# SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
## (AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
**Accredited by NAAC with 'A+' Grade.**
Recognised as Scientific and Industrial Research Organisation
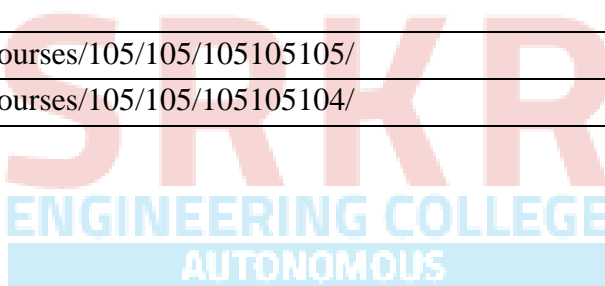**SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA**

| Regulation: R23 | III / IV - B.Tech.  I – Semester |
|---|---|

**CIVIL ENGINEERING**

**COURSE STRUCTURE**
**(With effect from 2023-24 admitted Batch onwards)**

| Course Code | Course Name | Category | L | T | P | Cr | C.I.E. | S.E.E. | Total Marks |
|---|---|---|---|---|---|---|---|---|---|
| B23CE3101 | Design and Drawing of Reinforced Concrete Structures | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3102 | Engineering Hydrology | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3103 | Geotechnical Engineering-I | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| #PE-I | Professional Elective -I | PE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| #OE-I | Open Elective -I | OE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3109 | Geotechnical Engineering Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| B23CE3110 | Fluid Mechanics and Hydraulic Machines Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| B23CE3111 | Estimation, Specifications and Contracts | SEC | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| B23CE3112 | Tinkering Lab | ES | 0 | 0 | 2 | 1 | 30 | 70 | 100 |
| B23CE3113 | Evaluation of Community Service Internship | PR | -- | -- | -- | 2 | -- | 50 | 50 |
| B23MC3102 | Employability Skills - I | MC | 2 | -- | -- | -- | 30 | -- | 30 |
| | | **TOTAL** | 17 | 1 | 10 | 23 | 300 | 680 | 980 |

| | Course Code | Course |
|---|---|---|
| **#PE-I** | B23CE3104 | Repair and rehabilitation of Structures |
| | B23CE3105 | Architecture and Town Planning |
| | B23CE3106 | Climate change impact on ecosystem |
| | B23CE3107 | Advanced Surveying |
| | B23CE3108 | MOOCS-I |
| **#OE-I** | Student has to study one Open Elective offered by AIDS or AIML or CIC or CSBS or CSG or CSE or CSIT or ECE or EEE or ME or IT or S&H from the list enclosed. | |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3101 | PC | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES
(For CE)

**Course Objectives:**

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| 1. | To introduce the philosophy of Ultimate Limit State (ULS) design for basic structural elements such as beams, slabs and columns, which form an integral part of any structural system, in accordance with the Indian Standard Code of practice. |

**Course Outcomes**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Find** the moment capacity of reinforced concrete sections given the material properties, cross-sectional dimensions and area of steel. | K3 |
| 2. | **Determine** the required flexural steel for reinforced concrete sections given the material properties and moment capacities. | K3 |
| 3. | **Calculate** the required shear reinforcement for reinforced concrete beams subjected to shear alone and to the combined action of shear and torsion. | K3 |
| 4. | **Predict** the required flexural and torsional reinforcement for uniformly loaded and simply supported unrestrained and restrained rectangular slabs. | K3 |
| 5. | **Compute** the longitudinal reinforcement for axially loaded short columns and for short columns subjected to combined axial load and uniaxial and biaxial moments by using design handbook SP:16. | K3 |

## SYLLABUS

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|---|---|
| **UNIT-I (10Hrs)** | **Introduction:** Loading standards as per IS 875, Grades of steel and cement, Introduction to basic design concepts of Limit State Method (L.S.M.). **Limit State of Collapse:** Introduction, Characteristic load and strengths, Design values, Partial safety factors Loads and materials, Stress-strain characteristics of concrete and steel. **Limit State of Collapse in Flexure:** Assumptions, Limiting depth of neutral axis. Concrete stress block in compression. Under reinforced, Balanced and over reinforced sections. Analysis of singly reinforced rectangular sections, analysis of singly reinforced flanged section, analysis of doubly reinforced rectangular sections. |
| **UNIT-II (10 Hrs)** | **Design of Beams:** IS Code 456 requirements for design of flexural reinforcement are effective span, concrete cover, spacing of reinforcing bars, minimum and maximum areas of flexural reinforcement, requirements for deflection control, general guidelines for choosing beam size. Design of singly and doubly reinforced rectangular sections. Estimation of Effective flange width, Design of flanged beams (T-Beams). Steel detailing. |

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| **UNIT-III**<br>**(10 Hrs)** | **Limit State of Collapse in Shear:**<br>Calculation of nominal shear stress, critical sections for shear design. Types of shear reinforcement, limiting ultimate shear resistance. Minimum shear reinforcement. Design of shear reinforcement in beams as per IS456 Code. Steel detailing.<br><br>**Limit State of Collapse in Torsion:**<br>Design strength in torsion combined with flexure and IS456 code provisions for design of longitudinal reinforcement, design strength in torsion combined with shear and IS code 456 provisions for design of transverse reinforcement, distribution of Torsional reinforcement. Design of rectangular section for combined bending shear and torsion. Detailing of torsion reinforcement.<br>**Limit State of Collapse in Bond:**<br>Concept of bond, Code requirement for bond, flexural bond, anchorage bond, development length. Bends, Hooks and Mechanical anchorages. |
| **UNIT-IV**<br>**(10 Hrs)** | **Design of one way slabs:**<br>Behaviour of one-way slabs, general considerations for slabs, minimum flexural reinforcement in slabs, deflection control by limiting Span/Depth ratio. Design of simply supported one way slab. Detailing of reinforcement in one-way slabs.<br>**Design of two way slab:**<br>Behaviour of two-way slabs, design of wall supported two-way slabs, slab thickness based on deflection control criterion, uniformly loaded and simply supported rectangular slabs (Rankine-Grashoff theory), Uniformly loaded restrained rectangular slabs using IS 456 provisions. Detailing of flexural reinforcement and torsional reinforcement. Shear force in uniformly loaded two-way slabs.<br>**Design of Staircases:**<br>Types of staircases Geometrical Configurations, Stair slab spanning longitudinally Loads and Load effects on stair Slabs, Design a ('waist slab' type) dog-legged staircase. |
| **UNIT-V**<br>**(10 Hrs)** | **Limit State of Collapse in Compression:**<br>Classification of columns based on type of reinforcement, type of loading and slenderness ratios. Definition of effective length- unsupported length. IS456 Code recommendations for idealized boundary conditions. Code requirements on slenderness limits, minimum eccentricities and reinforcement. Design of short column under axial compression-condition of axial loading- behaviour under ultimate loads-Tied columns- Spiral columns. Design strength of axially loaded short columns. Design of short columns, subjected to combined axial load and uniaxial and biaxial moments by using design handbook SP:16.<br>**Design of Footings:**<br>General design considerations and Code requirements- Factored soil pressure at ultimate limit state, general design considerations, Thickness of footing base slab, Design for Shear, design for Flexure, Transfer of force at Column Base. Design of isolated square and Rectangular footings concentrically loaded. |

