CE301N HYDROLOGY AND IRRIGATION

Teaching Scheme: 03L **Total:** 3**Hr** **Credit:** 03
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

COURSE DESCRIPTION

This course introduce the elements of hydrology and describe the precipitation, infiltration evaporation, runoff and hydrograph. The course is focused on developing the skills of students for identification and assessment of available natural and artificial water resources. It deals with the study of Hydrology and water requirement of crops related to Civil Engineering. The part of the subject is focused on irrigation engineering and development of water resources.

COURSE OUTCOMES

After successful completion of this course; student shall be able to:

1. analyze hydrological parameters required for water resource management.
2. demonstrate ground water potential.
3. study different hydrograph and statistical methods
4. identify suitable method of irrigation and drainage of waterlogged area**.**

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2		1				1		1		3		
2	2					1	2	2			2	1	2	
3	2	2		1									2	
4	3				1	1		3				3		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction: Hydrologic cycle, water-budget equation. **[01Hr.]**

Precipitation: **[06Hrs]**

Forms and types of precipitation, Measurement of precipitation, rain gauge network, mean precipitation over an area. Depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, probable maximum precipitation (PMP)

Abstractions from precipitation: **[06Hrs]**

Evaporation process, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction. Measurement of evapotranspiration, interception, infiltration, infiltration capacity, measurement of infiltration, infiltration indices.

Runoff: **[02Hrs]**

Runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, reservoir capacity.

Floods: **[02Hrs]**

Estimation of peak flow, rational method and introduction to other methods. Introduction to design floods for various hydraulic structures.

Hydrographs: **[04Hrs]**

Definition, components, factors affecting the shape, base flow separation, flood hydrograph, unit hydrograph – definition, assumptions, applications, derivations and limitations, S-hydrograph.

Ground Water Hydrology: **[06Hrs]**

Occurrences and distribution of ground water, specific yield of aquifers, Darcy's law, permeability, safe yield of basins, hydraulics of wells under steady flow in confined and unconfined aquifers, well loss, specific capacity of well.

Introduction to Irrigation: **[01Hr.]**

Necessity, benefits, Ill effect, irrigation systems and methods and their classifications.

Soil-water-plant Relationships: **[03Hrs]**

Classification of soil water, saturation capacity, Field capacity, determination of field capacity, quality of irrigation water.

Water Requirement of Crops: **[08Hrs]**

Limiting soil moisture condition, principal Indian crops and their seasons, base period, duty of water and delta, factors affecting & methods of improving the duty of water, intensity of irrigation, paleo irrigation, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance.

Water Logging: Causes, preventive and curative measures of water logging **[01Hr.]**

Text Books

1. Irrigation, Water Resources and Water Power Engineering, Modi P.N., Standard Book House, Delhi, 8th edition, 2012
2. Hydrology and Water Resources Engineering, Garg S.K., Khanna Publishers, Delhi, 23rd edition 1998.

Reference Books

1. Engineering Hydrology, Subramanya K, Tata McGraw-Hill Publishing Co.Ltd, New Delhi, 4rd edition, 2013.
2. Irrigation and Water Power Engineering, Punmia B.C., Pande B.B., .Lal, Ashok Kumar Jain, Laxmi Publications Pvt. Ltd., New Delhi, 2016.
3. Fundamentals of Irrigation Engineering, Bharat Singh, Nem Chand & Bros.,India; 7th Revised edition,1983
4. Irrigation and Water Resources Engineering, Asawa, G.L, New Age International publisher, 1st edition 2008
5. Online Resources:

https://nptel.ac.in/courses/105/105/105105110/
https://nptel.ac.in/courses/126/105/126105010/
https://nptel.ac.in/courses/126/105/126105019/
https://nptel.ac.in/courses/105/102/105102159/
https://nptel.ac.in/courses/105/105/105105110/

CE302N: THEORY OF STRUCTURE-II

Teaching Scheme: 3L, Total: 3 Hr **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

Structural analysis is an important aspect of civil engineering. The determinate structures are covered by the previous courses. However this course covers the statically indeterminate structures, which emphasis on the analysis of statically indeterminate beams and rigid frames. Methods included are moment area method to calculate slope and deflection, and matrix analysis.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. formulate equilibrium and compatibility equations for structural members
2. analyze one dimensional indeterminate problems using classical methods
3. solve indeterminate structures using energy methods
4. analyze structures for gravity loads and moving loads

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	2	1	2	1			1		3	1	1
2	2	1	2	2	1	2			1			2	1	1
3	2	2	1	3		1	1					2	2	2
4	2	3	2	1	1				1	2		3	2	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Basic Concepts of Structural Analysis: **[08Hrs]**
Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, Fundamental concept of force and the displacement method of analysis.

Slope Deflection Method: **[08Hrs]**
Applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown),Sway and non-sway problems.

Moment Distribution Method: **[04Hrs]**
Applied to continuous beams and rigid jointed rectangular frames, transnational and rotational yielding of supports.

Fundamental Concept of Flexibility: **[10Hrs]**
Method for structural analysis, flexibility coefficient, matrix formulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, hand solution of simple problems on beams, Rigid jointed frames (Up to three unknowns)

Fundamental Concept of Stiffness: **[10Hrs]**
Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, degree of freedom. Influence coefficients, physical significance effect of settlement and rotation of trusses and rigid jointed plane frames (Upto three unknown)

Text Books:

1. Basic Structural Analysis, Reddy C. S., 3rd edition, Tata – McGraw Hill, New Delhi, 2012.
2. Theory of structures, S. Ramamrutham, Dhanpat Rai Books Publishers New Delhi, 9th edition, 2014

Reference Books:

1. Structural Analysis, Bhavikatti S. S., New Age Publication, 4th edition, 2013
2. Theory of Structures, Stephen P. Timoshenko and D. H. Young, 2nd edition, McGraw- Hill, 1965
3. Structural Analysis, G. S. Pandit and S. P. Gupta, Tata McGraw Hill, Pub. Co. Ltd., New Delhi, 2nd edition, 2008

CE303N: DESIGN OF RCC STRUCTURES

Teaching Scheme: 3L **Total: 3 Hr** **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 4 Hrs

COURSE DESCRIPTION

The primary aim of this course is to provide an introduction to the analysis and design of reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, and footing in RCC. It equips the students with the tools necessary for designing RCC structures and to familiarize them with the relevant national design code.

COURSE OUTCOMES

After successful completion of this course; student will be able to:

1. study conceptually the difference between Working stress method, Ultimate load theory method & Limit state Design method.
2. design the structural elements like RCC beam, slab, column, and footings by limit state design method as per I.S.456-2000.
3. analyze two-way slab & one-way continuous slabs.
4. design columns & footings for eccentric loads.

Program Outcomes (Pos) and strength of co-relation (PO)

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	1	1			1		1		1		
2	1	2	2	3		1			1		1		1	
3	2	2	1	3		1	1					2	2	
4	2	2	2		2	2	1		2		2			

1 - Weakly correlated 2- Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Design Philosophies and Analysis [10Hrs]

Working stress method, Ultimate load method, Limit state method: Limit state of collapse, serviceability & durability, characteristic strength, characteristic load, partial safety factors, Structural properties of concrete and reinforcing steel, assumptions of limit state method, strain variation diagram, stress variation diagram.

Design parameters for Singly reinforced rectangular section, under-reinforced, balanced & over-reinforced section, Moment of resistance, Design of singly and doubly reinforced sections, flanged ("T" and "L") sections.

Design of Slabs [06Hrs]

Design of one-way slabs: simply supported, cantilever and continuous slabs using IS Code method, Design of two-way slabs: simply supported, continuous and restrained.

Design of Beams & Staircase [10Hrs]

Design of simply supported, fixed, cantilever and two span symmetric continuous beams for flexure (singly reinforced, doubly reinforced and flanged), shear, bond and torsion. Limit state of serviceability: Deflection and moment curvature relationship for beams and one-way slabs.

Design of dog-legged and open well staircase.

Design of Columns [04Hrs]

Assumptions, minimum eccentricity, design of short column for axial load, design of short column subjected to combined axial load and uniaxial/biaxial bending using interaction curves .

Design of Footings [04Hrs]

Design of isolated column footing for axial load and uni-axial bending, design of combined footing for two columns, strap beam.

Design of Portal frames, retaining walls. [06Hrs]

Design of portal frames (single bay single storey) hinged, fixed at base.

Design of cantilever retaining walls.

Textbooks:

1- Limit State Design of Reinforced Concrete Structures, Ramchandra, Standard Book House, 3rd edition, 2014

2- Limit State Theory and Design of Reinforced Concrete, Structures, Karve S.R. and Shah V.L., Structured Publications, 9th edition, Pune, 2019

3- Reinforced Concrete Structures, Dr. B.C. Punmia and A.K. Jain, laxmi Publications, 10th edition, New Delhi, 2015

4- Reinforced Concrete Design, Dr. S. Unnikrishna Pillai and Dr. Devdas Menon, McGraw Hill Education (India) Pvt Ltd, 4th edition, 2022

Reference:

1- Limit state design of Reinforced Concrete Structures, Varghese P. C., Prentice Hall of India, 2008
2- Limit State Analysis and Design, P. Dayaratnam, Wheeler Publishing Company, Delhi, 12th edition, 2017
3- I.S. 456-2000: Plain and Reinforced Concrete, Code of Practice, Bureau of Indian Standards, 2000
4- S.P. (16): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards, 1980

CE304NA ENVIRONMENTAL ENGINEERING-I

Teaching Scheme: 03L **Total:** 3**Hr** **Credit:** 03
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE **Total Marks:** 100
Duration of ESE: 03Hrs

COURSE DESCRIPTION

This course introduces about source of water, water quality and quantity, suitable methods for treatment of the impurities in water design of water treatment plant and water supply system.

COURSE OUTCOMES

After successful completion of this course; student shall be able to:

1. study the water supply scheme
2. estimate quantities and quality of water for municipal purpose.
3. analyze water supply engineering problems.
4. design and operate the processes used in water treatment systems.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3		3					1	1			3		
2		2		2		2	2				1	3	2	
3		3		2		3				2		2	3	
4	3		2		1			1				2	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Water Demand and Quantity studies: [10Hrs]
Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies. Collection of Water: Factors governing the selection of the intake structure, Types of Intakes.

Conveyance of Water: [04Hrs]
Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipelines, laying of pipe lines.

Quality and Analysis of Water: [06Hrs]
Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

Treatment of Water: [10Hrs]
Flowchart of water treatment plant, Treatment methods (Theory and Design) - Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration, Chlorination and other Disinfection methods, Softening of Water, De-fluoridation, Removal of Odors.

Distribution of Water: [10Hrs]
Methods of Distribution system, Components of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks, Water connection to the houses.

Text Book

1. Water Supply Engineering, Garg S.K , Khanna Publisher, New Delhi 33rd edition 2015.
2. Water Supply and Sanitation Engineering, G.S.Birdi and J.S.Birdi, Dhanpat Rai Publication Company, New Delhi 9th edition 2014.

Reference Book

1. Water Supply and Sewerage, E W Steel and Terence J McGhee, Tata McGraw Hill Publishing Company, 6th edition 2007
2. Physici-Chemical Processes for Water Quality Control,Walter J Weber, Wiley Inter-science Publications 2012.
3. Water Supply Engineering, Punamia, Jain and Jain, Laxmi Publications, New Delhi 2015.
4. Manual on Water Supply and Treatment, Central Public Health and Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India.
5. Water Supply, Waste Disposal and Environmental Engineering, A. K. Chatterjee, Khanna Publisher, 8th edition, 2006.

