SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

FACULTY OF ENGINEERING & TECHONOLOGY

ORDINANCE No. V-2 (B6)

RELATING TO COURSE CURRICULUM & SYLLABUS OF UG PROGRAM

BACHELOR OF TECHNOLOGY (B.Tech.) CE

(Effective from the Session – 2025-26)

Apporved by the Academic Council of the Meeting held on 06 May 2025

Apporved by the Executive Council of the Meeting held on 28 June 2025

Faculty of Engineering & Technology DEAN

Dr. Amit

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
(As per NEP 2020 and AICTE Guidelines)
B.Tech 2nd Year/3rd Semester (Civil Engineering)
w.e.f. academic Session 2026-27

SEMESTER III

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UOE-3**/UAS-303	Science Based Open Elective/Engineering Mathematics-III	ES/BS	3	0	0	20	10	30	-	70	-	100	3
2	UHU-305/UAS-304	Soft skills*/Environmental Science	AEC	3	0	0	20	10	30	-	70	-	100	3
3	UCE-301	Solid Mechanics	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCE-302	Civil Engineering Material Testing & Evaluation	ES	3	0	0	20	10	30	-	70	-	100	3
5	UCE-303	Fluid Mechanics	ES	3	0	0	20	10	30	-	70	-	100	3
6	UCE-351	Solid Mechanics Lab	ES	0	0	2	-	-	-		-	150	150	2
7	UCE-352	Civil Engineering Materials Testing & Evaluation Lab	SEC	0	0	2	-	-	-	15	-	35	50	1
8	VAC-301/ VAC-302	Disaster Mitigation & Climate Resilient Infrastructure/Surveying Techniques and application	VAC-3/ VAC-4	0	0	4	-	-	-	15	-	35	50	2
9	UCC-351	Internship Assessment/Mini Project		-	-	-	-	-	-	100	-	-	100	2
10	UNC-301	Disaster Management & Preparedness	MC	2	0	2	20	10	30	-	70	-	100	0
Total													**850**	**22**

***May be offered through NPTEL**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
MC: Mandatory Course

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B.Tech 2nd Year/4th Semester (Civil Engineering)
w.e.f. academic Session 2026-27

SEMESTER IV

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	UOE-4**/ UAS-403	Science Based Open Elective/ Engineering Mathematics-III	ES/BS	3	0	0	20	10	30	-	70	-	100	3
2	UHU-405/ UAS-404	Soft Skills/ Environmental Science	AEC	3	0	0	20	10	30	-	70	-	100	3
3	UCE-401	Structural Analysis	ES	3	0	0	20	10	30	-	70	-	100	3
4	UCE-402	Transportation Engineering-I	ES	3	0	0	20	10	30	-	70	-	100	3
5	UCE-403	Surveying and Geomatics	ES	3	0	0	20	10	30	-	70	-	100	3
6	UCE-451	Structural Analysis Lab	ES	0	0	2	-	-	-	15	-	35	50	1
7	UCE-452	Transportation Engineering Lab	SEC	0	0	4	-	-	-	15	-	35	50	2
8	VAC-401/ VAC402	Disaster Mitigation & Climate Resilient Infrastructure/Surveying Techniques and application	VAC-3/ VAC-4	0	0	4	-	-	-	15	-	35	50	2
9	UHU-401	Universal Human Values-II: Understanding Harmony and Ethical Human Conduct	HS	3	0	0	20	10	30	-	70	-	100	3
Total													**750**	**23**

Summer Internship (4-6 weeks) during summer break after Semester-IV and same will be assessed/ evaluated in the Semester-V

UCE-301 **Solid Mechanics** **3L: 0T:0P** **3 Credits**

Course Objectives:

1) To understand the behavior of engineering materials under different types of loading and environmental conditions.
2) To analyze stresses, strains and deformations in structural members subjected to various loads.
3) To apply principles of mechanics for determining internal forces and moments in structural elements.
4) To evaluate the strength, stability and safety of engineering structures.
5) To develop analytical and problem-solving skills essential for civil engineering design.

Course Outcomes (COs) :

CO1: Explain the concepts of stress, strain, elastic constants and analyze members subjected to axial loading.

CO2: Analyze beams under various loading conditions using shear force and bending moment concepts.

CO3: Evaluate bending stresses, shear stresses and principal stresses in structural members.

CO4: Analyze torsion in shafts and determine slopes and deflections of beams using analytical methods.

CO5: Apply theories of failure and column analysis for the safe design of engineering structures.

Unit 1: Stress and Strain

Simple stresses and strains. Hooke's law and elastic behavior of materials. Elastic constants and their relationships. Stress–strain diagrams for ductile and brittle materials. Thermal stresses and strains. Bars of varying cross-sections and composite bars. Volumetric strain and bulk modulus.

Unit 2: Shear Force and Bending Moment

Types of beams, supports and loads. Shear force and bending moment diagrams for cantilever,

simply supported and overhanging beams. Relationship between load, shear force and bending moment. Point of contraflexure. Numerical problems on SFD and BMD.

Unit 3: Bending and Shear Stresses

Theory of simple bending. Bending equation and assumptions. Section modulus and moment of resistance. Bending stresses in beams. Shear stress distribution in rectangular, circular and I-sections. Principal stresses and principal planes. Mohr's circle for stress analysis.

Unit 4: Torsion and Deflection of Beams

Theory of torsion for circular shafts. Torsion equation and power transmission by shafts. Closed coil helical springs. Slope and deflection of beams using double integration method, moment area method and conjugate beam method.

Unit 5: Columns and Theories of Failure

Columns and struts. Euler's buckling theory and limitations. Rankine's formula for columns. Thin and thick cylinders. Strain energy due to axial, bending and torsional loads. Theories of elastic failure: Maximum principal stress theory, maximum shear stress theory and distortion energy theory.

References:

1. M.S. Bansal, Strength of Materials, Laxmi Publications.
2. S.S. Rattan, Strength of Materials, McGraw Hill Education.
3. Beer, Johnston and DeWolf, Mechanics of Materials, McGraw Hill.
4. Gere and Goodno, Mechanics of Materials, Cengage Learning.
5. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Strength of Materials, Laxmi Publications.
6. Timoshenko and Young, Elements of Strength of Materials.
7. Relevant BIS Standards.

UCE-302: Civil Engineering Material Testing and Evaluation 3L: 0T:0P 3 Credits

Course Objectives:

- To understand the properties, behavior, and applications of construction materials used in civil engineering.
- To develop knowledge of standard testing procedures and quality evaluation methods.
- To analyze the engineering performance of construction materials through laboratory and field investigations.
- To interpret test results and apply relevant BIS/ASTM standards for material selection and quality control.

Course Outcomes (COs) :

- **CO1:** Explain the properties, classification, manufacturing processes and testing procedures of fundamental construction materials such as stones, bricks, cement, concrete, aggregates and timber.
- **CO2:** Apply standard testing methods and quality evaluation techniques for construction materials in accordance with relevant BIS/ASTM standards.
- **CO3:** Analyze the engineering properties and performance of traditional and modern construction materials used in civil engineering projects.
- **CO4:** Evaluate building components, foundations, masonry, floors, stairs, doors, windows and roofing

Unit 1:

Scope of Study of building Materials, economics of the building materials.

Stones: Classification of Stones–Properties of stones in structural requirements

Bricks: Composition of good brick earth, Various methods of manufacturing of bricks & Testing of Bricks.

Cement: chemical composition, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Hydration, Compressive strength, Tensile strength, Soundness and consistency, Setting time

Concrete: compositions and grades of concrete various steps in concrete construction – batching, mixing, transporting, compacting, curing, shuttering, jointing. tests and quality control of concrete.

Aggregates –Natural stone aggregates, Industrial by-products (EAF Slag, Steel Slag), Crushing strength, Impact strength, Flakiness, Abrasion Resistance, Grading

Wood- Structure–Properties–Seasoning of timber–Classification of various types of woods used in buildings – Defects in timber.

Unit 2:

Paints varnishes and distempers: Common constituents, types and desirable properties, Cement paints.

Glass: Ingredients, properties types and use in construction.

Paints: Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces.

Supplementary cementitious materials: Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash (Basic properties and their contribution to concrete strength)

Modern Materials: Glass and plastic composites, Plywood, laminates, wall and roof panels,

Unit 3:

Building Construction: Components of building area considerations, Principles of building Planning Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation

Masonry: Definition and terms used in masonry. Brick and stone masonry, Bonds in brick and stone masonry work.

Types of walls: load bearing, partition walls, cavity walls.

Floors: Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring

Stairs: Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical

Unit4:

Building Components Lintels, arches, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs.

Doors and Windows: Construction details, types of doors and windows

References:

1. M.S. Shetty, Concrete Technology.
2. M.L. Gambhir, Concrete Technology.
3. S.K. Duggal, Building Materials.
4. Khanna, Justo and Veeraragavan, Highway Materials and Pavement Testing.
5. Relevant BIS, ASTM and IRC Standards.

UCE-303 **Fluid Mechanics** **2L: 1T :0P** **3 Credit**

Course Objectives:

1. To understand the fundamental properties of fluids and their behavior under static and dynamic conditions.
2. To develop the ability to analyze fluid pressure distribution, hydrostatic forces, buoyancy, and stability of floating bodies.
3. To apply principles of fluid kinematics and fluid dynamics in solving engineering problems involving fluid flow.
4. To understand dimensional analysis, similitude, and the operation of fluid flow measuring devices.
5. To analyze boundary layer behavior, flow separation, and fluid resistance phenomena relevant to civil engineering applications.

Course Outcomes (COs):

CO1: Explain the basic properties of fluids, fluid statics, viscosity, surface tension, capillarity, and compressibility characteristics.

CO2: Analyze pressure measurement systems, hydrostatic forces on submerged surfaces, buoyancy, and stability of floating bodies.

CO3: Classify fluid flows and apply continuity equations, stream functions, and velocity potential functions for fluid kinematic analysis.

CO4: Apply Euler's and Bernoulli's equations, momentum principles, dimensional analysis, and similitude concepts to solve fluid flow problems and evaluate flow measuring devices.

CO5: Analyze boundary layer development, frictional resistance, flow separation, and methods of boundary layer control in engineering applications.

Unit 1: Basic Concepts and Definitions

Distinction between a fluid and a solid. Density, specific weight, specific gravity, kinematic viscosity and dynamic viscosity. Variation of viscosity with temperature. Newton's law of viscosity. Vapour pressure, boiling point and cavitation. Surface tension and capillarity. Bulk modulus of elasticity and compressibility.

Unit 2: Fluid Statics

Fluid pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer and Micromanometers. Pressure gauges. Hydrostatic pressure and hydrostatic force on horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Unit 3: Fluid Kinematics

Classification of fluid flow: Steady and unsteady flow, uniform and non-uniform flow, laminar and turbulent flow, rotational and irrotational flow, compressible and incompressible flow, ideal and real fluid flow, one-, two- and three-dimensional flows. Streamline, pathline, streakline and stream tube. Stream function and velocity potential function. One-, two- and three-dimensional continuity equations in Cartesian coordinates.

Unit 4: Fluid Dynamics

Surface and body forces. Equations of motion – Euler's equation. Bernoulli's equation and its derivation. Energy principle. Practical applications of Bernoulli's equation including Venturimeter, Orifice Meter and Pitot Tube. Momentum principle. Forces exerted by fluid flow on pipe bends. Vortex flow – free vortex and forced vortex. Dimensional analysis and dynamic similitude. Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number. Buckingham's π-Theorem.

Unit 5: Boundary Layer Analysis

Assumptions and concept of boundary layer theory. Boundary layer thickness, displacement thickness, momentum thickness and energy thickness. Laminar and turbulent boundary layers on a flat plate. Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Boundary layer separation and methods of separation control.