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| **Textbooks:** | |
| 1. | Reinforced concrete design by S. Unnikrishna Pillai & Devdas Menon, Tata Mc. GrawHill, New Delhi. |
| 2. | Design of Reinforced Concrete Structures by N. Subramanian, Oxford UniversityPress, YMCA Library Building, 1, Jail Singh Road, New Delhi, India. |
| **Reference Books:** | |
| 1. | Limit State Design by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi publications Pvt. Ltd., New Delhi. |
| 2. | Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi |
| 3. | Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi. |
| 4. | Limit state designed of reinforced concrete – P. C. Varghese, Printice Hall of India, New Delhi. |
| 5. | Reinforced concrete Limit state design by Ashok K. Jain, Nem Chand & Bros, Roorkee. |
| 6. | Reinforced Concrete Vol. I (Elementary Reinforced concrete) by Dr. H. J. Shah, Charotar publication house Pvt. Ltd, ANAND, Gujarath. |
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| **e-Resources** | |
| 1. | https://archive.nptel.ac.in/courses/105/105/105105105/ |
| 2. | https://archive.nptel.ac.in/courses/105/105/105105104/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3102** | **PC** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

## ENGINEERING HYDROLOGY

### (For CE)

**Course Objectives:**

| 1. | To enable students to understand key hydrological processes and apply them in the design and analysis of irrigation systems, storage structures, and water resource planning. |
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**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Apply** key concepts to several practical areas of engineering hydrology & related design aspects. | K3 |
| 2. | **Compute** the runoff characteristics using unit hydrograph methods for hydrological modeling. | K3 |
| 3. | **Apply** canal systems using Kennedys and Lacey's theories and utility of gravity dams. | K3 |
| 4. | **Calculate** storage capacity & life of reservoirs. | K3 |
| 5. | **Determine** the irrigation needs of crops. | K3 |

### SYLLABUS

| UNIT-I (10 Hrs) | **Hydrology:** Hydrology in water resources development, Applications of Hydrology & Hydrological cycle, Precipitation -Types, Measurement of rainfall; Average depth of rainfall over an area, Mean annual rainfall, Analysis of Rainfall Data – Consistency of rainfall record, Double mass curve. Infiltration – Factors affecting, Infiltrometers; Evaporation and Evapo- transpiration – Pan Evaporation |
|---|---|
| UNIT-II (10 Hrs) | **Hydrological Aspects:** Runoff –Factors affecting Runoff, Methods of determination of Runoff, Hydrograph Analysis, Base flow separation, Unit Hydrographs, Hydrograph of different durations, <br> Applications of Unit Hydrograph; S-hydrograph. |
| UNIT-III (10 Hrs) | **Canal Systems:** Classification of irrigation canals – Canal alignment, Design of unlined canals, Regime theories – Kennedys and Lacey's theories, Design problems –Water logging – Causes and control –Canal lining – methods, Design of lined canals. <br> Storage Works: Classification of dams, Factors governing selection of types of dams, Selection of site. Basic introduction to types of dams, <br> Gravity Dams: Forces acting on a gravity dam, Modes of failure – Elementary and Practical profiles, Openings in dams – Galleries, Foundation treatment of gravity dam. |

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| **UNIT-IV (10 Hrs)** | **Reservoir Planning:** Types of developments – Investigations for reservoir planning, Selection of site for a reservoir, Zones of storage in a reservoir; Purpose of reservoir, Reservoir regulation, Reservoir yield, Mass curve and Demand curve, Determination of reservoir capacity, Yield from a reservoir of given capacity; Reservoir Losses –Measures to reduce evaporation loss in reservoirs sedimentation, Control of reservoir sedimentation. |
| | |
| **UNIT-V (10 Hrs)** | **Irrigation:** Definition of irrigation, Types of irrigation systems – Direct and Indirect, Lift and Inundation irrigation Systems, Methods of irrigation – Surface and Sprinkler methods, Trickle or Drip Irrigation, Irrigation efficiencies — Water requirements of crops, Duty, Delta and Base period – Their relationship, Factors affecting duty and methods of improving duty, Consumptive use of water-Determination of evapo transpiration, Assessment of irrigation water charges. |

**Textbooks**

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|---|---|
| 1. | Irrigation and Water Power Engineering, Punmia, B.C. and P.B.B. Lal, Laxmi Publications Pvt. Ltd. |
| 2. | Irrigation and Water Resources & Water Power, Modi, P.N., Standard Book House. |

**Reference Books**

| | |
|---|---|
| 1. | Irrigation and Hydraulic structures, Garg, S.K., Khanna Publishers. |
| 2. | Handbook of Applied Hydrology, Chow, V.T., McGraw-Hill Book Co. |
| 3. | Impacts of climate change and climate variability on hydrological regimes, Jan C. van Dam, Cambridge University Press. |
| 4. | Hydrology: Principles, Analysis and Design, Raghunath, H.M., New Age International. |

**e-Resources**

| | |
|---|---|
| 1. | https://archive.nptel.ac.in/courses/105/105/105105110/ |
| 2. | https://archive.nptel.ac.in/courses/105/104/105104103/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3103 | PC | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## GEOTECHNICAL ENGINEERING-I
### (For CE)

**Course Objectives:**

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|---|---|
| 1. | To understand the fundamental relationships between different parameters of soil and classify it accordingly. |
| 2. | To appreciate the principle of effective stress and the influence of water on it. |
| 3. | To appreciate the processes of compaction and consolidation and apply them to field problems. |
| 4. | To understand the stress distribution, settlement, and strength of different soils in different conditions. |
| 5. | To understand the importance of Soil Mechanics in solving engineering problems. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Predict** different types of soils to enable effective utilization in various engineering applications. | K3 |
| 2. | **Apply** the concept of soil hydraulics to estimate the effective stresses and permeability of soils. | K3 |
| 3. | **Predict** stress distribution in soil to understand the behavior of soil under different loading conditions. | K3 |
| 4. | **Use** the processes of compaction and consolidation to solve real world problems | K3 |
| 5. | **Apply** the concept of shear strength of soils to understand the strength characteristics in different field conditions. | K3 |

## SYLLABUS

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|---|---|
| **UNIT-I (10 Hrs)** | **Introduction:** Historical development, Soil Formation, Minerals in clays and sand, Soil Structure, Physical properties of Soil: Void ratio, Porosity, Degree of Saturation, Water content, Specific Gravity, weight –volume Relationships, Relative density, Consistency limits: Determination and consistency indices, Activity, Sensitivity and Thixotropy. Mechanical analysis and Soil Classification: Sieve analysis, Stoke's law and hydrometer analysis. Unified soil classification, Indian Standard Soil Classification Systems, Field Identification of Soils |
| **UNIT-II (10 Hrs)** | **Soil Hydraulics:** Types of soil water, capillary rise and surface tension, Darcy' law and its limitations, constant head and variable head permeability tests, Factors effecting Coefficient of permeability, permeability of stratified soils. Total, neutral and effective stresses, Effective Stress Principle, Upward flow conditions, quick sand conditions and critical hydraulic gradient. |

