Kan Paul Chen, John Miles, "Recommendations for World Road Association (PIARC)" ITS Hand Book 2000.

References:

1. Ghosh, S., Lee, T.S., ―Intelligent Transportation Systems: New Principles and Architectures‖, CRC Press, 2000
2. US Department of Transportation, "National ITS Architecture Documentation", 2007(CDROM).
3. Sussman, J. M., "Perspective on ITS", Artech House Publish.

Course Code	Course Title						Core/ Elective
U23CE805	Repair and Rehabilitation of Structures						PEC6
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Investigate the cause of deterioration of concrete structures
2. Strategies different repair and rehabilitation of structures.
3. Evaluate the performance of the materials for repair
4. To understand the various concepts of rehabilitation and retrofitting of structures
5. Understand the performance of the materials for repair

Course Outcomes

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

1. Understand the cause of deterioration of concrete structures
2. Able to assess the damage for different type of structures
3. Summarize the principles of repair and rehabilitation of structures
4. Recognize ideal material for different repair and retrofitting technique
5. Choose the various assessment techniques to diagnose the damage occurred in the structures

UNIT-I:

General: Introduction and Definition for Repair, Retrofitting, Strengthening and rehabilitation. Physical and Chemical Causes of deterioration of concrete structures, Evaluation of structural damages to the concrete structural elements due to earthquake.

UNIT-II:

Damage Assessment: 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

UNIT-III:

Influence on Serviceability and Durability: Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection.

UNIT-IV:

Maintenance and Retrofitting Techniques: Definitions: Maintenance, Facts of Maintenance and importance of Maintenance Need for retrofitting, retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique, near surface mounted (NSM) technique, External posttensioning, Section enlargement and guidelines for seismic rehabilitation of existing building

UNIT-V: Materials for Repair and Retrofitting: Artificial fibre reinforced polymer like CFRP, GFRP, AFRP and natural fiber like Sisal and Jute. Adhesive like, Epoxy Resin, Special concretes and mortars, concrete chemicals, special elements for accelerated strength gain, Techniques for Repair: Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning

Text Books:

1. Sidney, M. Johnson, "Deterioration, Maintenance and Repair of Structures"
2. Denison Campbell, Allen & Harold Roper, "Concrete Structures – Materials, Maintenance and Repair"- Longman Scientific and Technical.
3. CPWD Handbook on Repair and Rehabilitation of RCC buildings, Govt of India Press, New Delhi.

References:

1. R.T.Allen and S.C. Edwards, "Repair of Concrete Structures"-Blakie and Sons
2. Raiker R.N., "Learning for failure from Deficiencies in Design, Construction and Service"-R&D Center (SDCPL).
3. Vidivelli, B,"Rehabilitation of Concrete Structures", Standard Publishers Distributors, New Delhi, 2008
4. P.K.Guha, "Maintenance and Repairs of Buildings", New Central Book Agency (P) Ltd, Kolkata
5. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications

Course Code	Course Title						Core / Elective
U23CE806	FINITE ELEMENT METHODS						PEC6
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
Structural Analysis-II	3	-	-	3	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of:

1. To learn basic principles of finite element analysis procedure.
2. To learn the characteristics of finite elements that represent engineering structures.
3. To introduce the transition from 2D to 3D structural problems (linear and non-linear).
4. Analysis of all kind of loads and their respective effects.
5. To introduce a high-end computer oriented numerical analysis tool.

Course Outcomes

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

1. Apply the fundamentals of FEM, elements of theory of elasticity for 2D, 3D and axisymmetric problems.
2. Apply Principle of minimum potential energy and Principle of Virtual work; analyze simple problems using Rayleigh Ritz Method and Galerkin's method.
3. Formulate the local and global stiffness matrix, load matrix for 1D bar elements and 2D truss elements and analyze simple problems.
4. Develop the stiffness matrix for beams and rigid jointed plane frames and solve problems with degree of freedom not exceeding three.
5. Select displacement functions, formulate the stiffness matrix, load matrix for CST elements. Use Iso-parametric elements and quadrilateral elements, and evaluate definite integral by Gauss Quadrature.

UNIT- I:

Introduction to FEM: General description of the method, brief history of the method, applications of the method, advantages of the finite element method, steps in the finite element method. Types of elements, Types of forces, and Boundary conditions. Strain displacement, and stress- strain relations for 2-D, 3-D problems & Plane stress and plane strain situations and derivation of elasticity matrices.

UNIT- II:

Finite Element Formulation: Principle of minimum potential energy, Principle of virtual displacement, Raleigh Ritz method, Weighted Residual method- Galerkin's method. Coordinate system - Global coordinate, local coordinate and natural coordinate system.

UNIT- III:

Bar Elements: Shape functions, stiffness matrix for a 2- noded bar element, axial bar subjected to point loads, surface forces and body forces - constant cross section and varying cross section bar.

