Kolhapur Institute of Technology's

COLLEGE OF ENGINEERING
(AUTONOMOUS)

Gokul Shirgaon, Kolhapur

KOLHAPUR INSTITUTE
OF TECHNOLOGY'S
COLLEGE OF
ENGINEERING
KOLHAPUR
(EMPOWERED AUTONOMOUS)

Curriculum Structure

For

B. Tech. Civil Engineering

Academic Year 2026-2027

Under Graduate Programme

Submitted for Approved to BoS on ***23.01.2026***

INDEX

Final Year B. Tech
Semester - VII

Academic Year 2026-2027

Title of the Course:	**QUANTITY SURVEYING AND VALUATION**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0701**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Building Material, Building Planning, Surveying, RCC Detailing.

Course Description:

Preparation of Estimates, Rate Analysis, Bar Bending Schedule, Tender and Contract Document

Course Learning Objectives:

1. To prepare the Approximate estimate and Detail estimate for Administrative approval of building and other civil structure.
2. To choose types of Estimate & Specification as per requirement of Government & Private Organization.
3. To develop Rate analysis Bar Bending Schedule for Building and other civil structure

Course Outcomes:

CO	After the completion of the course, the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Select and apply appropriate types of **specifications and estimates** in accordance with the requirements of **government and private organizations**.	3	Apply
CO2	Analyze and evaluate **rate analysis and bar bending schedules** for buildings and other civil engineering structures.	5	Evaluate
CO3	Prepare **approximate and detailed estimates** for buildings and other civil engineering works using standard measurement practices.	6	Create
CO4	Develop and execute **tender and contract documents**, and perform **valuation of properties** for both government and private sectors.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	1	1	-
CO2	-	1	-	1	1	-	-	1	-	1	1
CO3	1	1	1	2	2	2	-	3	3	3	3
CO4	1	-	2	2	-	-	1	3	3	3	3

CO	PSO1	PSO2	PSO3

CO1	1	-	2
CO2	1	-	2
CO3	3	1	3
CO4	3	-	2

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1 Introduction	**CO: 01**	**04 Hrs.**

General introduction to Quantity surveying – purpose of estimates. Administrative approval and technical sanction to estimates.

Principles in selecting units of measurement for items, various units. Modes of measurement for different items.

Specification- purpose and basic principle of general and detailed specification (writing the detailed specification for various constructions should be covered in term work).

Unit: 2 Methods of Estimation	**CO: 01**	**08 Hrs.**

Types of Structures - Load bearing and framed structures

Methods of Estimation- Long Wall Short Wall Method and Center Line Method.

Prime cost, provisional sums and provisional quantities, taking out quantity – Long wall - short wall, centre line method. Measurement and abstract sheets and recording. I.S. 1200 and its Part .DSR: introduction, How to use D.S.R in preparation of BOQ. Bill of Quantities (BOQ).

Unit: 3 Type of Estimation for Buildings and Other Civil Structure	**CO: 03**	**10 Hrs.**

Approximate estimates, purpose, various methods used for buildings and other civil engineering works such as bridge, water supply, drainage, road project, school buildings, industrial sheds.

Detailed Estimates – types, purpose.

Calculation of quantities for other structures such as arches, retaining wall, well.

Estimation of quantities from detailed drawing (doors, windows, MS Gate, Steel Structure)

Extra work and items, penalty and liquidated charges, Settlement of disputes, R.A. Bill and Final Bill, Payment of advance, insurance, claims.

Unit: 4 Rate Analysis, Bar Bending Schedule and Other works	**CO: 02**	**10 Hrs.**

Analysis of rates, factors affecting the cost of materials, labour. Task work, schedule as basis of labour costs.

Plants and equipment –hour costs based on total costs and outputs. Transports, Overhead charges.

Preparation of Bar Bending Schedule for RCC foundation, column, Beam, Slab (one way, two way and Cantilever), Chajja and Lintel, Staircase.

R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works.

Unit: 5 Tender and Contracts.	**CO: 04**	**06 Hrs.**

Types of Tender & Contracts.

Tendering Document-List of Tender document, Tender notice, Condition of Contract, form of Tender, Schedule A, B and C.

Tendering Process: Submission of tenders using the envelope method, opening of tenders, scrutiny and evaluation of tenders, acceptance of the tender, award and termination of contract

Introduction to e-tendering

Unit: 6 Valuation	**CO: 04**	**07 Hrs.**

Introduction to terminologies of valuation: definition of value, price and cost. Different types of values and valuers' duties, different types of lease.

Types of Depreciation and its calculation. Methods of valuation for land and buildings.

Study of Valuation Report.

Recommended Textbooks:

1. Dutta, S. K. (2020). *Estimating and costing* (6th ed.). Dhanpat Rai & Sons.
2. Birdi, G. S. (2022). *Estimating and costing* (7th ed.). Dhanpat Rai & Sons.
3. Chakraborty, M. (2018). *Estimating, costing and specification in civil engineering* (5th ed.). Bhabananda Publications.
4. Rangwala, S. C. (2021). *Elements of estimating and costing* (14th ed.). Charotar Publishing House.
5. Patil, B. S. (2019). *Civil engineering contracts and estimates* (4th ed.). Universities Press Private Ltd.
6. Government of Maharashtra, Public Works Department. (2022). *Standard specifications* (Vols. I–II). Government Press.
7. Government of India. (2020). *The Indian Contract Act, 1872* (Act No. 9 of 1872). Ministry of Law and Justice.

References Books:

1. The A To Z of Practical Building Construction and its Management- Sandeep Mantri ,Satya Prakashan, New delhi.
2. C.P.W.D. specifications
3. C.P.W.D. schedules of rates
4. M.J.P. schedules of rates
5. W.R.D. schedules of rates
6. Indian Contract Act

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Choose types of Estimate & Specification
ULO2	Study and use Bill of Quantities, IS 1200, DSR and Standard Specification
ULO3	Calculation of quantities for other structures
ULO4	Develop, Rate analysis,
ULO5	Bar Bending Schedule for Building and Estimation of other structure.
ULO6	Understand Tender and Contract and its Types

Title of the Course:	**EARTHQUAKE ENGINEERING AND STRUCTURAL DYNAMICS**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0702**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Strength of Materials, Structural Analysis, Design of Reinforced Concrete Structures, Basic Mathematics (differential equations), and Engineering Mechanics

Course Description:

This course introduces the fundamentals of earthquake engineering and structural dynamics, focusing on structural response to earthquake loading. It covers engineering seismology, ground motion characteristics, theory of vibrations, and earthquake-resistant design principles. Emphasis is placed on codal provisions and ductile detailing for buildings, masonry, steel structures, and elevated service reservoirs as per Indian Standards.

Course Learning Objectives:

1. Understand the causes and characteristics of earthquakes, seismic waves, and ground motion parameters using principles of engineering seismology.
2. Apply the theory of vibrations to evaluate the seismic response of single and multi-degree-of-freedom structural systems.
3. Analyze seismic forces and structural response of buildings and elevated service reservoirs using relevant provisions of Indian Standards.
4. Interpret and apply earthquake-resistant design principles and ductile detailing requirements to ensure safe seismic performance of structures.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** fundamental concepts of earthquakes and seismology.	2	Understand
CO2	**Apply** principles of structural dynamics to idealized structural systems.	3	Apply
CO3	**Examine** earthquake-resistant design principles and ductile detailing of buildings.	4	Analyze
CO4	**Evaluate** seismic forces and seismic behavior of buildings and special structures using codal provisions.	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	-	-	2	-	-	1	-	-
CO2	3	3	1	1	1	-	-	-	-	-	-
CO3	1	-	-	-	-	2	-	-	1	-	-
CO4	1	1	1	-	2	-	-	-	-	-	1

CO	PSO1	PSO2	PSO3
CO1	-	-	1
CO2	-	-	2
CO3	-	1	1
CO4	-	-	2

Course Contents:

Unit: 1 Engineering Seismology	**CO: 01**	**Hrs. 06**

Internal structure of the earth. Causes of earthquakes. Plate tectonic theory, continental drift theory and elastic rebound theory.

Earthquake terminologies – focus, epicenter and focal depth. Seismic waves – P-waves, S-waves, Love waves and Rayleigh waves.

Measurement of earthquakes – magnitude and intensity, energy released. Seismograph and accelerogram. Strong motion earthquakes. Major past earthquakes in India and lessons learnt. Seismic zoning of India as per IS 1893.

Unit: 2 Theory of Vibrations	**CO: 02**	**Hrs. 09**

Single Degree Freedom Systems (SDOF) - Fundamentals, Mathematical modeling, Damping, Formation of Equation of motion of SDOF system & solution – physical significance (without derivation), numerical, Free and Forced vibration (Damped and Undamped) cases, Resonance phenomenon, Earthquake response.

Multi-degree of freedom systems (MDOF): Concept of 2-degree of freedom systems, natural frequencies and mode shapes (no derivations or numerical problems).

Unit: 3 Earthquake Resistant Design Principles	**CO: 03**	**Hrs. 08**

Conceptual Design - Lessons learnt from past earthquakes. Fundamental principles of earthquake resistant design at conceptual planning stage, Load path and lateral load resisting systems, Effect of non-structural elements on seismic performance.

Design philosophy – strong column weak beam concept, Seismic behavior of reinforced concrete buildings. Ductility – concept and significance, Ductile detailing of structural members and joints as per IS 13920.

Modern Techniques - Introduction to base isolation and seismic dampers (concept only).		
Unit: 4 Evaluation of Seismic Loads for Buildings	**CO: 04**	**Hrs. 09**
Different methods of Seismic Force Evaluation, Construction of design response spectrum as per IS 1893, Evaluation of seismic forces for regular buildings using Equivalent Static Load Method as per IS 1893 (Part 1), Distribution of seismic forces along height. Storey drift and its limitations, Rigid and flexible diaphragm concepts.		
Unit: 5 Seismic Behaviour of Masonry and Steel Buildings	**CO: 03**	**Hrs. 06**
Masonry Buildings - Seismic behavior of unreinforced and reinforced masonry buildings, Failure mechanisms, Seismic strengthening using RC bands and vertical reinforcement, Effect of openings, Provisions of IS 4326. **Steel Buildings -** Structural steel and classification of steel frames, Unbraced and braced steel frames, Concept of ductile design of steel frame members and connections.		
Unit: 6 Seismic Analysis of Elevated Service Reservoirs (ESR)	**CO: 04**	**Hrs. 07**
Seismic behavior of liquid storage structures - Hydrodynamic effects, Impulsive and convective mass concepts, Evaluation of seismic forces, as per IS 1893 (Part 2), Numerical problems using equivalent static method.		

Recommended Textbooks:

1. Earthquake Resistant Design of Structures – S. K. Duggal, Oxford University Press.
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering – Anil K. Chopra, Pearson Education.
3. Structural Dynamics – C. S. Kumar, Tata McGraw-Hill Education.
4. Earthquake Engineering: Theory and Practice – A. R. Chandrasekaran, Oxford University Press.
5. Design of Earthquake Resistant Structures – Pankaj Agarwal & Manish Shrikhande, PHI Learning.

References Books:

1. Dynamics of Structures – Anil K. Chopra, Pearson Education.
2. Earthquake Engineering – C. S. Krishna, PHI Learning.
3. Seismic Design of Reinforced Concrete and Masonry Buildings – T. Paulay & M. J. N. Priestley, John Wiley & Sons.
4. Earthquake Resistant Design of Structures – E. Rosenblueth, Springer.
5. Structural Dynamics and Earthquake Engineering – B. L. Karihaloo, CRC Press.
6. Seismic Design Practice into Eurocodes – Andrew J. Moss, ICE Publishing.

Title of the Course:	**WATER RESOURCES ENGINEERING**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0703**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

This course requires the basic knowledge of Water Supply Engineering, Fluid Mechanics and Hydraulics

Course Description:

The course mainly deals with irrigation and its importance & necessity, irrigation structures and irrigation methods

Course Learning Objectives:

1. To understand importance and methods of irrigation
2. To equip the students with capabilities required for identifying, types of reservoirs, dams and forces acting on gravity dams
3. To impart the students with knowledge required for minor, micro irrigation and river training works
4. To understand the basic concepts and importance of pipe irrigation network, lift irrigation works and components of hydropower plants

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	To understand the importance of irrigation and water requirements of crops	2	Understand
CO2	Apply the knowledge for failure aspects of different types of dams	3	Apply
CO3	To apply the knowledge to understand basic concepts of minor, micro irrigation and pipe irrigation network	3	Analyze
CO4	To apply the knowledge to understand basic concepts of lift irrigation and hydro power plants	3	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	--	--	--	1	1	--	1	2	1	1
CO2	2	1	--	--	--	--	--	--	--	--	--
CO3	2	--	2	--	2	2	1	--	--	--	--
CO4	2	1	2	2	--	--	1	1	2	1	--

CO	PSO1	PSO2	PSO3
CO1	2	--	2
CO2	--	2	--
CO3	2	--	--
CO4	--	--	--

Assessments:

Teacher Assessment:

- Two components of Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/ Assignment/ Declared test/Quiz/Seminar/Group Discussions/Site Visit
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course contentwith 60-70% weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO: 1**	**07 Hrs.**

SCOPE OF WATER RESOURCES ENGINEERING

Need and scope of irrigation Engineering, Methods of Irrigation: Surface, subsurface and overhead irrigation., advantages and disadvantages of irrigation, Crop Water requirement: Cropping seasons, Crop period, Duty, Delta, base period, intensity of irrigation, factors affecting duty. Relation between duty, delta and base period. Numerical on water requirement.