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| **UNIT-III (10 Hrs)** | **Stress Distribution in Soils:** Bousinesq 's theory for determination of vertical stress, assumptions and validity, rectangular and circular loaded areas, Pressure Bulb and Influence diagrams, Westergaard's theory, Newmark's influence chart-construction and use, 2:1 approximate method, contact pressure distribution beneath footings. |
| | |
| **UNIT-IV (10 Hrs)** | **Compaction:** Mechanism of compaction, Factors effecting compaction: water content, compaction effort, Type of soil. I.S Light and I.S Heavy compaction tests, Effect of compaction on soil Properties, Field compaction: compaction Equipment and Evaluation of field Compaction. <br> **Consolidation: Basic Definitions:** compression index, coefficient of compressibility and coefficient of volume decrease. Terzaghi's one dimensional consolidation theory-assumption, Derivation of differential equation and Solution, Oedometer Test, Determination of coefficient of consolidation by time fitting methods, initial compression, primary compression and secondary compression, determination of preconsolidation pressure. Normally consolidated, over consolidated and under consolidated clays. |
| | |
| **UNIT-V (10 Hrs)** | **Shear Strength of Soils:** Stress at a point, Mohr circle of stress, Mohr coulomb failure theory, shear parameters, laboratory shear tests – shear box, triaxial and unconfined compression tests, laboratory and field vane shear tests, Sensitivity of clays, Types of shear tests on drainage conditions, shear strength of sands, critical void ratio and dilatancy, Factors affecting shear strength of clays and sands, Total stress analysis and Effective stress analysis. |
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**Textbooks**

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|---|---|
| 1. | Soil Mechanics and Foundation Engineering by K.R. Arora. |
| 2. | Basic and Applied Soil Mechanics by Gopal Rajan and A. S. R. Rao. |

**Reference Books**

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|---|---|
| 1. | Principles of Geotechnical Engineering– Braja M. Das |
| 2. | Geotechnical Engineering by P. Purushothama Raj |
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**e-Resources**

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|---|---|
| 1. | https://onlinecourses.nptel.ac.in/noc22_ce03/preview |
| 2. | https://archive.nptel.ac.in/courses/105/105/105105168/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3104 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## REPAIR AND REHABILITATION OF STRUCTURES

### (For CE)

**Course Objectives:**

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|---|---|
| 1. | To describe causes of distress in concrete structures and plan repair strategies. |
| 2. | To explain issues on serviceability and durability of concrete |
| 3. | To throw light on various repair materials and their characteristics |
| 4. | To demonstrate repair techniques and protection measures |
| 5. | To illustrate suitable retrofitting schemes. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Describe** the reasons for deterioration in the concrete structures | K2 |
| 2. | **Interpret** the damage of concrete structures using various techniques like destructive and non-destructive tests | K2 |
| 3. | **Explain** various parameters influencing the serviceability and durability of structures | K2 |
| 4. | **Explain** the suitability of certain materials for a specific type of repair | K2 |
| 5. | **Illustrate** suitable techniques for repair and retrofitting. | K2 |

### SYLLABUS

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|---|---|
| **UNIT-I** (10 Hrs) | Introduction: Definition of Repair, Retrofitting, strengthening and rehabilitation. Types of failure/ damages in concrete structures. Causes of deterioration of concrete structures. Cracking- Types, causes and characteristics. Cracking in masonry walls and RCC structures. |
| **UNIT-II** (10 Hrs) | **Damage Assessment:** Purpose of assessment, Rapid assessment, Investigation of damage, Evaluation of surface and structural cracks, Damage assessment procedure, destructive, non-destructive, and semi destructive testing systems |
| **UNIT-III** (10 Hrs) | **Influence on Serviceability and Durability of Concrete:** Strength, Durability and Thermal properties– Effects due to climate, temperature, Corrosion - Effects of cover thickness and cracking. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings, and cathodic protection. |

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| **UNIT-IV**<br>**(10 Hrs)** | **Materials for Repair:** Artificial fibre reinforced polymer like CFRP, GFRP, AFRP. Adhesive like Epoxy Resin, Special concretes and mortars, sulphur infiltrated concrete, polymer concrete, Expansive cement, Ferro cement, concrete chemicals, special elements for accelerated strength gain. |
| | |
| **UNIT-V**<br>**(10 Hrs)** | **Techniques for Repair:** Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning.<br>Techniques for Retrofitting:<br>Retrofitting of structural members i.e., column and beams by Jacketing technique, externally bonding (ERB) technique, near surface mounted (NSM) technique, External post- tensioning, Section enlargement and guidelines for seismic rehabilitation of existing building. |

**Textbooks**

| | |
|---|---|
| 1. | Poonam I. Modi, Chirag N. Patel, "Repair and Rehabilitation of Concrete Structures", PHI Learning private limited, Delhi. |
| 2. | J Bhattacharjee, "Concrete Structures: Repair, Rehabilitation and Retrofitting", CBS Publishers and Distributors Pvt. Ltd, New Delhi. |

**Reference Books**

| | |
|---|---|
| 1. | R T. Allen and S.C. Edwards, "Repair of concrete Structures", Blakie and sons, UK. |
| 2. | Santhakumar, A. R. "Training Course notes on damage assessment and Repair in Structures" |
| 3. | Raikar, R. N. "Learning from failures –deficiencies in Design, construction and service" R&D centre (SDCPL), Raikar Bhavan, Bombay. |
| 4. | D Campbell- Allen and Harold Roper, "Concrete Structures: Materials, Maintenance and Repair", Longman Scientific and Technical, U.K. |
| 5. | "Handbook on Repair and Rehabilitation of RCC buildings", Published by CPWD, Delhi, Edition-2002. |
| 6. | A.R. Santhakumar, "Concrete chemicals – Theory and applications, Indian society for construction Engineering and Technology", Madras |

**e-Resources**

| | |
|---|---|
| 1. | https://archive.nptel.ac.in/courses/105/106/105106202/ |
| 2. | https://archive.nptel.ac.in/courses/105/105/105105213/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3105 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## ARCHITECTURE AND TOWN PLANNING
### (For CE)

| Course Objectives: | |
|---|---|
| 1. | To introduce Civil Engineering students to the fundamental principles of Architecture and Town Planning, as allied disciplines that shape the built environment. |
| 2. | To establish connections between Architecture, Engineering, and Construction (AEC) domains, and prepare students to effectively contribute within multidisciplinary teams in the AEC industry |
| 3. | To explore the historical evolution of architectural styles in both Western and Eastern civilizations, highlighting their contextual responses to climate, geography, and available natural resources. |