Text/Reference Books:

1. R.K. Bansal, *A Textbook of Fluid Mechanics and Hydraulic Machines*, Revised Reprint Edition, Laxmi Publications, New Delhi, 2004.
2. C.S.P. Ojha, R. Berndtsson and P.N. Chandramouli, *Fluid Mechanics and Machinery*, Oxford University Press, New Delhi, 2010.
3. P.M. Modi and S.M. Seth, *Hydraulics and Fluid Mechanics*, Standard Book House, New Delhi.
4. K. Subramanya, *Theory and Applications of Fluid Mechanics*, Tata McGraw Hill Education, New Delhi.
5. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, *Fluid Mechanics with Engineering Applications*, International Student Edition, McGraw Hill Education.
6. Yunus A. Cengel and John M. Cimbala, *Fluid Mechanics: Fundamentals and Applications*, McGraw Hill Education.

UCE-351 Solid Mechanics Lab 0 L: 0T :2P 1 Credit

Note: Students will perform minimum 10 experiments from the following:

List of Experiments

1. Tension test on Mild Steel specimen and determination of its mechanical properties.
2. Bending tests on simply supported beam and cantilever beam.
3. Determination of torsion and angle of twist in circular shafts.
4. Measurement of reactions at supports in a statically determinate beam.
5. Determination of shear force distribution in beams.
6. Determination of bending moments in beams.
7. Measurement of deflections in a statically determinate beam.
8. To determine the flexural rigidity (**EI**) of a given beam.
9. To determine the deflection of curved members.
10. To determine the critical load in struts with different end conditions.
11. Hardness tests using **Brinell** and **Rockwell** hardness testing machines.
12. Impact tests using **Charpy** and **Izod** testing machines.

Suggested References

1. R.K. Bansal, *Strength of Materials*, Laxmi Publications.
2. S.S. Rattan, *Strength of Materials*, McGraw Hill Education.
3. Beer, Johnston and DeWolf, *Mechanics of Materials*, McGraw Hill.
4. Gere and Goodno, *Mechanics of Materials*, Cengage Learning.
5. Punmia, Ashok Kumar Jain and Arun Kumar Jain, *Strength of Materials*, Laxmi Publications.
6. Timoshenko and Young, *Elements of Strength of Materials*.
7. Relevant BIS Standards and Laboratory Manuals.

UCE-351 CIVIL ENGINEERING MATERIAL TESTING AND EVALUATION LAB

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I. Cement

I. Normal Consistency of cement.
II. Initial &final setting time of cement
III. Compressive strength of cement
IV. Fineness of cement by air permeability and Le-chatalier's apparatus.
V. Soundness of cement.
VI. Tensile strength

II. Coarse Aggregate

I. Water absorption of aggregate
II. Sieve Analysis of Aggregate
III. Specific gravity & bulk density

III. Fine Aggregate:

I. Sieve analysis of sand
II. Silt content of sand
III. Bulking of sand

VI .Bricks:

I. Water absorption.
II. Dimension Tolerances
III. Compressive strength
IV. Efflorescence

UNC-301	Disaster Management &Preparedness	L	T	P	2 Credits
		2	0	0	

Course Objective:

- To Understand Definitions and Terminologies used in Disaster Management
- To Understand basic concepts in Disaster Management
- To Understand the Challenges posed by Disasters
- To Understand Types and Categories of Disasters
- To understand Impacts of Disasters Key Skills

Syllabus:

Unit-1: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation).

Unit-2: Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India.

Unit-3: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Unit-4: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction,

Course Outcomes: After studying the course, students will be able to:

- Develop competencies in
- The application of Disaster Concepts to Management
- Analyzing Relationship between Development and Disasters.
- Ability to understand Categories of Disasters and realization of the responsibilities to society

Reference books:

- http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
- Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

BCE072: Disaster Mitigation & Climate Resilient Infrastructure

(L-T-P: 3-0-0) Credits: 3 Total Contact Hours: 40

Course Objectives:

- To equip students with knowledge of disaster risk and climate resilience.
- To understand air pollution, MSW, sludge management, and EIA basics
- To align civil practices with national disaster policies and climate mandates.
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Course Outcomes (COs):

CO1: Identify disaster types and national management frameworks.

CO2: Apply tools for resilient infrastructure and climate adaptation.

CO3: Design basic air pollution control systems.

CO4: Analyze MSW and sludge treatment systems.

CO5 : Interpret EIA process and emergency planning in civil projects

Unit 1: Disasters and Frameworks (8 Hours): Earthquakes, floods, landslides, cyclones, droughts Concepts: hazard, risk, resilience, capacity NDMA, SDMA, Indian frameworks.

Unit 2: Resilient Infrastructure (8 Hours) :Climate change impacts on infra (heat, sea rise) Urban heat islands, resilient buildings/bridges Tools: CRISTAL, PRECIS, adaptation strategies.

Unit 3: Air Pollution Control (8 Hours) Particulate/gaseous sources and effects • Control: ESP, scrubbers, filters, converters AQI, CPCB norms, indoor air pollution.

Unit 5: EIA & Disaster Preparedness (8 Hours) • EIA: TOR, screening, scoping, hearing Emergency response, GIS/RS, planning • Rapid and comprehensive EIA process.

Unit 4: Waste Management (8 Hours) • MSW Rules 2016, treatment systems RDF, incineration, composting, landfill design Sludge thickening, drying, co-treatment.

Refrences: 1.NDMA Guidelines, MoEF&CC Reports 2. CPCB & CPHEEO Manuals 3. Rao & Sultana - Solid Waste 4. R.K. Bhandari - Disaster Educat

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UCE-401: STRUCTURAL ANALYSIS	L:T:P = 3:0:0	Credits: 3

Course Objectives

- To understand the behavior of determinate and indeterminate structures under various loading conditions.
- To develop analytical skills for beams, frames, arches and cables.
- To apply energy methods and classical methods of structural analysis.
- To evaluate structural responses such as deflection, support reactions and internal forces.

Course Outcomes (COs)

CO1: Explain the concepts of structural determinacy, stability, strain energy and virtual work principles used in structural analysis.

CO2: Analyze determinate and indeterminate beams using classical methods such as three-moment theorem and moment distribution method.

CO3: Analyze beams and frames using slope-deflection and energy methods for determination of forces and displacements.

CO4: Evaluate structural behavior of arches, suspension cables and influence lines under moving loads.

CO5: Apply structural analysis techniques to solve practical engineering problems involving beams, frames and other structural systems.

Unit–I

Energy Principles and Deflection of Structures

- Strain energy and complementary strain energy,Castigliano's theorem. ,Maxwell's reciprocal theorem. Unit load method. Deflection of beams, trusses and frames. Principle of virtual work.

Unit–II

Indeterminate Structures – I

- Degree of static and kinematic indeterminacy. Analysis of continuous beams. Clapeyron's theorem of three moments. Support settlement effects. Moment distribution method. Analysis of continuous beams by moment distribution.

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Unit–III

Indeterminate Structures – II

- Slope deflection equations. Analysis of continuous beams. Analysis of rigid frames. Side sway in frames. Comparison of slope-deflection and moment distribution methods.

Unit–IV

Arches and Suspension Cables

- Three-hinged arches. Eddy's theorem. Normal thrust, radial shear and bending moment. Two-hinged arches. Temperature and rib-shortening effects. Suspension cables under concentrated and distributed loads. Stiffening girders.

Unit–V

Influence Lines and Moving Loads

- Influence line diagrams for determinate structures. ILD for reactions, shear force and bending moment. Moving concentrated loads. Uniformly distributed moving loads. Maximum shear force and bending moment. Applications in bridge structures.

KCE-401 Transportation Engineering 1L: 1T :0P 2 Credit

Course Objectives:

To understand the principles of highway planning, road development and transportation systems in India.
To develop the ability to design geometric features of highways in accordance with IRC standards and safety requirements.
To analyze traffic characteristics, traffic flow behavior and traffic control measures for efficient transportation management.
To understand the properties and performance requirements of pavement materials used in highway construction.
To apply the principles of pavement analysis and design for flexible and rigid pavements using relevant IRC guidelines.

Course Outcomes (COs):

CO1: Explain the concepts of highway planning, road classification, highway development and alignment selection for transportation projects.

CO2: Design highway geometric elements including cross-sections, sight distances, horizontal curves, vertical curves and intersections in accordance with IRC standards.

CO3: Analyze traffic characteristics, conduct traffic engineering studies and design traffic control measures, intersections and parking facilities.

CO4: Evaluate the engineering properties and suitability of soils, aggregates, bituminous materials and cement concrete used in pavement construction.

CO5: Design flexible and rigid pavements by applying pavement analysis concepts and IRC design procedures for safe and economical highway systems.

Unit 1: Highway Development and Planning

Classification of roads. Road development in India. Current road development projects in India. Highway alignment and factors affecting alignment. Highway project preparation and planning.

Unit 2: Geometric Design of Highways

Introduction to geometric design of highways. Highway cross-sectional elements. Sight distance requirements. Design of horizontal alignment. Design of vertical alignment. Design of intersections. Numerical problems related to geometric design.

Unit 3: Traffic Engineering and Control

Traffic characteristics. Traffic engineering studies. Traffic flow and highway capacity. Traffic regulation and control. Design of road intersections. Design of parking facilities. Highway lighting. Numerical problems related to traffic engineering.

Unit 4: Pavement Materials

Materials used in highway construction including soils, stone aggregates, bituminous binders and bituminous paving mixes. Portland cement and cement concrete. Desirable properties, testing procedures and requirements of pavement materials for different types of pavements. Numerical problems related to pavement materials.

Unit 5: Design of Pavements

Introduction to pavement design. Flexible pavements, factors affecting their design and performance, stresses in flexible pavements and design of flexible pavements as per IRC guidelines. Rigid pavements, components and functions, factors affecting their design and performance, stresses in rigid pavements and design of cement concrete pavements as per IRC guidelines. Numerical problems related to pavement design.

Text/Reference Books:

S.K. Khanna, C.E.G. Justo and A. Veeraragavan, *Highway Engineering*, Revised 10th Edition, Nem Chand & Bros., Roorkee, 2017.
L.R. Kadiyali, *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi.
Partha Chakraborty and Animesh Das, *Principles of Transportation Engineering*, PHI Learning Pvt. Ltd., New Delhi.
Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, *Principles of Highway Engineering and Traffic Analysis*, 4th Edition, John Wiley & Sons, New York.
R. Srinivasa Kumar, *Textbook of Highway Engineering*, Universities Press, Hyderabad, 2011.
Paul H. Wright and Karen K. Dixon, *Highway Engineering*, 7th Edition, Wiley India Student Edition, New Delhi, 2009.
Relevant IRC, MORTH and BIS Standards.

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KCE-403	Surveying and Geomatics	PCC	2L: 1T :0P	3 Credit

Module 1: Introduction to Surveying (8 hours): Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Module 2: Triangulation and Trilateration (6 Hours): Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods - triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections.

Module 3: Curves (6 hours) Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

Module 4: Modern Field Survey Systems (8 Hours): Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications,

Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Module 5: Photogrammetry Surveying (8 Hours): Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

Module 6: Remote Sensing (9 Hours): Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

UCE-451: STRUCTURAL ANALYSIS LAB

L:T:P = 0:0:1 Credits: 1

Course Objectives

- To provide experimental verification of structural analysis theories.
- To study the behavior of beams, arches, frames and columns under loading.
- To develop practical skills in measuring deflections, reactions and buckling loads.
- To compare experimental results with analytical solutions for structural systems.

Course Outcomes (COs)

CO1: Determine flexural rigidity, deflections and strains in structural members through laboratory experiments.

CO2: Verify fundamental structural analysis principles such as Maxwell's Reciprocal Theorem and influence line concepts.

CO3: Analyze the behavior of arches, frames and trusses under different loading conditions.

CO4: Evaluate buckling characteristics of columns and struts with various end conditions.

CO5: Interpret experimental data and compare it with theoretical predictions for structural systems.

List of Experiments

Experiment 1

Determination of Flexural Rigidity (EI) of a simply supported beam.