Unit: 2	**CO: 1**	**07 Hrs.**

RESERVOIR PLANNING

Reservoir: Types, selection of site, estimation of required storage and safe yield, mass curve, reservoir sedimentation, GCA, CCA, NCA, Dam and its classification based on use, materials and hydraulic design.

Unit: 3	CO: 4	08 Hrs.

EARTHEN AND GRAVITY DAMS

Earthen Dams: Components with function, typical cross section. Methods of construction of earthen dams, seepage through embankment and foundation and control, Types of failure of earthen dam and its preventive measures.

Gravity Dams: Forces acting on dam, typical cross section, drainage gallery. Spillways: Definition, function, Types. Emergency and service spillway - ogee spillway and discharge over spillway, Spillway gates. Energy dissipation.

Unit: 4	CO: 4	08 Hrs.

MINOR AND MICRO IRRIGATION

Bandhura irrigation: Introduction, Layout, components, construction. Percolation Tanks: Selection of site, need, construction, layout. Drip and Sprinkler Irrigation: components, layout, suitability. Well irrigation: Introduction, types, advantages and disadvantages.

Unit: 5	CO: 2	08 Hrs.

PIPE IRRIGATION NETWORK

Pipe Irrigation Network, Cross drainage works need, types, canal regulatory work.

River training and stabilization- stream bank erosion, bank protection, flow control structures, bank protection and river training along braided rivers, river flood control, and bridge scour

Unit: 6	CO: 3	07 Hrs.

LIFT IRRIGATION SCHEMES

Lift irrigation schemes - Various components and their design principles. General features of Hydropower, general layouts of different types of Case study on determination of flood line using HEC-RAS Software

Recommended Textbooks:

1. Punmia, Irrigation and waterpower engineering, 1986. Standard Publications, New Delhi.
2. S.K.Garg, Irrigation Engg.
3. P.N.Modi. Irrigation and waterpower engineering
4. Satyanarayan Murty, Water resources Engg_, New age international private Ltd.

References Books:

1. Justinn, Creager and Hinds, Engg. For Dams. Vol. I, II, III
2. Varshney, Design of hydraulic structures
3. U.S.B.R., Oxford and IBH Publ. Co. Design of small dams
4. Varshney, Design of hydraulic structures
5. Leliavsky, Design of hydraulic structures
6. Irrigation Engineering, by Subramanyam

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	To understand importance and scope of water resources engineering
ULO2	To understand different types and classification of dams, estimation of storage capacity of reservoir
ULO3	To understand the components and construction of earthen and gravity dams
ULO4	To understand the components of different irrigation methods
ULO5	To evaluate Various piping network and river training works
ULO6	To understand concepts of lift irrigation schemes and layout of hydropower plant

PROGRAM ELECTIVE III		
Sr. No.	**Course Code**	**Course Name**
1	UCVPE0711	Transportation And Smart City Planning – (PE-III)
2	UCVPE0712	Structural Health Monitoring and Retrofitting – (PE-III)
3	UCVPE0713	Human Resource Management – (PE-III)
4	UCVPE0714	GEODESY and Satellite Geospatial Technologies (PE-III)

Title of the Course:	**TRANSPORTATION AND SMART CITY PLANNING (PE-III)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0711**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students must possess fundamental knowledge of engineering mechanics, basic civil engineering, and transportation engineering

Course Description:

This course serves as a preparatory module for understanding the principles and concepts underlying transportation planning and urban infrastructure development. It covers the fundamental theories and methodologies necessary for effective participation in advanced studies in transportation planning. Students will delve into topics such as transportation systems, travel demand modelling, emerging trends, smart city infrastructure, and sustainable transportation practices.

Course Learning Objectives:

1. Understand foundational principles of transportation planning and its role in urban development.
2. Apply travel demand modelling techniques using software tools.
3. Explore emerging trends in transportation technology and their implications for urban mobility.
4. Evaluate sustainable transportation infrastructure design principles and environmental impact assessment methodologies.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Assess the scope of transportation systems in shaping urban development and smart city planning.	2	Understand
CO2	Examine smart city infrastructure, global policies, and case studies to understand their impact on urban development.	3	Apply
CO3	Analyse travel demand and urban transportation systems using OD based modelling techniques.	4	Analyze
CO4	Evaluate emerging transportation planning trends, including automated vehicles, MaaS, hyperloop, and aerial transport.	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	2	-	-	-	-	1
CO2	-	-	-	-	-	3	-	-	-	-	1
CO3	3	1	-	1	2	-	-	-	-	-	-

CO4	-	-	-	-	-	3	-	-	-	2	-

CO	PSO1	PSO2	PSO3
CO1	-	-	1
CO2	2	-	-
CO3	2	3	1
CO4	-	-	-

Assessments:

Teacher Assessment:

- Two components of Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/ Assignment/ Declared test/Quiz/Seminar/Group Discussions/Site Visit
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course contentwith 60-70% weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO: 1**	**09 Hrs.**

Introduction to Transport Planning: Principles and objectives, evolution of transportation systems, various modes of transportation and multimodal systems, role of transportation in shaping urban development and smart city planning, socioeconomic effects of transportation projects & application of GIS, relationship between transportation infrastructure, land-use pattern, and economic growth, Transportation Planning Process and Concepts.

Unit: 2	**CO: 3**	**06 Hrs.**

Urban Transportation Systems and Travel Demand Modelling (Part A): Trip Generation Analysis, Zoning, Types and sources of data, OD studies, Expansion factors, Accuracy checks, Trip generation models, Zonal models, Household models, Category analysis, Trip attractions of work centres, Trip Distribution Analysis, Trip distribution models, Growth factor models, Gravity models, Opportunity models.		
Unit: 3	**CO: 3**	**06 Hrs.**
Urban Transportation Systems and Travel Demand Modelling (Part B): Mode Split Analysis, Mode split Models, Mode choice behaviour, competing modes, Probabilistic models, Logit Models- binary, multinomial, nested logit models, Traffic Assignment - Route split analysis: Elements of transportation networks, Nodes and links, minimum path trees, all-or- nothing assignment, Multipath assignment, Capacity restraint.		
Unit: 4	**CO: 4**	**10 Hrs.**
Emerging Trends in Transportation Planning: Automated vehicles, MaaS, and their potential impacts on urban mobility patterns, Future trends in transportation infrastructure: hyperloop, drone delivery, aerial transportation, and their feasibility, benefits, and challenges, Implications of emerging technologies on transportation planning and urban design, Case studies of innovative transportation projects and pilot initiatives.		
Unit: 5	**CO: 2**	**08 Hrs.**
Smart City Infrastructure: Concept, objective, history of smart city world and India, Need to develop smart city, challenges of managing infrastructure in India and world, various types of Infrastructure systems, Integrated infrastructure management systems and its applications, Worldwide policies for smart city, Government of India - policy for smart city, Mission statement & guidelines, Smart cities in India, Case studies of smart city.		
Unit: 6	**CO2**	**06Hrs.**
Sustainable Transportation Infrastructure: Sustainable transportation infrastructure design principles, green transportation technologies- EVs, hybrid systems, alternative fuels, etc., environmental impact assessment and mitigation measures, policies and regulations promoting sustainable transportation practices, transportation costs.		

Recommended Textbooks:

1. Kadiyali. L.R., 'Traffic Engineering and Transportation Planning', Khanna Publishers, New Delhi.
2. Hutchinson, B.G, 'Introduction to Urban System Planning', McGraw Hill.
3. Khisty C.J., 'Transportation Engineering– An Introduction', Prentice Hall.
4. Papacostas, 'Fundamentals of Transportation Planning', Tata McGraw Hill.

References Books:

1. Meyer M. and Miller E., 'Urban Transportation Planning: A decision-oriented Approach', McGraw Hill.
2. Bruton M.J., 'Introduction to Transportation Planning', Hutchinson of London.
3. Dicky, J.W., 'Metropolitan Transportation Planning', Tata McGraw Hill.

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understand the basics of transport planning.
ULO2	Understand the importance of travel demand modelling.
ULO3	Utilise the simulation software.
ULO4	Acknowledge recent developments in planning.
ULO5	Understand smart city planning philosophy.
ULO6	Implement sustainable transport practices.

Title of the Course:	**STRUCTURAL HEALTH MONITORING AND RETROFITTING (PE-III)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0712**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Concrete Technology and Non-Destructive Testing

Course Description:

This Course contains Structural Health Monitoring Technique and Retrofitting Technique

Course Learning Objectives:

1. To explain the importance of Structural Health Monitoring
2. To explain different technique of Structural Health Monitoring
3. To explain the importance of Retrofitting.
4. To explain different technique of Retrofitting.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Classify Structural Health Monitoring.	2	Understanding
CO2	Apply knowledge about Structural Health Monitoring	3	Applying
CO3	Analyze the retrofitting	4	Analyzing
CO4	Explain different Retrofitting Technique	5	Evaluating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	2	-	-	-	-	1	-	-
CO2	-	-	-	2	-	2	-	2	-	-	-
CO3	-	-	1	2	-	2	-	2	1	-	-
CO4	-	-	2	2	-	2	-	2	-	-	-

CO	PSO1	PSO2	PSO3
CO1	1	2	2
CO2	1	2	2
CO3	1	2	2
CO4	1	2	2

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with60-70% Weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO:1**	**08 Hrs.**
Structural Health- factors affecting health of structures, Structural health monitoring-Various measures, regular maintenance, structural safety in alteration. Quality control & assurance of materials of structure, durability of concrete.		
Unit: 2	**CO: 1,2**	**06 Hrs.**
Motivation and objectives of structural health monitoring, active and passive health monitoring techniques, Load testing of structures, Dynamic testing of Structures.		
Unit: 3	**CO: 2**	**08 Hrs**
Introduction to system identification techniques; Sensors, Exciters, Data acquisition and data processing, filtering technique, Sampling rate, Application of Digital Signal Processing in structural health monitoring, Introduction to probabilistic structural health monitoring		
Unit: 4	**CO: 3**	**07 Hrs.**
Repair and Retrofitting Technique-I Definitions, repair methodology, Methods of crack repair in masonry and concrete structures, routing and sealing of cracks, removal and surface preparation in masonry and concrete structures, cleaning of reinforcement steel, reinforcement repair, anchorage, bonding repair materials to existing concrete.		

Unit: 5	CO: 3,4	08 Hrs
Repair and Retrofitting Technique-II Repairs using Mortars and Dry Packs, Concrete Replacement, Surface Impregnation, Rust Eliminators and Polymers Coating for Rebar During Repair Foamed Concrete, Vacuum Concrete, Gunite and Shotcrete, Injection: Epoxy, Resin, Polymer Modified Cement Slurry; Shoring and Underpinning. Propping and Supporting: False Work, Requirement of Good False Work, Design Brief for False Work, Execution Procedure.		
Unit: 6	**CO: 4**	**08 Hrs.**
Strengthening of Existing Structures General Principle, Relieving Loads, Stress Reduction, Strengthening of Super Structures (Beam, Column, Slab including Joints) for Tension, Compression, Flexural, and Shear respectively, Jacketing (RCC, Plate, Fiber ,Wrap), Bonded Overlays, Reinforcement Addition, Strengthening the Substructures, Increasing the Load Capacity of Footing, Strengthening of Masonry Structure		

Recommended Textbooks:

1. ShettyM.S., "Concrete Technology - Theory and Practice", S.Chand and Company.
2. Concrete Technology by M.L.Gambhir, Tata McGraw-Hill Education, Third Edition Professional Practice, RoshanNamavati.
3. Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.
4. Concrete Microstructures, properties and materials - P Kumar Mehta and Paulo J. M. Monterio
5. V. Giurgiutiu, Structural Health Monitoring with Piezoelectric Wafer Active Sensors, Academic Press.
6. Fu Ko Chang, Structural Health Monitoring: Current Status and Perspectives.
7. Philip, W., Industrial sensors and applications for condition monitoring, MEP.
8. Armer, G.S.T (Editor), Monitoring and assessment of structures, Spon, London

References Books:

1. Handbook on Repairs and Rehabilitation of RCC buildings – CPWD, Government of India.
2. Repairs and rehabilitation of concrete structures by P. I. Modi & C. N. Patel, PHI Publication

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understand the importance of Structural health monitoring
ULO2	Aware of factors affecting health of structures
ULO3	Understand the importance of system identification techniques for Structural health monitoring
ULO4	Understand the provisions made for Repair and Retrofitting.
ULO5	Aware of Repair and Retrofitting Technique.
ULO6	Understand the importance of Strengthening of Existing Structures.

Title of the Course:	**HUMAN RESOURCE MANAGEMENT (PE-III)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0713**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic understanding of management principles and organizational structure. Familiarity with communication skills and teamwork. Awareness of workplace/industrial environment and professional ethics.

Course Description:

This course provides fundamental concepts of Human Resource Management, focusing on manpower planning, recruitment, training, performance appraisal, compensation, and employee relations to prepare engineering students for effective people management in technical organizations.

Course Learning Objectives:

5. To understand the fundamental functions and strategic role of Human Resource Management in organizations.
6. To develop skills in manpower planning, recruitment, training, and performance management.
7. To analyze employee relations, compensation systems, and HR practices applicable in engineering and industrial environments.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain the principles, functions, and role of HRM in modern engineering organizations.	L2	Understand
CO2	Apply HR planning, recruitment, selection, and training methods to solve basic workforce-related problems.	L3	Apply
CO3	Evaluate employee performance through appropriate appraisal techniques and recommend suitable compensation practices.	L5	Evaluate
CO4	Analyze industrial relations issues, labor laws, and emerging HR trends to ensure effective employee management and organizational harmony.	L4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	1	1	3	2	2	2	3	2

CO2	2	2	2	2	1	3	2	2	3	3	2
CO3	1	2	2	2	1	3	2	2	2	3	2
CO4	1	2	1	2	1	3	3	3	2	3	2

CO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	2	3	2
CO3	1	2	2
CO4	2	2	3

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one in Mid semester examination (MSE) and one End Semester Examination (ESE) having 20%, 30%, and 50% weights respectively.