**Course Outcomes:** At the end of the course, the student will be able to

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Explain** the evolution and key features of Western, Indian, and Indo-Saracenic architectural styles with reference to notable examples and cultural influences. | K2 |
| 2. | **Apply** fundamental principles of architectural design and planning to create basic residential layouts that balance aesthetics and functional requirements. | K3 |
| 3. | **Apply** the design philosophies and concepts of modern master architects to interpret contemporary architectural styles and practices. | K3 |
| 4. | **Apply** fundamental principles of historical town planning to interpret and compare the spatial and functional organization of ancient Indian and Western cities. | K3 |
| 5. | **Apply** the fundamental components and standards of town planning to propose organized, functional, and sustainable landscaping. | K3 |

### SYLLABUS

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| **UNIT-I (8 Hrs)** | **History of Architecture:** <br> a) **Western Architecture:** Overview of Egyptian, Greek and Roman Architectures; their major characteristics, influences, and a comparative analysis of styles and architectural orders. <br> b) **Indian Architecture: Ancient Period**: Vedic age - Indus Valley civilization - **Buddhist Period**: Stambhas, Stupas, Toranas, Chaityas, and Viharas – with one example for each from Andhra Pradesh (Amaravati, Guntupalli, Nagarjunakonda etc.,). **Hindu temples**: - Evolution of Dravidian and Indo-Aryan styles; principal factors influencing temple architecture, Mahabalipuram, Meenakshi Temple (Madurai), Deogarh Temple, Lingaraja Temple (Bhubaneshwar), and Dilwara Temples (Mount Abu). c) Indo - Saracenic Architecture |

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| **UNIT-II**<br>**(8 Hrs)** | **Architectural Design:**<br>a) **Principle of designing:**<br>Fundamentals of design composition — relationship between plan and elevation; elements of form, surface, mass, texture, colour, and tone.<br>b) **Principle of Compositions:**<br>Unity, contrast, proportion, scale, balance, rhythm, and character.<br>c) **Residential Planning Principles**: Design principles for planning a residence, including site orientation, prospect, grouping of spaces, circulation, privacy, services, and other contextual factors. |
| | |
| **UNIT-III**<br>**(8 Hrs)** | **Introduction of Post-classic Architecture and contribution of eminent architects to modern period.**<br>a) **Overview of Post-Classic Architecture**:<br>Brief summary of the evolution and characteristics of Post-Classic architecture in both Indian and Western contexts.<br>b) **Architectural contribution of Eminent Architects:** Study of the philosophies and works of key figures in modern architecture, including Sir Edward Lutyens, Le Corbusier, Frank Lloyd Wright, Walter Gropius, Ludwig Mies van der Rohe, Louis Kahn, Pier Luigi Nervi, Oscar Niemeyer, Edward Durell stone |
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| **UNIT-IV**<br>**(8 Hrs)** | a) **Historical Background of Town Planning in India:**<br>Overview of ancient Indian town planning principles and practices.<br>Study of notable historical examples: Magadha, Mauryan towns (e.g., Pataliputra), Vijayanagara, Delhi (various historic phases)<br>b) **Historical Background of Town Planning in the West:**<br>Review of classical and medieval Western urban planning. Study of significant examples: Acropolis (Athens), Ancient Rome, Paris, London |
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| **UNIT-V**<br>**(8 Hrs)** | **Land Scaping and Expansion of Towns:** Land scaping for the towns, horizontal and vertical expansion of towns-garden cities, satellite towns-floating towns-skyscrapers-pyramidal cities. |
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| **Textbooks:** | |
|---|---|
| 1. | Indian Architecture – Vol:- I and II by Percy Brown, Taraporevala Publications, Mumbai. |
| 2. | Town Planning - G.K. Hiraskar, Dhanpat Rai Publications. |
| **Reference Books:** | |
| 1. | Town Planning in India - Town and Country Planning Organisation, New Delhi 1962. |
| 2. | Urban and Regional Planning; Peter Hall, Routledge. |
| 3. | Modern Architecture Since 1900 by William J.R. Curtis, Phaidon Press |
| 4. | Building Design and Drawing by Shah, Kale, and Patki Tata McGraw Hill |
| **e-Resources** | |
| 1. | https://archive.nptel.ac.in/courses/124/107/124107158/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3106 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## CLIMATE CHANGE IMPACT ON ECO-SYSTEM
### (For CE)

**Course Objectives:**

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|---|---|
| 1. | To introduce Civil Engineering students to the fundamental principles of Architecture and Town Planning, as allied disciplines that shape the built environment. |
| 2. | To establish connections between Architecture, Engineering, and Construction (AEC) domains, and prepare students to effectively contribute within multidisciplinary teams in the AEC industry |
| 3. | To explore the historical evolution of architectural styles in both Western and Eastern civilizations, highlighting their contextual responses to climate, geography, and available natural resources. |

**Course Outcomes:** At the end of the course, the student will be able to

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Explain** earth's climate system, atmospheric structure, radiation processes, and temperature variations. | K2 |
| 2. | **Describe** the hydrologic cycle, global water balance, and water cycling on land using simple water balance models. | K2 |
| 3. | **Interpret** climate variables affecting precipitation and hydrological processes including evaporation and surface runoff. | K2 |
| 4. | **Explain** climate variability including floods, droughts, heat waves, and climate extremes. | K2 |
| 5. | **Describe** climate change causes, modeling approaches, and IPCC scenarios. | K2 |

## SYLLABUS

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|---|---|
| **UNIT-I (8 Hrs)** | Climate System; Climate, weather and Climate Change; Overview of Earth's Atmosphere; Vertical Structure of Atmosphere; Radiation and Temperature; Laws of Radiation; Heat-Balance of Earth Atmosphere System; Random Temperature Variation; Modelling Vertical Variation in Air Temperature; Temporal Variation of Air temperature; Temperature Change in Soil; Thermal Time and Temperature Extremes. |
| **UNIT-II (8 Hrs)** | Hydrologic Cycle: Introduction; Global water balance; Cycling of water on land, a simple water balance model |
| **UNIT-III (8 Hrs)** | Climate Variables affecting Precipitation: Precipitation and Weather, Humidity, Vapor Pressure, Forms of Precipitation, Types of Precipitation; Cloud; Atmospheric Stability; Monsoon; Wind Pattern in India; Global Wind Circulation; Evaporation and Transpiration, Processes of Vadose Zone, Surface Runoff, Stream flow |

| UNIT-IV (8 Hrs) | Climate Variability: Floods, Droughts, Drought Indicators, Heat waves, Climate Extremes. Case studies on climate variability |
|---|---|
| | |
| UNIT-V (8 Hrs) | Climate Change: Introduction; Causes of Climate Change; Modeling of Climate Change, Global Climate Models, General Circulation Models, Downscaling; IPCC Scenarios |
| | |

| Textbooks: | |
|---|---|
| 1. | J. Oliver and J. Hidore (2001): Climatology-An Atmospheric Science (second edition). |
| 2. | Climate Change: What it means for us, our children and our grandchildren by Joseph F.C. DiMento and Pamela Doughman, MIT press |

| Reference Books: | |
|---|---|
| 1. | M. Maslin (2004): Global Warming- A very short introduction, Oxford publication. |
| 2. | Climate and Global Environmental Change by L.D. Danny Harvey, Prentice Hall publication |
| 3. | Global Warming- A very short introduction by Mark Maslin, Oxford publication |
| 4. | Climate change: Biological and Human aspects by Jonathan Cowie |

| e-Resources | |
|---|---|
| 1. | Anonymous:http://unfccc.int/resource/docs/publications/infokit_2002_en.pdf |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3107** | **PE** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