CE304NB: SUSTAINABLE CONSTRUCTION PRACTICES

Teaching Scheme: 3L, Total: 3 Hr Credit: 3
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE Total Marks: 100
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course introduces students about the fundamental concepts of sustainability as well as qualities, uses of sustainable building materials. Bio materials : Properties, application, specification and standards. Further the aim of this course is to provide broad understanding about Green building rating systems and Intelligent Construction Techniques (ICT) for Sustainable Construction.

COURSE OUTCOMES:

Upon successful completion of this course the students will able to:

1. Explain the fundamental concepts of sustainability.
2. describe the properties and uses of sustainable building materials.
3. identify suitable construction techniques and practices for sustainable buildings.
4. discuss the standards and guidelines for sustainable buildings and comment on the role of BIM and automation in sustainable construction.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	2	3	1		1				2		
2	2	3	2	2	3		1		2		1	3	1	
3	3	2	1	3	2							2	2	
4	2	3	3	1	2	1		2		1		3		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to sustainability: **[04Hrs]**

sustainability concept, impacts of global warming, sustainability indicators- Carbon foot print, Embodied energy and carbon, sustainability analysis - Life Cycle Analysis, EIA - Concept of Green Buildings.

Sustainable building materials: **[04Hrs]**

Introduction to sustainable building materials, qualities, use, examples - Natural building materials, locally available and locally manufactured materials –wood, earth, stone and lime based materials.

Contemporary Building Materials: **[10Hrs]**

Bio materials : Properties, application, specification and standards(Indian and International) - Bio materials from industrial waste, mining waste, agricultural waste - Non toxic materials: low VOC paints, coating and adhesives - Use of waste materials such as paper, glass bottles, tires, shipping containers - Use of post-consumer and industrial waste such as fly-ash, bags, building construction &demolition waste – use of salvaged and recycled materials from flooring, columns, beams, timber, glass, etc.

Sustainable methods & technologies: **[06Hrs]**

Eco friendly and low cost techniques - Different substitute for wall construction - Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall – Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials -Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building

Green building rating systems: **[02Hrs]**

Guidelines from IGBC – LEED rating system, TERI-GRIHA rating system.

Concept of Net Zero building: **[06Hrs]**

Use of BIPV and other renewable energy in buildings.

Intelligent Construction Techniques (ICT) for Sustainable Construction: **[08Hrs]**

Building Information modelling – Introduction to BIM, concepts and benefits, BIM for construction scheduling, cost estimation and construction management.

Building Automation – Concepts, components of BA, applications of BA for functional efficiency of buildings.

Text Books:

1.Sustainable Construction - Green Building Design and Delivery by Charles J. Kibert, John Wiley & Sons, 2nd edition, 2008.

2. Sustainable Construction and Design by Regina Leffers, Prentice Hall, 2009.

3. Green Building Fundamentals by Mike Montoya, Pearson, 2nd edition, 2010.

4. The Philosophy of Sustainable Design by Jason F. McLennan, Ecotone Publishing Co., 2004.

Reference Books:

1.Sustainable Building - Design Manual Pt 1 & 2, The Energy and Resources Institute, TERI, 2004
2.Ross Spiegel.G, Green Building Materials A Guide to Product Selection and Specification,3rd Edition by, John Wiley &Sons, 2010
3.Jagadish. K.S. Alternative Building Materials and Technologies, New age International Pvt Ltd Publishers, 2008
4.Traci Rose Rider, Stacy Glass, Jessica McNaughton, Understanding Green Building Materials, W.W. Norton and Company, 2011

CE304NC: SURVEYING II

Teaching Scheme: 3L **Total: 3 Hr** **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course provides comprehensive knowledge of surveying, covering both fundamental principles and advanced techniques. It focuses on the use of modern surveying equipment such as digital levels, Electronic Distance Measurement (EDM) devices, digital theodolites, and total stations. Additionally, the course explores cutting-edge technologies, including Geographic Information Systems (GIS), Global Positioning Systems (GPS), and mobile applications for data collection and analysis. Emphasis is placed on practical applications, accuracy enhancement, and integration of these tools in real-world surveying and mapping projects.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities
2. demonstrate technology of GIS and Remote Sensing for carrying out survey and preparation of 3D views of terrains
3. use of photogrammetry for surveying and preparation of maps and
4. analyze data for contour generation, surface modeling.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	1				2	1					3		
2	2			2		2		1			2	2	3	
3	2			2		3						2	2	
4	1	1		2		2	1		2			1	2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Advance Surveying and Leveling Equipment [04Hrs]

Electronic Distance Measurement (EDM): Principles, types (infrared, microwave, laser), errors, and corrections. Digital Leveling: Components, types (differential, reciprocal, precise), field procedures, errors, and compensations. Digital Theodolite: Horizontal/vertical angle measurement, repetition/reiteration methods, traverse adjustments, errors, and corrections.

Total Station Surveying and Data Processing [08Hrs]

Setup and Calibration: Instrument settings, atmospheric corrections, resection. Data Collection: Coordinate systems, point coding, attribute data. Traversing: Open/closed traverses, misclosure adjustments. Topographic Surveying: Contour mapping, interpolation, terrain modeling, area/volume computation. Data Processing: Transfer to computers, software applications, error rectification.

GPS and GIS in Surveying [10Hrs]

Global Positioning System (GPS): Fundamentals, satellite constellations (NAVSTAR, GLONASS, Galileo), signal structure. GPS Receivers: Handheld, differential, geodetic-grade. GPS Errors: Ionospheric/tropospheric effects, multipath, satellite geometry. DGPS and RTK GPS: Principles, error correction, applications. Geographic Information System (GIS): Components, spatial/non-spatial data, vector/raster models. GIS Applications: Land use planning, transportation, water resources, disaster mitigation. LIDAR and DEMs: Data collection, terrain modeling, 3D mapping.

Remote Sensing and Photogrammetry [06Hrs]

Principles: Active/passive sensors, electromagnetic spectrum, spectral reflectance. Imagery Interpretation: Classification, change detection, accuracy assessment. Photogrammetry: Stereoscopic vision, parallax, 3D modeling, ortho-rectification. Applications: Land cover mapping, environmental monitoring, urban planning.

Mobile-Based Surveying and UAV (Drone) Applications [08Hrs]

Mobile Surveying: GPS-enabled apps, cloud integration. UAV Surveying: Types, sensors, flight planning, photogrammetry (SfM, point clouds, orthomosaics). Applications: Construction, flood mapping, agriculture, mining. Data Processing: Tools like Pix4D, Agisoft Metashape, DroneDeploy.

Surveying Software and Automation [04Hrs]

Software Tools: AutoCAD Civil 3D, ArcGIS, QGIS, Surfer, Leica Geo Office. Data Analysis: Contour generation, surface modeling, spatial analysis. AI and Machine Learning: Feature extraction, predictive analytics. Future Trends: AI, cloud computing, automation in geospatial analysis.

Text books:

1. Advanced Surveying: Total Station, GIS and Remote Sensing, Satheesh Gopi, R. Satishkumar and N. Madhu, Pearson India, 1st edition, 2008
2. Surveying and Leveling, Vol. I and II, Bhavikatti, S.S., I.K. International Publishing

House Pvt. Ltd., 1st edition, 2010
3. Higher Surveying, Chandra, A.M., New Age International (P) Limited, 2nd edition, 2005
4. Surveying, Vol-I, II and III, Arora, K.R., Standard Book House, 2015

Reference books:

1. Geomatics Engineering, Manoj, K. Arora and Badjatia, Nem Chand & Bros., 2011
2. Remote sensing and Geographical information system, Anji Reddy, M., B.S. Publications, 2001.
3. Artificial inteligence in surveying and geoinfromatics curriculum for training of professionals by: Kamorudeen Folorunso ALEEM

MDM III:CEM305N: CONCRETE TECHNOLOGY

Teaching Scheme: 3L, 1T **Total: 4 Hr** **Credit: 4**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

Concrete technology provides a comprehensive coverage of the theoretical and practical aspects of the subject and includes the latest developments in the field of concrete construction. Learn different types of aggregates, admixtures & know the mechanism of hydration of cement. The properties of concrete and it constituent materials.

COURSE OUTCOMES:

Upon successful completion of this course the students will able to:

1. Suggest relevant types of cement to be used in the given site conditions.
2. Classify the given aggregates based on its shape and size with the importance of their properties.
3. Study the behaviour of concrete at its fresh and hardened state, describe and carry out tests relevant to the use of concrete on site.
4. Suggest relevant type of admixtures to be used in the given situation.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	1	2	2	2		3	1			1
2	1	2	3		3		1		2	1	
3	2	2	1	3	2		3				1
4	2	3	3		1		2		2		

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Cement: **[06Hrs]**

Portland cement – chemical composition – Hydration of cement, Types of cement and their field applications, Physical properties of OPC: fineness, specific gravity, standard consistency, setting time, soundness, compressive strength.

Testing of OPC: **[04Hrs]**

Field tests and laboratory tests-fineness test, standard consistency test, setting time test, soundness test, and compressive strength test.

Aggregates: **[08Hrs]**

Requirement of good aggregates, Classification according to source, size and shape, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand.

Concrete: **[10Hrs]**

Different grades of concrete (ordinary Concrete, standard concrete and high strength concrete) as per provisions of IS 456. Water cement ratio, Properties of fresh concrete: Workability, Factors affecting workability of Concrete. Determination of workability of concrete by slump cone test and compaction factor test.

Properties of Hardened concrete: **[02Hrs]**

compressive strength, durability, creep and shrinkage.

Concrete Mix Design: **[04Hrs]**

Objectives, methods of mix design, study of mix design procedure by I.S. method as per I.S. 10262-(Only procedural steps)

Special Concrete: **[06Hrs]**

Properties, advantages and limitation of the following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete and self-compacting concrete, light weight concrete.

TEXT BOOKS:

1. Concrete Technology by M. S. Shetty. S. Chand and Co. Pvt. Ltd., Ram Nagar, New Delhi-110055

2. Properties of Concrete by A. M. Neville Pearson 5th edition Education ltd 2016.

REFERENCES:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
2. Concrete Technology by Job Thomas -Cengage learning India Pvt Ltd 2015.

CE306NX: ENVIRONMENTAL IMPACT ASSESSMENT

Teaching Scheme: 2L, **Total: 2 Hr** **Credit: 2**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

The aim of this course is to provide broad understanding about the need of environmental impact assessment, effect of human activity on environment, and Indian policies requiring EIA. This course also introduces the concepts of green cities, green belt development, and Water conservation. Prediction and assessment of impacts on air, water, biota, noise, land, cultural and socio-economic environment.

COURSE OUTCOMES:

At the end of the course the student will be able to:
1. identify the environmental attributes to be considered for the EIA study
2. formulate objectives of the EIA studies
3. study the methodology to prepare rapid EIA
4. prepare EIA reports and environmental management plans.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	3	1	2	2	2		3	1			1
2	1	2	3		3		1		2	1	
3	2	2	1	3	2		3				1
4	2	3	3		1		2		2		

1- Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction: **[02Hrs]**
The Need for EIA, effect of human activity on environment, concept of ecosystem imbalances, definition of E.I.A, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction.

Methodologies for EIA: Environmental attributes: **[08Hrs]**
Criteria for the selection of EIA methodology, preliminary assessment, quantification, Matrix and Network methods.
Environmental pollution due to increasing growth rate, population and human interaction. Water, land and air pollution. Prediction and assessment of impacts on air, water, biota, noise, land, cultural and socio-economic environment.