Assessment	Marks
ISE-I	10
MSE	30
ISE-II	10
ESE	50

- ISE 1 & 2 are based on assignment / declared test / quiz / seminar / Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three units) covered after MSE.

Course Contents:

Unit: 1 Introduction to Human Resource Management	**CO1**	**07 Hrs.**

Meaning, definition, scope & objectives of HRM, Functions of HRM: Managerial & Operative, Role of HR Manager in modern organizations, Strategic HRM & its importance in engineering industries, Evolution of HRM: (Personnel: HRM: HRD), Challenges of HRM in globalized & technological environments.

Unit: 2 Human Resource Planning & Recruitment	**CO1, CO2**	**08 Hrs.**

HR Planning: Need, process & levels, Manpower forecasting techniques (qualitative & quantitative), Job Analysis: Job Description (JD), Job Specification (JS), Recruitment: Sources & Methods (internal & external), Modern recruitment practices (e-recruitment, AI in hiring), Selection Process: Tests, interviews, background verification.		
Unit: 3 Training & Development	**CO2**	**08 Hrs.**
Meaning & objectives of Training, Training need identification (TNI), Training methods: On-the-job & Off-the-job, Development programs for engineers & technical staff, Evaluation of training: Kirkpatrick Model, Career planning & succession planning.		
Unit: 4 Performance Management & Appraisal	**CO3**	**08 Hrs.**
Concepts of Performance Management System (PMS), Performance appraisal methods: Rating scales, BARS, MBO, 360° appraisal, Key Performance Indicators (KPIs) & Competency mapping, Errors in performance appraisal, Employee counselling & feedback, linking performance to rewards & promotions.		
Unit: 5 Compensation Management & Employee Relations	**CO3, CO4**	**08 Hrs.**
Components of compensation: financial & non-financial, Wage & salary administration, Incentive plans & bonus systems, Employee welfare & social security, Grievance handling procedure, Employee relations: discipline, works committees, code of conduct.		
Unit: 6 Industrial Relations, Labor Laws & HR Trends	**CO4**	**06Hrs.**
Concept & objectives of Industrial Relations (IR), Trade unions: roles & functions, Collective bargaining – process & importance, Overview of key labor laws (in simple engineering-oriented form): Factories Act, Industrial **Disputes** Act, Minimum Wages Act, Industrial conflicts: causes & settlement mechanisms, Modern HR Trends: HR analytics, HRIS, remote workforce management, Digital HR.		

Recommended Textbooks:

6. Gary Dessler, Human Resource Management, Pearson Education.
7. K. Aswathappa, Human Resource Management: Text and Cases, McGraw Hill.]
8. P. Subba Rao, Personnel and Human Resource Management, Himalaya Publishing House.
9. V.S.P. Rao, Human Resource Management, Excel Books

References Books:

1. David A. DeCenzo & Stephen P. Robbins, Fundamentals of Human Resource Management, Wiley.
2. Michael Armstrong, Armstrong's Handbook of Human Resource Management Practice, Kogan Page.
3. Snell & Bohlander, Principles of Human Resource Management, Cengage.
4. Raymond Noe et al., Human Resource Management: Gaining a Competitive Advantage, McGraw Hill.
5. Edwin B. Flippo, Personnel Management, McGraw Hill.
6. J. N. Chatterjee, Human Resource Management, Sage Publications.

Title of the Course:	**GEODESY AND SATELLITE GEOSPATIAL TECHNOLOGIES (PE-III)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0714**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

- Knowledge of fundamentals of science, physics and basic mathematical ability - trigonometry.
- Good geographical clarity of places
- Surveying and levelling basics
- Knowledge of coordinate geometry and rectangular coordinate

Course Description:

Geodesy is a scientific and technological discipline closely integrated with the domains of **Geography** and **Information and Communication Technology (ICT)**. It focuses on the development and application of **surveying techniques, aerial surveying methods, and satellite-based remote sensing infrastructure** to address problems related to **geography, cartography, geosciences**, and other allied branches of **science and engineering**.

Course Learning Objectives:

1. Acquire knowledge of fundamentals of Geodesy and map projections.
2. Learn the importance of aerial Surveying and satellite remote sensing.
3. Use GNSS concepts knowledge for absolute positioning mapping.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Classify GNSS systems, Remote sensing satellites, platforms & sensors and role of DIP for improving Acquired data quality	2	Understand
CO2	Outline and demonstrate Geodesyasa Earth science. Relate the Earth shape with physical surfaces and datums.	3	Demonstrate
CO3	Learn applications of the course in ernuances by referring webinar/guest lecturers of scientist in the field	3	Apply
CO4	Compare and use Geodetic Survey, remote sensing and GPS data for Earth Resource mapping.	4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	-	-	1	-	-	-	-	-	2

CO2	3	3	-	-	-	-	-	-	-	-	2
CO3	-	1	2	2	-	-	-	-	-	-	2
CO4	3	1	1	2	-	-	-	-	-	-	2

CO	PSO1	PSO2	PSO3
CO1	-	1	-
CO2	-	1	-
CO3	-	1	-
CO4	-	1	-

Assessments:

Teacher Assessment:

- Two components of Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/ Assignment/ Declared test/Quiz/Seminar/Group Discussions/Site Visit
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course contentwith 60-70% weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO: 2**	**08 Hrs.**

Fundamentals of Geodesy and Map Projections:

The Earth: its shape and size; physical surface, geoid, and reference ellipsoid; datum and coordinate systems; geographical and projected coordinate systems and grid systems; choice, necessity, and classification of map projections

Unit: 2	**CO: 1,4**	**07 Hrs.**

Global Navigation Satellite Systems (GNSS):

Introduction to GNSS and basic principles of satellite positioning; components of GNSS (space, control, and user segments); types of GNSS; GNSS satellites and signals; Differential GPS (DGPS); sources of GNSS errors and their corrections; applications of GNSS in surveying, mapping, and navigation

Unit: 3	**CO: 1,4**	**07 Hrs.**

Fundamentals of Remote Sensing:

Definition and scope of remote sensing; basic principles and elements of remote sensing; history and development of remote sensing technology; fundamentals of electromagnetic radiation (EMR) and electromagnetic spectrum; interaction of EMR with the atmosphere and Earth's surface; atmospheric windows and their significance in remote sensing

Unit: 4	**CO: 2,4**	**07 Hrs.**

Remote sensing satellites:

Types and their characteristics; Types of Sensors; Orbital and sensor characteristics of major earth resource satellites. Indian remote sensing satellite programme. applications in resource monitoring, environmental management, and disaster assessment.

Unit: 5	**CO: 1**	**08 Hrs.**

Digital Image Processing:

Digital image – introduction and data formats; introduction to image processing; sources of errors – geometric and radiometric; image rectification; image enhancement – methods and techniques; image classification – supervised and unsupervised; image accuracy assessment.

Unit: 6	**CO: 3**	**08Hrs.**

ISRO-IIRS outreach edusat programs with online lectures on Remote Sensing, aerial photography, GNSS and GIS

Recommended Textbooks:

1. Jensen, J.R. (2006): Remote Sensing of the Environment: An Earth Resource Perspective (2nd Ed.), Prentice Hall, New Jersey
2. Lillesand, T.M., Kiefer, R.W., and Chipman, J.W. (2007): Remote Sensing and Image Interpretation (6th Ed.). Wiley, New Jersey
3. Reddy, M.A. (2008): Textbook of Remote Sensing and Geographical Information System (3rd Ed.), BS Publications, Hyderabad,1

References Books:

1. Nair, N. B. (1996): Encyclopedia of Surveying, Mapping and Remote Sensing. Rawat Publications., Jaipur and New Delhi.
2. Bernhardensen, Tor. 1999. Geographic Information Systems: An Introduction. Toronto: John Wiley & Sons, Inc

Websites:

1. Indian institute of remote sensing, (IIRS),
2. National Remote Sensing Centre (NRSC), India: http://www.nrsc.gov.in
3. National Aeronautics and Space Administration (NASA), USA:
4. http://www.nasa.gov
5. United States Geological Survey (USGS), USA: http://www.usgs.gov
6. International Society for Photogrammetry and Remote Sensing (ISPRS):
7. http://www.isprs.org
8. Bhuvan: http://www.bhuvan.nrsc.gov.in
9. Wikimapia: http://www.wikimapia.org

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Compare different satellite systems of the world and their capabilities.
ULO2	Trace history and present-day GIS
ULO3	Trace history and present-day GIS
ULO4	Choose the appropriate tool for data modelling
ULO5	Learn and use Visual Image Interpretation
ULO6	Students will gain comprehensive understanding and practical skills in remote sensing, aerial photography analysis, GNSS utilization, and GIS application through ISRO-IIRS outreach edusat programs.

Title of the Course:	**QUANTITY SURVEYING AND VALUATION LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0731**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Building Material, Building Planning, Surveying, RCC Detailing.

Course Description:

Preparation of Estimates, Rate Analysis, Bar Bending Schedule, Tender and Contract Document

Course Learning Objectives:

1. To choose types of Estimate & Specification as per requirement of Government & Private Organization.
2. To develop Bill Of Quantities, Rate analysis, Bar Bending Schedule for Building and other structure
3. To create tender & contract document.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Prepare detailed specifications and estimates for buildings and other civil engineering works in accordance with the requirements of government and private organizations.	6	Create
CO2	Develop Bills of Quantities , rate analysis, and bar bending schedules for buildings and other civil engineering structures using standard measurement practices.	6	Create
CO3	Create and compile tender and contract documents for civil engineering projects, incorporating standard contractual provisions.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	1	-	-	2	1	1	-	1	-
CO2	1	1	2	2	2	3	3	3	3	1	3
CO3	-	1	2	2	2	3	3	3	3	3	3

CO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	2
CO3	3	-	3

Assessments :

Teacher Assessment:

- Two components of In Semester Evaluation (ISE)

Assessment	Marks
ISE	50
ESE OE	50

- ISE based on Assignment
- ESE: oral exam assessment based on 100 % on Course Content.

Course Contents:

Experiment No: 1	**CO: 02**	**02 Hrs.**
Detailed specification for minimum ten civil engineering items. (One each from Roads, Irrigation works, Water Supply & Sanitation & seven from buildings)		
Experiment No: 2	**CO: 02**	**02 Hrs.**
Mode of measurement for different components of building based on Red Book.		
Experiment No: 3	**CO: 01**	**10 Hrs.**
Detailed estimate of G + 1 Framed Structure. Using any software (Excel Worksheet/Estimation Software)		
Experiment No: 4	**CO: 01**	**06 Hrs.**

Preparing detailed estimate for any one of the following:

- A stretch of a road about 1 Km. long including earthwork.
- A reach of canal about 1 Km. long.
- A factory shed of steel frame.
- Precast or Prefabricated structure

Experiment No: 5	**CO: 02**	**04 Hrs.**
Rate Analysis of ten civil engineering items.		
Experiment No: 6	**CO: 02**	**04 Hrs.**
Schedule of reinforcement for the following • Beams • Slab, • Staircase • Column & footing • Chajja and Lintel,		
Experiment No: 7	**CO: 03**	**02 Hrs.**
Preparation of contract document for building mentioned in Term Work		
Experiment No: 8	**CO: 01**	**02 Hrs.**
Solve any TEN Problems based on Depreciation and Valuation Methods for Land and Building.		

Recommended Textbooks:

1. Dutta, S. K. (2020). *Estimating and costing* (6th ed.). Dhanpat Rai & Sons.
2. Birdi, G. S. (2022). *Estimating and costing* (7th ed.). Dhanpat Rai & Sons.
3. Chakraborty, M. (2018). *Estimating, costing and specification in civil engineering* (5th ed.). Bhabananda Publications.
4. Rangwala, S. C. (2021). *Elements of estimating and costing* (14th ed.). Charotar Publishing House.
5. Patil, B. S. (2019). *Civil engineering contracts and estimates* (4th ed.). Universities Press Private Ltd.
6. Government of Maharashtra, Public Works Department. (2022). *Standard specifications* (Vols. I–II). Government Press.
7. Government of India. (2020). *The Indian Contract Act, 1872* (Act No. 9 of 1872). Ministry of Law and Justice.

References Books:

1. The A To Z of Practical Building Construction and its Management- Sandeep Mantri ,Satya Prakashan, New delhi.
2. C.P.W.D. specifications

3. C.P.W.D. schedules of rates
4. M.J.P. schedules of rates
5. W.R.D. schedules of rates

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understand Detailed specification
ULO2	Understand Mode of measurement
ULO3	Prepare detailed estimate of G + 1 Framed Structure
ULO4	Prepare detailed estimate of other structure then building
ULO5	Prepare Rate Analysis
ULO6	Prepare Schedule of reinforcement
ULO7	Prepare Contract document
ULO8	Use software for above experiments

Title of the Course:	**REINFORCED CONCRETE STRUCTURE DESIGN LABORATORY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPC0732**	**-**	**-**	**4**	**2**

Course Pre-Requisite:

Students should have prior knowledge of Strength of Materials, Structural Analysis, Design of Reinforced Concrete Structures, Building Planning and Drawing, Concrete Technology, and basic familiarity with structural analysis software.

Course Description:

This laboratory course emphasizes practical application of reinforced concrete design through the complete design of a G+1 residential building. It includes structural analysis using software with manual validation, preparation of detailed design reports, and ductile detailing as per IS 13920. The course also familiarizes students with real-world construction practices through site visits.