## ADVANCED SURVEYING

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Principles of hydrographic surveying including tides, tide gauges, soundings, and shoreline methods. |
| 2. | Mine surveying techniques using instruments and control methods for tunnelling and underground surveys. |
| 3. | Terrestrial and aerial photogrammetry techniques to determine position, scale, elevation, and angles. |
| 4. | Field astronomy concepts and spherical trigonometry to compute coordinates and solve survey-related problems. |
| 5. | Advanced mapping methods including UAV surveys, 3D scanning, and GIS/BIM-based data integration |

**Course Outcomes**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Understand** the principles of hydrographic surveying including tides, tide gauges, soundings, and shoreline methods. | K2 |
| 2 | **Apply** mine surveying techniques using instruments and control methods for tunnelling and underground surveys. | K3 |
| 3 | **Apply** terrestrial and aerial photogrammetry techniques to determine position, scale, elevation, and angles. | K3 |
| 4 | **Apply** field astronomy concepts and spherical trigonometry to compute coordinates and solve survey-related problems. | K3 |
| 5 | **Understand** advanced mapping methods including UAV surveys, 3D scanning, and GIS/BIM-based data integration | K2 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I (12Hrs)** | **Hydrographic Surveying:** Introduction, Horizontal and Vertical Control, Shoreline Survey, Theory of Tides, Tide Gauges and Self-Registering Instruments, Sounding Techniques Using Echo Sounders, Reduction of Soundings to Datum, and Methods of Locating Soundings from Shore and Boat |
| **UNIT-II (12 Hrs)** | **Mine Surveying:** Principles, Definitions, Applications in Tunnelling and Mining, Surface and Underground Surveying Techniques, Horizontal Control, Mining Theodolite Usage, Auxiliary Telescope Adjustments, and Weisbach Triangle Method for Surface-to-Underground Line Transfer |

| | |
|---|---|
| **UNIT-III** (10 Hrs) | **Photogrammetric surveying:** The photo theodolite, definitions, Terrestrial Photogrammetry: Calculating Horizontal and Vertical Angles, Position, and Elevation in Terrestrial Photogrammetry, **Aerial Photogrammetry Essentials:** Camera Terminology, Vertical Photo Scale, Ground Distance Calculation at Varying Elevations, and Lens Height Determination and simple problems |
| | |
| **UNIT-IV** (08 Hrs) | **Field Astronomy:** Definitions of Astronomical Terms, Fundamentals and Applications of Celestial Concepts, Coordinate Systems, Terrestrial Latitude and Longitude, Spherical Trigonometry, Astronomical Triangle, and Coordinate Transformations with Simple Problems |
| | |
| **UNIT-V** (08 Hrs) | **Data Acquisition and Modern Mapping Techniques:** Mobile Mapping Systems, UAV/Drone-Based Surveys, 3D Laser Scanning, Digital Photogrammetry, and Integration with GIS and BIM for Smart Mapping Solutions |
| | |

| Textbooks: | |
|---|---|
| 1. | Surveying (Vol-2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015 |
| 2. | Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi 16th 2023 |
| 3. | Remote Sensing and GIS, by Basudeb Bhatta- Oxford University Press, 3rd Edition, 2021 |
| 4. | Topographic Laser Ranging and Scanning: Principles and Processing, Jie Shan, Charles Toth- CRC Press, 1st Edition, 2008 |
| **Reference Books:** | |
| 1. | Plane Surveying and Higher Surveying by Chandra A M, New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition, 2015 |
| 2. | Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi 16th 2023 |
| 3. | BIM Handbook: A Guide to Building Information Modeling, Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston-Wiley publisher, 3rd Edition, 2018 |
| 4. | UAV Photogrammetry and Remote Sensing, Francesco Nex, Fabio Remondino- MDPI, 1st Edition, 2019 |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/105103176 |
| 2. | https://nptel.ac.in/courses/105104100 |

| Course Code | Category | L | T | P | C | I.M | E.M | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3109** | **PC** | -- | -- | **3** | **1.5** | **30** | **70** | **3 Hrs.** |

## GEOTECHNICAL ENGINEERING LAB

### (For CE)

**Course Objectives:** Student shall be able to

| | |
|---|---|
| 1 | To evaluate index properties such as specific gravity, Atterberg limits, and grain size distribution. |
| 2 | To determine compaction characteristics and field densities using standard methods. |
| 3 | To Measure permeability of soils using constant and variable head tests. |
| 4 | To assess the strength parameters of soils through unconfined compression, triaxial, direct shear, and vane shear tests. |
| 5 | To conduct California Bearing Ratio (CBR) tests to understand pavement subgrade characteristics. |
| 6 | To interpret test results to classify soils and assess their suitability for various geotechnical engineering applications. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Classify** various types of soil based on the properties identified | K4 |
| 2 | **Analyze** the compaction and settlement characteristics of soil by conducting laboratory and field compaction and consolidation tests | K4 |
| 3 | **Analyze** the permeability of soil by conducting permeability tests | K4 |
| 4 | **Analyze** the shear strength parameters of soils by using shear tests | K4 |
| 5 | **Analyze** the pavement subgrade characteristics of soil by conducting California Bearing Ratio (CBR) test. | K4 |

## LIST OF EXPERIMENTS

| | |
|---|---|
| 1 | Specific gravity by pycnometer /density bottle method. |
| 2 | Atterberg limits |
| 3 | Grain size analysis (Sieve analysis)/ Hydrometer analysis |
| 4 | Relative density |
| 5 | I. S. light/heavy compaction |
| 6 | Field density by Core Cutter method. |
| 7 | Field density by Sand replacement method |
| 8 | Permeability of soil– Constant head method. |
| 9 | Permeability of soil–Variable head method |
| 10 | Unconfined compression test |
| 11 | Triaxial compression test |
| 12 | Direct shear test |

| | |
|---|---|
| 13 | Vane shear test |
| 14 | CBR test |
| 15 | Oedometer test |
| *Atleast 12 experiments must be done | |
| **Reference Books** | |
| 1 | Soil Mechanics and Foundation Engineering by K. R. Arora |

| Course Code | Category | L | T | P | C | I.M | E.M | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3110 | PC | -- | -- | 3 | 1.5 | 30 | 70 | 3 Hrs. |