Environmental Management: **[08Hrs]**
Preventive policy of environment, waste minimization, conservation of water and energy, use of renewable sources, pollution audit, pollution control strategy, disposal of treated effluents, solid waste disposal concept of green cities, green belt development – Case history.

EIA notification by Ministry of Environment and Forest (Govt. of India): **[06Hrs]**
Provisions in the EIA notification, procedure for environmental clearance, procedure for conducting environmental impact assessment report- evaluation of EIA report.

Environmental laws and protection acts: **[01Hr.]**
The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972,

TEXT BOOKS:
1. Anjaneyulu. Y and Manickam. V., Environmental Impact Assessment Methodologies, B.S. Publications, Hyderabad, 2007
2. Barthwal, R. R., 'Environmental Impact Assessment', New Age International Publishers, 2002.
3. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2016.

REFERENCE BOOKS:
1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van Nostrand Reinhold Co., New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub. Co., New York, 1996
3. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
4. R.K. Trivedi, Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . Edition 2010.

CE306N(Y): INDUSTRIAL POLLUTION AND CONTROL

Teaching Scheme: 2L **Total: 2 Hr** **Credit: 2**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course covers the fundamentals of pollution, its monitoring, and control techniques, with a focus on environmental impacts and regulatory frameworks. It explores wastewater treatment processes, air pollution control methods, and solid waste management practices, emphasizing sustainable solutions. The course also delves into the management of hazardous waste and various pollution control technologies.

COURSE OUTCOMES

Upon successful completion of this course, students will be able to:

1. identify different types and sources of pollution and understand their environmental impacts.
2. apply pollution monitoring and sampling techniques for air, water, and solid waste.
3. design wastewater treatment processes, including primary, biological, and advanced treatments.
4. implement air pollution control methods for particulate and gaseous pollutants.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2			3			2	1		1	
2		3		2	2		3		2		2
3		2	3			3	2			2	
4	2	2		3		2	2		2		

1- Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Pollution & Environmental Impact [06Hrs]

Types of Pollution: Air, Water, Soil, and Noise Pollution. Sources of Pollution in Industries: Chemical, Fertilizer, Pulp & Paper, Petroleum. Environmental Effects: Impacts on Ecosystems, Human Health, and Climate. Regulatory Frameworks: Environmental Legislation, International Agreements, and Effluent Guidelines. Pollutant Characteristics: Types, Sources, and Environmental Impact

Pollution Monitoring & Sampling [04Hrs]

Air Quality Monitoring: Techniques for Gaseous and Particulate Pollutants. Stack Sampling: Industrial Emission Sampling Techniques. Water Pollution Monitoring: Sampling, BOD, COD, TOC Analysis. Solid Waste Characterization: Industrial Waste Segregation and Classification

Wastewater Treatment & Management [06Hrs]

Effluent Characteristics: Pollutants and Their Impact (BOD, COD, TOC). Primary Treatment: Screening, Sedimentation, Flotation, Neutralization. Biological Treatment: Aerobic (Activated Sludge, Stabilization Ponds), Anaerobic Processes. Advanced Treatment: Reverse Osmosis, Carbon Adsorption, Ozonation, UV Disinfection. Common Effluent Treatment Plants (CETPs): Concept and Implementation

Air Pollution Control Methods & Technologies [04Hrs]

Source Control Measures: Process Modifications, Raw Material Changes. Particulate Matter Control: Settling Chambers, Cyclones, ESP, Fabric Filters. Gaseous Pollutant Control: Scrubber Systems (Wet, Venturi, Packed Bed). Emission Reduction Strategies: Industry-Specific Pollution Control Methods

Solid Waste & Hazardous Waste Management [04Hrs]

Municipal Solid Waste (MSW): Generation, Segregation, Recycling, and Disposal. Hazardous Waste: Classification (Chemical, Nuclear, Biomedical), Treatment & Disposal. Legislation & Regulatory Framework: Global and Indian Waste Management Standards. Sustainable Waste Management: Circular Economy, Waste-to-Energy Technologies.

Textbooks

1. Industrial Waste Water Treatment – A.D. Patwardhan, Prentice Hall of India, 2008.
2. Environmental Pollution Control Engineering – C.S. Rao, New Age International, 2006.
3. Waste Water Treatment – M.N. Rao & A.K. Datta, Oxford & IBH, 2009.
4. Solid Waste Management: Collection, Processing, and Disposal – A.D. Bhide & B.B. Sundaresan, 2001.

Reference Books

1. Introduction to Environmental Engineering & Science – G.M. Manster, Pearson, 2013.
2. Air Pollution – M.N. Rao & H.V.N. Rao, Tata McGraw Hill, 2007.
3. Pollution Control in Process Industries – S.P. Mahajan, Tata McGraw-Hill, 2008.
4. Solid Waste Engineering – A.P. Vesilind, W.A. Worrell, Thomson, 2002.
5. Industrial Wastewater Treatment: A Guide Book – Edwards Joseph D., CRC Press, 1995.

Important Links

1. Central Pollution Control Board: www.cpcb.nic.in
2. Maharashtra Pollution Control Board: www.mpcb.gov.in
3. Ministry of Environment, Forest & Climate Change: www.moef.nic.in

CE307N HYDROLOGY AND IRRIGATION LAB

Teaching Scheme: 02P, **Total**: 02Hr
Evaluation Scheme:30 ICA + 20 ESE

Credit: 01
Total Marks: 50

COURSE DESCRIPTION

Water is an important source. This laboratory course deals with determination of precipitation, determination of reservoir capacity which required for design of various water resources projects. This course also include design of micro-irrigation methods.

COURSE OUTCOMES

After successful completion of this course; student shall be able to

1. plot flow distribution curve, mass curve and derive unit hydrograph from given data.
2. estimate reservoir capacity required for water requirements of crops.
3. decide suitable method for irrigation
4. develop unit hydrograph from flood hydrograph.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2				1		2		1		3		
2	3		2		1			1	2		1		2	
3	2	1	2	2		1	1					2		1
4	2	2	3	2	1		2		1			2	1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Experiments shall be performed to cover entire curriculum of course CE301N. The list given below is just a guideline.

List of experiments

1. Marking catchment area on a topo-sheet and working out average annual rainfall and determining yield.
2. Checking for inconsistency of precipitation record by double mass curve technique.
3. Frequency analysis of precipitation data (plotting on semi-log graph paper)
4. Development of flood hydrograph from unit hydrograph and complex storm.
5. Development of unit hydrograph from isolated and composite flood hydrograph.
6. Determination of canal and reservoir capacity for water requirement of crops.
7. Determination of reservoir capacity from mass inflow and mass demand curve.
8. Design of micro – irrigation system; either sprinkler or drip irrigation

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE308N SOFTWARE ENGINEERING LAB I

Teaching Scheme: 02P **Total**: 02**Hr** **Credit**: 01
Evaluation Scheme: 30 ICA+ 20 ESE **Total Marks**: 50

COURSE DESCRIPTION

The laboratories cover practicals /experimentd related to basic commands of Civil engineering software's and their use in the planning of building.

COURSE OBJECTIVES

To introduce the basics of computer software and graphics for the planning of buildings also introduce the basic commands of Auto CAD and similar for the effective building planning.

COURSE OUTCOMES:

After successful completion of this course; student shall be able to:

1. identify the drawing with the help of software.
2. prepare working drawings of an existing building based upon measurements.
3. apply software to prepare 3D models of buildings
4. use the symbols and signs in planning of various buildings/structures.

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1		2			3			1		2		2	3	
2	2	2	2	2			2	1			1	2		
3		2	1		3							2	3	
4			1						1	1		2		

1-Weakly correlated 2 _ Moderately correlated 3 _ Strongly correlated

The list given below shall be drawn with AutoCAD/Rivet/3D Max /Auto civil software's.

List given below is just a guideline.

List of Drawing Experiments

1. Single story buildings with RCC/load bearing walls including details of doors and windows etc.
2. Preparation of standard drawings of a typical two storied building and writing out a description of the facilities.
3. RCC framed structures with plan, elevation and cross section.
4. Reinforcement drawings for typical slabs, beams, columns and spread footings.
5. Industrial buildings, North light roof structures and trusses
6. Perspective view of two storey buildings.

ICA : Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE309N: DESIGN OF RCC STRUCTURES LAB

Teaching Scheme: 2P **Total: 2 Hr** **Credit: 1**

Evaluation Scheme: 30 ICA + 20 ESE **Total Marks: 50**

COURSE DESCRIPTION

The primary aim of this course is to analysis and design of reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, and footing in RCC. It equips the students with the software tools necessary for designing RCC structures.

COURSE OBJECTIVES

1. To prepare detailing of reinforcement of members under various loading conditions.
2. To prepare schedule of the reinforcement.
3. To practice the elementary design of different structural elements.
4. To practice software tools like MS Excel or STAADPro or ETABS or python, etc for the elementary design of different structural elements.

COURSE OUTCOMES

After successful completion of this course; student will be able to

1. use the concepts of structural design procedure
2. design the individual members and hence building as a whole
3. implement the concept of detailing of reinforcement
4. prepare detailed drawing of columns and footings after design.

Program Outcomes (POs) and strength of co-relation (PO)

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	1	1	1	2			2		1		
2	1	2	2	3		2		1	1		1		1	
3	2	2	1	3	1							2	2	
4	2	3	1	2				1				2	2	

1 - Weakly correlated 2- Moderately correlated 3 – Strongly correlated

Following assignments shall be performed to cover entire curriculum of course CE309N. List given below is just a guideline.

1. Spreadsheets for Design of Beam, Two-way slabs, Axially loaded columns, Isolated & Combined footing, cantilever retaining wall.
2. Design of beams and slabs and prepare detailed drawing of beams and slab with reinforcement detailing.
3. Design of columns and footings and prepare detailed drawing of columns and footings
4. Design of staircase.
5. Project: Design of G+1 Building with detailed drawing of designs should be completed with AutoCAD software
6. Design of G+1 Building performed on STAADPro or ETABS
7. A report on at least one site visit shall be submitted in ICA

Note:

- **ICA -** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.
- **ESE -** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be outside the institute.

CE310N(A)ENVIRONMENTAL ENGINEERING-I LAB

Teaching Scheme: 02P, Total: 02**Hr** **Credit:** 01
Evaluation Scheme: 30 ICA + 20 ESE **Total Marks:** 50

COURSE DESCRIPTION

In this Laboratory the emphasis is given on determining various properties and characteristics of water, design of water supply scheme, design of water distribution scheme and prepare a report on site visit to water treatment plant

COURSE OBJECTIVES

1. To determine the various properties of water.
2. To understand the application of various units of water treatment process.
3. To be able to design a water distribution system.

COURSE OUTCOMES

After successful completion of this course; student shall be able to:

1. analyze the characteristics of water.
2. design of a water treatment plant.
3. access required water treatment..
4. design the water distribution system for city

Relevance of Program Outcomes (Pos)and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	3				1		1		1		3	2	
2			3	2	1			1			2	3		1
3		1	2				1		1			3		
4			2			1	2			2			2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

Minimum **six** experiments shall be perform from group A and group B is compulsory and one from group C to cover entire curriculum of course CE252U, The list given below is just a guideline

List of Experiments:

(A) Determination of (Any six)

1. pH and Alkalinity of water and soil
2. Total Hardness- Calcium and Magnesium
3. Chlorides
4. Chlorine demand and residual chlorine
5. Turbidity
6. Optimum dose of alum.
7. MPN
8. Sulphates
9. Fluorides

(B) Site visit to water treatment plant. A report based on the visit to water treatment plant would be submitted and would form a part of the term work.