Course Learning Objectives:

8. Apply reinforced concrete design principles to design a G+1 residential building subjected to gravity loads.
9. Perform structural analysis using standard structural analysis software and validate the results through manual calculations.
10. Prepare a comprehensive structural design report and detailed drawings with ductile detailing as per IS 13920.
11. Understand practical construction practices and detailing through site visits and professional documentation.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Apply construction practices and site observations for effective implementation of RC designs.	3	Apply
CO2	Analyze the RC structural system using structural analysis software and verify results with manual calculations.	4	Analyze
CO3	Design a G+1 RC residential building for gravity loads as per relevant Indian Standards.	6	Create
CO4	Prepare structural design reports and drawings with ductile detailing in accordance with IS 13920.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	2		1	2	1	2	1		
CO2	3	3	2	2	3			1	1		1
CO3	3	3	3	2	2	2	1	1	1	2	1
CO4	2	2	3	1	2	2	2	2	3	1	1

CO	PSO1	PSO2	PSO3
CO1	3	2	1
CO2	2	3	2
CO3	3	3	2
CO4	2	2	3

Assessments:

- One component of In Semester Evaluation (ISE) and one End Semester Examination (ESE) having 50%, and 50% weights respectively.

Assessment	Marks
ISE	25
ESE OE	25

- ISE: Assessment is based on performance of students in laboratory, analysis and design write- up, Detailed Drawing etc.
- ESE: Assessment is based on performance in design write-up, drawing presentation, and oral.

Course Contents:

1. Students shall design a G+1 residential reinforced concrete building with a minimum built-up area of 120 sq. m, considering gravity loads only, in accordance with relevant Indian Standard codes.
2. A comprehensive and detailed structural design report shall be prepared, including design calculations, assumptions, and code references.
3. Structural analysis of the building shall be carried out using recognized structural analysis software,

and the obtained results shall be validated through representative manual calculations.

4. Structural drawings shall be prepared and shall clearly indicate ductile detailing provisions in accordance with IS 13920.
5. A detailed site visit report shall be prepared to document construction practices, reinforcement detailing, and execution aspects related to reinforced concrete structures.

Recommended Textbooks:

10. Reinforced Concrete Structural Elements – Purushothaman, P., Tata McGraw-Hill Education.
11. Reinforced Concrete – Ashok K. Jain, Nem Chand & Bros., Roorkee.
12. Plain and Reinforced Concrete, Vol. I & II – Jain & Jaikrishna, Nem Chand & Bros., Roorkee.
13. Reinforced Cement Concrete Design – Neelam Sharma, S. K. Kataria & Sons, New Delhi.
14. Illustrated Design of Reinforced Concrete Buildings – Dr. V. L. Shah & Dr. S. R. Karve, Structures Publications, Pune.
15. Limit State Design of Reinforced Concrete – P. C. Varghese, PHI Learning.
16. Reinforced Concrete Design – S. Pillai & D. Menon, Tata McGraw-Hill Education.
17. Design of Reinforced Concrete Structures – B. C. Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications.
18. Reinforced Concrete Structures – B. K. Handa & S. S. Bhattacharjee, Tata McGraw-Hill Education.

References Books:

7. IS 456: 2000 – Plain and Reinforced Concrete – Code of Practice.
8. IS 3370: 2009 – Concrete Structures for Storage of Liquids.
9. IS 875 (Part 1–3) – Code of Practice for Design Loads (Dead, Imposed, and Wind Loads).
10. SP 16: 1980 – Design Aids for Reinforced Concrete to IS 456.
11. SP 34: 1987 – Handbook on Concrete Reinforcement and Detailing.

Title of the Course:	**MAJOR PROJECT-I**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVIL0771**	**-**	**-**	**2**	**1**

Course Pre-Requisite:

Basic knowledge up to pre-final year level in Civil Engineering.

Course Description:

The course focuses on problem identification, project planning and scheduling, role allocation, literature survey, methodology formulation, synopsis preparation, and data collection.

Course Learning Objectives:

1. To carry out extensive literature survey on the research topic
2. Identify the problem statement for the research work.
3. Decide methodology for the research work.
4. Develop the mathematical/analytical modeling or experimental set up or field work and derive the outcomes of the work.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Relate available knowledge with reference to specific problem.	2	Understand
CO2	Formulate problem and define systematic approach to arrive at solution.	6	Create
CO3	Compose collected data, analyse and arrive at Solution to a defined problem.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	2	1	1	1	1	1
CO2	1	3	2	1	1	2	1	1	1	1	1
CO3	2	2	3	3	2	2	1	1	1	1	1

CO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	2	2	1
CO3	2	2	1

Assessments:

Teacher Assessment:

- One component of In Semester Evaluation (ISE)

Assessment	Marks
ISE	50
ESE (OE)	50

- ISE and ESE (OE) is based on performance of student in Presentations and report Submitted at the time of final presentation.

Course Contents:

Every student eitherhas to work for a one semester (VIIth Semester) or for a one-year project in the final year under the guidance of a Guide allotted by the department. The project work will be a design project, experimental project, field surveying or computer-orientedsimulation on any of the topics of civil engineering and multi-disciplinary interest. The group is required to do literature survey, formulate the problem, form a methodology and arrive at the solution of the problem.

Project work shall be carried out at

A. Parent Institute
B. Industry
C. Research Institute
D. Incubation Centre at Institute

Depending on students 'choice from above options, the group has to be formed accordingly.

The evaluation shall be done by Project Assessment Committee consist of Four to Six Faculty Members from the Department at the end of Seventh Semester. Project Group will have to submit

1. Synopsis of project in prescribed format to Project Assessment Committee at the time of Synopsis presentation.

   and

2. A detailed report based on the work done in prescribed format to Project Assessment Committee at time of Final Presentation.

Students are expected to define the problem and its scope, completeLiterature survey, finalize methodology for data collection, analysis and final outcomes of the work.

The project guide will award the marks to the individual students depending on the group average awarded by the Project Assessment Committee.

For work load calculation minimum load is 1Hr/week, for one group of THREE to FIVE students. (As per AICTE Guide Lines).

Guidelines:

1. Project group consists of a minimum THREE and maximum FIVE students.
2. One Project Guide shall be allotted maximum TWO groups for guidance.
3. After interactions with guide and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of project.
4. Students are expected to detail out methodology, software required, critical issues involved in analysis /design and implementation and submit the proposal within Two week of commencement of the semester
5. Completed project work and documentation in the form of report is to be submitted before the end of semester assessment.
6. Schedule for Presentation:
    a) Synopsis Presentation
    b) Monthly Presentation given by student groups – ISE Assessment
    c) Final presentations given by student groups - ESE (OE)

Title of the Course:	**Automation in Construction**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVMM0741**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basics of Projects and Automation, Instrumentation and Data Analytics, AI Applications, Digital Twin and Asset Management

Course Description:

This course is designed to apply various automation strategies for construction applications

Course Learning Objectives:

The objective of learning this course is to apply automation for productivity enhancement amongst Civil Engineering applications

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	**Descriptor**
CO1	Recognize the significance of automation in construction	01	Knowledge
CO2	Apply automation skills to civil engineering applications	03	Application

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	1	1	2	2	2	0	3	3	3	3
CO2	0	0	0	0	0	0	0	0	1	1	0

CO	PSO1	PSO2	PSO3
CO1	3	1	3
CO2	1	0	2

Assessments:

Teacher Assessment:

ESE: End Semester Examination is based on 100% course content It may include Multi choice questions

Course Contents:

Unit: 1	**CO: 1**	
Introduction and Feasibility Concepts: Evolution of construction automation, current industry challenges, and the necessity of automation. Strategic Analysis: Cost-benefit analysis of automated vs. manual methods, feasibility studies for specific project conditions, and economic impact. Standards: Introduction to relevant BIS and international standards for automated construction.		**Hrs. 06**
Unit: 2	**CO: 1**	
Automated Equipment and Machinery Heavy Machinery: Automation in highway construction, canal lining, and concrete technology. Operating Systems: Understanding the productivity, owning, and operating costs of automated excavators, pavers, and concrete batching plants. Control Systems: Basics of hydraulics, pneumatics, and electrical drives used in heavy automation.		**Hrs. 06**
Unit: 3	**CO: 2**	
Robotics in Construction Types of Robots: Aerial drones, ground-based robots, robotic manipulators, and exoskeletons. Applications: Automated bricklaying (masonry), demolition robots, robotic welding for prefabrication, and rebar tying/bending. Control Fundamentals: Robot kinematics, path planning algorithms, and sensor integration (proximity, ultrasonic, and force sensors).		**Hrs. 10**
Unit: 4	**CO: 2**	
Digital Integration and Advanced Technologies BIM and Modeling: Integration of Building Information Modeling (BIM) with real-time site data for clash detection and progress monitoring. Visualization: Applications of Virtual Reality (VR) and Augmented Reality (AR) for site walkthroughs and structural health monitoring.		**Hrs. 10**

Emerging Tech: Introduction to 3D concrete printing (additive manufacturing) and modular building prefabrication.			
Unit: 5	**CO: 2**		
Drones and Data Acquisition UAS Applications: Use of Unmanned Aerial Systems (UAS) for photogrammetry, aerial mapping, and land surveying. Project Monitoring: Real-time data collection for quantity and quality surveys, and underwater site inspections. Sensor Networks: IoT-based sensor technologies for monitoring building performance and structural health.			**Hrs. 06**
Unit: 6	**CO: 2**		
Building and Site Automation Smart Systems: Introduction to Building Automation Systems (BAS) for HVAC, lighting, fire safety, and security. Logistics: Automation in site logistics, material handling, and cloud-based data management systems. Future Trends: Role of Artificial Intelligence (AI) in construction management and the use of Block chain for secure project data.			**Hrs. 08**

Reference Books:

1. Construction and Building Automation: From Concepts to Implementation by Benny Raphael (Routledge, CRC Press, 2022).
2. Automation and Robotics in the Architecture, Engineering, and Construction Industry by Houtan Jebelli, et al. (Springer, 2022).
3. Automation in Construction toward Resilience: Robotics, Smart Materials and Intelligent Systems by Ehsan Noroozinejad Farsangi and Mohammad Noori (Taylor & Francis, 2026).
4. Construction 4.0: An Innovation Platform for the Built Environment edited by Anil Sawhney, Michael Riley, and Javier Irizarry (Routledge, 2020).
5. BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers and Contractors by Charles Eastman, et al. (Wiley, 2011).

Title of the Course:	**Mathematical Modelling and Simulation**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0741**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students shall have the knowledge of:

- Introduction to Data Science
- Statistics for Data Science
- Python for Data Science
- Data Analytics

Course Description:

This course introduces mathematical modelling and simulation concepts with specific applications to environmental engineering systems, using data-driven approaches and Python programming. The focus is on understanding how environmental processes can be represented using simple mathematical models, calibrated using real or simulated data, and analyzed through computational simulations. Emphasis is placed on conceptual modelling, interpretation of results, and decision-making, rather than advanced numerical methods or software development. The course equips students with practical skills to analyze environmental data, simulate system behaviour, and support planning and management of environmental systems.

Course Learning Objectives:

1. Understand the role of mathematical modeling and simulation in environmental engineering.
2. Develop simple mathematical models for environmental processes using data-driven approaches.
3. Apply Python-based tools to simulate and analyze environmental systems.
4. Interpret model outputs for environmental decision-making and sustainability planning.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain fundamental concepts of mathematical modelling and simulation in environmental engineering.	02	Understanding
CO2	Formulate simple mathematical models for environmental systems using data and assumptions.	03	Application
CO.3	Apply Python-based simulation techniques to analyze environmental engineering problems.	03	Application
CO.4	Interpret simulation results to support environmental management and engineering decisions.	04	Analyzing

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	–	–	–	1	–	–	–	–	–
CO2	3	2	2	–	1	2	–	–	–	–	–
CO3	3	2	2	–	2	2	–	–	–	–	–
CO4	2	3	2	–	–	3	–	–	–	–	1

CO	PSO1	PSO2	
CO1	1	1	
CO2	2	2	
CO3	2	2	
CO4	3	2	

Assessments:

Teacher Assessment:

Assessment	Weightage (Marks)
ESE	100

- **ESE:** Assessment is based on 100% course content

Course Contents:

Unit: 1		
Unit 1: Introduction to Modelling and Simulation in Environmental Engineering Concept of systems and models; types of models—physical, conceptual, mathematical, and data-driven; deterministic vs stochastic models; static vs dynamic models; role of modelling in environmental engineering; limitations and uncertainty in models; overview of simulation workflow using Python.		**Hrs. 07**
Unit: 2	**CO: 1**	
Unit 2: Mathematical Representation of Environmental Processes Basic mass balance concepts; steady-state and unsteady-state models; simple algebraic and differential equations in environmental systems; population growth models; pollutant transport basics; model assumptions and simplifications for environmental applications		**Hrs. 07**

Unit: 3	**CO: 2**	
Unit 3: Data-Driven Modelling Using Python Environmental data types and sources; data preprocessing and visualization; regression models (linear and multiple); correlation and trend analysis; fitting models using Python libraries (NumPy, Pandas, Matplotlib, SciPy – conceptual use); interpretation of model parameters.		**Hrs. 08**
Unit: 4	**CO: 2**	
Unit 4: Simulation of Environmental Systems Simulation concepts; time-based simulations; numerical solution of simple differential equations (Euler method – conceptual); simulation of water quality systems, air pollution dispersion (basic), population and resource models; scenario analysis and sensitivity analysis.		Hrs. 07
Unit: 5	**CO: 2**	
Unit 5: Modelling Applications in Environmental Engineering Water supply and demand modelling; wastewater treatment process modelling (conceptual); air quality index modelling; solid waste generation forecasting; climate-related environmental indicators; use of models in environmental impact assessment and planning.		**Hrs. 07**
Unit: 6	**CO: 2**	
Unit 6: Model Evaluation, Uncertainty, and Decision Support Model calibration and validation; goodness-of-fit indicators (R^2, RMSE – concept level); uncertainty and limitations in environmental models; ethical and responsible use of models; role of modelling and simulation in policy-making and sustainable development; brief case studies.		**Hrs. 08**

Text Books:

1. Chapra, S. C., Surface Water-Quality Modeling, McGraw-Hill, 1st Edition, 1997.
2. Beck, M. B., Environmental Foresight and Models, Elsevier, 1st Edition, 2002.
3. Montgomery, D. C., Runger, G. C., Applied Statistics and Probability for Engineers, Wiley, 7th Edition, 2018.