## FLUID MECHANICS AND HYDRAULIC MACHINERY LAB
### (For CE)

**Course Objectives:** Student shall be able to

| | |
|---|---|
| 1 | Measure rate of flow in pipes, tanks and open channels using the different types measuring devices. |
| 2 | Estimate the performance characteristics of pumps and turbines. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Analyze** discharge coefficient through pipes, tanks and channels using different measuring devices. | K4 |
| 2 | **Analyze** coefficient of loss of head and friction factor under sudden contraction. | K4 |
| 3 | **Apply** Bernoulli's principle to analyze and solve engineering problems involving fluid flow. | K3 |
| 4 | **Analyze** the effect of fluid jets on stationary and moving vanes. | K4 |
| 5 | **Analyze** the construction, working principles, and performance characteristics of various types of pumps and turbines. | K4 |

### LIST OF EXPERIMENTS

| | |
|---|---|
| 1 | Determination of coefficient of discharge through venturi meter and orifice meter. |
| 2 | Determination of coefficient of discharge through orifice and mouth piece by a constant head and variable head method. |
| 3 | Determination of coefficient of discharge through rectangular notch or triangular notch. |
| 4 | Determination of Coefficient of loss of head and friction factor in sudden contraction. |
| 5 | Verification of Bernoulli's principle. |
| 6 | Determine the efficiency of the jet on a vane. |
| 7 | Study the characteristics of hydraulic jump. |
| 8 | Study the performance characteristics of a centrifugal pump. |
| 9 | Determine the overall efficiency, slip and percentage of slip of the reciprocating pump. |
| 10 | Determine the characteristic curves, overall efficiency, and specific speed of a Pelton wheel turbine under constant head and speed conditions. |
| 11 | Determine the performance characteristics curves determination of overall efficiency of a Kaplan turbine. |

**Reference Books**

| | |
|---|---|
| 1 | Hydraulic Fluid Mechanics and Fluid Machines, S.Ramamrutham, Dhanpat Rai Publishing Co. |
| 2 | Fluid Mechanics and Hydraulic Machines by R.K.Bansal, Laxmi Publications |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3111** | **PC** | **--** | **1** | **2** | **2.0** | **30** | **70** | **3 Hrs.** |

## ESTIMATION, SPECIFICATION AND CONTRACTS

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1 | To understand the basic units of measurement and specifications used in construction work. |
| 2 | To learn and apply different methods for estimating quantities in building construction. |
| 3 | To calculate material and labor costs using rate analysis for various building items. |
| 4 | To estimate steel quantities for different structural elements. |
| 5 | To determine the methods of contracts involved in bidding. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Apply** long-wall and short-wall, and center line methods to estimate quantities for building construction. | K3 |
| 2 | **Apply** standard specifications to identify the materials and workmanship required for various building components. | K3 |
| 3 | **Calculate** the cost of different building items using rate analysis techniques. | K3 |
| 4 | **Compute** steel quantities needed for beams, columns, slabs, and footings in RCC construction. | K3 |
| 5 | **Apply** various methods of contracts for participation in bidding | K3 |

### SYLLABUS

| | |
|---|---|
| 1 | Basics of units of measurement |
| 2 | Estimation of building by long-wall and short-wall method |
| 3 | Estimation of building by Centre line method |
| 4 | Specification of different items of building |
| 5 | Rate analysis of different item of building |
| 6 | Estimation of steel quantity for beam and column |
| 7 | Estimation of steel quantity for slab |
| 8 | Estimation of steel quantity for footing |
| 9 | Tender & Contract Document |
| 10 | Conditions of Contract |

**Reference Books**

| | |
|---|---|
| 1 | Estimating and Costing in Civil Engineering by B.N. Dutta. |
| 2 | Estimation, Costing, Specifications and Valuation in civil Engineering by M. Chakraborti. |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3112** | **ES** | -- | -- | **2** | **1** | **30** | **70** | **3 Hrs.** |

### TINKERING LAB
#### (For CE)

**Course Objectives:** To

| | |
|---|---|
| 1. | Encourage Innovation and Creativity |
| 2. | Provide Hands-on Learning |
| 3. | Impart Skill Development |
| 4. | Foster Collaboration and Teamwork |
| 5. | Enable Interdisciplinary Learning |
| 6. | Impart Problem-Solving mind-set |
| 7. | Prepare for Industry and Entrepreneurship |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Explain** various sensor function and their applications. | K3 |
| 2. | **Analyze** series and parallel circuit configurations by designing and assembling applications on a breadboard. | K4 |
| 3. | **Examine** automated systems like traffic lights and streetlights to determine how sensors influence circuit behavior. | K4 |
| 4. | **Investigate** workflows involved in designing and producing functional prototypes through sensors. | K4 |
| 5. | **Assess** the design thinking process to propose innovative improvements for structural elements. | K5 |

Students have to perform any 10 of the following Experiments:

| | |
|---|---|
| 1. | Familiarization with lab tools – Breadboard, multimeter, soldering station, power supply. |
| 2. | Basic electronic circuits – Series, parallel circuits, use of resistors, capacitors, LEDs. |
| 3. | Introduction to Arduino – Writing and uploading simple sketches. |
| 4. | Design and build parallel and series circuits using a breadboard for any application of your choice. |
| 5. | Simulate a traffic light controller circuit on a breadboard. |
| 6. | Build an automatic street light using an LDR and demonstrate its operation. |
| 7. | Simulate Arduino LED blinking using Tinkercad. |
| 8. | Build and test Arduino LED blinking activity using the Arduino IDE and hardware. |
| 9. | Interface an IR sensor and a servo motor with Arduino and demonstrate functionality. |
| 10. | Develop a water quality (minimum two parameters) monitoring system. |
| 11. | Build a water flow monitoring system. |

| | |
|---|---|
| 12. | Build a soil moisture monitoring system. |
| 13. | Apply the steps of Design Thinking to structural (beams) health monitoring. |
| | |

**References**

| | |
|---|---|
| 1. | https://aim.gov.in/pdf/equipment-manual-pdf.pdf |
| 2. | https://atl.aim.gov.in/ATL-Equipment-Manual/ |
| 3. | https://aim.gov.in/pdf/Level-1.pdf |
| 4. | https://aim.gov.in/pdf/Level-2.pdf |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23MC3102** | **MC** | **2** | -- | -- | | **30** | | |

## EMPLOYABILITY SKILLS -I

(For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To familiarise students with soft skills and how they influence their professional growth. |
| 2. | To build/refine the professional qualities/skills necessary for a productive career and to instill confidence through attitude building. |