C) Design of various components of water treatment plant Design of various components of water treatment plant would be carried out based on the theory covered in Environmental Engineering

OR

Study of Software or programming for analysis of water distribution system, Programmes available for the design of various water treatment plants would be used or Computer Programmes to Design various units of water treatment plant would be written in any suitable programming language.

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10)

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE310NB: SUSTAINABLE CONSTRUCTION PRACTICES LAB

Teaching Scheme: 2P **Total: 2 Hr** **Credit: 1**
Evaluation Scheme: 30 ICA + 20 ESE **Total Marks: 50**

COURSE DESCRIPTION :-

This course introduces the students about the fundamental concepts of sustainability as well as qualities, uses of sustainable building materials. Bio materials : Properties, application, specification and standards. Further the aim of this course is to provide broad understanding about LEED rating systems for Sustainable Construction.

COURSE OBJECTIVE :-

1. To get a comprehensive overview of materials used for sustainable construction.
2. Apply cost effective technologies and methods in construction.
3. Discuss the concepts, benefits and application of BIM and automation for functional efficiency of buildings.

COURSE OUTCOME :-

Upon successful completion of this course the students will able to:

1. explain the fundamental concepts of sustainability.
2. describe the properties and uses of sustainable building materials.
3. identify suitable construction techniques and practices for sustainable buildings.
4. use of BIM and automation in sustainable construction.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	2			2		1			2		
2	2	3	2		1		3	1		2		3	1	
3	3	2	1	3			3		1			2	2	
4	2	3	3		1		2	2			1	3		

Minimum **three** experiments shall be performed from **group A and group B is compulsory** to cover entire curriculum of course CE304NB. List given below is just a guideline.

Group A -

1. Study of various Natural building materials, locally available and locally manufactured sustainable building materials.
2. Study and use of post-consumer and industrial waste such as fly-ash, building construction & demolition waste with case study
3. Study by market survey of sustainable building materials.
4. Study of pre-engineered and ready to use building and building components.
5. Introduction of BIM for cost optimization.

Group B-

Project work –

Project work shall consist of preparation of report on LEED rating for any one existing building. Every student shall select different type of buildings; individual work is expected from the students.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE310NC: SURVEYING II LAB

Teaching Scheme: 2P **Total: 2 Hr** **Credit: 1**

Evaluation Scheme: 30 ICA + 20 ESE **Total Marks: 50**

COURSE DESCRIPTION

This course equips students with the skills to use advanced surveying equipment such as digital levels, digital theodolites, and total stations for precise leveling and surveying. It also covers data storage, processing, and map development using specialized software, enabling accurate analysis and visualization for civil engineering applications.

COURSE OBJECTIVES

1. Setting out curves by various methods
2. Apply the knowledge and skills of advanced surveying equipment for leveling and surveying for preparation of plans/maps.
3. Use of a current widely-used GIS computer software system. for geographic data entry and editing, spatial analysis, and map development and display

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. acquire the skill of using advanced surveying equipments such as digital level, digital theodolite and total station
2. apply the knowledge of photogrammetry GIS and Remote Sensing for surveying and preparation of plans/maps.
3. use of a current widely-used GIS computer software system for geographic data entry and editing, spatial analysis, and map development and display.
4. Explore mobile apps for data collection

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2		2		1	2	2		1		2	2		
2	3		2		1	2			1		1		3	
3	2		1		2	3				2			3	
4	3		2		2	3		1					2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

The experiments shall be performed to cover entire curriculum of course CE310NC. The list given below is just a guideline. All surveying equipments should be introduced and used before experiments.

Setting Out Curves

1. Setting out a simple circular curve by offsets from the long chord.
2. Setting out a simple circular curve by Rankine's method of tangent angles (deflection angles).

Digital Level

1. Conduct profile leveling along a given road alignment using a digital level.
2. Transfer leveling data to a computer and develop/print leveling pages using software.

Digital Theodolite

1. Traversing and plotting: Set out a closed traverse with a minimum of 6 sides.
2. Set out an open traverse with a minimum of 5 sides.

Total Station

1. Measure horizontal and vertical angles, prolong a given straight line, and determine the magnetic bearing of a line.
2. Traversing and plotting: Set out a closed traverse with a minimum of 6 sides.
3. Topographic surveying using a total station.

Use of GIS & GPS Software

1. Use GIS software (e.g., ArcGIS, QGIS) for surveying applications.- Perform tasks like digitizing, spatial analysis, and map creation.
2. Use GPS software for data collection and processing. - collect waypoints, process data, and analyze accuracy.

Use of Mobile Apps

1. Use mobile apps for surveying applications.- Explore apps for data collection, GPS positioning, and cloud-based data sharing.

The following additional practicals and tutorials can be conducted to enhance students' understanding of the subject and its practical applications:

Additional Practicals for Comprehensive Learning

1. Setting out a building layout using a total station. - Mark the corners of a building based on given coordinates.
2. Volume calculation using total station data. - Compute cut-and-fill volumes for a construction site.
3. Drone-based surveying and photogrammetry. - Capture aerial data using a drone, process it to create orthomosaics, and generate 3D models.
4. LIDAR data processing for terrain modeling. - Use LIDAR data to create a Digital Elevation Model (DEM) and analyze terrain features.
5. AI-based feature extraction from surveying data. - Use machine learning tools to automate feature extraction from point clouds or imagery.

Additional Tutorials for Software and Tools

1. Introduction to AutoCAD Civil 3D for surveying applications.- Learn to create contour maps, perform volume calculations, and design alignments.
2. Data processing using total station software (e.g., Leica Geo Office). - Transfer field data, adjust traverses, and generate reports.
3. Introduction to drone photogrammetry software (e.g., Pix4D, Agisoft). - Process drone data to create orthomosaics, point clouds, and 3D models.
4. Cloud-based surveying tools for collaboration. - Explore tools for real-time data sharing and project management.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE351N: GEOTECHNICAL ENGINEERING

Teaching Scheme: 3L **Total : 3Hr** **Total Credit: 3**

Evaluation Scheme: 30MSE + 10ISA + 60ESE **Total Marks: 100**

Duration of ESE: 03 Hrs

COURSE DESCRIPTION

The course focuses on study of various aspects related to Geotechnical engineering that includes rock, soil, their physical and engineering properties and its influence on the overlying structures. The student will able to learn the formation of soil, its classification and distinct characteristics, failure mechanisms, and improvement techniques.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. classify soil and interpret its physical and engineering properties.
2. solve practical problems related to three phase system, stress estimation, permeability and seepage analysis.
3. estimate soil bearing capacity and problems related to compaction and consolidation.
4. identify problematic soils and understand suitable ground improvement technique to be used.

Relevance of Program Outcomes (PO's) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	1	2		1	1		1		3		
2	3	2	3	2		1		2	2			3		
3	3	2	3	2			2				2	3		
4	3	2	2	3	1			1		2		3		

1-Weakly Correlated 2-Moderately Correlated 3-Strongly Correlated

COURSE CONTENT

Introduction, Physical and Index Properties [08Hrs]

Introduction to Geotechnical Engineering, Need to study, IS definition of Soil, Classification of Soil, Grading Characteristics, Field Identification of Soil, Three Phase System, Physical properties of soil – Related Derivations and Problems, Laboratory tests on soil, Consistency Limits

Permeability, Shear Strength, Vertical Stress Distribution [08Hrs]

Permeability, Darcy's Law, Laboratory Tests, Seepage – Head, gradient, pressure, steady state flow, flow net, Shear strength, Mohr-Coulomb failure criterion, Laboratory tests, Different drainage conditions.

Shear properties - [08Hrs]

Shear properties of cohesionless and cohesive soils, Stress distribution in Soils: Importance of estimation of stresses in soils – Boussinesq's and Westergaard's theories for point loads, Pressure Bulb

Bearing Capacity, Compaction and Consolidation [06Hrs]

Bearing Capacity and theory of earth pressure, Terzaghi's Analysis, Field methods – Plate Load and SPT, Active and Passive Earth Pressure, Rankine's Theory

Compaction - [06Hrs]

Laboratory tests, Consolidation, Compressibility, Settlement, Normally, Over and Under consolidated soils, Terzaghi's 1D theory - Coefficient of consolidation and its determination.

Ground Improvement Techniques [04Hrs]

Need of Ground Improvement, Problematic Soils, Classification of Ground Modification Techniques – suitability and feasibility, Case Studies

Text Books:

1. Geotechnical Engineering, Dr. C. Venkatramaiah, New Age International Publishers, 6th edition, 2018
2. Soil Mechanics and Foundation Engineering, K. R. Arora, Standard Publishers and Distributors, New Delhi, 7th edition, 2018.
3. Textbook of Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS Publishers & Distributors, 1st edition, 2018

Reference Books:

1. Gopal Ranjan and Rao, P. Basic and Applied Soil Mechanics, New Age International Pvt. Limited, New Delhi, 2002.
2. Murthy, V.N.S., A text book of Soil Mechanics and Foundation Engineering, UBS Publishers Distributors Ltd., New Delhi, 1999
3. Punmia, B.C. Soil Mechanics and Foundation Engineering, Laxmi Publications Pvt. Ltd., New Delhi, 1995.
4. Braja M. Das, Fundamentals of Geotechnical Engineering, Thomson Asia Pvt. Ltd., Singapore, 2005.
5. Manfired R. Hausmann, Engineering Principles of Ground Modification, McGraw-Hill Pub, Co.,1990.

CE352N: HIGHWAY ENGINEERING

Teaching Scheme: 2L **Total : 2Hr** **Total Credit: 2**
Evaluation Scheme: 30MSE + 10ISA + 60ESE **Total Marks: 100**
Duration of ESE: 03 Hr

COURSE DESCRIPTION

This course enables a student to plan, design and execute a roadway project. It introduces complete geometric design and structural design of road pavements using relevant IS codes. It also introduces a student with traffic engineering so that a student can design a traffic control system for smooth flow of vehicles. The modern trends in roadway engineering are also introduced.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1: study the importance of the transportation system in the development of a country, classification of roads and highway planning in India.
2: demonstrate ability to decide a road geometry depending upon the anticipatory traffic and Structural design of pavement using IS codes.
3: appraise different types of pavements and their materials.
4: analyze and design of pavements, Demonstrate knowledge of traffic studies, analysis and their interpretation.

Relevance of Program Outcomes (PO's) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1		3	3		2		1			1		3	2	1
2		1	3		2	1		1	2			3	2	1
3		1	3		2		2				2	3	2	1
4		1	3		2				1			3	2	1

1-Weakly Correlated 2-Moderately Correlated 3-Strongly Correlated

COURSE CONTENT

Highway development and planning: [04Hrs]
History of road development, Road planning in India, Classification of roads: rural and urban roads, road patterns, road authorities i.e. IRC, CRRI, NHAI etc., Current road projects in India, highway alignment, Highway project preparation, surveys and investigations, and project preparation.

Geometric design of highways: [04Hrs]
Introduction, highway cross section elements, carriageway width, formation width, friction, camber, design speed, super-elevation, transition curve, gradients, sight distance.
Basic requirements of an ideal alignment and factors controlling it, special requirements for hill roads.Design of horizontal alignment; design of vertical alignment; design of intersections.

Highway material and construction: [06Hrs]
Sub grade soil investigation and properties, Desirable properties of aggregates and bitumen, Testing of aggregates, binders and mixes, IRC specifications for materials, Construction of low-cost roads, WBM, WMM, Types of bituminous surfaces and C.C. roads, IRC specification for construction, Tools, Equipment and Plants, Highways in hilly region.