Experiment 2

Verification of Maxwell's Reciprocal Theorem.

Experiment 3

Measurement of strain in an externally loaded beam using strain gauges and comparison with theoretical values.

Experiment 4

Determination of horizontal thrust in a three-hinged arch and plotting influence line diagrams for horizontal thrust and bending moment.

Experiment 5

Determination of horizontal thrust in a two-hinged arch and plotting influence line diagrams for horizontal thrust and bending moment.

Experiment 6

Experimental analysis of pin-jointed trusses and determination of member forces.

Experiment 7

Determination of critical buckling load of columns/struts with different end conditions.

Experiment 8

Measurement of deflection in beams subjected to unsymmetrical bending.

Experiment 9

Study of deflection and reactions in rigid frames.

Experiment 10

Computer-aided structural analysis of beams and frames using structural analysis software.

Recommended Reference Books

1. Structural Analysis – R. C. Hibbeler, Pearson.
2. Theory of Structures – Dhanpat Rai Publications.
3. Structural Analysis – Tata McGraw-Hill.
4. Basic Structural Analysis – Tata McGraw-Hill.
5. Theory of Structures – Laxmi Publications.
6. Structural Analysis – Narosa Publishing.
7. Matrix Analysis of Structures – Cengage Learning.

KCE-451 Transportation Engineering Lab 0L: 0T :2P 1 Credit

Note: Students will perform minimum 10 experiments from the following:

List of Experiments

Determination of Aggregate Crushing Value of coarse aggregates.
Determination of Aggregate Impact Value of coarse aggregates.
Determination of Los Angeles Abrasion Value of aggregates.
Determination of Shape Characteristics of aggregates, including Flakiness Index and Elongation Index.
Determination of Penetration Value of bituminous binder.
Determination of Softening Point of bituminous binder.
Determination of Stripping Value of bituminous mixes.
Determination of Ductility of bituminous binder.
Determination of Flash Point and Fire Point of bituminous binder.
Classified Two-Directional Traffic Volume Study.
Traffic Speed Study using Radar Speedometer or Enoscope.

Suggested References

S.K. Khanna, C.E.G. Justo and A. Veeraragavan, *Highway Engineering*, Nem Chand & Bros., Roorkee.
L.R. Kadiyali, *Traffic Engineering and Transport Planning*, Khanna Publishers, New Delhi.
Partha Chakraborty and Animesh Das, *Principles of Transportation Engineering*, PHI Learning Pvt. Ltd., New Delhi.
R. Srinivasa Kumar, *Textbook of Highway Engineering*, Universities Press.
Khanna, Justo and Veeraragavan, *Highway Materials and Pavement Testing*, Nem Chand & Bros., Roorkee.
Relevant IRC Standards, MORTH Specifications and BIS Codes for Highway Materials Testing.
Laboratory Manual for Highway Engineering and Transportation Engineering.

VAC-402	**Surveying Techniques and application**	**PCC**	**0L: 0T :2P**	**1 Credit**

1. Study of different types of topographical maps and top repare conventional symbols chart.

2.To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.

3. To find out reduced levels of given points using dumpy/Auto level.

4. To perform fly leveling with a Auto/tilting level.

5. To study parts of a vernier/Electronic theodolite and practice for taking angle measurements.

6. To measure vertical angle of given points by Electronic theodolite.

7. Tomeasurehorizontalanglebetweentwoobjectsbyrepetitionmethodwiththreerepetitions.

8. To measure horizontal angle by method of reiteration

9. Todeterminetheelevationofchimneytopbytrigonometricallevellingbytakingobservations in single vertical plane.

10.To set out a simple circular curve by Rankine'smethod

11.To study various parts and practice with Wild T-2micro-optic theodolite and EDM (DistomatDI-1600).

12. Demonstration and practice work with hand held GPS (GS-5).

UVA-401	UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able to:

CO	CO Statement	Bloom's Level
CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society	K2
CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.	K2,K4
CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society	K2
CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.	K2
CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	K3, K4

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Module 1 – Introduction to Value Education

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: Self-exploration as the Process for Value Education
Lecture 4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

Module 2 – Harmony in the Human Being

Lecture 7: Understanding Human being as the Co-existence of the Self and the Body
Lecture 8: Distinguishing between the Needs of the Self and the Body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of Self and Body
Lecture 9: The Body as an Instrument of the Self
Lecture 10: Understanding Harmony in the Self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the Self
Lecture 11: Harmony of the Self with the Body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of Self with the Body

Module 3 – Harmony in the Family and Society

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect

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Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

Module 4 – Harmony in the Nature/Existence

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

Module 5 – Implications of the Holistic Understanding – a Look at Professional Ethics

Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Guidelines and Content for Practice Sessions (Tutorials)

In order to connect the content of the proposals with practice (living), 14 practice sessions have been designed. The full set of practice sessions is available in the Teacher's Manual as well as the website.

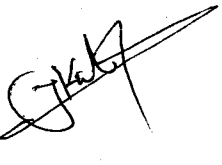
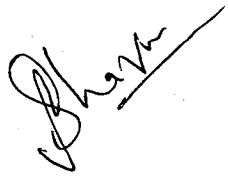
Text Books:

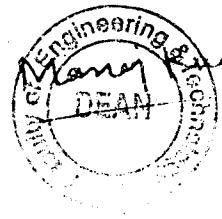
Text Book and Teachers Manual

1. The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1

2. The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53

3. Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.

Syllabus and Evaluation Scheme

For

B.Tech. (CE)-2nd Year

Session: 2024-25

SUBHARTI INSTITUTE OF TECHNOLOGY AND ENGINEERING

SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 2nd Year/3rd Semester (CE)
w.e.f. academic Session 2024-25

SEMESTER-III

S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KOE-3**/ KAS-303	Science Based Open Elective/ Mathematics-III	ES/BS	3	1	0	20	10	30	-	70	-	100	4
2	KHU-305/ KAS-304	Soft Skills*/ Environmental Science *	HS/BS	3	0	0	20	10	30	-	70	-	100	3
3	KCE-301	Solid Mechanics	ES	2	1	0	20	10	30	-	70	-	100	3
4	KCE-302	Civil Engineering Materials, Testing & Evaluation	ES	1	1	0	20	10	30	-	70	-	100	2
5	KCE-303	Concrete Technology	PCC	1	1	0	20	10	30	-	70	-	100	2
6	KCE-304	Fluid Mechanics	PCC	2	1	0	20	10	30	-	70	-	100	3
7	KMNC-01	Civil Engineering- Societal & Global Impact	AU	3	0	0	-	-	-	-	-	-	-	-
8	KCE-351	Solid Mechanics Lab	ES	0	0	2	-	-	-	15	-	35	50	1
9	KCE-352	Civil Engineering Materials, Testing & Evaluation Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
10	KCE-353	Fluid Mechanics Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
11	KCE-354	Building Planning and Computer - aided Civil Engineering drawing Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
12	KCC-351	Internship Assessment/Mini Project		-	-	-	-	-	-	100	-	-	100	2
Total													**900**	**23**

* **May be offered through NPTEL.**

** **Automation and Robotics is offered for the Civil Engineering students from the list of Science based open elective courses.**

Abbreviation Used:

BS: Basic Science Course

ES: Engineering Science Course

HS: Humanities and Social Sciences including Management Course

PCC: Professional Core Courses

AU: Mandatory Non-Credit Audit Courses

Faculty of Engineering & Technology DEAN

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech. 2nd Year/4th Semester (CE)
w.e.f. academic Session 2024-25

SEMESTER IV

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KOE-4**/ KAS-403	Science Based Open Elective/Mathematics-III	ES/BS	3	1	0	20	10	30	-	70	-	100	4
2	KHU-405/ KAS-404	Soft Skills/ Environmental Science	HS/BS	3	0	0	20	10	30	-	70	-	100	3
3	KCE-401	Transportation Engineering	PCC	1	1	0	20	10	30	-	70	-	100	2
4	KCE-402	Surveying and Geomatics	PCC	2	1	0	20	10	30	-	70	-	100	3
5	KCE-403	Geotechnical Engineering	PCC	2	1	0	20	10	30	-	70	-	100	3
6	KCE-404	Hydraulic Engineering	PCC	2	1	0	20	10	30	-	70	-	100	3
7	KCE-405	Structural Analysis	PCC	2	1	0	20	10	30	-	70	-	100	3
8	KCE-451	Transportation Engineering Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
9	KCE-452	Surveying and Geomatics Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
10	KCE-453	Geotechnical Engineering Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
11	KCE-454	Hydraulic Engineering Lab	PCC	0	0	2	-	-	-	15	-	35	50	1
Total													**900**	**25**

Abbreviation Used:

BS: Basic Science Course
ES: Engineering Science Course
HS: Humanities and Social Sciences including Management Course
AU: Audit Course
PCC: Professional Core Courses
AU: Mandatory Non-Credit Audit Courses

The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

Semester-III
Detailed Syllabus

Solid Mechanics

KCE-301	Solid Mechanics	ES	2 L: 1T :0P	3 Credit

Module1: *Simple Stresses and Strains*- Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience– Gradual, sudden, impact and shock loadings – simple applications.

Module 2: *Compound Stresses and Strains*- Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Module 3: *Bending moment and Shear Force Diagrams*- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Module 4: *Flexural Stresses-Theory of simple bending* – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Module 5: *Shear Stresses- Derivation of formula* – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Module 6: *Slope and deflection*- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Module 7: *Torsion*- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.

Module 8: *Thin Cylinders and Spheres*- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Text/Reference Books:

1. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVN Company, New York, USA.

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Text Books

1. M.L. Gambhir, Concrete Technology, McGraw Hill Book Company, Fifth Edition, 2017. (ISBN- 1259062554, 978-1259062551).

2. M.S. Shetty, Concrete Technology, Theory and Practice, S. Chand Publication, Sixth Edition, 2018. (ISBN- 9788121900034,978-8121900034)

3. B.L. Gupta and A. Gupta, Concrete Technology, Jain Book Agency, 2013. (ISBN-8180140407, 978-8180140402).

Recommended Reading

1. A.R. Santhakumar, Concrete Technology, Oxford University Press, New Delhi, 2018. (ISBN- 9780195671537, 978-0195671537).

2. A.M. Neville, Properties of Concrete, Pearson Publication, London, 2012. (ISBN- 978-

0273755807, 9780273755807).

3. IS 10262-(2009) Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 2009.

4. IS10262 (2009), Mix Design

5. IS269 (2015), Ordinary Portland Cement (33 Grade).

6. IS12269 (2013), Ordinary Portland Cement (53 Grade).

7. IS650 (1991), Specification of Standard Sand. 8. IS383 (1970), Specification for Coarse and Fine aggregate.

Fluid Mechanics

KCE-304	**Fluid Mechanics**	**PCC**	**2L: 1T :0P**	**3 Credit**

Module 1: Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Module 2: Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

KOE-822 BUILDING SERVICES INSTALLATION, SAFETY & PRACTICES

3L:0T: 0P 3 CREDITS

Course Objectives

To expose students to real-site installation practices

To understand coordination challenges between civil & services

To introduce safety, compliance, and maintenance thinking

To improve site readiness for construction & facility roles

To align learning with industry, audits, and defect liability practices

Course Outcomes

CO	Course Outcome
CO 1	Explain scope and coordination role of building services
CO 2	Describe plumbing and sanitary installation practices
CO 3	Understand electrical, earthing, and lightning systems
CO 4	Explain fire and life safety systems from execution perspective
CO 5	Apply inspection, testing, and maintenance principles

Unit–I: Overview of Building Services & Coordination 08 Classification of building services (MEPF); Role of civil engineer in services coordination; Interface between structure, finishing & services; Understanding service drawings and layouts; Shafts, ducts, and service zones planning; Common site coordination failures and solutions; Introduction to BIM-based coordination awareness.