**Course Outcomes**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | Interpret the essence of key soft skills such as creativity & problem solving, emotional intelligence, leadership qualities, etc. | K2 |
| 2. | Outline interview essentials for graduate-job prospects. | K2 |
| 3. | Apply writing skills in academic and professional settings. | K3 |
| 4. | Apply presentation skills in examinations like CAT, GRE, GATE, IBPS | K3 |
| 5. | Demonstrate knowledge about domain specific industry and the prospective workplace | K2 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I (10Hrs)** | **INTRODUCTION** <br> Introduction to soft skills, definition and meaning, importance and need in personal and professional settings; soft skills vs. hard skills; personality development. |
| **UNIT-II (10 Hrs)** | **INTRA-PERSONAL AND INTER-PERSONAL COMMUNICATION** <br> Significance of Inter & Intra-Personal Communication; SWOT Analysis; Goal Setting – Guidelines for Goal Setting; Emotional Intelligence; Creativity & Problem Solving; Stress and Time Management; Leadership & Team Work; Building a positive attitude, Social Consciousness. |
| **UNIT-III (10 Hrs)** | **WRITTEN COMMUNICATION** <br> Resume Preparation: Common resume blunders, Tips for betterment, Resume Review; Report Writing; Writing an SOP (Statement of purpose). |
| **UNIT-IV (10 Hrs)** | **PRESENTATION SKILLS** <br> Importance of Presentation Skills; JAM; Essential guidelines for Group Discussions; Debates; Role Plays; PPTs etc. |

| UNIT-V (10 Hrs) | **INTERVIEW SKILLS**<br>Employability Skills: Knowing about Selection Process; Interview Skills, types of Interviews, E-Interviews, Do's and Don'ts of Interviews, FAQs, Mock Interviews; Awareness about Industries; Importance of researching the prospective workplace. |
|---|---|
| | . |

| **Textbooks:** | |
|---|---|
| 1. | *How to Prepare for Verbal Ability and Reading Comprehension for CAT* (10th edition) by Arun Sharma and Meenakshi Upadhyay, McGraw Hill Education, 2022. |
| 2. | *How to Prepare for Quantitative Aptitude for CAT (10th edition) by* by Arun Sharma , McGraw Hill Education, 2022. |
| **Reference Books:** | |
| 1. | *English Collocation in Use-* Intermediate (2nd edition) by Michael McCarthy& Felicity O'Dell, CUP, 2017. |
| 2. | *Magical Book On Quicker Maths* (5th Edition) By M.Tyra, BSC Publishing Co Pvt. Ltd, 2018. |
| | |
| **e-Resources** | |
| 1. | www.Indiabix.com |
| 2. | www.800score.com |

# SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
## (AUTONOMOUS)
(Approved by AICTE, New Delhi, Affiliated to JNTUK, Kakinada)
**Accredited by NAAC with 'A+' Grade.**
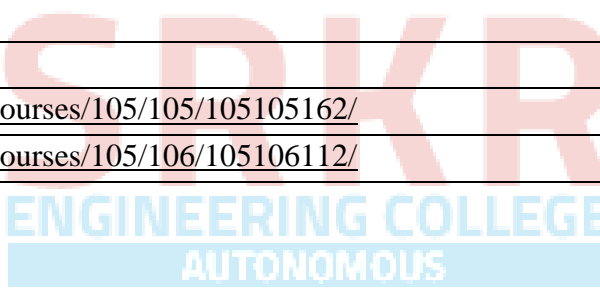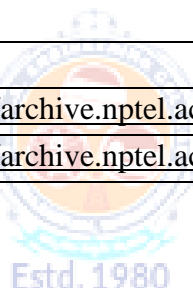Recognised as Scientific and Industrial Research Organisation
**SRKR MARG, CHINA AMIRAM, BHIMAVARAM – 534204 W.G.Dt., A.P., INDIA**

| Regulation: R23 | | III / IV - B.Tech.  II - Semester | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **CIVIL ENGINEERING** | | | | | | | | | |
| **COURSE STRUCTURE** **(With effect from 2023-24 admitted Batch onwards)** | | | | | | | | | |
| **Course Code** | **Course Name** | **Category** | **L** | **T** | **P** | **Cr** | **C.I.E.** | **S.E.E.** | **Total Marks** |
| B23CE3201 | Design and Drawing of Steel Structures | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3202 | Highway Engineering | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3203 | Environmental Engineering | PC | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| #PE-II | Professional Elective -II | PE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| #PE-III | Professional Elective -III | PE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| #OE-II | Open Elective -II | OE | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| B23CE3214 | Environmental Engineering Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| B23CE3215 | Highway Engineering Lab | PC | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| B23CE3216 | CAD Lab | SEC | 0 | 1 | 2 | 2 | 30 | 70 | 100 |
| B23AC3201 | Technical paper writing and IPR | AC | 2 | -- | -- | -- | 30 | -- | 30 |
| B23MC3202 | Employability Skills-II | MC | 2 | -- | -- | -- | 30 | -- | 30 |
| | | **TOTAL** | **22** | **1** | **8** | **23** | **330** | **630** | **960** |

| | **Course Code** | **Course** |
|---|---|---|
| **#PE-II** | B23CE3204 | Structural Analysis II |
| | B23CE3205 | Sustainable Materials and Methods for Construction |
| | B23CE3206 | Building Services |
| | B23CE3207 | Valuation and Quantity Survey |
| | B23CE3208 | MOOCS-II |
| **#PE-III** | B23CE3209 | Ground Improvement Techniques |
| | B23CE3210 | Air Pollution Control |
| | B23CE3211 | Railways, Airport and Harbour Engineering |
| | B23CE3212 | Finite Element Methods |
| | B23CE3213 | MOOCS -III |
| **#OE-II** | Student has to study one Open Elective offered by AIDS or AIML or CIC or CSBS or CSG or CSE or CSIT or ECE or EEE or ME or IT or S&H from the list enclosed. | |
| *Mandatory Industry Internship /Mini Project of 08 weeks duration during summer vacation | | |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3201** | **PC** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

## DESIGN AND DRAWING OF STEEL STRUCTURES

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Understand fundamental concepts of limit state design of steel structures for design of bolted and welded connection as per IS:800-2007 |
| 2. | Understand the behaviour of the steel structure under tension, compression and flexure as per IS:800-2007 |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Predict** the number of bolts, pitch, gauge and strength of the joint for bolted connections. | K3 |
| 2. | **Model** the size of weld, length of weld, and strength of the joint for welded connections. | K3 |
| 3. | **Find** a suitable section as a tension member and calculate the number of bolts and strength of the tension member. | K3 |
| 4. | **Find** a suitable section as a compression member and determine the strength of the axially loaded compression members as built-up column with lateral supporting system. | K3 |
| 5. | **Find** a suitable rolled steel section as a flexural member and determine its flexural and shear strength, then check the safety of the beam. | K3 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I (10 Hrs)** | Fundamental Concepts of limit state design of structures, Different types of rolled steel sections available to be used in steel structures. Stress – Strain relationship for mild steel. <br> **Bolted connections:** Behavior of bolted joints, Design strength of ordinary black bolts, high strength friction grip bolts, Simple connections. |
| **UNIT-II (10 Hrs)** | **Welded Connections:** Introduction, welding processes, Advantages of welding, Types and properties of welds, Types of joints, weld specifications as per IS 800:2007 code provisions, Types of weld defects, Design of lap joints and butt joints subjected to axial load using fillet and butt welds. |
| **UNIT-III (10 Hrs)** | **Tension members:** Types of tension members, slenderness ratio, displacement of tension members, behaviour of tension members, modes of failure, factors affecting strength of tension members, design of tension members, Lug angles |