Reference Books:

4. Jørgensen, S. E., Fundamentals of Ecological Modelling, Elsevier, 5th Edition, 2016.
5. Lindstrom, M., Environmental Modelling Using Python, CRC Press, 1st Edition, 2020.
6. Wes McKinney, Python for Data Analysis, O'Reilly Media, 2nd Edition, 2018.
7. EPA Manuals on Environmental Modelling and Decision Support Systems.

Title of the Course:	**Introduction to Financial Management**	**L**	**T**	**P**	**Credit**
Course Code:	**UCEMM0742**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Students shall have the knowledge of:

- Algebra and Engineering Mathematics
- Engineering Management
- Basics of Human Resource Management

Course Description:

This course introduces fundamental concepts of financial management with a strong emphasis on their application in engineering projects, environmental infrastructure, sustainability initiatives, and organizational decision-making. The course enables students to understand how financial principles support planning, evaluation, and execution of engineering and environmental projects. It integrates financial analysis with real-world considerations such as risk, sustainability, resource efficiency, and project viability, preparing environmental engineering graduates to make informed techno-economic decisions in professional practice.

Course Learning Objectives:

1. Understand core principles and functions of financial management in engineering organizations.
2. Apply financial planning and analysis tools to engineering and environmental projects.
3. Explain time value of money, risk–return trade-offs, and cost of capital concepts.
4. Analyze capital budgeting decisions for infrastructure and sustainability projects
5. Understand working capital management in project and organizational contexts.
6. Interpret dividend decisions, sources of finance, and financial statements for decision-making.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain fundamental concepts, objectives, and functions of financial management in engineering and environmental projects.	02	Understanding
CO2	Apply financial planning, time value of money, and cost of capital concepts to evaluate engineering and sustainability projects.	03	Application
CO.3	Analyze capital budgeting and working capital decisions using appropriate financial evaluation techniques.	04	Analyzing
CO.4	Interpret dividend policies, sources of finance, and basic financial statements for managerial and project-related decision-making.	03	Application

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	–	–	2	–	–	–	–	–
CO2	3	2	2	–	–	2	–	–	–	–	–
CO3	2	3	2	–	–	2	–	–	–	–	–
CO4	2	2	1	–	–	1	–	–	–	2	–

CO	PSO1	PSO2	
CO1	–	–	
CO2	1	1	
CO3	1	2	
CO4	–	1	

Assessments:

Teacher Assessment:

Assessment	Weightage (Marks)
ESE	100

- **ESE:** Assessment is based on 100% course content

Course Contents:

Unit: 1		
Unit 1: Introduction to Financial Management and Engineering Applications Meaning, objectives, and scope of financial management; role of finance in engineering and infrastructure organizations; finance functions—investment, financing, liquidity, and dividend decisions; risk–return trade-off; relevance of financial management in environmental and sustainability projects; overview of financial decision-making in public and private sector projects, carbon pricing.		**Hrs. 07**
Unit: 2	**CO: 1**	
Unit 2: Time Value of Money and Risk Analysis Concept of time value of money; simple and compound interest; present value and future value; annuities; discounting and compounding techniques; application of TVM in engineering projects; risk and return concepts; types of risk; introduction to risk assessment in infrastructure and environmental projects.		**Hrs. 07**

Unit: 3	**CO: 2**	
Unit 3: Cost of Capital and Capital Structure Concept and significance of cost of capital; cost of equity, debt, and preference capital; weighted average cost of capital (WACC); theories of capital structure; optimum capital structure; relevance of cost of capital in project appraisal and sustainable investment decisions.		**Hrs. 08**
Unit: 4	**CO: 2**	
Unit 4: Capital Budgeting and Project Appraisal Capital budgeting concept and importance; methods of capital budgeting—Payback Period, Net Present Value (NPV), Internal Rate of Return (IRR), Profitability Index, Accounting Rate of Return; limitations of methods; application of capital budgeting to environmental, renewable energy, water supply, and waste management projects; basics of break-even analysis.		Hrs. 07
Unit: 5	**CO: 2**	
Unit 5: Working Capital Management Concept and significance of working capital; estimation of working capital requirements; management of cash, receivables, and inventory; operating cycle; working capital management in construction, infrastructure, and environmental projects; liquidity management and short-term financing.		**Hrs. 07**
Unit: 6	**CO: 2**	
Unit 6: Dividend Policy, Sources of Finance, and Financial Statements Dividend—meaning, types, and policies; determinants and theories of dividend policy; sources of finance—long-term, medium-term, and short-term; role of financial institutions; basics of financial statements—balance sheet, income statement, and cash flow statement; interpretation of financial statements for engineering and environmental decision-making.		**Hrs. 08**

Text Books:

1. Financial Management by I.M. Pandey Vikas Publishing House PVT Ltd.
2. Financial Management Theory and practice by Prasanna Chandra Tata McGraw Hill co. Chennai.
3. Financial Management by Rajiv Srivastava & Anil Misra, Oxford University Press, Chennai
4. Financial management – Preeti Singh Ane books – PVT Ltd., Chennai.

Reference Books:

1. Financial Management by D. Chandra Bose, PHI learning India PVT Ltd., www.phindia.com
2. Financial Management Text and cases – Cengage learning – By Brigham &Ehrhardt India edition.
3. Financial Management Text, problem and cases – My. Khan and PK. Jain Tata McGraw-Hill Co.
4. Financial Management – Bhabatosh Banerjee – PHI Learning PVT Ltd.,
5. Financial Management India Edition, James C.VAN Horne &Joh. M. Wachowfcz, PHIlearning Private Ltd.,

Final Year B. Tech
Semester - VIII

Academic Year 2026-2027

PROGRAM ELECTIVE IV		
Sr. No.	**Course Code**	**Course Name**
1	UCVPE0811	Advanced Structural Analysis – (PE-IV)
2	UCVPE0812	Traffic Engineering and Management – (PE-IV)
3	UCVPE0813	Finite Elements Methods (PE-IV)
4	UCVPE0814	Legal Aspects in Construction Industry – (PE-IV)
5	UCVPE0815	Soil Conservation and Watershed Management – (PE-IV)

Title of the Course:	**ADVANCED STRUCTURAL ANALYSIS – (PE-IV)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0811**	**3**	**0**	**0**	**3**

Course Pre-Requisite:

Elements of Engineering Mechanics, Solid Mechanics, Strength of Materials, Theory of Structures, Design of concrete structures

Course Description:

Analysis and Design of Structural Elements

Course Learning Objectives:

1. Categories complex structures and identify their distinct responses to loading
2. Apply mathematical concepts towards explaining structural behavior
3. Analyze specific structures for their structural behavior

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Construct the influence line curves for singly redundant structures or fixed beams	3	Applying
CO2	Solve complex indeterminate structures for the desired targets of study	3	Applying
CO3	Analyze asymmetric sections subjected to bending and / or torsion	4	Analyzing

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	-	2	3	3	1	1	1	2	-	-
CO2	3	3	2	3	3	1	1	1	3	-	-
CO3	3	3	2	3	-	1	1	1	3	-	-

CO	PSO1	PSO2	PSO3
CO1	1	3	1
CO2	2	3	1
CO3	1	3	1

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit: 1	**CO: 1**	**09 Hrs.**
Indeterminate Linear structures: Beams Curved in Plan: Determinate and Indeterminate beams. **Fixed Arches :** Analysis of fixed arches by Elastic Center Method		
Unit: 2	**CO: 2**	**06 Hrs.**
Influence Line Diagrams: Muller Breslau Principle, I.L.D. for Propped Cantilever, Fixed beam, 2-span Continuous beam, 2 hinged Arches.		
Unit: 3	**CO: 2**	**08 Hrs.**
Beams on Elastic Foundations: Analysis of infinite and semi-infinite beams. Standard Loading cases Specific Numerical examples on infinite beams		
Unit: 4	**CO: 3**	**09 Hrs.**
Approximate Analysis of Multi-story Frames: Analysis of multi-story Frames subjected to lateral loads - Portal Method, Cantilever Method		

Unit: 5	CO: 3	06 Hrs.
Flexure & Torsion of Asymmetric Section Unsymmetrical Bending and Shear Center		
Unit: 6	**CO: 2**	**07 Hrs.**
Space Trusses : Member Forces by Tension Coefficient Method, Determination of change in angles		

Recommended Textbooks:

1. Analysis of Structures Vol.II- Vazirani and Ratwani, Khanna Publishers, Delhi
2. Advanced Theory of Structures & Matrix Methods- Vazirani and Ratwani
3. Structural Analysis – Negi and Jangid, Tata McGraw Hill Pub. Co. Ltd.
4. Design of Steel Structures Vol.II– Ramchandra Standard Book House, Delhi
5. Strength of Materials Vol.II – Timoshenko, East-West Press ltd. Delhi
6. Mechanics of Structures Vol. II & III- S. B. Junnerkar & Shah, Chartor Pub.House.
7. Design of Steel Structures- B.C.Punmia, A.K.Jain, Laxmi Publication(p) Ltd. Delhi

References Books:

1. S.P. Timoshenko and J.N. Goodier, ―Theory of Elasticity‖, Tata McGraw-Hill Publishing Co. Ltd., 3rd edition
2. Norris and Wilbur, ―Elementary Structural Analysis‖, McGraw Hill Inc., 4th Edition

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Analyze linear structures curved either in plan or elevation
ULO2	Construct the influence line curves for singly redundant structures and fixed beams.
ULO3	Analyze linear foundations on elastic soils
ULO4	Solve multi-story frames with lateral loads, manually and approximately
ULO5	Solve sections for structural responses and / or geometric characteristics
ULO6	Analyze 3-D pin connected frames for member forces and change in angles

Title of the Course:	**TRAFFIC ENGINEERING & MANAGEMENT – (PE-IV)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0812**	**3**	**0**	**0**	**3**

Course Pre-Requisite:

Students must possess fundamental knowledge of engineering mechanics, basic civil engineering, and transportation engineering.

Course Description:

This course will help the students to understand importance of Traffic Studies and its Application, traffic regulation, traffic management, road safety auditing & benefits of ITS.

Course Learning Objectives:

1. To understand the fundamentalsoftrafficengineering.
2. Togetacquaintedwithvarioussurveysintrafficengineering&useofthedatacollected.
3. Toknowthegeometricdesignaspectsoftrafficfacilitiessuchasintersections.
4. Tounderstandthedifferentaidsavailablefortrafficregulation.
5. Togainknowledgeofroadsafetyforhighways.
6. Tointroducethelearnertodevelopingareasoftrafficengineeringsuchas Intelligent Transportation System.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Examinefundamentalrelationshipsbetweentrafficparameters to characterize traffic flow.	2	Understand
CO2	Assess theimportanceof road safety and applications of ITS.	2	Understand
CO3	Conducttrafficengineeringstudyandanalysethe data	4	Analyze
CO4	Designthetrafficfacilitiesandsummarizethetraffic management measures.	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	3	-	-	-	-	-
CO3	1	2	-	2	-	-	-	3	2	-	-
CO4	2	1	1	-	-	3	-	-	-	-	-

CO	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	-	-	-
CO3	2	1	1
CO4	-	1	1

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit: 1 IntroductiontoTrafficEngineering	**CO: 1**	**08 Hrs.**

Definition,RoleofTrafficEngineer,TransportationSystems&their function,ElementsofTrafficEngineering.Roaduser&vehicle characteristics,fundamentalparameters&relationshipoftrafficflow,speed and concentration.

Unit: 2 TrafficStudies&Analysis	**CO: 3**	**08 Hrs.**

Spot speed study & its presentation, speed & delay & its methods, Origin & Destination studies & its methods, Volume study, Parking surveys & planning. Statistical applications in traffic engineering.

Fieldassignment-anytrafficstudy&analysiswork.(duration=1week) Highway capacity -HCM & IRC Specification. Concept of Level of Service

Unit: 3 TrafficFacilityDesign	**CO: 4**	**05 Hrs.**
At-grade intersections- Principles of design- Design of channelising islands, T, Y, skewed, staggered, roundabout, mini-roundabout and other forms of at-grade crossings Gradeseparatedintersections:Warrantsanddesignfeatures Highway Lighting -need, laws, spacing, types, quantity of illumination needed for different classes of roads, lighting in tunnels, maintenance.		
Unit: 4 Trafficoperation,regulation&control	**CO: 4**	**06Hrs.**
TrafficSigns–importance&types.Roadmarkings-function,types,IRC specifications. Traffic Signals- use, types, number & location. Miscellaneous traffic aids. Traffic regulation – principle, types, enforcement measures. Traffic System Management - speed control, one-way streets, reversible lanes, access control, bus priority measures, turning restrictions, congestion pricing.		
Unit: 5 RoadSafetyAspects	**CO: 2**	**08 Hrs.**
Accident Investigation and Prevention: Characteristics of road accidents, causes of accidents: road – driver – vehicle - environment, Significance of accident data, Accident recording and analysis - Crash reporting and collision diagrams - Statistical Interpretation and Analysis of Crash Data. Identification of potential sites for treatment - Safety counter measures. Monitoring and evaluation. Road Safety Audit – Overview, stages of road safety audit, audit process, checklists and elements of good road safety audit. Surrogate Safety Measures.Highway safety improvement program - Safety Education, Traffic Law Enforcement. Road Safety Management System. Case studies		
Unit: 6 IntelligentTransportationSystem	**CO: 2**	**06 Hrs.**
Introduction to Intelligent Transportation Systems (ITS); ITS Organizational Issues,thefundamentalconceptsofIntelligentTransportationSystems (ITS), Benefits, Data Collection Methods, Automatic Vehicle Location (AVL), RFID,AdvancedTrafficManagementSystem(ATMS).		