Unit–II: Plumbing & Sanitary Installation Practices 08 Water supply systems (UGT, OHT, pumps); Pipe materials: GI, CPVC, UPVC, HDPE; Installation sequence in residential & institutional buildings; Sanitary fixtures, traps, vent pipes; Internal drainage systems; Testing: leakage, pressure & flow; Common defects and rectification methods.

Unit–III: Electrical, Earthing & Lightning Protection 08 Electrical load concepts and safety norms; Wiring systems used on site; Distribution boards and protective devices; Earthing: purpose, types, installation practices; Lightning protection system components; Safety during construction and operation; Role of engineer in audits and compliance. Unit–IV: Fire Safety &

Life Safety Systems 08 Fire hazards in buildings; Active vs passive fire protection systems; Fire extinguishers - types & applications; Fire detection and alarm systems; Emergency exits, staircases, signage; Fire safety norms during construction; Introduction to NBC & local fire authority compliance.

Unit–V: Inspection, Testing, Maintenance & Post-Occupancy 08 Inspection checklists for services; Testing & commissioning overview; Coordination during finishing & handover; Basics of operation & maintenance (O&M); Common failures after occupancy; Defect liability period responsibilities; Sustainability, safety, and lifecycle thinking.

Reference Books

1. Punmia, B. C., Jain, A. K., & Jain, A. K. Water Supply and Sanitary Engineering.
2. Birdie, G. S., & Jayakumar, J. S. Water Supply and Sanitary Engineering.
3. Uppal, S. L., & Raja, S. P. Electrical Installation Work.
4. Gupta, S., & Bhatnagar, R. Electrical Installations: Design, Practice and Management.
5. Bharati, B. S., & Rana, N. C. Electrical Wiring, Estimating and Costing.
6. Sharma, S. K. Fire Protection and Fire Engineering in Buildings.
7. Mukherjee, P. N. Construction Safety Management.
8. Jain, R. K. Safety Management in Construction.
9. Rangwala, S. C. Building Services Engineering.
10. Chakraborti, M. Building Construction and Services.
11. Usha, M. S. Facility Management: An Indian Perspective.
12. National Building Code of India (NBC), Latest Edition, Bureau of Indian Standards (BIS). IS 4770: Code of Practice for Rainwater Harvesting, BIS.
13. IS 16700: Criteria for Structural Safety and Serviceability of Buildings in Fire, BIS.
14. Relevant CPWD and BIS MEP Guidelines (Plumbing, Electrical, and Fire Services).

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2. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.

3. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004

4. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979

5. Laboratory Manual of Testing Materials - William Kendrick Hall

6. Mechanics of Materials - Ferdinand P. Beer, E. Russel Jhonston Jr., John T. DEwolf – TMH 2002.

7. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Solid Mechanics Lab

KCE-351	**Solid Mechanics Lab**	**ES**	**0 L: 0T :2P**	**1 Credit**

Note: Students will perform minimum 10 experiments from the following:

1. Tension test on Mild Steel
2. Bending tests on simply supported beam and Cantilever beam.
3. Determination of torsion and deflection,
4. Measurement of forces on supports in statically determinate beam,
5. Determination of shear forces in beams,
6. Determination of bending moments in beams,
7. Measurement of deflections in statically determinate beam.
8. To determine Flexural Rigidity (EI) of a given beam
9. To find deflection of curved members.
10. To find Critical load in Struts with different end conditions.
11. Hardness Test (Brinnel's and Rockwell)
12. Impact test (Charpy and IZOD)

Civil Engineering, Materials, Testing and Evaluation

KCE-302	**Civil Engineering, Materials, Testing and Evaluation**	**ES**	**1 L: 0T :0P**	**1 Credit**

Module 1: **Introduction to Engineering Materials covering**, Cements, M-Sand, Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete) Ceramics, and Refractories, Bitumen and asphaltic materials, Timbers, Glass and Plastics, Structural Steel and other Metals, Paints and Varnishes, Acoustical material and geo-textiles, rubber and asbestos, laminates and adhesives, Graphene, Carbon composites and other engineering materials including properties and uses.

Module 2: **Introduction to Material Testing covering**, What is the " Material Engineering" ?; Mechanical behavior and mechanical characteristics; Elasticity – principle and characteristics; Plastic deformation of metals; Tensile test – standards for different material (brittle, quasi-brittle, elastic and so on) True stress – strain interpretation of tensile test; hardness tests; Bending and torsion test; strength of ceramic; Internal friction, creep – fundamentals and characteristics; Brittle fracture of steel – temperature transition approach.

Module 3: **Standard Testing & Evaluation Procedures covering**, Laboratory for mechanical testing; Discussion about mechanical testing; Naming systems for various irons, steels and nonferrous metals; Discussion about elastic deformation; Plastic deformation; Impact test and transition temperatures; Fracture mechanics – background; Fracture toughness – different materials; Fatigue of material; Creep.

Module 4: Building Construction:

Components of building area considerations, Principles of building Planning
Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation
Masonry: Definition and terms used in masonry. Brick and stone masonry, Bonds in brick and stone masonry work. Types of walls; load bearing, partition walls, cavity walls.
Floors: Requirement of good floor, Components of ground floor, Selection of flooring material, Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring,
Stairs: Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical design of RCC dog legged and open-well stairs. Construction Principle and Methods for layout

Module 5: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings;

Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; **Acoustics** – characteristic-absorption – Acoustic design;**Fire protection** – Fire Hazards – Classification of fire resistant materials and constructions. **Plastering and Pointing:** Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, and defects in plastering. Water proofing with various thicknesses.**Damp proofing:** causes, effects and methods. Principles & Methods of building maintenance **Introduction to current construction practices such as:** Expanded Polystyrene (EPS), 3D Printing, Pre-Fabricated Panel System

Text/Reference Books:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. ButterworthHeinemann

2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand& Bros, Fifth Edition

3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materialsused for Civil Engineering applications

4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella

5. E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition

6. American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000)

7. Related papers published in international journals

Civil Engineering, Materials, Testing and Evaluation Lab

KCE-352	**Civil Engineering, Materials, Testing and Evaluation Lab**	**ES**	**0 L: 0T :2P**	**1 Credit**

List of Practical:

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II Course Aggregates

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregates

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

Concrete Technology

KCE-303	Concrete Technology	PCC	1L: 1T :0P	1 Credit

Course Contents

1. Properties of ingredients

Properties of coarse and fine aggregates and their influence on concrete, types of cement and their use, Grades of ordinary Portland cement, Portland pozzolana cement, rapid hardening Portland cement, hydrophobic cement, low heat Portland cement and sulphate resisting Portland cement as per relevant I.S. codes. Types of aggregates and their properties. Testing of aggregates as per relevant IS Codes.

2. Properties of different types of concrete

Concrete for structural work, light weight concrete, high density concrete, biological concrete, workability, durability and strength requirements, effect of w/c ratio on properties of fresh and hardened concrete, acceptability criteria, laboratory testing of fresh and hardened concrete, Fire resistant properties of hardened concrete.

3. Concreting methods

Process of manufacturing of concrete, transportation, placing, compaction and curing of concrete. Extreme weather concreting, special concreting methods, vacuum dewatering–underwater concrete, special form work., Plum Concrete, Self-Compacting Concrete

4. Admixtures

Plasticizers, Retarders, Accelerators and other Admixtures, Test on Admixtures, Chemistry and Compatibility with concrete. GGBS fly Ash, Metakaolin, Silica Fumes, crush sand

5. Ready mix concrete

Requirements of ready-mix concrete, properties of RMC, transit mixer details, Automation, instrumentation and Layout of RMC plant.

6. Concrete mix design

Mix Design for compressive strength by I.S. methods, road note method, British method, ACI Method, Mix design for flexural strength.

7. Concrete for repairs and rehabilitation of structures

High Performance concrete, Polymer Concrete, Fiber Reinforced Concrete, Light weight concrete and its manufacture, Polymer Impregnated Cement Concrete, Polymer Modified cement concrete and Ferro Cement, Special Tests for concrete used for repairs and rehabilitation.

8. Non-destructive testing of concrete

Rebound hammer test, Ultrasonic pulse velocity test, Magnetic particle testing, Liquid penetration testing, Visual testing, Laser Testing methods, Leak Testing, Impact echo test, carbonation test, Half-cell potentiometer and corrosion of steel, Core test and relevant provisions of I.S. codes.

Module 3: Fluid Kinematics- Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one-, two- and three-dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates.

Module 4: Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's* π-Theorem.

Module 5: Boundary Layer Analysis-Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Text/Reference Books:

1. A Textbook of Fluid Mechanics and Hydraulic Machines R. K. Bansal reprint, revised Publisher Laxmi Publications, 2004 ISBN 8131808157, 9788131808153.
2. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
3. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
4. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
5. Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc Graw Hill.

Fluid Mechanics Lab

KCE-353	**Fluid Mechanics Lab**	**PCC**	**0L: 0T :2P**	**1 Credit**

Note: Students will perform minimum 10 experiments from the following:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. Verification of Bernoulli's Theorem

7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement, sudden contraction and losses in bend.
13. Flow Visualization -Ideal Flow

Civil Engineering – Societal & Global Impact

KMNC-01	**Civil Engineering – Societal & Global Impact**	**PCC**	**3L: 0T :0P**	**0 Credit**

Module 1: Introduction to Course and Overview; Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;

Module 2: Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

Module 3: Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability;

Module 4: Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and nonstationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Module 5: Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban

Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

Module 6: Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development;

Text/Reference Books:

1. *Žiga* Turk (2014), Global Challenges and the Role of Civil Engineering, Chapter 3 in:

Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake

Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32.

Springer, Dordrecht

2. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social,

Economical and Working Environment, 120th ASEE Annual Conference and Exposition

3. NAE Grand Challenges for Engineering (2006), Engineering for the Developing World,

The Bridge, Vol 34, No.2, Summer 2004.

4. Allen M. (2008) Cleansing the city. Ohio University Press. Athens Ohio.

5. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A. (2010). London Tideway

Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options

6. http://www.thamestunnelconsultation.co.uk/consultation-documents.aspx

7. Ashley R M., Nowell R., Gersonius B., Walker L. (2011). Surface Water Management

and Urban Green Infrastructure. Review of Current Knowledge. Foundation for Water Research FR/R0014

8. Barry M. (2003) Corporate social responsibility – unworkable paradox or sustainable

paradigm? Proc ICE Engineering Sustainability 156. Sept Issue ES3 paper 13550. P 129-130

9. Blackmore J M., Plant R A J. (2008). Risk and resilience to enhance sustainability with

application to urban water systems. J. Water Resources Planning and Management. ASCE. Vol. 134, No. 3, May.

10. Bogle D. (2010) UK's engineering Council guidance on sustainability. Proc ICE

Engineering Sustainability 163. June Issue ES2 p61-63

11. Brown R R., Ashley R M., Farrelly M. (2011). Political and Professional Agency

Entrapment: An Agenda for Urban Water Research. Water Resources Management.

Vol. 23, No.4. European Water Resources Association (EWRA) ISSN 0920-4741.

12. Brugnach M., Dewulf A., Pahl-Wostl C., Taillieu T. (2008) Toward a relational concept of uncertainty: about knowing too little, knowing too differently and accepting not to know. Ecology and Society 13 (2): 30

13. Butler D., Davies J. (2011). Urban Drainage. Spon. 3rd Ed.

14. Cavill S., Sohail M. (2003) Accountability in the provision of urban services. Proc. ICE. Municipal Engineer 156. Issue ME4 paper 13445, p235-244.