Design of pavements: [06Hrs]
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, Maintenance & Strengthening of pavements; Numerical treatment.

Traffic engineering & control: [04Hrs]
Traffic characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control devices (signs, signals, islands, road markings), accident studies, types of road intersections, parking studies; highway lighting.

Text Books:

1. Khanna and Justo, Highway engineering, 8th Edition, Nemachand Bors, 2002.
2. Saxena and Arora, Railway Engineering, Dhanpat Rai Publications.

Reference Books:

1. A Course in Highway Engineering, S. P. Bindra, Dhanpat Rai and Sons.
2. Principles of Highway Engineering and Traffic Analysis (4th edition), F. L. Mannering and Scott S. Washburn, Wiley India.
3. E J Yoderand and M W Witczak, Principles of Pavement Design, Wiley India Pvt. Ltd., New Delhi, 2012.
4. C S Papacostas and P D Prevedouros, Transportation Engineering and Planning.

CE353N: DESIGN OF STEEL STRUCTURES

Teaching Scheme: 3L **Total: 3 Hr** **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 4 Hrs

COURSE DESCRIPTION

The students admitting in Civil Engineering discipline have to understand the behaviour of various steel structural components. Also, they should be able to understand the philosophy behind design of steel structures. This course will give methodology to students to design of steel structural components.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. calculate design loads for various steel structural components.
2. design simple steel structures.
3. design simple steel connections.
4. study details of steel structural drawings.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2				1		2		1		2		
2	1		3		2		1				2	3	2	
3	1		3		2				1			3	2	
4	1		3		2						1	3	2	

1- Weakly correlated 2 _ Moderately correlated 3 _ Strongly correlated

COURSE CONTENT

Introduction: **[08Hrs]**

Principles of structural design, Structural systems, Role of the designer, Advantages of steel as a structural material, Types of structural steel, Mechanical properties of steel, various rolled steel sections (including cold-formed sections, structural pipe (tubes)) sections and their properties. Design philosophies: Introduction to working stress method, Limit state method. Introduction to Plastic theory: Plastic hinge concept, Plastic moment, Shape factor, Plastic section modulus. Types of loads acting on structure, Introduction to IS Codes and specifications: IS 875:2015, IS 800:2007

Connections: **[06Hrs]**

Bolted connections: Types of bolts, Behavior of bolted joints. Strength of joint, efficiency of joint, Analysis and Design of connections, Beam to beam, beam to column.

Welded connections: Types and properties of welds, Types of joints, Design of connections, Beam to beam, beam to column.Analysis and design of moment resisting bolted and welded connection

Tension Members: **[04Hrs]**

Identification of tension members in various types of Structures; Behavior of tension members; Mode of failures; Design of single and double angle sections.

Compression Members: **[08Hrs]**

Identification of compression members in various types of Structures; Behavior of compression members; Mode of failures; Classification of cross section; Effective length, slenderness ratio, Design strength ,Compression members in roof trusses.

Beams and Columns: **[06Hrs]**

Behavior of beams; simply supported beams; Laterally restrained and unrestrained, Design of Beams; Design of Purlin; Welded Plate Girder; Curtailment of flange plates.

Columns and Bases: **[04Hrs]**

Behaviour of Column members in various types of Structures; Load calculations for columns; Design of columns subjected to axial load and biaxial bending; Built-up column sections; Laced and Battened columns; Slab bases

Design of Truss : Design of Roof Truss for DL, LL & WL **[04Hrs]**

Text books:

1. Design of Steel Structures- Limit State Approach, N. Subramanian, Oxford University Press, 2015
2. Limit State Design of Steel Structures, V.L. Shah and V. A. Gore, 1st edition, Structures Publications, 2009
3. Design of Steel Structures by Limit State Method, S. S. Bhavikatti, I.K International Publishing House Pvt. Ltd., 2012

Reference books:

1. Design of Steel structures, Edwin Gaylord and Charles Gaylord, Tata McGraw Hill, 2010
2. Steel Structures: Controlling behaviour through Design, Robert Englekirk, John Wiley

and Sons, 2003
3. Limit State Design in Structural Steel, M. R. Shiyekar, PHI Learning Pvt. Ltd., 2nd edition, 2013
4. IS 800 (2007) General Construction in Steel code of Practice.

CE354NA: ESTIMATION CONTRACT AND VALUATION

Teaching Scheme: 3L **Total: 3 Hr** **Credit: 3**

Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**

Duration of ESE: 3 Hrs

COURSE DESCRIPTION

In civil engineering construction, estimating, costing, and valuation are fundamental processes that provide critical insights for project planning, budgeting, resource allocation, decision-making, contract negotiation, regulatory compliance, performance evaluation, and investment analysis. In today's technology-driven era, integrating these processes with advanced software enhances efficiency, accuracy, and precision in quantity estimation.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. determine the quantities of items and labour requirements of civil engineering works.
2. prepare the estimate of the civil engineering works.
3. explain and prepare types of specifications of construction items/works,
4. interpret principles for report preparation.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	1	2				2	2	1			1	2	1	1
2	1	1	1			1	2		1			2		1
3	1	1	1			1	2					1	1	1
4	1	2	1			2	2					1		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Approximate Estimate: **[02Hrs]**
Definition and necessity, general principles, methods of preparing approximate estimates for buildings, roads, bridges.

Detailed Estimate: **[02Hrs]**
Types of detailed estimate, purpose, data required for preparing detailed estimate, factors to be considered during preparing detailed estimate, methods of taking out quantities, abstracting, units of measurement

Building Cost: **[06Hrs]**
Building cost, provisional sum, centage charges, work charged establishment, administrative approval, budget provision, technical sanction, different methods of execution of minor works in PWD, like piece work, check list, day work, daily labour, introduction to registration as contractor in the PWD

Building Estimate: **[08Hrs]**
PWD method and centre line method of taking out quantities, using IS 1200 rules, estimate of framed residential building (estimating items of work like earthwork, concrete stair case, RCC elements like slab, beam, column, footing & masonry, finishes, interiors etc.), Bar bending schedule Estimating earthwork for road work, irrigation works(channels).

Specification: **[02Hrs]**
Definition & purpose, types of standard specification, legal aspect, drafting detailed specification for buildings, roads, minor bridges.

Rate analysis: **[06Hrs]**
Purpose and principles, importance of schedule of rates in cost estimates, Rate analysis, factors affecting rate analysis, task work, fixed, variable, prime and supplementary cost, overhead cost.

Tender & Contracts: **[08Hrs]**

Preparation of tender documents, importance of inviting tenders, types of contracts, relative merits, prequalification, General & special Conditions: termination of contracts, extra works & changes, penalty and liquidated charges, settlements of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc.

Valuation: **[06Hrs]**
Purpose of valuation, value and cost, types of value, factors affecting value of property, net and gross return, free hold and lease hold property, sinking fund, depreciation, capitalized value, annualized value, methods of valuation, rent fixation, valuation of old building.

Text books:

1. Estimating and Costing in Civil Engineering, Theory and Practice, Datta B.N., UBS Publisher, New Delhi, Latest edition.
2. Estimating, Costing Specifications & Valuation in Civil Engineering, Chakraborti M., UBS Publisher, New Delhi, Latest edition.

3. Estimating, Costing and Valuation, Rangwala S. C., Charotar Publishing House, Anand, Latest edition.
4. A Text Book of Estimating and Costing, Birdie G. S., Dhanpatrai publishing company, Latest edition.

Reference books:

1. Civil Engineering Contracts & Estimates, Patil B. S., Orient Longman Ltd, Mumbai, Latest edition.
2. National Building Code of India 2005, Group I to V, Bureau of Indian Standards, New, Delhi.
3. Principles of Economics, Gregory Mankiw N., Thomson Southwestern, Latest edition.
4. Typical PWD Rate Analysis documents.
5. Current District/State Schedule Rate (DSR/SSR).
6. IS1200: Methods of measurement of building and civil engineering works

CE354NB: STUDY OF DESIGN PRINCIPLES FOR FIBER REINFORCED CONCRETE

Teaching Scheme: 3L **Total: 3 Hr** **Credit: 3**
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE **Total Marks: 100**
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

The primary aim of this course is to provide an introduction to the analysis and design of reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, and footing in RCC. It equips the students with the tools necessary for designing RCC structures and to familiarize them with the relevant national design code.

COURSE OUTCOMES

After successful completion of this course; student will be able to:

1. identify the role of fibres in enhancing concrete properties and their design implications.
2. design structural elements like beams, slabs, and pavements using fibre-reinforced concrete.
3. analyze the behavior of fibre-reinforced concrete under different loading conditions.
4. optimize fibre-reinforced concrete mixes for specific structural and durability requirements.

Program Outcomes (Pos) and strength of co-relation (PO)

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	1		2			1			1		
2	1	2	2	3	1	2		1			1		1	
3	2	2	1	3								2	2	
4	2	2	2				1							

1 - Weakly correlated 2- Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Fibre Reinforced Concrete Design [04Hrs]
Overview of FRC and its applications in structural and non-structural elements, Material characteristics and behaviour: fibre-matrix interaction, load transfer, and crack bridging, Importance of fibre geometry, orientation, and volume fraction in design.

Design Principles and Structural Behaviour [08Hrs]
Fundamentals of FRC design: tensile, compressive, and flexural strength, Toughness indices and fracture mechanics of FRC, Design for impact resistance and fatigue performance, Serviceability considerations: control of shrinkage, creep, and crack width.

Mix Design for Fibre Reinforced Concrete [08Hrs]
Principles of mix proportioning for FRC, Impact of fibre type, dosage, and aspect ratio on workability and performance, Practical considerations: rheology, placement, and compaction methods, Design using supplementary cementitious materials (SCMs) and admixtures.

Structural Applications and Design Examples [08Hrs]
Design of fibre-reinforced concrete pavements and overlays, Precast and prefabricated FRC components, Blast-resistant and seismic applications, Design for tunneling, shotcrete, and rehabilitation works, Case studies of real-world FRC designs.

Standards, Guidelines, and Advanced Techniques [08Hrs]
Design codes and guidelines: ACI 544, IS 16462, and others, Numerical modeling and simulations of FRC structures, Testing and validation of FRC design: experimental setups and methods, Advances in hybrid fibre systems and multi-functional concretes.

Sustainability and Future Trends [04Hrs]
Lifecycle assessment of FRC designs, Sustainable practices in the use of fibres and cementitious materials, Smart and self-healing FRC systems for advanced design applications, Innovations in fibre technology: recycled fibres, carbon nanotubes, and more.

Reference:

1- Fibre Reinforced Cementitious Composites – Arnon Bentur & Sidney Mindess
2- Concrete Technology – M. S. Shetty & A. K. Jain
3- Design of Fibre Reinforced Concrete Structures– Nemkumar Banthia & S. P. Shah
4- ACI 544.4R-18: Guide to Design with Fibre-Reinforced Concrete
5- Concrete: Microstructure, Properties, and Materials – P. Kumar Mehta & Paulo J. M. Monteiro

CE354NC: BRIDGE ENGINEERING

Teaching Scheme: 3L **Total : 3Hr** **Total Credit: 3**
Evaluation Scheme: 30MSE + 10ISA + 60ESE **Total Marks: 100**
Duration of ESE: 03 Hrs

COURSE DESCRIPTION

This course introduces the fundamental concepts, design principles, and construction methods associated with bridge engineering. It covers the classification, loads, structural systems, analysis and design of various types of bridges including culverts, RCC and PSC bridges, steel bridges, and bearings. Emphasis is placed on design standards and IRC guidelines, with practical exposure to bridge planning, inspection, and maintenance.