Recommended Textbooks:

1. KadiyaliL.R.andN.B.Lal(2004):PrinciplesandPracticeofHighwayEngineeringIncludingExpresswaysandAirportEngineering),KhannaPublishers,NewDelhi.
2. Partha ChakrobortyandAnimeshDas(2003): Principles of Transportation Engineering,Prentice-HallIndia,NewDelhi.
3. DRDrew.Trafficflowtheoryandcontrol.McGraw-HillBookCompany,New York, 1968.
4. IndianHighwayCapacityManual(2018).CouncilofScientificandIndustrialResearch – Central Road Research Institute.
5. RoessR.P.,PrassasS.E,Mc-ShaneW.R.,TrafficEngineering,PrenticeHall, 2011.

References Books:

1. BlackJohn(1981):UrbanTransportationPlanning.CroomHelmLtd.London.
2. BPR(1970):UrbanTransportationPlanning:GeneralInformationandIntroductiontoSystem360.BureauofPublicRoads,WashingtonD.C.
3. BrutonM.J.(1975):IntroductiontoTransportationPlanning.IIEdn.Hutchinson,London.
4. IRC: SP:110-2017, titled "Application of Intelligent Transport System for Urban Roads".

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	Understandtheimportanceoftrafficengineeringandrelationship between traffic parameters.
ULO2	Performtrafficstudiesonfieldanddemonstratetheanalysis.
ULO3	Designthetrafficfacilities&discusstheimportanceofhighway lighting.
ULO4	Understandthelevelsoftrafficmanagementmeasures.
ULO5	Understandtheroadsafetyaspects&identifythelacunaeinroad infrastructure.
ULO6	SummarizethevarioustoolspresentinITS.

Title of the Course:	**FINITE ELEMENTS METHODS (PE-IV)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0813**	**3**	**0**	**0**	**3**

Course Pre-Requisite:

Acquaintance with the basic concepts of theory of structures.

Course Description:

The objective of the course is to make the students aware of the basic concepts of Finite Element Technique, the worldwide accepted numerical tool for the solution of different classes of problems in solid mechanics.

The curriculum intends to cover the analysis methodologies for 1-D, 2-D and 3-D problems with the advantages and disadvantages clearly highlighted.

Course Learning Objectives:

1. To impart knowledge of finite element method for 1-D, 2-D, 3-D elements
2. To discuss finite element methods in structural engineering.
3. To illustrate applications of FEM for plates, shells and structural dynamics

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the fundamentals of the FEM including history, matrix notation, computer role, and applications.	2	Understand
CO2	Formulate and analyze structural systems using the stiffness method for spring, beam, and truss elements.	3	Analyze
CO3	Apply FEM to engineering problems involving trusses and plane stress/plane strain using energy and Galerkin methods.	4	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	1	-	-	-	-	-	-
CO3	3	3	-	-	1	-	-	-	-	-	-

CO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	2	2	1

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar/Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit: 1 Introduction to F.E.M:	**CO: 1**	**06 Hrs.**

History, introduction to matrix notation, role of the computer, general steps of the finite element method, applications of the finite element method, advantages of the finite element method, computer programs for the finite element method.

Unit: 2 Introduction to the Stiffness (Displacement) Method:	**CO: 2**	**08 Hrs.**

Definition of the stiffness matrix, derivation of the stiffness matrix for a spring element, example of a spring assemblage, assembling the total stiffness matrix by superposition (direct stiffness method), boundary conditions, potential energy approach to derive spring element equations.

Unit: 3 Development of Beam Equations:	**CO: 3**	**08 Hrs.**

Beam Stiffness, Example of Assemblage of Beam Stiffness Matrices, Examples of Beam Analysis Using the Direct Stiffness Method.

Unit: 4 Development of Truss Equations- I:	**CO: 2,3**	**07 Hrs.**
Introduction, derivation of the stiffness matrix for a bar element in local coordinates, selection of a displacement function for the one-dimensional bar element, transformation of vectors in two dimensions, global stiffness matrix for an arbitrarily oriented bar in the plane, computation of stress for a bar in the x–y plane		
Unit: 5 Development of Truss Equations- II:	**CO: 2,3**	**08 Hrs.**
Solution of a plane truss, transformation matrix and stiffness matrix for a bar in three-dimensional space, use of symmetry in structures, inclined or skewed supports, potential energy approach to derive bar element equations, comparison of finite element solution to exact solution, Galerkin's residual method		
Unit: 6 Introduction to Plane Stress and Plane Strain Stiffness Equations	**CO: 3**	**08 Hrs.**
Introduction, basic concepts of plane stress and plane strain, derivation of the constant-strain triangular element stiffness matrix and equations		

Recommended Textbooks:

1. O. C. Zienkiewicz and Y. K. Cheung, The Finite Element Method in Structural and Solid Mechanics, McGraw Hill, London
2. S. S. Rao, Finite Element Analysis, Elsevier Butterworth-Heinemann
3. W. Weaver Jr. and J. M. Gere, Matrix Analysis of Framed Structure, CBS Publishers &Distributors, New Delhi, India
4. Reddy J. N., An Introduction to the Finite Element Method, McGraw Hill, 7. 3rd edition, New York, 2006.
5. Cook Robert D., Malkus David S., Plesha Michael E., and Witt Robert J., Basic Structural Analysis: C.S. Reddy, Tata McGraw Hill Publishing House, New Delhi.
6. Mechanics of Structures (Vol-I and II): S. B. Junnarkar H.J. Shah, Charotar Publishers.
7. Analysis of Structures: Vol. I II, Vazirani and Ratwani, Khanna Publishers

References Books:

1. Bathe Klaus-Jurgen, Finite Element Procedures in Engineering Analysis,1982.
2. Chandrupatla T. R. and Belegundu A. D., Introduction to Finite Element in Engineering, Prentice.
3. Erik G. Thompson, Introduction to the Finite Element Method: Theory, Programming and Applications, John Wiley
4. H. C. Martin and G. F. Carey, Introduction to Finite Element Analysis -Theory and Application, New York, McGraw-Hill
5. Irving H. Shames, Clive L. Dym, Energy and Finite Element Methods in Structural Mechanics; New Age International
6. K. J. Bathe, Finite Element Procedures, Prentice-Hall of India, New Delhi, India
7. M. Mukhopadhyay, Matrix, Finite Element, Computer and Structural Analysis, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India.

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	interpret the capabilities of Finite element method
ULO2	visualize the merits of Finite element method
ULO3	apply the finite element method for basic professional problems
ULO4	extend the FEM application to complicated problem
ULO5	optimize his FEM modelling utilities for improved solutions.
ULO6	apply the techniques in the field of dynamics

Title of the Course:	**LEGAL ASPECTS IN CONSTRUCTION INDUSTRY**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0814**	**3**	**-**	**-**	**3**

Course Prerequisite:

Basic understanding of construction project workflow (tendering, drawings, estimates, contracts) and awareness of common site disputes and basic legal documentation

Course Description:

This course introduces final-year civil engineering students to key construction-industry legal frameworks, contracts, dispute resolution, RERA, labour laws and welfare, professional ethics, and land acquisition to ensure compliant and risk-aware project execution.

Course Learning Objectives:

1. Understand construction contract documents and apply key provisions of the **Indian Contract Act, 1872,** to construction contracts.
2. Understand dispute resolution in construction through **Arbitration** and an overview of the **Commercial Courts Act, 2015**.
3. Understand legal compliance in construction through **RERA** and major **labour laws/labour welfare schemes** applicable to projects.
4. Develop professional decision-making using **engineering ethics/code of conduct** and understand the **Land Acquisition Act, 2013** process and implications for projects.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Interpret construction contract clauses and apply contract-law principles to identify breach, liabilities, and remedies	3	Apply
CO2	Analyze construction disputes and recommend appropriate forums and processes, including the Arbitration, the Commercial Court, and the RERA Act.	4	Analyze
CO3	Evaluate compliance and propose legally compliant actions on-site or projects for Labour Laws, Welfare Scheme, Professional Ethics, and Land acquisition.	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	-	-	3	3	-	-	-	2
CO2	1	-	-	-	-	3	3	-	-	-	2
CO3	1	-	-	-	-	3	3	1	-	-	2

CO	PSO1	PSO2	PSO3
CO1	1	-	1
CO2	1	-	1
CO3	1	-	1

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one in Mid semester examination (MSE) and one End Semester Examination (ESE) having 20%, 30%, and 50% weights respectively.

Assessment	Marks
ISE-I	10
MSE	30
ISE-II	10
ESE	50

- ISE 1 & 2 are based on assignment / declared test / quiz / seminar / Group Discussions etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three units) covered after MSE.

Course Contents:

Unit: 1 : Construction Contracts	**CO1**	**08 Hrs.**

Tender and Contract Document and the general conditions of the contract. Contract between Owner, Engineer, and Contractor. Study the Indian Contract Act, 1872 : essentials of a valid contract, and interpretation of contract terms, along with indemnity, guarantee, bailment, pledge, and agency in project dealings. Breach and remedies relevant to construction damages, penalty clauses, specific performance, termination, time and delay claims, variations, and dispute resolution basics as reflected in construction contracts.

Unit: 2 Arbitration	**CO2**	**08 Hrs.**
Indian Arbitration Act-1996, Arbitration Agreement, Conduct of Arbitration, Power and Duties of Arbitration, Rules of Evidence, Preparation and publication of award, Methods of Enforcement impending Awards and Final Awards. Overview of Commercial Courts Act, 2015		
Unit: 3 Real Estate Regulation and Development Act (RERA)	**CO2**	**07 Hrs.**
Introduction to RERA-2016, Regulatory Authorities and Appellate Tribunals, Registration of Real Estate Projects and Agents, Obligations of Promoters and Developers, Rights and Duties of Allottees, Financial and Technical Standards, Real Estate Regulatory Authority (RERA) Rules and Regulations, introduction to Online registration process.		
Unit: 4 Labour Laws	**CO3**	**08 Hrs.**
Need and Broad provisions of: Workmen's Compensation Act, Payment of Wages Act, Contract Labour Act, Employees' Provident Funds, Child Labour Act, Labour Welfare Schemes.		
Unit: 5 Professional Ethics and Code of Conduct	**CO3**	**06 Hrs.**
Professional ethics and code of conduct for civil engineers: integrity, competence, and accountability; public safety, quality, and sustainability as first priority; fair tendering and anti-bribery; avoiding conflicts of interest and protecting client confidentiality; accurate site records, measurements, testing, and certifications; reporting unsafe/unethical practices and understanding consequences of misconduct.		
Unit: 6 Land Acquisition Act	**CO3**	**08 Hrs.**
Right to Fair Compensation and Transparency , Land Acquisition, Rehabilitation and Resettlement Act 2013.Land Acquisition Process under the Act, Compensation and Rehabilitation, Social Impact Assessment and Public Consultation, Social Impact Assessment and Public Consultation, Acquisition of Land for Special Purposes, Judicial Review and Dispute Resolution and Implementation and Monitoring Mechanisms		

Recommended Textbooks:

1. Singh, A. (2008). *Law of Contract and Specific Relief: (A Study of the Contract Act, 1872)*. Eastern Book Company.
2. Hughes, W., Champion, R., & Murdoch, J. (2015). *Construction contracts: Law and management* (5th ed.). Routledge.
3. Singh, A. (2002). *Law of arbitration and conciliation* (6th ed.). Eastern Book Company.
4. Malik, P. L. (2026). *Handbook of labour and industrial law* (21st ed.). Eastern Book Company.
5. Subramanian, R. (2013). *Professional ethics* (2nd ed.). Oxford University Press.

References Books:

1. Building and Engineering Contracts—Law and Practice (6th Ed., 2023) Dr. P. C. Markanda
2. Commentary on the Commercial Courts Act (3rd Ed., 2025) Sharath Chandran
3. Real Estate (Regulation and Development) Act, 2016 (Bare Act, 2025 ed.) Universal
4. Commentary on RFCTLARR Act, 2013 (Land Acquisition Act) Om Prakash Aggarwala
5. Building & Other Construction Workers (BOCW) Act with Rules (Bare Act)

Unit learning Objective: Students will be able to

1. Apply the Indian Contract Act basics to interpret construction contract documents and remedies for breach.
2. Understand arbitration procedure and the role of commercial courts in resolving construction disputes.
3. Explain RERA registration, duties of promoter/agent, and rights of allottees in real estate projects.
4. Identify key labour laws, PF/ESI, and welfare schemes applicable to construction sites.
5. Practice ethical conduct in tendering, site records, safety, and certifications with accountability.
6. Describe the RFCTLARR, 2013 process, including SIA, compensation, and R&R provisions.

Title of the Course:	**SOIL CONSERVATION AND WATERSHED MANAGEMENT**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPEO815**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

This course requires basic knowledge of: Geotechnical Engineering, Hydrology & Water Resources Engineering and Water Supply Engineering

Course Description:

The course mainly deals with the conservation of soil, Erosion of soil, Control of soil Erosion, Occurrence, circulation and distribution of water and their functioning, components, practical application, and significance.