15. Centre for Water Sensitive Cities (2012) Blueprint for a water sensitive city. Monash University.

16. Charles J A. (2009) Robert Rawlinson and the UK public health revolution. Proc ICE Eng History and Heritage. 162 Nov. Issue EH4. p 199-206

Building Planning and Computer - Aided Civil Engineering Drawing Lab

KCE-354	**Building Planning and Computer - Aided Civil Engineering Drawing Lab**	**PCC**	**0L: 0T :2P**	**1 Credit**

Course Content:

1. Preparation of detailed constructional plan of a residential building.
2. Preparation of front elevation, detailed sectional view, site plan, foundation plan, terrace plan,
waterproofing treatment, typical door and window.
3. Concept of perspective drawing- one point, two-point, three point and uses.
4. Preparation of line plans of various public buildings like:
   - Building for Education – School, College. Library
   - Building for health –Dispensary, Hospital Industrial structure
   - Building for entertainment-Theatre, Club House, Sports Club.
   - Other Structure- Office, Hostel, Guest house.
5. Prepare layout for water supply and drainage for a residential building and for multi-storeyed buildings.
6. Building's Solid Waste Collection and disposal system: Wet and dry solid waste segregation, Vermi-composting etc. Provision of Chutes.
7. Fire Protection System: Design of emergency exits and emergency vehicle routes with fire protection symbols.

Text Books

1. Scott Onstott, AutoCAD 2018 and AutoCAD LT 2018 Essentials, Wiley (2017), ISBN: 9788126569298)

2. M.G.Shah, Kale, Patki, Building Drawing with an Integrated Approach to Built Environment, Tata McGraw-Hill Education India, 5th edition, 2011, (ISBN: 9780071077873, 0071077871).
3. Building Services Environmental And Electro Mechanical Services, Second Revised, 2014, (ISBN: 9788175259805)

Recommended Reading:

1. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989, (SP-41: ISBN: 8170610117)
2. Croome, J. D. & Roberts, B. M., "AIR-CONDITIONING AND VENTILATION OF BUILDINGS VOL-1". Pergamon Press, (ISBN: 0080247792)
3. SP-35 (1987): Handbook of Water supply & drainage-BIS, (SP- 35: ISBN: 8170610095)
4. N.B.C.-2016, Volume 1 & 2, BIS, (ISBN: 8170610990)

Semester-IV

Transportation Engineering

KCE-401	**Transportation Engineering**	**PCC**	**1L: 1T :0P**	**2 Credit**

Module 1: Highway development and planning-Classification of roads, road development in India, Current Road projects in India; highway alignment and project preparation.

Module 2: Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems.

Module 3: Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems

Module 4: Pavement materials- Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems

Module 5: Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems

Text/Reference Books:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017

2. Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.

3. Partha Chakraborty, ' Principles Of Transportation Engineering, PHI Learning,

4. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski,'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley

5. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.

6. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

Transportation Engineering Lab

KCE-451	**Transportation Engineering Lab**	**PCC**	**0L: 0T :2P**	**1 Credit**

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer or Enoscope)

Manoj Kapil

Surveying and Geomatics

KCE-402	Surveying and Geomatics	PCC	2L: 1T :0P	3 Credit

Module 1: *Introduction to Surveying (8 hours):* Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Module 2: *Triangulation and Trilateration (6 Hours)*: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control - methods - triangulation - network- Signals. Baseline - choices - instruments and accessories - extension of base lines - corrections - Satellite station - reduction to centre - Intervisibility of height and distances - Trigonometric leveling - Axis single corrections.

Module 3: Curves (6 hours) Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve - Vertical curves

Module 4: *Modern Field Survey Systems (8 Hours)*: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications,

Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Module 5: *Photogrammetry Surveying (8 Hours)*: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereoplotting instruments, mosaics, map substitutes.

Module 6: *Remote Sensing (9 Hours)*: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

Text/Reference Books:

1 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

2 Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

3 Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010

4 Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

DEAN

Amit

5 Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.

6 Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

Surveying and Geomatics Lab

KCE-452	Surveying and Geomatics Lab	PCC	0L: 0T :2P	1 Credit

1. Study of different types of topographical maps and to prepare conventional symbols chart.

2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.

3. To find out reduced levels of given points using dumpy/Auto level.

4. To perform fly leveling with a Auto /tilting level.

5. To study parts of a vernier / Electronic theodolite and practice for taking angle measurements.

6. To measure vertical angle of given points by Electronic theodolite.

7. To measure horizontal angle between two objects by repetition method with three repetitions.

8. To measure horizontal angle by method of reiteration.

9. To determine the elevation of chimney top by trigonometrical levelling by taking observations in single vertical plane.

10. To set out a simple circular curve by Rankine's method.

11. To study various parts and practice with Wild T-2 micro-optic theodolite and EDM (Distomat DI-1600).

12. Demonstration and practice work with hand held GPS (GS-5).

Geotechnical Engineering

KCE-403	Geotechnical Engineering	PCC	2L: 1T :0P	3 Credit

Module 1: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Clay minerals, Index properties, Particle size analysis, Soil classification.

Module 2: Soil-water systems, capillarity-flow, Darcy's law, permeability, field and lab tests, piping, quick sand condition, seepage, flow nets, flow through dams, filters. Soil compaction, water content – dry unit weight relationships, OMC, field compaction control, Proctor needle method.

Module 3: Effective stress principle, Stresses due to applied loads, Boussinesq and Westergaard equations. Compressibility and consolidation characteristics, Rate of consolidation, Terzaghi's one dimensional theory of consolidation and its applications, Over Consolidation Ratio, determination of coefficient of consolidation and secondary consolidation (creep), consolidation under construction loading.

Module 4: Shear strength - direct & triaxial shear tests, Mohr – Coulomb strength criterion, drained, consolidated, undrained and unconsolidated tests, strength of loose and dense sands, Normally Consolidated and Over Consolidated soils, dilation, pore pressure, Scampton's coefficient. Earth pressure theories, Coulomb and Rankine approaches for c-φ soils, smooth and rough walls, inclined backfill

Module 5: Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ test, SPT, CPT, DCPT Types of foundations – shallow / deep, isolated, combined, mat, etc., Definitions, Bearing capacity of shallow foundations (Terzaghi analysis), general, local and punching shear failures, corrections for size, shape, depth, water table, Bearing capacity by consolidation method, in-situ bearing capacity determination, Provisions of IS code of practice, selection of depth of footing, eccentrically loaded footings.

Text Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)

2. K.R. Arora – Soil Mechanics and Foundation Engineering

References

1. Alam Singh – Modern Geotechnical Engineering

2. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning

3. I.H. Khan – Text Book of Geotechnical Engineering

4. C. Venkataramaiah – geotechnical Engineering

5. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics

6. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics

DEAN

Geotechnical Engineering Lab

KCE-453	**Geotechnical Engineering Lab**	**PCC**	**0L: 0T :2P**	**1 Credit**

Practical Work: List of tests on-

1. Sieve Analysis
2. Hydrometer Analysis
3. Liquid & Plastic Limit Tests
4. Shrinkage Limit Test
5. Proctor Compaction Test
6. Relative Density
7. In Situ Density – Core cutter & Sand Replacement
8. Permeability Test
9. Direct Shear Test
10. Auger Boring
11. Static Cone Penetration Test
12. Standard / Dynamic Cone Penetration Test12. Permeability test using Falling-head method.

Hydraulic Engineering

KCE-404	**Hydraulic Engineering**	**PCC**	**2L: 1T :0P**	**3 Credit**

Module 1: Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section.

Module 2: Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting

Manning's Roughness Coefficient- n. *Most economical section of ch*annel. Computation of Uniform flow, Normal depth.

Module 3: Non-Uniform Flow- Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir. Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow, Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Direct Step method, Graphical Integration method and Direct integration method.

DEAN

Module 4: Hydraulic Jump- Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types,applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges. **Dynamics of Fluid Flow**- Momentum principle, applications: Force on plates, pipe bends, moments of momentum equation,

Module 5: **Flow through Pipes**: Loss of head through pipes, Darcy-Wiesbatch equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.

Module 6: **Computational Fluid Dynamics**: Basic equations of fluid dynamics, Grid generation, Introduction to in viscid incompressible flow, Boundary layer flow as applicable to C.F.D. Hydro informatics: Concept of hydro informatics –scope of internet and web based modeling in water resources engineering.

Text/Reference Books:

1. Hydraulics and Fluid Mechanics, P.M. Modi and S.M. Seth, Standard Book House
2. Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill.
3. Open channel Flow, K. Subramanya, Tata McGraw Hill.
4. Open Channel Hydraulics, Ven Te Chow, Tata McGraw Hill.
5. Burnside, C.D., "Electromagnetic Distance Measurement," Beekman Publishers, 1971.

Hydraulic Engineering Lab

KCE-454	**Hydraulic Engineering Lab**	**PCC**	**0L: 0T :2P**	**1 Credit**

Note: Students will perform minimum 10 experiments from the following:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.

10. To study characteristics of Kaplan Turbine.

11. To study the free over-fall phenomenon in an open channel and to determine the end depth

12. To determine coefficient of discharge for given rectangular notch.

Structural Analysis

KCE-405	**Structural Analysis**	**PCC**	**2L: 1T :0P**	**3 Credit**

Course Contents

Module 1: Classification of Structures, stress resultants, degrees of freedom per node, Static and Kinematic determinacy. [3]

Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient. [5]

Module 2: Rolling loads, influence lines for beams and trusses, Absolute maximum bending moment, Muller-Breslau's principal & its application for determinate structures [08]

Module 3: Analysis of Arches, Linear arch, Eddy's theorem, three hinged parabolic arch, spandrel braced arch, moving load & influence lines. [08]

Module 4: Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load & Conjugate beam methods. [08]

Module 5: Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre its location for common structural section. [05]

Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures. [03]

References

1. Hibbler ," Structural Analysis ", Pearson Education
2. T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
5. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures ". Vol. I & II Nem Chand.
6. Vazirani & Ratwani et al ," Analysis of Strcuctures " , Khanna Publishers
7. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 3rd Year/5th Semester (CE BRANCH)
w.e.f. academic Session 2024-25

SEMESTER V

S. No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCE-501	Advanced Structural Analysis	PC	3	0	0	20	10	30	-	70	-	100	3
2	KCE-502	Environmental Engineering	PC	3	0	0	20	10	30	-	70	-	100	3
3	KCE-503	Quantity Estimation And Construction Management	PC	3	0	0	20	10	30	-	70	-	100	3
4	KCE-511-S to KCE-514-S	**Departmental Elective-I** *	PE	3	0	0	20	10	30	-	70	-	100	3
5	KCE-521 to KCE-524	**Departmental Elective-II**	PE	3	0	0	20	10	30	-	70	-	100	3
6	KCE-551	Cad Lab	PC	0	0	2	-	-	-	15	-	35	50	1
7	KCE-552	Environmental Lab	PC	0	0	4	-	-	-	15	-	35	50	1
8	KCE-553	Quantity Estimation And Construction Management Lab	PC	0	0	2	-	-	-	15	-	35	50	1
9	KCE-551	**Internship Assessment/ Mini Project #**		-	-	-	-	-	-	100	-	-	100	2
10	KNC-501/ KNC-502	**Constitution of India/ Essence of Indian Traditional Knowledge**	MC	2	0	0	20	10	30	-	70	-	100	0
Total													**850**	**20**

#The Mini Project and internship (4 weeks) conducted during summer break after IV semester and will be assessed during V semester.

*** Will be offered through SWAYAM-NPTEL.**

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
MC: Mandatory Course

***KNC-501/KNC-502 Subject is common to all branches**

Departmental Elective-I (Bucket to be prepared according to the courses offered by SWAYAM-NPTEL
KCE-511-S to KCE-514-

Departmental Elective-I

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Departmental Elective-II

1. KCE-521- Advanced Concrete Technology
2. KCE-522 - Design of Concrete Structures-I &II
3. KCE-523 - Industrial waste water Management.
4. KCE-524- Solid and Hazardous Waste Management
5. KCE-525 - Groundwater Engineering.
6. KCE-526 - Steel Concrete Composite Structures.