COURSE OUTCOMES

On successful completion of the course, the student will be able to:

1. classify different types of bridges and understand their suitability based on site conditions and functional requirements.
2. analyze different loads acting on bridges and apply relevant IRC loadings.
3. design components of concrete and steel bridges as per IRC standards.
4. identify the construction methods, materials, and technological aspects of bridge building and to evaluate bridge condition through inspection methods and proposed maintenance strategy.

Relevance of Program Outcomes (PO's) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	3	1		2	2	3	2			1	3	2	
2	3	3	2		1	3	1		1			1	2	
3	2	3	2		2	1	1					2	3	
4	2	2	3		2	2	3			1		2	3	

1-Weakly Correlated 2-Moderately Correlated 3-Strongly Correlated

COURSE CONTENT

Introduction and Classification of Bridges - [06Hrs]

Definition, components, and significance of bridges, Classification based on material, span, usage, and location, Selection of site and alignment, Economic span and preliminary survey, Standard specifications for road and railway bridges.

Loading Standards and Analysis of Bridge Structures- [08Hrs]

Design loads and forces: Dead load, live load, impact, wind, temperature, seismic, and braking forces. IRC Loadings (IRC Class A, B, 70R, and footbridge loading), Load distribution methods for slab bridges, Influence lines for reactions, bending moment, and shear force, Analysis of culverts and T-beam bridges (introductory concepts only).

Design of Concrete Bridges- [10Hrs]

Design of RC Slab Bridge (solid slab type), Design of Tee-beam bridge: load distribution using Courbon's method, Design of box culverts, Introduction to prestressed concrete bridges (basic concepts and types only)

Steel Bridges and Bridge Bearings - [08Hrs]

Types of steel bridges: truss, plate girder, and suspension bridges, Design principles of riveted/welded plate girder bridges (IRC recommendations only), Components of steel bridges and connections, Types of bridge bearings: elastomeric, rocker & roller bearings, Design considerations and selection of bearings.

Construction Techniques, Inspection and Maintenance- [08Hrs]

Construction methods of concrete and steel bridges, Launching methods for girder and segmental bridges, Inspection of bridges – visual, non-destructive techniques, Common distresses and their causes, Maintenance and strengthening of bridges, Introduction to Bridge Management System (BMS)

TEXTBOOKS:

1. Essentials of Bridge Engineering by D. Johnson Victor
2. Bridge Engineering by S. P. Bindra

REFERENCE BOOKS:

1. Design of Bridge Structures by T. R. Jagadeesh and M. A. Jayaram
2. Bridge Engineering Handbook by Wai-Fah Chen and Lian Duan

CE355N (A) ENVIRONMENTAL ENGINEERING-II

Teaching Scheme :03L, Total: 03 Hr Credit: 03
Evaluation Scheme:30 MSE + 10 ISA +60 ESE Total Marks: 100
Duration of ESE :03Hrs

COURSE DESCRIPTION:- This course provides comprehensive knowledge on wastewater engineering, including sewer systems, wastewater treatment processes, and advanced treatment technologies. It covers the design of sewers, treatment units, sludge management, and sustainable practices like water reuse and energy recovery. The course also addresses environmental impacts such as pollution and regulatory frameworks

COURSE OUTCOME:-

Upon successful completion of this course, students will be able to:

1. study the significance and components of wastewater and sewerage systems.
2. design sewer systems, calculate flow rates, and select appropriate materials for sewer construction.
3. explain and apply the principles of primary, secondary, and tertiary wastewater treatment processes and identify various sludge management techniques and explore emerging treatment technologies.
4. evaluate water reuse opportunities, energy recovery from wastewater, and understand related environmental and regulatory impacts.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	1	2					2					2	1	1
2	1	1	1		1	2	1					2		1
3	1	1	1		1	2	1					1	1	1
4	1	2	1		2	2	1						1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT:

Introduction to Wastewater Engineering & Collection Systems [08Hrs]
Overview of Wastewater Engineering: Importance, objectives, and significance. Sources of Wastewater: Domestic, industrial, and stormwater; pollutant types and variations. Wastewater Quality Parameters: BOD, COD, TSS, TDS, pH, and their determination methods. Sewerage Systems: Components (trunk sewers, lateral sewers, manholes, pumping stations), design considerations.

Sewer Design & Flow in Sewers [06Hrs]
Sewer Design: Flow rate calculations, slope, velocity, pipe size, and material selection. Types of Sewers: Sanitary, storm, and combined sewer systems. Flow in Sewers: Hydraulic principles, critical velocities, and self-cleansing mechanisms.

Primary, Secondary, and Tertiary Wastewater Treatment [08Hrs]
Primary Treatment: Screening, grit removal, sedimentation principles, and primary clarifiers. Secondary Treatment: Activated Sludge Process, Trickling Filters & Rotating Biological Contactors (RBCs), Oxidation Ponds & Secondary Clarifiers. Tertiary Treatment: Filtration, Advanced Oxidation Processes (AOPs), Membrane Technologies, Nutrient Removal.

Sludge Management and Advanced Treatment Technologies [08Hrs]
Sludge Characteristics & Treatment: Thickening, digestion, dewatering methods. Sludge Disposal Methods: Landfilling, incineration, agricultural use, and energy recovery. Emerging Treatment Technologies: Constructed Wetlands, Membrane Bioreactors (MBRs), Electrocoagulation & Electroflotation, Microbial Fuel Cells (MFCs).

Water Reuse, Energy, Environmental Impacts & Regulations [10Hrs]
Water Reuse & Recycling: Industrial reuse, irrigation, and potable water recovery. Zero Liquid Discharge (ZLD): Principles, technologies, and resource recovery. Energy in Wastewater Treatment: Biogas production, energy optimization, and renewable energy integration. Environmental & Health Impacts: Public health risks, waterborne diseases, and contamination issues. Noise Pollution & Control: Industrial sources, impact on human health, mitigation techniques, noise standards (CPCB, WHO). Regulatory Aspects: Wastewater discharge limits, legal frameworks (IS, EPA, WHO), Cost-effective, sustainable wastewater treatment technologies.

Textbooks

1. S.K. Garg, Environmental Engineering Vol. 2, Khanna Publishers, Latest Edition.
2. G.S. Birdie & J.S. Birdi, Water Supply & Sanitation Engineering, Dhanpat Rai Publications, Latest Edition.
3. B.C. Punmia, Ashok Jain, Arun Jain, Wastewater Engineering, Firewall Medium, Latest Edition.

Reference Books

1. E.W. Steel & Terence J. McGhee, Water Supply & Sewerage, McGraw-Hill, Latest Edition.
2. M.N. Rao & S.K.S. Rao, Air Pollution, TMH Publications, Latest Edition.
3. Metcalf & Eddy, George Tchobanoglous, Wastewater Engineering: Treatment & Resource Recovery, Latest Edition.

CE355N(B) DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Teaching Scheme : 03 L + 00 T; Total: 03 hours/week **Credits** : 03

Evaluation Scheme : 30 MSE + 10 ISA + 60 ESE **Total Marks** : 100

ESE Duration : 4 Hrs.

COURSE DESCRIPTION

This course is intended to provide the engineering student with the basic tools required to design and build prestressed concrete structures. Emphasis will be placed on the behavior of prestressed concrete under load along with potential failure mechanisms.

DESIRABLE AWARENESS / SKILLS

Knowledge of basics of concrete technology and design of RCC structures.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. identify the principles and importance of prestressed concrete.
2. Analyse and design prestressed concrete beams/girders and slabs.
3. design of end blocks for prestressed concrete members.
4. apply design codes and standards to prestressed concrete components.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	1	1		1		1	2	1		2	2	1		1
2	2	2		1					1			1		1
3	3	3		2		2		1			2	2		1
4	3	3		2				1		1		1		2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Prestressed Concrete [06Hrs]
Introduction to basic concept and general principle of prestressed concrete, materials used in prestressed concrete - High strength concrete and high tensile steel and their characteristics, Advantages and limitations of prestressed concrete.

Systems of prestressing [04Hrs]
Pre-tensioned and post tensioned Prestressing systems, Hoyer system, Freyssinet system- The Magnel Blaton system, Gifford Udall system, Lee Mccall system, cable profile and cable zone.

Analysis of prestressed concrete beams [06Hrs]
Analysis of sections for flexure; analysis of concrete beams pre-stressed with straight, concentric, eccentric, bent and parabolic tendons, kern lines, concept of load balancing.

Loss of prestress [08Hrs]
Losses of prestress at various stages, loss of stress due to elastic deformation of concrete, loss of stress due to shrinkage of concrete, loss of stress due to creep of concrete, loss of stress due to relaxation of stress in steel, loss of stress due to friction, loss of stress due to anchorage slip, total losses allowed in design.

Anchorage Zones [04Hrs]
Transmission of prestress in pretensioned members; Anchorage zone stresses for post-tensioned members, End Block design as per IS: 1343.

Limit state design criteria for prestressed concrete members [04Hrs]
Philosophy of limit state design, criteria for limit state design, design loads and strength, strength and serviceability limit state, crack width in prestressed members.

Design of prestressed concrete beams [04Hrs]
Design of post tensioned prestressed concrete simply supported prestressed concrete beam for flexure, shear, bond and bearing including end block (limit state method).

Design of prestressed concrete slabs [04Hrs]
Design of one way and two way post tensioned slabs

Text Books:

1. Prestressed Concrete, Krishnaraju N., Tata McGraw Hill, New Delhi, 6th edition 2018.
2. Prestressed concrete, Pandit and Gupta, CBS publishers, January 2019.
3. Prestressed Concrete, S. Ramamrutham, Dhanpat Rai and Sons, 2003.

Reference Books

1. Design of Prestressed Concrete Structures, Lin T.Y., Asia Publishing House, 6th edition2018.
2. Limit State Design of Prestressed Concrete, Guyan Y., Applied Science Publishers,1974
3. Prestressed Concrete, Dayaratnam, Medtech Publishers, 7th edition, 2017
4. Fundamentals of Prestressed Concrete Sinha N.C. & Roy, S. Chand & Company, 3rdedition, 2011
5. Prestressed Concrete, Rajagopalan N, Narosa Publishing house, 2nd edition, 2010.

6. IS 1343: 2012, Code of Practice for Prestressed Concrete, BIS, 2012.
7. All latest relevant Indian Standards published by BIS, India and Indian Road Congress, India.

Useful Links

1. NPTEL, www.nptel.ac.in

CE355NC : BUILDING SYSTEMS AND SERVICES

Teaching Scheme: 3L, Total: 3 Hr Credit: 3
Evaluation Scheme: 30MSE + 10 ISA + 60 ESE Total Marks:100
Duration of ESE: 3 Hrs

COURSE DESCRIPTION

This course introduces the students about the systems and services required in various buildings such as: Lighting and ventilation, Water supply and drainage system to be provided for proposed building, Study of various components of these systems, Electrical and Mechanical services and their layout, Importance of fire protection, acoustics and sound insulation for various buildings.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:
1. plan various types of services required for different types of buildings.
2.supervise installation and testing of services such as lift, fire protection, lightings, air conditioning, acoustic and sound insulation.
3. apply the basic aesthetic principles involved in architectural design for building projects.
4. manage building services provisions in big construction sites.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	2	1		2			2		3		
2	2	1	2	2		2	3	2	1			2	3	
3	2	2	1	3	3		2					2	2	
4	2	3	2	1			2					3		

COURSE CONTENT

Introduction to building services : **[04Hrs]**
Definitions, Objective and uses of services, Applications of services for different types of building considering, Classification of building services, Types of services and selection of services.