Course Learning Objectives:

1. To understand the concept of soil erosion, types and control of soil erosion,
2. To equip the students with capabilities required for identifying, formulating of soil conservation and planning methods
3. To impart the students with knowledge of analysis and scope of watershed management
4. To evaluate problems associated with water conservation issues

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand the concept and scope of the soil conservation	2	Understand
CO2	Apply the knowledge for formulating and management of soil conservation and planning aspects	3	Apply
CO3	Analyze problems associated with watershed management planning	4	Analyze
CO4	Evaluate the problems associated with sustainable watershed management, water conservation and harvesting	5	Evaluate

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	--	--	--	1	1	--	1	2	1	1
CO2	2	1	--	--	--	--	--	--	--	--	--
CO3	2	--	2	--	2	--	1	--	--	--	--

CO4	2	1	2	2	--	--	1	1	2	1	--

CO	PSO1	PSO2	PSO3
CO1	2	--	2
CO2	--	2	--
CO3	2	--	--
CO4	--	--	--

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE1	10
MSE	30
ISE2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/ Assignment/ Declared test/Quiz/Seminar/Group Discussions/Site Visit
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course contentwith 60-70% weightage for course content (Normally last three Units) covered after MSE

Course Contents:

Unit: 1	**CO: 1**	**06 Hrs.**

SOIL EROSION – INTRODUCTION

Soil erosion - Introduction, causes and types - geological and accelerated erosion, agents, factors affecting and effects of erosion.

Water erosion - Mechanics and forms - splash, sheet, rill, gully, ravine and stream bank erosion. Gullies - Classification, stages of development.

Mechanics of wind erosion – factors, process, wind erosion equation. Management of soil and nutrient losses. Shifting cultivation – principles, extent and impact.

Unit: 2	**CO: 1**	**08Hrs**
SOIL EROSION CONTROL Methods of soil erosion control – vegetative measures like crop rotation, afforestation, agrostological technique, etc. and mechanical measures like contour bunding, trenching, gully plugging, strip cropping, terracing, etc. Conservation farming system. Reclamation of ravine lands. Sand dune stabilization. Grazing and its impact on soil erosion. Forest fire and soil erosion. Control measures of grazing and forest fire.		
Unit: 3	**CO: 4**	**06 Hrs.**
SOIL CONSERVATION PLANNING Soil conservation planning; land capability classification; soil conservation in special problem areas such as hilly, arid and semi-arid regions, waterlogged and wetlands		
Unit: 4	**CO: 4**	**06 Hrs.**
CONCEPT OF WATERSHED MANAGEMENT Concept and Definition of Watershed, Scope of Watershed Management, Watershed Management: Indian and Global Perspective, Timeline of Watershed Management Programmes in India, Management Problems, New Prospects and Opportunities Associated with Watershed management		
Unit: 5	**CO: 2**	**06 Hrs.**
COMPONENTS OF WATERSHED MANAGEMENT Land resources Management, Need For Land Management, Objectives of Land Management, Sustainable Land Management, Principles of Sustainable Land Management, Land Management Examples, Water Resources management, Sustainable water management, Integrated water resources management, Managing water in urban settings		
Unit: 6	**CO: 3**	**08 Hrs.**
CASE STUDY OF WATER BODY Students should be able to understand the following with respect to the Case-Study: Key considerations of Selection sites for lakes and reservoirs, Importance of geological, geographical and socio-economic factors, Importance and components of catchment area, determination capacity of a lake or reservoir		
Recommended Textbooks: 1. Principles of soil conservation and water management, by. Hanumappa Ramappa Arakeri , Oxford & IBH Publishing Company, 1984		

References Books:

1. Soil erosion in India. Ahmad, E. 1973, Asia Publishing House, New Delhi.
2. Soil Erosion and Conservation. Tripathi, R.P. and H.P. Singh. 1993. Wiley Eastern Ltd. New Delhi.
3. Watershed Management in India, Murty, J.V.S., 1994. Wiley Eastern Ltd, New Delhi.
4. Integrated Watershed Management, Rajesh Rajora, 2002., R. Rawat Publications, New Delhi.

Unit wise Measurable students Learning Outcomes:

ULO	After the completion of the course the student should be able to
ULO1	To understand concept and scope of soil conservation and factors affecting soil erosion
ULO2	To understand different types of soil erosion and control measures
ULO3	To understand Soil conservation planning; land capability classification; soil conservation in special problem areas
ULO4	To understand the concept and scope of the watershed management
ULO5	To evaluate Sustainable water management, Integrated water resources management and Managing water in urban settings
ULO6	To understand concepts of Rainwater harvesting, catchment harvesting, harvesting structures,

PROGRAM ELECTIVE V		
Sr. No.	**Course Code**	**Course Name**
1	UCVPE0816	Prestressed Concrete – Analysis & Applications (PE-V)
2	UCVPE0817	Design Of Substructure (PE-V)
3	UCVPE0818	Bridge Design and Construction (PE-V)
4	UCVPE0819	Advanced Design of Concrete Structures – (PE-V)

Title of the Course:	**PRESTRESSED CONCRETE – ANALYSIS & APPLICATIONS (PE-V)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPEO816**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Knowledge of Strength of Materials, Structural Analysis, Reinforced Concrete Design, Concrete Technology, and basic Engineering Mathematics is required.

Course Description:

This course introduces the fundamentals and applications of prestressed concrete, including prestressing systems, analysis of prestressed sections, losses of prestress, deflections, and strength in flexure, shear, and torsion. Emphasis is placed on codal provisions and practical design considerations. The course also covers planning and economic aspects of prestressed concrete structures in modern civil engineering.

Course Learning Objectives:

1. Understand the basic concepts of prestressing, prestressing systems, and the role of high-strength materials in prestressed concrete structures.
2. Analyze prestressed concrete sections considering different cable profiles, thrust line concepts, and various cross-sections.
3. Evaluate losses of prestress and deflections in prestressed concrete members in accordance with codal provisions.
4. Apply principles of flexural, shear, and torsional resistance for the design and assessment of prestressed concrete members.
5. Recognize the planning, economic, and practical applications of prestressed concrete in buildings, bridges, and other major civil engineering structures.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Explain the basic concepts of prestressed concrete, including prestressing systems, materials, and advantages.	2	Understand
CO2	Compute losses of prestress and deflections in prestressed concrete members in accordance with codal provisions.	3	Apply
CO3	Apply codal procedures to evaluate flexural, shear, and torsional strength of prestressed concrete members.	3	Apply
CO4	Analyze prestressed concrete sections for stresses considering different cable profiles and cross-sectional shapes.	4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1				2					2
CO2	3	3	1	2	1						1
CO3	3	2	1	2	1	2					1
CO4	3	2	3	1	1	2	1			1	3

CO	PSO1	PSO2	PSO3
CO1	1	2	2
CO2	2	3	2
CO3	3	2	2
CO4	3	3	2

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), one Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 have 10 marks.
- MSE: Assessment is based on 50% of course content (Normally first three modules)
- ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three modules) covered after MSE.

Course Contents:

Unit: 1 Introduction	**CO: 01**	**Hrs. 07**

Basic concept of prestressing, Need for high strength steel in concrete, Advantage of prestressed concrete, Pre-tensioning systems, Post tensioning systems, Types of prestressing.

Unit: 2 Analysis of prestress	**CO: 04**	**Hrs. 08**

Basic assumptions, Concept of analysis of prestress sections, Different cable profiles, Analysis of rectangular, symmetrical and unsymmetrical I-Section. Prestress line or thrust line.		
Unit: 3 Losses of Prestress	**CO: 02**	**Hrs. 08**
Nature of losses of prestress, Loss due to elastic deformation of concrete, Loss due to shrinkage of concrete, Loss due to creep of concrete, Loss due to relaxation of stress in steel, Loss of stress due to friction, Loss due to anchorage slip, Total losses allowed for design.		
Unit: 4 Deflections	**CO:03**	**Hrs. 08**
Importance of control of deflections, Factors influencing deflections, Short term deflections of uncracked members, Prediction of long-time deflections, Deflections of cracked members, Codal provisions.		
Unit: 5 Flexural, Shear & Torsional Resistance	**CO: 03**	**Hrs. 08**
Flexural Strength – Types of flexural failure, Strain compatibility method, Codal procedure Shear and Principal stresses, Ultimate shear resistance, Prestressed concrete members in torsion.		
Unit: 6 Planning and Economical Aspects	**CO: 01**	**Hrs. 06**
Structural forms for high rise structures, bridges, aircraft hangers, irrigation and waterway works, energy structures. Concept of planning with practical examples.		

Recommended Textbooks:

1. Prestressed Concrete by N. Krishna Raju - McGraw Hill Education (India).
2. Prestressed Concrete by G.S. Pandit & S.P. Gupta - CBS Publishers & Distributors.
3. Modern Prestressed Concrete by J.R. Libby - CBS Publishers & Distributors.
4. Prestressed Concrete: Analysis and Design Practice of Members by Karuna Moy Ghosh
5. Prestressed Concrete Design by Dr. Praveen Nagarajan - Pearson Education.

References Books:

1. Fundamentals of Prestressed Concrete by N.C. Sinha & S.K. Roy
2. Prestressed Concrete edited by N. Rajagoplan
3. Prestressed Concrete by S. Ramamrutham

Title of the Course:	**DESIGN OF SUBSTRUCTURE (PE-V)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPOE0817**	**3**	**-**	**-**	**3**

Course Pre-Requisite:
Knowledge of elements of civil engineering, mechanics, engineering hydraulics, structural analysis and geotechnical engineering.

Course Description
This course provides an in-depth understanding of the principles and applications of foundation engineering. It covers the analysis, design, and construction of various foundation systems, including shallow and deep foundations. Students will learn design and detailing of various foundations – combined, raft, pile, well, pier and foundation for transmission tower. The syllabus content has direct application in the industry. Practical applications and case studies will be incorporated to enhance problem-solving skills and real-world engineering decision-making.

Course Learning Objectives:
1. To make students aware of the importance of structural design of foundations in civil engineering problems.
2. To introduce the design of various types of foundations and retaining structures.
3. To impart estimation of forces on foundation for transmission tower.

Course Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Estimate forces on foundation & substructures	2	Understand
CO2	Analyze foundation & substructures to find various stresses	4	Analyz
CO3	Design foundations and other substructures to safeguard against estimated stresses	6	Create

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	3	2	2	1	1	1	-	-	2
CO2	3	3	3	2	2	1	1	1	-	-	2
CO3	3	3	3	2	2	1	1	1	-	-	2

CO	PSO1	PSO2	PSO3
CO1	1	3	1
CO2	1	3	1

CO3	1	3	1	

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions/ site visits etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% Weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1	**CO: 2, 3**	**8 Hrs.**

Shallow Foundation

Shallow Foundation Detailed designing of RCC trapezoidal combined footing, RCC strap footing, Analysis and design of Raft Foundation.

Unit: 2	**CO: 2, 3**	**8 Hrs.**

Pile Foundation

Structural Design of RCC piles and pile caps for up to 4 piles group

Unit: 3	**CO: 1, 2 & 3**	**7 Hrs.**

Earth Retaining Wall

Design of RCC cantilever type of retaining wall for,
a) With Horizontal backfill
b) With Horizontal backfill and traffic load
c) With Slopping backfill

Unit: 4	**CO: 1, 2 & 3**	**7 Hrs.**

Bridge Substructure-1

Design of Pier, Design of Pier cap

Unit: 5	CO: 3	8 Hrs.
Bridge Substructure-2 Design of well cap, design of well steining, design of well curb, design of cutting edge, design of bottom plug		
Unit: 6	**CO: 2**	**7 Hrs.**
Special Foundations Introduction to Special foundations – Tunnel, underground water tanks, transmission line towers. Estimation of forces on special foundations, Design procedure for special foundations.		

Recommended Textbooks:

1. Limit State Design of Reinforced Concrete – Dr B C Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications P (Ltd).
2. Limit state theory and Design –Karve and Shah, Structures publications, Pune 3. Reinforced Concrete Design – Limit state - A.K. Jain, Nem Chand brothers Roorkee
4. Design of Bridges – N. Krishna Raju, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi
5. Analysis & Design of Substructures – Limit State Design – Swami Saran, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi

References Books:

1. J.E. Bowles, ―Foundation Analysis and Design‖ Tata McGraw Hill Book Company
2. W. C. Teng, ―Foundation Design‖, Prentice Hall of India Pvt. Ltd., New Delhi
3. Poulos, H.G. and Davis, E.H. (1980). ―Pile Foundation Analysis and Design, John Wiley and Sons, New York
4. Foundation design manual-Dr. N.V. Nayak. Dhanpat Rai and Sons.
5. Foundation Design and Construction by M.J. Tomlinson.

Title of the Course:	**BRIDGE DESIGN AND CONSTRUCTION (PE-V)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0818**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic knowledge of Engineering Mechanics, Strength of Materials, Structural Analysis, Hydrology, Engineering Hydraulics, Reinforced Concrete Design, Transportation engineering concepts is required to understand bridge engineering concepts and design principles.

Course Description:

This course introduces the principles of bridge engineering covering planning, hydrology, loads, structural components, superstructures, substructures, and special bridge types.

Course Learning Objectives:

1. Understand the fundamentals, components, and classification of bridges along with relevant design codes.
2. Apply hydrological and hydraulic principles in the planning and design of bridges.
3. Analyse various loads and apply IRC and railway design standards for bridge design.
4. Understand design concepts of culverts, bridge superstructures, and load distribution methods.
5. Gain knowledge of special bridges, construction techniques, inspection, and maintenance practices.