Truss Elements: Transformation matrix, Stiffness matrix of truss member in local and global coordinates, analysis of trusses with kinematic indeterminacy not exceeding two.

UNIT- IV

Beam Elements: Shape functions, beam element stiffness matrix, element load vector, and analysis of continuous beams with kinematic indeterminacy not exceeding two. Element stiffness matrix in local coordinates, Transformation or Rotation matrix, and stiffness matrix and load vector in global coordinates.

UNIT-V:

Displacement models: Selection of displacement models, geometric invariance, conforming and nonconforming elements. 2-D Triangular Elements (CST) and Rectangular Elements: Determination of strain-displacement matrix, shape functions, determination of element stiffness and load matrices, assembling global stiffness and load matrices.

Iso-parametric elements: Iso-parametric concept, Iso-parametric, Sub parametric and Super parametric elements. Gauss Quadrature of numerical integration.

Text Books:

1.O.C. Zienkiewicz and R.L. Taylor, The Finite Element Method, Vol. I, McGraw Hill,1989.
2.K.J. Bathe, Finite Element Procedures, Pearson Education,2006.
3. S. M. Jalaludeen, Finite Element Analysis, Anuradha Publications,2016.
4.T.R. Chandrupatla, Finite Element Analysis for Engineering and Technology, Universities Press, 2004.

References:

1 .Finite Element Method in Engineering Rao, S. S Pergaman Int. Library of Science 5th Edition 2010

2. Finite Element Method with applications in Engineering / YM Desai, Eldho & Shah /Pearson publishers,2006.
3. Concepts and Application of Finite Elements Analysis Cook R. D., et al. Wiley & Sons 4th Edition 2003
4. David V. Hutton, "Fundamentals of Finite Element Analysis", McGraw Hill Education (India) Private Limited, Delhi, 2014.
5. P. N. God bole," Introduction to Finite Element Method", I. K. International Publishing House Pvt. Ltd. New Delhi, 2013.
6. P. Seshu, "Finite Element Analysis", Prentice Hall of India Private Limited, New Delhi, 2010.

Course Code	Course Title						Core/Elective
U23CE8P4	**Major Project**						**Core**
Prerequisite	Contact Hours Per Week				CIE	SEE	Credits
	L	T	D	P			
-	-	-	-	16	50	150	8

Course Objectives:

The objective of the course is to:

1. Developfurtherskillsandknowledgegainedduringtheprogrammebyapplyingthem
2. Analysis of a specific problem or issue, via a substantial piece of work carried out over an extended period.
3. Demonstrate proficiency in the design of are search project, application of appropriate research methods, collection and analysis of data and presentation of results.

Course Outcomes:

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

1. Do literature survey/industrial visit and identify the problem
2. Apply basic engineering fundamental in the domain of practical applications
3. Cultivate the habit of working in a team
4. Attempt a problem solution in a right approach
5. Correlate the theoretical and experimental /simulations results and draw the proper inferences
6. Prepare report as per the standard guidelines.

The aim of Major Project is to implement and evaluate the proposal made as part of Project. Student scan also be encouraged to do fulltime as part of project work based on the common guidelines for all the departments. The students placed in project need to write the new proposal in consultation with industry coordinator and project guide within two weeks from the commencement of instruction. The department will appoint a project coordinator who will coordinate the following:

1. Re-grouping of students-deletion of project candidates from groups made as part of project Work
2. Re-Allotment of project students to supervisor
3. Project monitoring at regular intervals

All re-grouping/re-allotment has to be completed by the 1st week of VIII semester so that students get sufficient time for completion of the project. All projects will be monitored at least twice in a semester through student presentation for the award of sectional marks. Sectional marks are awarded by a monitoring committee comprising of faculty members as well as by the supervisor. The first review of projects for 50 marks can be conducted after completion of five weeks. The final viva voce of150 marks can be conducted after 12 weeks of instruction. Common norms will be established for the final documentation of the project report by the respective departments. The students are required to submit draft copies of their project report within one week after completion of instruction.

Note: *Three periods of contact load will be assigned to each project guide*

Course Code	Course Title						Core/ Elective
U23CE8P5	Comprehensive viva-voice						Core
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
		-		4	100	-	2

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. To use variables for formulating complex mathematical models in management science, industrial engineering and transportation models.

Course Outcomes

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

1. Face interview both in the academic and the industrial sector.

Guidelines:

1. The course should be mapped with a faculty and classes shall be arranged for practicing questions based on the core courses listed in the curriculum.
2. The viva voce will be conducted by the same three-member committee assigned for final project phase II evaluation.
3. It comprises of Project coordinator, expert from Industry/research Institute and a senior faculty from a department.
4. The minimum passing for this course is 50.
5. The mark will be treated as internal and should be uploaded along with internal marks of other courses.
6. Comprehensive Viva should be conducted along with final project evaluation by the three-member committee.