Departmental Elective-III

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Open Elective-I (common to all branches)

KOE-601 – Idea to Business Model
KOE-602 – Quality Control and Reliability
KOE-603 – Embedded Systems
KOE-604 – Introduction to MEMS (Micro-Electro-Mechanical Systems)
KOE-605 – Object-Oriented Programming
KOE-606 – Computer-Based Numerical Techniques
KOE-607 – GIS & Remote Sensing
KOE-608 – Basics of Database Management Systems
KOE-609 – Software Project Management
KOE-610 – Understanding the Human Being Comprehensively – Human Aspirations and Its

KCE 501: Advanced Structural Analysis 3L: 0T:0P 3 Credits

Course Objectives:

- To understand the analysis of indeterminate structures using classical and modern methods.
- To apply influence line principles in the analysis of beams, arches, and cable structures.
- To introduce matrix methods for analyzing structural systems.
- To develop the ability to perform plastic analysis of structures for advanced design scenarios

Course Outcomes (COs) :

- **CO1:** Analyze indeterminate structures to calculate unknown forces, slopes, and deflections using different methods.
- **CO2:** Apply the principle of influence lines to analyze indeterminate beams and arches.
- **CO3:** Analyze and design cable structures along with their influence line diagrams.
- **CO4:** Apply basics of force and stiffness methods of matrix analysis for beams, frames, and trusses.
- **CO5:** Apply the basics of plastic analysis to analyze structures using different mechanisms.

Unit 1: Analysis of Indeterminate Structures: Analysis of Fixed Beams and Continuous Beams. Analysis of Simple Frames with and without Joint Translation. Methods: Slope-Deflection Method, Moment Distribution Method, Strain Energy Method.

Unit 2: Suspension Bridges and Cable Structures: Introduction to Suspension Bridges. Analysis of Two- and Three-Hinged Stiffening Girders. Influence Line Diagrams for Maximum Bending Moment and Shear Force Design Principles for Cable Structures.

Unit 3: Matrix Methods of Structural Analysis: Basic Concepts of Force and Displacement Matrix Methods. Matrix Analysis of Beams, Frames, and Trusses. Application of Stiffness and Flexibility Methods.

Unit 4: Plastic Analysis of Structures: Basics of Plastic Analysis. Applications of Static and Kinematic Theorems. Plastic Analysis of Beams and Single-Storey Frames. Mechanism Methods for Determining Collapse Loads.

References:

1. Jain, A. K. - Advanced Structural Analysis, Nem Chand & Bros., Roorkee
2. Hibbeler, R.C. - Structural Analysis, Pearson Prentice Hall

3. C. S. Reddy - Structural Analysis, Tata McGraw Hill
4. Timoshenko, S. P. & D. Young - Theory of Structures, Tata McGraw Hill
5. Dayaratnam, P. - Analysis of Statically Indeterminate Structures, Affiliated East-West Press
6. C. K. - Intermediate Structural Analysis, McGraw-Hill.
7. Thandavamoorthy, T.S. - Structural Analysis, Oxford University Press.
8. Martin, H. C. - Introduction to Matrix Methods of Structural Analysis, McGraw-Hill.
9. Mau - Introduction to Structural Analysis, CRC Press.

KCE-502 Environmental Engineering 3L:0T:2P 3 Credits

Course Objectives:

- To understand the principles of water supply, treatment, and wastewater management.
- To develop skills in the design of water distribution systems and wastewater treatment
- plants.
- To assess the environmental impact of water-related projects and promote sustainable
- Practices

Course Outcomes (COs:

- **CO1:**Recall basic concepts of freshwater resources, water demand, and transmission systems.
- **CO2:** Apply principles of water storage and distribution system design.
- **CO3:** Analyze physical, chemical, and biological parameters of water and wastewater.
- **CO4:** Evaluate the efficiency of water and wastewater treatment processes.
- **CO5:** Apply sustainable wastewater treatment solutions using emerging technologies.

Unit 1: **Water:** -Sources of Water and quality issues, water quality requirement for different Beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and Agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, various valves used in W/S systems, service reservoirs and design.
Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, Advanced treatments like adsorption, ion exchange, membrane processes.

Unit 2: **Sewage**- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shape design parameters, operation and maintenance of Sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans,

Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached Growth systems, recycling of sewage- quality requirements for various purposes.

Unit 3: **Air** - Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and Inter-relationship. Air quality standards, Control measures for Air pollution, construction and Limitations.

Unit 4 : Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities.

Unit 5: **Building Plumbing**-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used.

Text/Reference Books:

1. Environmental Engineering, M.P. Poonia, SC. Sharma, Santosh Kumar, Khanna Book
2. Publishing Co., New Delhi.
3. Air Pollution and Control, Keshav Kant, Rajni Kant, Khanna Book Publishing Co.,
4. New Delhi.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice
6. Hall, New Jersey.
7. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan,
8. Thompson /Brooks/Cole; Second Edition 2008.
9. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -
10. Hill International Editions, New York 1985.
11. MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata
12. McGraw-Hill, New Delhi.
13. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
14. Plumbing Engineering. Theory, Design and Practice, S.M. Patil, 1999
15. Gupta, O.P., Elements of Water Pollution Control Engineering, Khanna Publishing
16. House, New Delhi (ISBN: 9789386173225)
17. Gupta, O.P., Elements of Land/ Soil Pollution, Khanna Publishing House, New Delhi
18. (ISBN: 9789382609735)
19. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House,
20. New Delhi (ISBN: 9789382609667)

21. Gupta, O.P., Khanna's Objective Types Questions & Answers in Environmental
22. Engineering, Khanna Book Publishing Co.
23. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill
24. Publication
25. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public
26. Health and Environmental Engineering Organization, Ministry of Urban Development

KCE-503 Quantity Estimation and Construction Management 3L:0T:2P 3 Credits

Course Objectives:

- To estimate quantities of building materials using standard methods and interpret PWD schedule of rates.
- To analyze rates, prepare specifications, and understand tendering and contractual procedures.
- To apply project planning and control techniques using PERT and CPM in construction management.
- To evaluate the productivity and cost-effectiveness of various construction equipment.
- To perform cost analysis and economic evaluation of construction projects using standard financial methods.

Course Outcomes:

- **CO1:** Understand the importance of units of measurement and preliminary estimates for administrative approval of projects.
- **CO2:** Understand the contracts and tender documents in construction projects.
- **CO3:** Analyze and assess the quantity of materials required for civil engineering works as per specifications.
- **CO4:** Evaluate and estimate the cost of expenditure and prepare a detailed rate analysis report.
- **CO5:** Analyze and choose cost effective approach for civil engineering projects.

Unit 1: Quantity Estimation For Buildings: Measurement units for various building materials, Center line method, Long and short wall method of estimates, Types of estimates, PWD schedule of rate.

Unit 2: Rate Analysis, Specification and Tenders: Analysis of rates knowing cost of material, labour, equipment, overheads, profit, taxes etc, Specifications – Preparation of detailed and

general specifications, Legal aspects of contracts, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items.

Unit 3: Elements Of Management & Network Techniques: Project cycle, Organization, planning, scheduling, monitoring, updating and management system in construction, Bar charts, milestone charts, work break down structure and preparation of networks. Network Techniques like PERT & CPM in construction management. Project monitoring and resource allocation through network techniques.

Unit 4: Equipment Management: Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, earth compaction, Hauling Equipment, Hoisting Equipment, Conveying Equipment, Concrete Production Equipment, Tunnelling Equipment.

Unit 5: Project Cost Management: Budgeting, Cost planning, Direct Cost, Indirect cost, Total Cost Curve, Cost Slope. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method Equivalent annual cost method, discounted cash flow method, Depreciation and its type, depletion, Arbitration, and break-even cost analysis.

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003.
2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.
3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500004.
4. Construction Management by Ojha. 5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd

KCE – 522 : Design of Concrete Structures 3L: 0T:0P 3 Credits

Course Objectives:

- To introduce the fundamental principles of reinforced concrete design based on Indian Standards.
- To develop the ability to apply IS Codes in the design and detailing of structural elements.

- To enable students to analyze, evaluate, and create safe and economical RCC structural designs.

Course Outcomes:

- **CO1:** Recall key IS codes, design philosophies, and basic RCC terminologies & learn WSM Method.
- **CO2:** Apply IS code provisions for designing beams and understanding shear behavior. Analyze structural behavior and design of slabs and staircases.
- **CO3:** Evaluate the design efficiency of columns for axial and biaxial loading conditions.
- **CO4:** Designs for footings, retaining walls, and structural drawings with bar bending schedules.

Unit 1: **Introduction to Design Philosophies**: Working Stress Method (WSM) vs. Limit State Method (LSM).Basic Assumptions in RCC Design, Stress-Strain Relationships in Concrete and Steel. Introduction to IS 456:2000 and Design Aids (SP-16).Design of RCC Beam by Working Stress Method.

Unit 2: Design of RCC Beams by Limit State Method :Design of Rectangular Singly and Doubly Reinforced Beams. Design of T-Beams and L-Beams as per Limit State Method .Analysis of Shear Strength, Design of Shear Reinforcement Development Length, Anchorage Bond, and Flexural Bond.

Module 3: Design of Slabs and Staircases by LSM :Design of One-Way, Two-Way, Continuous, and Cantilever Slabs Serviceability Limit States: Deflection, Cracking, and Vibration Control Design of Dog-Legged Staircases and Open-Well Staircases.

Unit 4: Design of Compression Members :Classification of Columns: Short and Long Columns, Design of Columns under Axial Load and Biaxial Bending Effective Length of Columns, Slenderness Ratio Ductile Detailing as per IS 13920:2016 for Seismic Design.

Unit 5: Design of Footings and Retaining Walls Design of Isolated, Combined, and Strap Footings Structural Behavior of cantilever and counterfort RW and Design of Retaining Walls (Cantilever Type) Stability Analysis: Overturning, Sliding, and Bearing Capacity Considerations.

Refrences Books:

1. IS 456:2000 – Code of Practice for Plain and Reinforced Concrete

2. IS 13920:2016 – Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces

3. IS 1893:2016 – Criteria for Earthquake Resistant Design of Structures.

4. SP-16 – Design Aids for Reinforced Concrete to IS 456:2000.

5. SP-34 – Handbook on Concrete Reinforcement and Detailing

6. Reinforced Concrete Design by S. Unnikrishna Pillai & Devdas Menon.

7. Limit State Design of Reinforced Concrete by A.K. Jain.

8. Reinforced Concrete Structures by B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain.

9. Design of Reinforced Concrete Structures by N. Krishna Raju.

10. Reinforced Concrete Design by M.L. Gambhir.

KCE-551 CAD LAB 0L:0T:2P 1 Credits

List of Experiments

1. Working on latest version of geotechnical engineering software, structural engineering software (Open source/commercial software).
2. Working on latest version of surveying software (Open source/commercial software).

NOTE:- For open source software, the following link of FOSSEE may be used apart from other available resources: https://fossee.in FOSSEE: (Free/Libre and Open Source Software for Education), National mission on education through ICT, MHRD, Govt. of India.

KCE-552 ENVIRONMENTAL LAB 0L:0T:2P 1 Credits

List of Experiments

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile,
3. inorganic etc.

4. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
5. Analysis of ions: copper, chloride and sulfate
6. Optimum coagulant dose
7. Chemical Oxygen Demand (COD)
8. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
9. Break point Chlorination
10. Bacteriological quality measurement: MPN,
11. Ambient Air quality monitoring (TSP, RSPM, SOx, NOx)
12. Ambient noise measurement

KCE-553 Quantity Estimation And Construction Management LAB

0L:0T:2P 1 Credits

List of Experiments

1. Study of DSR, CPWD specifications and NBC.
2. Estimation of quantities for any one of the following: Building/ Septic tank/Water supply pipe line/road/bridge
3. Preparation of Bill of Quantities (BOQ) for above project.
4. Practice on open source project management software / MS Project/Primavera software for same problem.
5. Study of any full set of tender documents (Institute shall provide the set from ongoing/ completed tenders).