Lighting and ventilation : **[04Hrs]**
Natural and artificial lighting, principles and factors, Arrangement of luminaries, Distribution of illumination, Utilization factors, Necessity of Ventilation, Types – Natural and Mechanical, Systems of air-conditioning.

Water supply and drainage : **[08Hrs]**
Methods of distribution systems of supply of water, storage tanks, water services to multistory buildings,
Building drains, sewers, gully traps, inspection chambers, manholes, connection to public sewer. Waste-water disposal systems, septic tank, soak pits and anaerobic filters. Basic requirements of Drainage and Sanitation, Installation of Sanitary Appliances, Drainage system for multi storied buildings.

Refuse disposal:- **[02Hrs]**
Refuse bins, Refuse chutes etc. Rain water harvesting:- Rainwater harvesting techniques, methods of recharging ground water.

Electrical services and layout : **[06Hrs]**
Electrical services in the building, Technical terms and symbols for electrical installations and Accessories of wiring, Elements of building wiring system – feeders, panel board, circuit breakers' fuses, switches etc.; electrical layout for residence.

Mechanical services in buildings: **[06Hrs]**
Introduction of mechanical services like Lift -Definition, Types of Lifts, Design Considerations, Location, Sizes, Elevators & Escalators - Different types of elevators and Escalators, Freight elevators, Passenger elevators, Hospital elevators,

Fire protection, acoustic and sound insulations: **[06Hrs]**
Causes of fire and Effects of fire General Requirements of Fire Resisting building as per IS and NBC 2005, Characteristics of Fire resisting materials, Maximum Travel Distance. Fire Fighting Installations.

Acoustic and sound insulations: **[04Hrs]**
Requirement of good Acoustic, Various sound absolvent Factors to be followed for noise control in residential building.

Text Books –
1. National Building code, Bureau of Indian standard.
2.Design and Installation of Services in Building complexes & High Rise Buildings, Jain. V.K., Khanna Tech. Publishers, New Delhi, Latest edition.
3. Water Supply and Sanitary Engineering, Chatterjee, A.K., Khanna Publishers,New Delhi, Latest edition.
4. Water Supply and Sanitary Engineering, Birdie, G. S., and Birdie, J. S., Dhanpat Rai and Sons, New Delhi, Latest edition.
5. Environmental Engineering, Vol. II,Garg, S. K., Khanna Publications, New Delhi, Latest edition.

Reference Books –

1. Energy Conservation Act 2001, Electricity Act 2003
2. Acoustic designing & practice, R. L. Suri, Asia Publishing House, Volume I, 1967.

MDM IV:CEM356N HYDROLOGY AND IRRIGATION

Teaching Scheme: 02L Total: 2Hr Credit: 02
Evaluation Scheme:30 MSE + 10 ISA + 60 ESE Total Marks: 100
Duration of ESE: 03Hrs

COURSE DESCRIPTION

This course introduce engineering hydrology and its applications. The course is focused on developing the skills of students for identification and assessment of available natural and artificial water resources. It deals with the study of water requirement of crops related to Civil Engineering. The part of the subject is focused on irrigation engineering and development of water resources.

COURSE OUTCOMES

After successful completion of this course; student shall be able to:

1. analyze the importance of hydrology, able to calculate the average rainfall over a basin.

2. understand the infiltration methods, evaporation and apply hydrograph base flow concept,

3. know the importance of irrigation, types and methods.

4. analyze soil-water plant relationship, duty & delta and factors affecting them.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
1	2	1	2	2	1		2			2	
2	2	1	2	2		2	3	2	1		
3	2	2	1	3	3		2				
4	2	3	2	1			2				

1-Weakly correlated **2 –** Moderately correlated **3 –** Strongly correlated

COURSE CONTENT

Introduction to Hydrology: [02Hrs]

Engineering hydrology and its applications; Hydrologic cycle; precipitation- Types and forms, rainfall measurement, types of rain gauges.

Evaporation: [03Hrs]

Factors affecting evaporation, measurement of evaporation; Infiltration- Factors affecting infiltration, measurement of infiltration, Run off- Factors affecting run- off, Computation of run-off.

Hydrograph: [04Hrs]

Unit Hydrograph- Construction and limitations of Unit hydrograph, Application of the unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; S-hydrograph.

Irrigation: [06Hrs]

Introduction; Necessity and Importance of Irrigation; advantages and ill effects of Irrigation; types of Irrigation; methods of application of Irrigation water; quality for Irrigation water. Duty and delta; duty at various places; relation between duty and delta; factors affecting duty; methods of improving duty.

Water requirement of crops: [08Hrs]

Types of soils, Indian agricultural soils, preparation of land for Irrigation; soil fertility; Soil-water-plant relationship; Depth and frequency of irrigation; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; Kor depth and Kor period; crop seasons and crop rotation.

Water Logging: [02Hrs]

Water logging; Effects of water logging; Causes of water logging; Remedial measures.

Textbooks:

1. Irrigation and water power engineering by Punmia& Lal, Laxmi publications pvt. Ltd., New Delhi 17th edition 2021

2. Engineering Hydrology by K. Subramanya, The Tata Mcgraw Hill Company, Delhi 5th edition 2020

Reference Books:

1. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi 36th edition

2. Engineering Hydrology by Jayarami Reddy, Laxmi publications pvt. Ltd., New Delhi 3rd edition 2016

3. Irrigation and Water Resources & Water Power by P.N.Modi, Standard Book House 6th edition 2020

CE357N: GEOTECHNICAL ENGINEERING LAB

Teaching Scheme: 2P **Total : 2Hr** **Total Credit: 1**

Evaluation Scheme: 30 ICA + 20ESE **Total Marks: 50**

COURSE DESCRIPTION

The student will be able to identify the type of soil based on its index and engineering properties. Also, it will be helpful to differentiate the impact of different types of soil on overlying structures. The hand-on-practice on software will enable students to improve understanding on slope failure mechanisms and the field visit will add in-situ insights of a project.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. identify and classify soil.
2. determine OMC and MDD for quality control.
3. estimate soil bearing capacity and problems related to compaction and consolidation.
4. identify problematic soils and understand suitable ground improvement technique to be used.

Relevance of Program Outcomes (PO's) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3											3		
2	3	1											2	
3	3	1	1									3		
4	3	2	3									3		

1-Weakly Correlated 2-Moderately Correlated 3-Strongly Correlated

Minimum eight experiments shall be performed to cover entire curriculum of course CE357N.

COURSE CONTENT

1. Perform Sieve Analysis on a given soil sample and classify soil as per Indian Standard Soil Classification System. Use at least 5 soil samples and apply field identification test to classify soil sample.
2. Determine water content of given soil sample using oven dry method as per I.S. 2720 Part II.
3. Determine specific gravity of given soil sample using pycnometer as per I.S. 2720 Part III.
4. Determine dry unit weight of soil by using field method (Core Cutter or Sand Replacement Method) as per I.S. 2720 Part XXIX or Part XXVII
5. Determine plastic limit and liquid limit of a given soil sample as per I.S. 2720 Part V.
6. Determine shrinkage limit of a given soil sample as per I.S. 2720 Part V.
7. Determine coefficient of permeability using any one method (Constant Head or Falling Head) as per I.S. 2720 Part XVII
8. Determine OMC and MDD of a given soil sample using Standard Proctor Test as per I.S. 2720 Part VII.
9. Determine shear strength of soil using direct shear test as per I.S. 2720 Part XIII.
10. A visit to construction site of road, foundation, embankment, earth dam etc. to identify type of soil, its characteristics, influence on choice of foundation.
11. Use of Geostudio software to determine Factor of Safety of a given slope.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE358N: DESIGN OF STEEL STRUCTURES LAB

Teaching Scheme: 2P **Total: 2 Hr** **Credit: 1**

Evaluation Scheme: 30 ICA + 20ESE **Total Marks: 50**

COURSE DESCRIPTION

The students admitted in Civil Engineering discipline have to understand the different loadings coming on steel structural components. Also, they should be able to design steel structures. This course will give exposure to students to design steel structural components.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. calculate design loads for various steel structures.
2. design simple steel structures.
3. design simple steel connections.
4. draw details of steel structures.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2					2						3		
2		3		1								3	2	
3		3										3	2	
4		3			1	1						3	2	

1-Weakly correlated 2 _ Moderately correlated 3 _ Strongly correlated

The experiments shall be performed to cover entire curriculum of course CE353N. The list given below is just a guideline.

A. Design of the following structures as per IS 800- 2007

1. G+1 Industrial building with roof supported by steel trusses (Angle sections / Tubular Sections).
   a. Design of primary and secondary beams
   b. Design of columns and footing
2. Design of Roof Truss :
   a. Loading on Roof Truss
   b. Analysis for Member Forces
   c. Design of Truss Members
   d. Design of Column and Column footing

B. A Report on Site visit.

The Term work should include

1. Brief Technical design project report involving: Introduction, assumptions, load calculations, analysis, preferably using suitable software and detailed design.
2. Drawings: Structural plan and detailed structural drawings
3. Report of a site visit mentioning structural details with relevant sketches of structural connections.

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by students. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE 359N: SOFTWARE ENGINEERING LAB II

Teaching Scheme: 01L, 02P Total: 3 Hr Credit: 2

Evaluation Scheme: 30 ICA + 20 ESE Total Marks: 50

COURSE DESCRIPTION

Use of the computer for both analysis and design is an integral part of the curriculum. This course is aimed at providing hands-on work using analytical tools contained in common software programs to solve civil engineering problems.

COURSE OUTCOMES

Upon successful completion of this course the students will able to:

1. apply knowledge for analysis and design of structures using different structural analysis and design softwares such as STAAD-Pro, SAP2000, ETABS etc.
2. use different softwares in Civil Engineering for analysis and design of structures.
3. Prepare basic design report for any building
4. Use of remote sensing and GIS software.

Relevance of Program Outcomes (POs)and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2		3			3					3	2	
2	2	1		2			2					1	3	
3	2	2		2			1					1	3	
4	3	2		1			2					1	3	

1- Weakly correlated 2 _ Moderately correlated 3 _ Strongly correlated

Minimum one software from each group shall be performed. The list given below is just a guideline.

Group A

Analysis and design of structure using any one software listed below or otherwise

i) STAAD-Pro
ii) STRUDS
iii) SAP-2000
iv) ETABS
v) ANSYS
vi) Build master
vii) SAFE

Preparation of Design Basis Report got G+2 Building from above software

Group B:

Solution of problems in any one different areas using software listed below or otherwise

i) Geotechnical Engineering: GEO5/ OYASYS Slope - 2D slope stability analysis/ MIDAS GTS
ii) Estimating and Surveying- QE-Pro/any other advanced software
iii) AutoCivil
iv) Project Management Software: Microsoft Project/ PRIMAVERA/Contractor
v) Transportation Engineering: Road Master
vi) Remote Sensing and GIS: ArcGIS/GEOMATICA/ERDAS
vii) Environmental Engineering: WaterGEMS, SewerGEMS
viii) Fluid Mechanics: Flowmaster

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE360NA: ESTIMATION, CONTRACT AND VALUATION LAB

Teaching Scheme: 02P **Total: 2 Hr** **Credit: 1**
Evaluation Scheme: 30 ICA + 20 ESE **Total Marks: 50**

COURSE DESCRIPTION

Engineering economics estimating and costing is a core syllabus of civil engineering which needs practical treatment. Here, a student has to find the estimated cost of a variety of contemplated structures using standard procedures and DSR/SSR. With advancements in technology, software integration ensures faster and more precise quantity estimation. This course equips learners with fundamental skills to enhance efficiency, minimize project risks, and support informed engineering decisions.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to:

1. attain the level of proficiency to prepare an approximate as well as detailed estimate of civil engineering project.
2. competent enough to calculate the amount of material, labor & machinery required to execute any civil construction projects.
3. perform and evaluate present worth of a property and assess the future worth & annual worth analysis on one of more economic alternatives
4. apply knowledge for estimation and valuation of building

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	1			2	2					1		2
2	2	1	1			1	1						1	2
3	2	2	1			1	2						1	
4	3	2	2			1	2						1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **six** assignments shall be performed to cover the entire curriculum of course CE354NA.
At least one assignment shall be performed using suitable computer software for estimation of buildings.
The list given below is just a guideline.