Mark Distribution Total marks: 100 Marks

Minimum required to pass: 50 Marks

Course Code	Course Title						Core / Elective
U23CE807	Green Building Technologies						OEC4
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to impart knowledge of and problem solving skills in

1. Learn the principles of green building technologies and rating systems
2. Understand the principles of effective energy and resources management in buildings
3. Understand the methodologies to reduce, recycle and reuse towards sustainability.

Course Outcomes

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

1. Classify the various features, benefits, and rating systems for a green building
2. Outline the criteria used for site selection and water efficiency methods
3. Select the energy efficiency techniques in designing a green building
4. Select materials for sustainable built environment & adopt waste management methods •
5. Identify an appropriate method for maintaining indoor environmental quality in a green building

UNIT-I

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

UNIT-II

Site selection and planning: Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT-III

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

UNIT-IV

Building materials: Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials (c) use of materials with recycled content such as blended cements materials from agro and industrial waste. (d) reuse of waste and salvaged materials Waste Management: Handling of construction waste materials, separation of household waste, onsite and off-site organic waste management

UNIT-V

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

Text Books:

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment

References:

1. _Alternative building materials and technologies‘ by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao.
2. _Non-Conventional Energy Resources‘ by G. D. Rai, Khanna Publishers.
3. Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004

`Course Code	Course Title						Core/Elective
U23CE808	Environmental Impact Assessment						OEC4
Prerequisite	Contact Hours per Week				CIE	SEE	Credits
	L	T	D	P			
-	3	-	-	-	40	60	3

Course Objectives

The objectives of this course is to:

1. Describe the ideas behind environmental impact assessments and how to use them in projects.
2. Enumerate and describe a variety of indicators, including socioeconomic, aquatic, terrestrial, and indicators of subsystems, and be able to choose indicators for environmental impact assessments.
3. Describe the effects on the environment of components related to transportation.
4. Capable of providing examples of environmental impact assessment approaches

Course Outcomes

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

1. Give an explanation of environmental imbalances, indicators, and the EIA concept.
2. Determine and characterize the natural and man-made environments that will be impacted by the planned developments and/or are likely to have a negative influence on the project.
3. Determine the adverse effects and suggest mitigating or providing infrastructure.
4. Analyze the environmental effects of different advancements.
5. Provide an overview of the methods used to conduct environmental impact assessments.

UNIT-I

Introduction: Environment and its interaction with human activities - Environmental imbalances - Attributes, Impacts, Indicators and Measurements - Concept of Environmental Impact Assessment (EIA), Environmental Impact Statement, Objectives of EIA, Advantages and Limitations of EIA The Environmental Protection Act, Pollution Act, Motor Act.

UNIT-II

Environmental Indicators: Indicators for climate - Indicators for terrestrial subsystems - Indicators for aquatic subsystems - Selection of indicators - Socio-economic indicators - Basic information - Indicators for economy - Social indicators - Indicators for health and nutrition - Cultural indicators - Selection of indicators.

UNIT-III

Environmental Impact Assessment for Transportation Projects: Basic Concepts, Objectives, Transportation Related Environmental Impacts – Vehicular Impacts – Safety & Capacity Impacts – Roadway Impacts – Construction Impacts, Environmental Impact Assessment – Environmental Impact Statement and Environment Audit.

UNIT-IV

Environmental Issues in Industrial Development: On-site and Off-site impacts during various stages of industrial development, Long term climatic changes, Green house effect, Industrial effluents and their impact on natural cycle, Environmental impact of Highways, Mining.

UNIT-V

Environmental Audit & Environmental legislation: objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

Text Books:

1. Jain, R.K., Urban, L.V., Stracy, G.S., (1991), "Environmental Impact Analysis", Van Nostrand Reinhold Co., New York
2. Rau, J.G. and Wooten, D.C., (1996), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York
3. Canter, L.W., (1997), "Environmental Impact Assessment", McGraw Hill Pub. Co., New York
4. Environmental Impact Assessment Methodologies, Anjaneyulu. Y., and Manickam. V., B.S. Publications, Hyderabad, 2007.

Suggested Readings:

1. Grand Jean, E. Gilgen A., “Environmental Fact ors in Urban Planning”, Taylor and Francis Limited, London, 1976.
2. UNESCO, (1987), "Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development", UNESCO/UNEP, Paris.
3. Environmental Impact Assessment, Barthwal, R. R.,New Age International Publishers, 2002
4. Environmental Impact Assessment- Theory and Practice, Wathern.P., Routledge Publishers, London, 2004.
5. Environmental Impact Assessment- Theory and Practice, Wathern.P., Routledge Publishers, London, 2004..
6. UNESCO, Methodological Guidelines for the Integrated Environmental Evaluation of Water Resources Development, UNESCO/UNEP, Paris, 1987

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