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 3rd Year/6th Semester (CE branch)
w.e.f. academic Session ~~2025-26~~ 2024-25

SEMESTER VI

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCE-601	Design of Steel Structures	PC	3	1	0	20	10	30	-	70	-	100	4
2	KCE-602	Foundation Design	PC	3	0	0	20	10	30	-	70	-	100	3
3	KCE-603	Sustainable And Green Construction	PC	3	0	0	20	10	30	-	70	-	100	3
4	KCE-604	Hydrology And Water Resources Engineering	PC	3	0	0	20	10	30	-	70	-	100	3
5	KCE-611-S to KCE-614-S	**Departmental Elective-III ***	PE	3	0	0	20	10	30	-	70	-	100	3
6	KOE-6**	**Open Elective-I**	OE	3	0	0	20	10	30	-	70	-	100	3
7	KCE-651	Structural Detailing Lab	PC	0	0	2	-	-	-	15	-	35	50	1
8	KNC-602/ KNC-601	**Essence of Indian Traditional Knowledge/ Constitution of India**	MC	2	0	0	20	10	30	-	70	-	100	0
9	KCSE-653	**Project-I**	PROJ	0	0	4	-	-	-	50	-	100	150	2
Total													**950**	**22**

*** Will be offered through SWAYAM-NPTEL.**

Abbreviation Used:

PC: Professional Core Course
PE: Professional Elective Course
OE: Open Elective Course
- **MC:** Mandatory Course

The Mini Project/Internship (4 weeks) will be done during summer break after 6th Semester and will be assessed during VII semester.

Departmental Elective-I

Manoj Kapil

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Departmental Elective-II

7. KCE-521- Advanced Concrete Technology
8. KCE-522 - Design of Concrete Structures-I &II
9. KCE-523 - Industrial waste water Management.
10. KCE-524- Solid and Hazardous Waste Management
11. KCE-525 - Groundwater Engineering.
12. KCE-526 - Steel Concrete Composite Structures.

Departmental Elective-III

* A bucket of four (04) courses should be prepared based on the courses offered by SWAYAM in the respective session.

Open Elective-I (common to all branches)

KOE-601 – Idea to Business Model
KOE-602 – Quality Control and Reliability
KOE-603 – Embedded Systems
KOE-604 – Introduction to MEMS (Micro-Electro-Mechanical Systems)
KOE-605 – Object-Oriented Programming
KOE-606 – Computer-Based Numerical Techniques
KOE-607 – GIS & Remote Sensing
KOE-608 – Basics of Database Management Systems
KOE-609 – Software Project Management
KOE-610 – Understanding the Human Being Comprehensively – Human Aspirations and Its

Faculty of Engineering & Technology
DEAN

KCE-601 Design of Steel Structures **(L-T-P 4-0-0)** **Credit – 4**

Course Objective:

- To provide a coherent development to the students for the courses in sector of Designing of the Steel Structures.
- To present the foundations of many basic Engineering concepts related Design of Steel Structures.
- To give an experience in the implementation of engineering concepts which are applied in field of Steel Structures.
- To involve the application of scientific and technological principles of planning, analysis, design of buildings.

Course Outcomes :

- **CO1:** Understand the fundamental concepts of steel structures, various types of loads, and design philosophies including limit state design.
- **CO2:** Analyze and design riveted, bolted, and welded connections considering load transfer mechanisms, failure modes, and code specifications.
- **CO3:** Determine the design strength of tension members and develop appropriate detailing including splices, lug angles, and gusset plates.
- **CO4:** Evaluate and design compression members, including columns, laced and battened columns, and column bases, considering buckling and slenderness.
- **CO5:** Analyze and design steel beams subjected to flexure, shear, and torsional effects, including rolled, built-up beams, purlins, and plate girders.

UNIT - 1

Introduction to steel structures Advantages and Disadvantages of Steel as a Structural Material. Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements. Introduction to Limit State Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design.

UNIT - 2

Introduction to Riveted, Bolted and Pinned Connections Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections . Simple Welded Connections, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections

UNIT – 3

Introduction to Tension Members Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate.

UNIT – 4

Introduction to Compression Members, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases.

UNIT – 5 Introduction to Beams Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder, Introduction to Gantry Girder.

Reference Books:

1. N.Subramanian; Steel Structures, Oxford Publication
2. K. S. Sai Ram; Design of Steel Structures, Pearson
3. Arya & Ajmani; Design of Steel Structures
4. Dayaratnam ; Design of Steel Structures
5. B.C.Punamia; Steel Structures, Laxmi Publication

KCE-602 FOUNDATION DESIGN (L-T-P 3-0-0) Credit – 3

Course Objectives:

- Understand various methods of Soil Exploration and its importance.
- Analyze bearing capacity and settlement of soil for shallow foundation.
- Design the various types of shallow foundation and understand the basics of deep foundation.
- Understand the characteristics of well foundations and retaining wall.
- Understand the concept of soil reinforcement.

Course Outcomes (COs):

- **CO1** Understand various methods of soil exploration, including boring, drilling, and in-situ tests.
- **CO2** Analyze bearing capacity and settlement of soil for shallow foundations using established theories
- **CO3** Design different types of shallow foundations and understand the basics of deep foundations.
- **CO4** Understand the characteristics, forces, and construction techniques of well foundations and retaining walls.
- **CO5** Understand the concept of soil reinforcement and its application in foundation design.

Amit

Manoj Kapil

Unit 1

Introduction to soil exploration, methods of boring and drilling, soil sampling and sampler, insitu tests, SPT, CPT, DCPT, geophysical methods; soil resistivity methods seismic refraction methods.

Unit 2

Bearing capacity of shallow foundation, design criteria, factors affecting bearing capacity, factors influencing selection of depth of foundation, modes of shear failures, types of shallow foundations, contact pressure under rigid and flexible footings, Terzaghi's, Meyerhof, Hansen's bearing capacity theories, IS code method Settlement of shallow foundations: components of settlement & its estimation, immediate, consolidation, & differential settlements.

Unit 3

Design of shallow foundation; principles of design of footing, design of isolated footings and strip footing. Deep foundation; introduction, necessity of deep foundations, pile installation, pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, single and double under reamed piles.

Unit 4

Introduction, shapes and characteristics of wells, components of well foundation, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts. Retaining walls: introduction, types of retaining structures, support systems for flexible retaining walls (struts, anchoring), construction methods, introduction and uses of sheet piles.

Unit 5

Geotechnical properties of reinforced soil, use of soil reinforcement, shallow foundation on soil with reinforcement, design considerations, idealized soil, foundation and interface behaviour, elastic models of soil behaviour.

Reference Books:

1. Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
2. Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
3. Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.
4. Joseph E. Bowles: Foundation analysis and design.McGraw-Hill Higher Education

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5. Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
6. Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
7. B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
8. V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Banglore.
9. P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
10. I.H. Khan – Text Book of Geotechnical Engineering
11. C. Venkataramaiah – Geotechnical Engineerin
12. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
13. Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida

KCE-603 Sustainable and Green Construction 3L:T:0P 3 Credits

Course Objectives:

- To introduce the basic concepts of the hydrologic cycle and water-budget equation, and to provide an understanding of precipitation, runoff, and abstractions in the hydrologic process.
- To develop an understanding of groundwater hydrology including aquifer types, properties, and well hydraulics under steady-state flow conditions.
- To provide knowledge on crop water requirements, irrigation scheduling, and methods of water application, including water use for agriculture, energy, and flood control.
- To impart skills in the design and analysis of canal distribution systems, estimation of water losses, drainage methods, and control of waterlogging.
- To educate students on the classification, design, and components of dams and spillways, and reservoir planning including sedimentation, capacity estimation, and regulation techniques.

Course Outcomes:

- **CO1:**Explain the concepts of sustainable development, ecology, and environmental challenges affecting construction.
- **CO2:**Analyze and apply sustainable materials and construction techniques to reduce environmental impact and improve resource efficiency.
- **CO3:**Design buildings with energy- and water-efficient systems using passive strategies and renewable technologies.
- **CO4:**Evaluate sustainable site planning and green building design principles to enhance ecological performance.
- **CO5:**Assess construction and demolition waste management strategies and apply relevant green building certification systems.

Unit 1:

Introduction to sustainable Development: Definition and principles of sustainable development, Historical context and evolution of sustainability, Global and local challenges related to sustainability. **Environment Science and Ecology:** Fundamentals of ecology, Biodiversity and conservation, Climate change and its impacts, Environmental pollution and waste management.

Unit 2:

Sustainable construction Material and Technology: Green building materials and technologies, Life cycle assessment of materials, Resource efficiency and waste reduction in construction, Low-impact construction methods.

Energy Efficiency in Buildings: Principles of energy-efficient design, Renewable energy integration in building design, Energy-efficient HVAC systems, Building energy modeling and simulation Water **Management in Construction**: Sustainable water use in construction processes, Rainwater harvesting and greywater recycling, Water-efficient construction practices, Strategies for mitigating water pollution on construction sites.

Unit 3:

Sustainable Site Planning: Site selection and evaluation for sustainable construction, green space planning and landscaping, Sustainable stormwater management.

Sustainable Building Design: Principles of green building design, Passive design strategies for energy efficiency, Daylighting and natural ventilation, Integration of sustainable technologies in design.

Unit 4:

Construction and Demolition Waste Management: Waste reduction and recycling in construction, Responsible demolition practices, Circular economy concepts in construction.

Building Certifications and Standards: LEED (Leadership in Energy and Environmental Design) certification, BREEAM (Building Research Establishment Environmental Assessment Method), Other regional and international green building certifications

Unit 5:

Environmental Regulations and Policy: - Building codes and regulations for sustainable construction - Environmental impact assessments - Government policies promoting green construction

Economics of Sustainable Construction: - Cost-benefit analysis for green building projects - Financial incentives for sustainable construction - Business models for green technologies in construction

Project Management for Sustainable Construction: - Sustainable project planning and execution- Stakeholder engagement and communication - Monitoring and evaluating sustainability performance

Ethics and Social Responsibility in Construction: - Ethical considerations in sustainable construction- Social impacts of green construction projects - Community engagement and stakeholder involvement.

References:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.
2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.
3. Complete Guide to Green Buildings by Trish riley
4. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009.
5. Green Building Fundamentals by Mike Montoya, Pearson, 2nd edition, 2010.
6. Sustainable Construction - Green Building Design and Delivery by Charles J. Kibert, John Wiley & Sons, 2nd edition, 2008.
7. Sustainable Construction and Design by Regina Leffers, Prentice Hall, 2009.

KCE-604 Hydrology and Water Resource Engineering 3L:0T:0P 3 Credits

Course Objectives:

- Understand the components of the hydrologic cycle and analyze various hydrological processes such as precipitation, abstraction, and runoff relevant to engineering applications.
- Explore the fundamentals of groundwater and well hydrology, including aquifer properties and the mechanics of groundwater flow.

Amit

Manoj Kapil

- Analyze the water requirements of crops and irrigation scheduling based on soil-water-plant relationships and various irrigation methods.
- Design and evaluate irrigation canal systems, understand flow in channels, and assess waterlogging and drainage techniques.
- Understand the design principles and components of dams, spillways, and reservoirs, and their importance in water storage, regulation, and flood control.

Course Outcomes:

- **CO1:** Explain the hydrologic cycle, forms and measurement of precipitation, and estimate abstractions and runoff using standard methods.
- **CO2:** Analyze groundwater flow, aquifer characteristics, and evaluate well hydraulics for confined and unconfined aquifers.
- **CO3:** Determine crop water requirements and evaluate appropriate irrigation methods based on soil, crop, and water conditions.
- **CO4:** Design canal systems and channels using Kennedy's and Lacey's theories and propose remedial measures for waterlogging and canal losses.
- **CO5:** Evaluate the design and functionality of different types of dams, spillways, and reservoirs, including considerations of seepage, sedimentation, and structural stability.