1. Units of measurements of various Items of Civil Engineering Works / study of DSR, study and use of check list of PWD for estimating of various building works
2. Approximate estimate of residential building, public building, elevated storage reservoir, road and bridge
3. Prepare detailed estimate for
   i) Ground plus two storied RCC framed building with block work walls also prepare bar bending schedule for the same.
   ii) Road Work/canal
4. Prepare detailed estimate for (any one)
   i. Cross Drainage Works/bridge/Box Culvert
   ii. Minor irrigation tank (dam line and spillway)
   iii. compound wall
5. Rate analysis and Specifications for any eight items
6. Valuation of existing building (single story 1BHK)/Rate analysis.
7. Site visit (attached estimate and photographs) / study of standard estimate of PWD or any reputed civil engineering organization

Note:

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE360NB: STUDY OF DESIGN PRINCIPLES FOR FIBER REINFORCED CONCRETE LAB

Teaching Scheme: 02P **Total: 2 Hr** **Credit: 1**
Evaluation Scheme: 30 ICA + 20 ESE **Total Marks: 50**

COURSE DESCRIPTION

The primary aim of this course is to analyze and design reinforced concrete structures, by limit state method conforming to IS 456:2000. The course covers design of various elements viz. beams, slabs, columns, and footing in RCC. It equips the students with the software tools necessary for designing RCC structures.

COURSE OUTCOMES

After successful completion of this course; student will be able to

1. develop the ability to prepare and test fibre-reinforced concrete mixes, analyzing the effects of fibre properties on fresh and hardened concrete.
2. conduct standard tests to determine the mechanical properties (e.g., compressive, tensile, and flexural strengths) and durability of fibre-reinforced concrete.
3. design and optimize FRC mixes for specific structural applications using experimental data and IS codes.
4. analyse the effects of fibre properties on fresh and hardened concrete.

Program Outcomes (POs) and strength of co-relation (PO)

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	1	2	1								1		
2	1	2	2	3									1	
3	2	2	1	3								2	2	
4	2	2	1	3								2	2	

1 - Weakly correlated 2- Moderately correlated 3 – Strongly correlated

Following assignments shall be performed to cover entire curriculum of course CE354NB. List given below is just a guideline.

1: Introduction to Fibres and Their Properties

Study the physical and mechanical properties of different fibre types (steel, glass, synthetic, natural),Aspect ratio, volume fraction, and tensile strength of fibres.

2: Workability of Fibre Reinforced Concrete

Conduct slump test, Vebe test, and compaction factor test for FRC mixes, Effect of fibre content on workability.

3: Compressive Strength Test

Design and prepare FRC cubes using different fibre types and dosages, Test compressive strength at different curing periods.

4: Flexural Strength and Toughness Testing

Perform third-point loading and center-point loading tests on FRC beams, Evaluate toughness indices and load-deflection behavior.

5: Split Tensile Strength Test

Evaluate the tensile strength of FRC cylinders, Analyze the effect of fibre volume and distribution on performance.

6: Shrinkage and Creep Testing

Measure shrinkage in FRC prisms with and without fibres, Creep testing setup for sustained load analysis.

7: Mix Design Optimization for FRC

Use IS codes to optimize FRC mix proportions for specific applications, Evaluate fresh and hardened properties of the optimized mix.

Note:

- **ICA -** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.
- **ESE -** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be outside the institute.

CE360NC: BRIDGE ENGINEERING LAB

Teaching Scheme: 2P; Total: 02Hr **Total Credit: 01**

Evaluation Scheme: 30ICA + 20ESE **Total Marks: 50**

COURSE DESCRIPTION

This course introduces the fundamental concepts, design principles, and construction methods associated with bridge engineering. It covers the classification, loads, structural systems, analysis and design of various types of bridges including culverts, RCC and PSC bridges, steel bridges, and bearings. Emphasis is placed on design standards and IRC guidelines, with practical exposure to bridge planning, inspection, and maintenance.

COURSE OUTCOMES

After successful completion of this course; student shall be able to

1: perform experiments to determine load distribution and IRC standards.
2: apply the codal provisions for loading and design standards of bridges.
3: determine suitability of bridge to the site condition.
4: design the bridge under primary and secondary loading conditions

Relevance of Program Outcomes (PO's) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	3	2	1	2	1	1	2					2	1	2
2	2	2	2	2	1	2	3					3	1	2
3	1	3	1	3	2	3	3					2	2	3
4	2	2	1	3	2	2	2					3	2	1

1-Weakly Correlated 2-Moderately Correlated 3-Strongly Correlated

Lab Experiments:

Minimum **eight** experiments shall be performed to cover the entire curriculum of course CE360N. The list given below is just a guideline.

1) Selection of bridge site, alignment and collection of design data.

2) Study of various types of bridges (arch, suspension, cantilever, cable-stayed, etc.) with model charts.

3) Study and comparison of IRC Loadings (IRC Class A, B, 70R, Footbridge Loads) with sketches and tables.

4) Analysis of a simply supported bridge girder under moving load using influence lines (manually drawn)

5) Design and drawing of a slab culvert for given site conditions as per IRC guidelines

6) Demonstration and study of elastomeric and fixed bearings (with actual sample or chart)

7) Introduction to bridge analysis software (STAAD.Pro or MIDAS) – modeling a simple span bridge

8) Bridge inspection report preparation – Site visit or video analysis + damage identification.

9) Non-destructive testing demonstration (Rebound hammer test on concrete bridge element)

10) Report on study of recent trends in bridge planning and design.

Note:

- **ICA -** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.
- **ESE -** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be outside the institute.

CE361NA: ENVIRONMENT ENGINEERING – II LAB

Teaching Scheme: 2P; Total: 02Hr **Total Credit: 01**

Evaluation Scheme: 30ICA + 20ESE **Total Marks: 50**

COURSE DESCRIPTION:-

This course provides practical knowledge of various experiments performed on sewage sample & also students have to do design of at least two treatment units which are covered in theory classes & students will visit Sewage treatment plant to gain live knowledge of wastewater treatment.

COURSE OUTCOME :-Upon successful completion of this course students will be able to:

1. calculate impurities present in wastewater
2. determine BOD & DO of wastewater
3. determine various types of solids present in Wastewater
4. design screen chamber, grit chamber and trickling filter.

Relevance of Program Outcomes (Pos) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2	2	1									1		2
2	2	1	1			1	1						1	2
3	1		1			1							1	
4	2	1	2			1							1	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum Seven experiments shall be performed to cover entire curriculum of course CE355NA, four from Group A, two from Group B and Group C is compulsory,

Group A:

1. Determination of Chloride content of wastewater sample.
2. Determination of DO content of water and wastewater sample.
3. Determination of BOD of wastewater sample.
4. Determination of COD of wastewater
5. Determination of total dissolved solids and suspended solids content of wastewater sample.
6. Determination of oil and grease content of waste water sample.
7. Determination of Sludge Volume Index of wastewater sample from aeration tank.

Group B:

1. Design of screen chamber
2. Design of grit chamber
3. Design of conventional Activated Sludge Process.
4. Design of trickling filters

Group C:

Visit to Sewage Treatment Plant/Waste Water Treatment Plant: Visit report shall be in brief consisting of layout of plant, necessity of units, design details such as: flow, size etc. along with cross-section of each unit.

Note:

- **ICA -** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format.
- **ESE -** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be outside the institute.

CE361N (B) DESIGN OF PRESTRESSED CONCRETE STRUCTURES LAB

Teaching Scheme : 02 P; Total: 02 hours/week **Credits** : 01
Evaluation Scheme : **30 ICA + 20 ESE** **Total Marks** : 50

COURSE DESCRIPTION

The Prestressed Concrete Laboratory Course provides students with hands-on experience in the application of prestressed concrete design principles, analysis methods. This laboratory course correlates with the theoretical aspects of prestressed concrete, focusing on the material behaviour, prestressing systems, structural analysis, and loss of prestress, among other key topics covered in the associated theoretical course.

DESIRABLE AWARENESS / SKILLS

Knowledge of basics of concrete technology and design of RCC structures.

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. Analyze beams for stresses due to prestressing.
2. Evaluate the loss of prestress at different stages, including elastic shortening, shrinkage, and creep etc.
3. Design prestressed concrete beams for flexure, shear, and other factors as per the limit state method.
4. Analyze and design prestressed concrete slabs for flexure, shear, and other factors as per the limit state method.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO											PSO		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**1**	**2**	**3**
1	1	1		1								2		1
2	2	2		1								1		2
3	3	3		2								2		1
4	3	3		2								1		2

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

Minimum five designs / experiments shall be performed to cover entire curriculum of course. List given below is just a guideline.

COURSE CONTENT

List of Experiments

1) To study different systems of prestressing.
2) Stress analysis of Prestressed Concrete Beams for Flexure.
3) To study and calculate the various losses in prestress at different stages of prestressing.
4) To design of prestress concrete beam (rectangular section).
5) To design of Post-Tensioned one way Slab.
6) To design of Post-Tensioned two way Slab.
7) Design of end block with detailing
8) Visit to prestressed concrete structure

Evaluation Methodology:

- **ICA –** Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S 10).
- **ESE –** The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.

CE361NC: BUILDING SYSTEMS AND SERVICES LAB

Teaching Scheme: 2P, Total: 2 Hr Credit: 1
Evaluation Scheme: 30 ICA + 20 ESE Total Marks: 50

COURSE DESCRIPTION :-

This course introduces the students about the building systems and services. It will helpful to student to prepare layout of house wiring, rain water harvesting, water supply and drainage system.

COURSE OUTCOME :-

Upon successful completion of this course the students will able to:
1. plan various types of services for different types of buildings.
2. prepare a plan for fire safety measures in multistoried buildings.
3. identify the location of mechanical services and to manage building services provisions in big construction sites.
4. suggest noise control methods for any type of building.

Relevance of Program Outcomes (POs) and strength of co-relation

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
1	2		2			2						2		
2	3		2			2							3	
3	2		3			3							3	
4	3		2			2							2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **five** assignments shall be performed to cover entire curriculum of course CE355NC

1.Prepare installation layout of house wiring in small building as well as in high rise building.
2.Prepare rain water harvesting layout plan for a given building.
3.Prepare layout of water supply and drainage system for residential building.
4. Suggest noise control methods for a given Commercial Complex building.
5.Prepare a plan for fire safety measures for a given multi story building.
6.Identify proper locations for Lift/ Escalator/ Elevator in a given commercial complex. (Case Study)
7. Visit a residential building & commercial building under construction and prepare layout for electrical, water supply, sanitary and related allied services of civil engineering and prepare site visit detailed report. (Site visit is Mandatory)

ICA – Internal Continuous Assessment shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using internal continuous assessment format (S10).

ESE – The End Semester Exam for this course shall be based on oral examination to judge the skills acquired by student. It shall be evaluated by two examiners out of which one examiner shall be out of institute.