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Understand modern bridge types, construction techniques, and maintenance practices for sustainable infrastructure development.	2	Understand
CO2	Apply fundamental principles, codes, and standards to plan and design basic bridge systems.	3	Apply
CO3	Design and evaluate bridge superstructures and substructures using appropriate load distribution methods.	3,4	Apply, Analyze
CO4	Analyze hydrological, hydraulic loading effects for safe and efficient bridge design.	4	Analyze

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	-	-	-	-	-	2	1	2
CO2	2	3	2	1	2	-	-	-	1	2	3
CO3	3	3	3	2	1	-	-	-	1	2	3
CO4	3	2	1	3	1	-	-	-	1	1	-

CO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	1	-	-
CO3	1	1	-
CO4	-	-	-

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions/ site visits etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% Weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1 Introduction to Bridge Engineering	**CO: 2**	**Hrs. 06**

A) Definition and importance of bridges, Classification of bridges based on function, material, and span, Components of a bridge system, General considerations in bridge design, Codes and standards used in bridge engineering

B) Bridge site selection and alignment, Topographical, Geological, and Geotechnical investigations, Data required for bridge planning, Economic, environmental, and traffic considerations

Unit: 2 Bridge Hydrology and Hydraulic Design	CO: 4	Hrs. 08
Hydrological studies for bridge design, Estimation of design discharge, Waterway calculation, Afflux and scour in bridges, River behavior and training works, Hydraulic considerations for bridge foundations.		
Unit: 3 Loads and Design Standards for Bridges	**CO: 02**	**Hrs. 08**
Types of loads on bridges, Dead load, Live load, Impact and dynamic effects, Wind and seismic loads, Temperature effects, IRC loading for highway bridges, Railway bridge loading standards, Load combinations and design philosophy.		
Unit: 4 Culverts and Bridge Superstructures	**CO:03**	**Hrs. 09**
Classification of culverts, Design principles of slab, box, and pipe culverts, Types of bridge superstructures, RCC slab bridges, RCC T-beam and girder bridges, Introduction to load distribution methods.		
Unit: 5 Load Distribution, Bearings, and Substructures	**CO: 03**	**Hrs. 08**
Load distribution in girder bridges, Courbon's method, Introduction to refined distribution methods, Types and functions of bridge bearings, Bridge substructures: piers and abutments.		
Unit: 6 Special Bridges, Construction, and Maintenance	**CO: 02**	**Hrs. 06**
Cable-stayed bridges, Suspension bridges, Flyovers and grade separators Temporary and movable bridges, Bridge construction techniques, Inspection, maintenance, and rehabilitation of bridges		

Recommended Textbooks:

1. Design of Bridge Structures (Jagadeesh & Jayaram)
2. Reinforced Concrete Structures – Vol. II by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications.
3. Concrete Bridge Practice, Analysis, Design and Economics by Dr.V.K.RAINA, Tata McGraw-Hills Publishing Company Limited.
4. Bridge Engineering by S.Ponnuswamy, Tata McGraw-Hills Publishing Company
5. Design of Bridges by N.Krishna Raju, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
6. IRC Codes–IRC:5, IRC:6, IRC:18, IRC:27, IRC:45, IRC:78, IRC:83

Recommended Textbooks:

1. Concrete Bridge Practice by Dr.V.K.Raina, Tata McGrawHill.
2. Reinforced Concrete Structures –Vol.II by Dr. B.C.Punmia, A. K. Jain, Laxmi Publications.

Title of the Course:	**ADVANCED DESIGN OF CONCRETE STRUCTURES (PE-V)**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVPE0819**	**3**	**-**	**-**	**3**

Course Pre-Requisite:

Basic knowledge of Strength of Materials, Structural Analysis, and fundamentals of Reinforced Concrete Design, along with familiarity with IS 456:2000.

Course Description:

The course deals with advanced analysis and design of reinforced concrete elements such as continuous beams, deep beams, flat slabs, shear walls, and water tanks as per IS codes, with emphasis on limit state design and serviceability requirements.

Course Learning Objectives:

1. Understand advanced reinforced concrete structural systems and IS code provisions.
2. Analyse and design continuous beams, deep beams, flat slabs, and shear walls.
3. Control cracking and serviceability in reinforced concrete members.
4. Design safe and watertight reinforced concrete water tanks

Course Outcomes:

CO	**After the completion of the course the student should be able to**	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Apply IS code provisions to analyze and design advanced reinforced concrete structural elements.	3	Apply
CO2	Evaluate crack width, serviceability, and ductile behavior of reinforced concrete structures.	4	Analyze
CO3	Analyze and design continuous beams, deep beams, flat slabs, and shear walls under gravity and lateral loads.	4,6	Analyze, Design
CO4	Design reinforced concrete water retaining structures ensuring safety, durability, and watertightness.	6	Design

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	1	2	1	-	-	1	2	1	-
CO2	3	2	-	2	-	-	-	1	2	-	2
CO3	3	2	1	3	2	-	-	1	3	1	2
CO4	3	2	3	2	1	-	-	1	3	1	1

CO	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	2	-	1
CO3	1	2	-
CO4	1	1	-

Assessments:

Teacher Assessment:

- Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and One End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

- ISE 1 and ISE 2 are based on Tutorial/Assignment/Declared test/Quiz/Seminar/Group Discussions/ site visits etc.
- MSE: Assessment is based on 50% of course content (Normally first three Units)
- ESE: Assessment is based on 100% course content with 60-70% Weightage for course content (Normally last three Units) covered after MSE.

Course Contents:

Unit: 1 Continuous Beams	**CO: 01**	**Hrs. 06**
Review of limit state design method, Continuous Beams, Limit state Design of two span continuous beams and three span continuous beams using IS coefficient, concept of moment redistribution overview of advanced structural elements.		
Unit: 2 Deep Beams	**CO: 03**	**Hrs. 08**
Analysis of deep beams- Design as per IS 456-2000.		
Unit: 3 Flat Slab	**CO: 03**	**Hrs. 08**
Flat Slab Classification, Behaviour of Flat slabs, Direct design and equivalent frame method-, IS Codal provisions.		
Unit: 4 Estimation of crack width in RC members	**CO:02**	**Hrs. 08**

Introduction, Factors Affecting Crack width in Beams, Mechanism of Flexural Cracking, Calculation of Crack widths, Simple Empirical Method, Estimation of Crack width in Beams by IS 456 and BS 8110, Shrinkage and Thermal Cracking.		
Unit: 5 Shear Wall	**CO: 03**	**Hrs. 08**
Classification, types of shear wall, Failure modes of shear wall, Design as per IS13920-2016.		
Unit: 6 Water Tank	**CO: 04**	**Hrs. 07**
Design of water tank - Introduction to working stress method for water tank design, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks with flexible and rigid joint between wall and floor, (ii) rectangular water tanks.		

Recommended Textbooks:

1. Reinforced Concrete Structural Elements- Purushothaman. P, Tata Mc Graw Hill
2. Reinforced Concrete – Ashok K Jain, Nem Chand Bros. Roorkee
3. Plain and Reinforced Concrete – Jain & Jaikrishna, Vol. I & II, Nem Chand Bros. Roorkee
4. Reinforced Concrete Chimneys- Taylor C Pere,
5. Design of deep girders, Concrete Association of India
6. Reinforced Concrete, Mallick & Gupta- Oxford & IBH

References Books:

1. IS 456-2000 - Plain and Reinforced Concrete - Code of Practice
2. IS 3370- 2009- Part 1 - 4 Code of Practice for concrete structures for the storage of liquids
3. IS13920-2016- Ductile Design and Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code of Practice

Title of the Course:	**MAJOR PROJECT II**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVIL0871**	**-**	**-**	**8**	**4**

Course Pre-Requisite:

Basics of Projects and Automation, Instrumentation and Data Analytics, AI Applications, Digital Twin and Asset Management

Course Description:

This course is designed to apply various automation strategies for construction applications

Course Learning Objectives:

1. To carry out extensive literature survey on the research topic
2. Identify the problem statement for the research work.
3. Decide methodology for the research work.
4. Develop the mathematical/analytical modeling or experimental set up or field work and derive the outcomes of the work.

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Relate available knowledge with reference to specific problem	2	Understanding
CO2	Formulate problem and define systematic approach to arrive at solution.	6	Creating
CO3	Compose Collected data, analyze and arrive at Solution to a defined problem.	6	Creating

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	2	1	1	1	1	1
CO2	1	3	2	1	1	2	1	1	1	1	1
CO3	2	2	3	3	2	2	1	1	1	1	1

CO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	2	2	1
CO3	2	2	1

Assessments :

Teacher Assessment:

- One component of In Semester Evaluation (ISE) and ESE (OE) at the end of semester

Assessment	Marks
ISE	50
ESE (OE)	50

- ISE and ESE (OE) is based on performance of student in Presentations and report Submitted at the time of final presentation.

Course Contents:

Every student either must work individually in the VIIIth Semester or in the group (only if the project work is continuation of Major Project I) in the final year under the guidance of a Guide allotted by the department. The decision about whether the student will work individually or in group is entirely upon the allotted guide and the Head of Department.

The project work will be a design project, experimental project, field surveying or computer-oriented simulation on any of the topics of civil engineering and multi-disciplinary interest. The student or group of students are required to do literature survey, formulate the problem, form a methodology and arrive at the solution of the problem.

Project work shall be carried out at

a. Parent Institute
b. Industry
c. Research Institute
d. Incubation Centre at Institute

Depending on student's choice from above options, he/she will work individually, or the group must be formed accordingly.

The evaluation shall be done by Project Assessment Committee consist of Four to Six Faculty Members from the Department at the end of Seventh Semester. The student or group of students

will have to submit

1. Synopsis of project in prescribed format to Project Assessment Committee at the time of Synopsis presentation.

and

2. A detailed report based on the work done in prescribed format to Project Assessment Committee at time of Final Presentation.

Students are expected to define the problem and its scope, complete Literature survey, finalize methodology for data collection, analysis and final outcomes of the work.

The project guide will award the marks to the individual students depending on the average awarded by the Project Assessment Committee.

For workload calculation minimum load is 1 Hr/week, for one group of THREE to FIVE students. (As per AICTE Guidelines).

Guidelines:

1. The work will be carried out by the individual student or Project group will be formed for minimum THREE and maximum FIVE students (only if the project work is continuation of Major Project I).
2. One Project Guide shall be allotted to maximum TWO groups for guidance.
3. After interactions with guide and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of project.
4. Students are expected to detail out methodology, software required, critical issues involved in analysis /design and implementation and submit the proposal within Two week of commencement of the semester
5. Completed project work and documentation in the form of report is to be submitted before the end of semester assessment.
6. Schedule for Presentation:
   a) Synopsis Presentation
   b) Monthly Presentation given by the student or groups – ISE Assessment
   c) Final presentations given by the student or groups - ESE (OE)

Title of the Course:	**INTERNSHIP**	**L**	**T**	**P**	**Credit**
Course Code:	**UCVIL0872**	**-**	**-**	**12**	**6**

Course Pre-Requisite:

Basic knowledge up to pre-final year level in Civil Engineering.

Course Description:

Course aims to provide construction industry entry level best practices to students on ongoing Civil Engineering projects

Course Learning Objectives:

This course will assist students to understand procedures and practices employed by professionals in ongoing civil engineering projects

Course Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Understand processes followed on ongoing Civil engineering Projects	2	Understand
CO2	Demonstrate the ability to handle assigned responsibility on ongoing Civil engineering Projects	3	Apply

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	2	1	1	1	1	1
CO2	1	3	2	1	1	2	1	1	1	1	1

CO	PSO1	PSO2	PSO3
CO1	3	2	3
CO2	3	3	3

Assessments :

Teacher Assessment:

- One component of In Semester Evaluation (ISE)

Assessment	Marks
ISE-1	75
ISE-2	75

- ISE is based on performance of student in Presentation and report Submitted at the time of presentation.

Course Contents:

All students need to complete Internship as per guidelines provided in Internship Policy document available on

https://www.kitcoek.in/documents/academics/internship-policy/guidelines-for-internship-and-project-accounted-throgh-kite.pdf

Students are required to develop at least one of the following skill set during this internship and demonstrate the same during assessment under this course.

1. **Software Proficiency & Design**
   - **Drafting and detailing :** 2D and 3D modelling using **AutoCAD**, **Revit**, and **Tekla Structures**
   - **Structural Analysis:** Learning software like **STAAD Pro**, **ETABS**, and for load analysis and seismic definitions.
   - **Infrastructure Design:** Bentley and Autodesk applications
   - **Project Management:** Basics in **BIM (Building Information Modeling)** and **MS Project**.
2. **On-Site Training & Field Exposure**
   - **Foundation & Earthwork:** Understanding marking, excavation, and types of foundations (shallow, deep, pile).
   - **Reinforcement & Concrete:** Learning bar bending schedules, reinforcement laying, mix ratios, and cube testing.
   - **Structural Elements:** Inspection of columns, beams, slabs, and masonry work (bricks, lintels).
   - **Infrastructure Specifics:** For road internships, modules include pavement engineering, traffic engineering (ADT/AADT), and geotechnical investigations.

3. **Project Management & Soft Skills**

Internships shall also focus on the administrative and legal aspects of the profession.

- **Quantity Surveying:** Learning quantity take-offs, Bill of Quantities (BOQ), and costing/estimation.
- **Tendering & Contracts:** Understanding different stages of contracts, bid documents, and project report preparation.
- **Safety & Ethics:** Adherence to site safety regulations, IS codes (e.g., IS 456, IS 800), and professional ethics.
- **Documentation:** Drafting daily progress reports (DPRs), feasibility studies, and final internship reports