Unit 1: Introduction - hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data.Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth- areaduration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India. Abstractions from precipitation - evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices. Runoff - runoff volume, flow duration curve, flow-mass curve,

hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India.

Unit 2: Ground water and well hydrology - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

UNIT 3: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. Water withdrawals and uses – water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply.

UNIT 4:Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

UNIT 5: Dams and spillways - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Text/Reference Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4. G L Asawa, Irrigation Engineering, Wiley Eastern
5. L W Mays, Water Resources Engineering, Wiley.
6. J D Zimmerman, Irrigation, John Wiley & Sons
7. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 4th /7th semester(Civil Engineering)
w.e.f. academic Session 2024-25

SEMESTER VII

S. No.	Course Code	Course Name	Course Domain	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KCE-701	Advanced Concrete Technology	PC	3	0	0	20	10	30	-	70	-	100	3
2	KCE-072	Artificial Intelligence in Civil Engineering	PE	3	0	0	20	10	30	-	70	-	100	3
3	KOE-078	Soil and Water Conservation Engineering	OE	3	0	0	20	10	30	-	70	-	100	3
4	KC-751	Advanced concrete Technology Lab	PC		0	4	-	-	-	15		35	50	2
5	KCE-752	Mini Project or Internship Assessment	PC	-	-	-	-	-		100	-	-	100	2
6	KCE-753	Project -I	PC	0	0	10	-	-	-		-	150	150	5
Total													**600**	**18**

FACULTY OF ENGINEERING AND TECHNOLOGY
SWAMI VIVEKANAND SUBHARTI UNIVERSITY, MEERUT
STUDY & EVALUATION SCHEME
B.Tech 4th Year/8th Semester (Civil Engineering)
w.e.f. academic Session 2024-25

SEMESTER VIII

S No.	Course Code	Course Name	Course Type	Periods			CCA				ESE		Total	Credit
				L	T	P	CT	AT	Total	PS	TE	PE		
1	KOE-804	Entrepreneurship development	OE	3	0	0	20	10	30	-	70	-	100	3
2	KOE-822	Building Services Installation safety & Practises	OE	3		0	20	10	30	-	70	-	100	3
3	KCE-851	Project-II				18				100		350	450	10
Total													**650**	**16**

DEAN
Kapil

KCE-701: ADVANCED CONCRETE TECHNOLOGY 3L: 0T:0P 3 Credits

Course Objectives:

1. Understand the properties and behaviour of constituent materials used in advanced concrete technology.
2. Study the properties of fresh and hardened concrete and the quality control practices adopted during concrete construction.
3. Analyse the durability issues affecting concrete structures and recommend suitable preventive measures.
4. Understand the production, properties, and applications of fiber-reinforced and lightweight concrete.
5. Evaluate the characteristics and applications of special concretes used in modern construction.

Course Outcomes (COs) :

CO No.	Course Outcomes	Bloom's Level
CO1	Explain the properties and functions of cement, aggregates, water, admixtures, and other constituent materials used in advanced concrete technology.	Understand (K2)
CO2	Evaluate the properties of fresh and hardened concrete and apply appropriate quality control methods during concrete construction.	Analyze (K4)
CO3	Analyze the durability of concrete by assessing deterioration mechanisms such as alkali–aggregate reaction, reinforcement corrosion, freezing and thawing, and suggest suitable preventive measures.	Analyze (K4)
CO4	Design and evaluate fiber-reinforced concrete and lightweight concrete by selecting suitable materials, mix proportions, and production techniques for engineering applications.	Create (K6)
CO5	Assess the characteristics, production techniques, and engineering applications of special concretes including high-strength concrete, mass concrete, roller-compacted concrete, high early strength concrete, and self-compacting concrete.	Evaluate (K5)

UNIT-I: Fundamentals Of Concrete: Materials-. Cement, Aggregates, mixing water soundness of aggregate- Fresh and hardened concrete: Admixtures- types of admixtures- purposes of using admixtures- chemical composition- effect of admixtures on fresh and hardened concretes- Natural admixtures.

UNIT-II: Properties of Fresh and hardened concrete and quality control in concrete construction

UNIT-III: Durability of concrete Alkali aggregate reaction, reinforcement corrosion, freezing and thawing, etc.

UNIT-IV: Fiber-reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes. Light weight concrete- Introduction- properties of light weight concrete- No fines concrete- design of light weight concrete

UNIT-V: High strength concrete, Mass concrete, Roller compacted concrete, high early strength, Self compacting concrete.

References:

1. A M Neville, Properties of concrete, Person India
2. Special Structural concrete- Rafat Siddique
3. Concrete repair and maintenance illustrated- Peter H Emmons
4. Concrete technology-M S Shetty
5. AR Santha Kumar, Concrete technology, Oxford university Press, India

KCE-072: Artificial Intelligence in Civil Engineering 3L: 0T:0P 3 Credits

Course Outcomes (COs)

CO1: Understand the fundamentals of AI and its role in Civil Engineering.

CO2: Analyze and manage civil engineering data using AI techniques.

CO3: Apply AI concepts in structural analysis and monitoring.

CO4: Utilize AI tools for construction planning, safety, and management.

CO5: Evaluate AI applications in transportation systems and smart infrastructure.

Unit I: Introduction to Artificial Intelligence and Civil Engineering

* Introduction to Artificial Intelligence (AI)
* Need and Applications of AI in Civil Engineering
* AI vs Traditional Engineering Methods
* Basic Concepts of Machine Learning and Deep Learning
* Future Trends of AI in Civil Engineering

Unit II: Data Collection and Analysis in Civil Engineering

* Types of Civil Engineering Data
* Data Collection Methods and Sensors
* Data Preprocessing and Visualization
* Introduction to Big Data in Civil Engineering
* Case Studies on Data-Driven Decision Making

Unit III: AI Applications in Structural Engineering

* Structural Health Monitoring
* Crack Detection using AI Techniques
* Predictive Maintenance of Structures
* Load and Stress Prediction
* AI-Based Design Optimization

Unit IV: AI in Construction Management

* Smart Construction and Automation

* Project Planning and Scheduling using AI
* Cost Estimation and Resource Management
* Safety Monitoring at Construction Sites
* Use of Drones and Computer Vision in Construction

Unit V: AI in Transportation and Smart Infrastructure

* Intelligent Transportation Systems
* Traffic Flow Prediction and Management
* Smart Cities and Smart Infrastructure
* AI for Road Condition Monitoring
* Challenges, Ethics, and Future Scope of AI in Civil Engineering

Reference Books

1. Russell, S. J. and Norvig, P., Artificial Intelligence: A Modern Approach, 4th Edition, Pearson Education, 2021.
2. Naser, M. Z., Machine Learning for Civil and Environmental Engineers: A Practical Approach to Data-Driven Analysis, Explainability, and Causality, Wiley, 2023.
3. Lagaros, N. D. and Plevris, V. (Eds.), Artificial Intelligence (AI) Applied in Civil Engineering, MDPI Books, 2022.
4. Bekdaş, G. and Nigdeli, S. M. (Eds.), Artificial Intelligence in Civil Engineering: Recent Advances, Springer, 2026.
5. Samui, P. and Kothari, D. P., Artificial Intelligence in Civil Engineering, LAP Lambert Academic Publishing, 2012.

Suggested Text Books

1. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education.
2. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, McGraw-Hill Education.

KOE-078 : SOIL AND WATER CONSERVATION ENGINEERING
3L: 0T:0P 3 Credits
Course Objectives:

To understand the causes, mechanisms, and effects of soil erosion and the principles of soil conservation.

To develop knowledge of engineering and biological measures used for controlling soil erosion and conserving land resources.

To study water conservation techniques, watershed management practices, groundwater recharge methods, and sustainable utilization of water resources.

To analyze water losses, water quality issues, and environmental impacts associated with agricultural and water resource development activities.

To apply principles of flood management, water resource planning, and conservation engineering for sustainable development and environmental protection.

Course Outcomes (COs) :

CO No.	Course Outcome	Bloom's Level
CO1	Explain the principles of soil conservation, mechanisms of soil erosion, and methods for controlling wind erosion using engineering and vegetative practices.	Understand (K2)
CO2	Analyze different types of water-induced soil erosion and recommend suitable engineering measures for erosion control, sediment transport, and reservoir sedimentation management.	Analyze (K4)
CO3	Apply biological soil conservation techniques, watershed management practices, water harvesting methods, and groundwater recharge systems for sustainable land and water resource management.	Apply (K3)
CO4	Evaluate water losses, agricultural water pollution, pollutant transport mechanisms, and water quality management practices for protecting surface and groundwater resources.	Evaluate (K5)
CO5	Assess water resource planning, flood management strategies, and sustainable utilization of water resources considering environmental and socio-economic aspects.	Evaluate (K5)

DEAN

Unit 1

Definition and scope of soil conservation, cause of soil erosion, Mechanism of erosion, universal soil loss equation, soil erosion due to wind and its control, vegetation management, i.e., strip cropping, stubble mulching and other practices

Unit 2

Types of soil erosion due to water- sheet erosion, rill erosion, gully erosion, sediment transport in channels, sediment deposition in reservoirs. Methods of soil erosion control: bounding and terracing on agriculture land for gully control, bench terraces, vegetated water ways, chute spillways, drop inlet spillways, check dams, river training works.

Unit 3

Biological methods of soil erosion control, grass land management, forest management. Soil quality management, drainage works, reclamation of salt affected soils. Water conservation: water harvesting, rainfall- run off relation, water storage in ponds, lakes, reservoirs and aquifers, groundwater recharge through wells, check dams and storage works.

Unit4:

Water losses: filtration, seepage and evaporation losses, pollution/ contamination of water quality due to agricultural practices i.e., fertilizers and pesticides, self purification of surface water, sources of agricultural water pollution, pollutant dispersion in ground water. 8

Unit-5

Need of planned utilization of water resources, economics of water resources utilization. Flood plain zones management, modifying the flood, reducing susceptibility to damage, reducing the impact of flooding

References:

1. Alam Singh – Modern Geotechnical Engineering
2. K. R. Arora – Soil Mechanics and foundation Engineering
3. N. C. Brady – Principles of Soil Sciences
4. B. C. Punmia – Soil Mechanics and Foundation Engineering

KCE-751: ADVANCED CONCRETE TECHNOLOGY LAB 2P 2 Credits

List of Experiments

1. To determine the tensile strength of concrete by split tensile test as per IS:516.
2. To test the concrete specimens by the non-destructive test methods namely rebound hammer test.
3. To determine bulking of a given sample of fine aggregate.
4. To determine the angularity number of coarse aggregate
5. To determine the flakiness index of coarse aggregate
6. To determine the chemical composition of a given sample of cement
7. To determine the soundness of a given sample of cement.
8. To test the concrete specimens by the non-destructive test methods namely ultrasonic pulse velocity test.
9. To determine the consistency of concrete by performing Vee Bee Consistometer test as per IS:1199 2018.

KOE-804	Entrepreneurship Development	3L:0T:0P	3 Credits

Course Outcomes:

On completion of course the students are able:

CO	CO Statement	Bloom's Level
CO1	Explain the fundamentals of entrepreneurship, small scale industries, and their role in economic development.	K2
CO2	Understand project identification, project formulation, feasibility analysis, and project financing methods.	K2
CO3	Apply basic accounting, financial management, production planning, and marketing concepts in entrepreneurial activities.	K3
CO4	Analyze project planning, financial control, risk analysis, and economic evaluation techniques used in enterprises.	K4
CO5	Discuss legal provisions, government policies, and the role of support agencies for entrepreneurship and small scale industries.	K2

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

COURSE CONTENTS:

Content	Contact Hours
Unit-1:	**8**
Entrepreneurship- definition. growth of small scale industries in developing countries and their positions visa-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.	
Unit-2:	**8**
Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.	
Unit-3:	**8**
Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.	
Unit-4:	**8**
Project Planning and control: The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.	

Unit-5:	8
Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.	

Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India