| UNIT-IV (10 Hrs) | **Compression members:** Possible failure modes, behaviour of compression members, Effective length, radius of gyration and slenderness of compression members, Allowable stresses in compression, Design of axially loaded compression members, built up compression members with lateral supporting system such as Lacing and Battened. |
|---|---|
| | |
| UNIT-V (10 Hrs) | **Beams:** Beam types, section classifications, lateral stability of beams, Allowable stress in bending, Shear and Bearing stresses, Effective length of compression flange, laterally supported and unsupported beams. |

| Textbooks | |
|---|---|
| 1. | Design of Steel structures by N. Subramanian, Oxford University Press. |
| 2. | Limit State Design of steel structures by S.K.Duggal, McGraw Hill Education Private Ltd. |

| Reference Books | |
|---|---|
| 1. | Limit State Design of steel structures – Ramchandra and Virendra Gehlot, Scientific Publishers (India) |
| 2. | Design of steel structures by K.S.Sai Ram, Pearson Education India. |
| 3. | Design of steel structures by Limit State Method as per IS: 800-2007 – S.S. Bhavikatti, IK Intern |

| e-Resources | |
|---|---|
| 1. | https://archive.nptel.ac.in/courses/105/105/105105162/ |
| 2. | https://archive.nptel.ac.in/courses/105/106/105106112/ |

| Course Code | Category | L | T | P | C | I.M | E.M | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3202** | **PC** | **3** | **--** | **--** | **3** | **30** | **70** | **3 Hrs.** |

## HIGHWAY ENGINEERING

### (For CE)

**Course Objectives:** Students are expected to learn

| 1. | To impart different concepts in the field of Highway Engineering. |
|---|---|
| 2. | To acquire design principles of Highway Geometrics and Pavements. |
| 3. | To learn various traffic management plans. |
| 4. | To acquire knowledge about pavement materials and design of flexible and rigid pavements. |
| 5. | To learn various highway construction and maintenance procedures. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Explain** principles of highway planning and alignment, including surveys, alignment factors, and preparation of drawings and reports for road projects. | K2 |
| 2. | **Apply** geometric design criteria to design elements such as sight distances, horizontal and vertical curves, super elevation, and cross-sectional features of highways. | K3 |
| 3. | **Apply** traffic engineering methods to analyze traffic characteristics, perform traffic studies, and design intersections and traffic signal systems using established standards. | K3 |
| 4. | **Apply** procedures for evaluating highway materials and designing flexible and rigid pavements using relevant tests and established design methods. | K3 |
| 5. | **Apply** appropriate construction techniques and maintenance practices for various types of highways, and evaluate pavements to recommend strengthening measures. | K3 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I (8Hrs)** | **Highway Planning and Alignment:** Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports. |
| **UNIT-II (10 Hrs)** | **Highway Geometric Design:** Importance of Geometric Design- Design controls and Criteria Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical Alignment Gradients- Vertical curves. |

| | |
|---|---|
| **UNIT-III**<br>**(10 Hrs)** | **Traffic Engineering:** Basic Parameters of Traffic-Volume, Speed and Density-Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents - Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways, Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals – Webster Method –IRC Method. |
| | |
| **UNIT-IV**<br>**(10 Hrs)** | **Highway Materials:** Sub grade soil: classification –Group Index – Sub grade soil strength – California Bearing Ratio – Modulus of Sub grade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.<br>**Design of Pavements:** Types of pavements; Functions and requirements of different components of pavements; Design factors, Design of Flexible Pavement using CBR method. Rigid Pavements: Design Considerations, stresses in rigid pavements, Design of Joints, Design of Rigid pavements by IRC method. |
| | |
| **UNIT-V**<br>**(6 Hrs)** | **Highway Construction and Maintenance:** Types of Highway Construction – Earthwork; Construction of Earth Roads, Gravel Roads, Water Bound Macadam Roads, Bituminous Pavements and Cement Concrete Pavements, Pavement Failures, Maintenance of Highways, pavement evaluation, strengthening of existing pavements. |

| Textbooks | |
|---|---|
| 1. | Highway Engineering, Khanna, S.K., Justo, C.E.G and Veeraragavan, A, Revised 10th Edition, Nem Chand & Bros, 2017. |
| 2. | Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi. |
| **Reference Books** | |
| 1. | Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi |
| 2. | Highway Engineering, Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P) Ltd., New Delhi |
| 3. | Principles, Practice and Design of Highway Engineering, Sharma S. K., S. Chand & Company Private Limited, New Delhi. |
| 4. | Highway and Traffic Engineering, Subhash C. Saxena, CBS Publishers, New Delhi. |
| **e-Resources** | |
| 1. | https://archive.nptel.ac.in/courses/105/101/105101087/ |
| 2. | https://archive.nptel.ac.in/courses/105/107/105107220/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3203 | PC | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## ENVIRONMENTAL ENGINEERING

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Introduce the planning and design principles of community water supply systems based on quality and demand. |
| 2. | Equip students with knowledge of conventional and advanced water treatment processes. |
| 3. | Explain water conveyance and distribution network design. |
| 4. | Familiarize students with the principles of sewerage system design, including house plumbing. |
| 5. | Introduce wastewater treatment methods, including the design of preliminary, primary, and secondary treatment units. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Find** a source based on quality and quantity and calculate design population and water demand | K3 |
| 2. | **Apply** the principles of water treatment methods and design unit operations | K3 |
| 3. | **Explain** the collection, conveyance and distribution aspects of water | K2 |
| 4. | **Explain** sewerage, house plumbing, preliminary and primary treatment concepts of wastewater | K2 |
| 5. | **Demonstrate** sewage treatment methods and design secondary treatment unit operations | K3 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (10Hrs)** | Introduction to Water Supply: Importance and necessity of protected water supply – Flowchart of public water supply system – Types of water demand – Per capita demand and influencing factors – Population forecasting (arithmetic, geometric, incremental methods) – Water quality parameters (physical, chemical, biological) – WHO guidelines for drinking water. Indian standards for potable, packaged drinking and mineral waters. |
| **UNIT-II (10 Hrs)** | Treatment of Water: Conventional treatment processes: Sedimentation, coagulation, filtration – Disinfection theory – Chlorination – Alternative disinfection methods – Design principles of treatment units. |
| **UNIT-III (10 Hrs)** | Advanced Treatment and Distribution Advanced methods: Color and odour removal – Iron & manganese removal – Adsorption – Reverse osmosis – Zeolite exchange. Water collection and conveyance – Intake structures – Gravity vs. pressure conduits – Pipe types – Design of pipelines – Distribution layouts. |

| | | |
|---|---|---|
| **UNIT-IV**<br>**(10 Hrs)** | Sewerage and Primary Treatment: Estimation of sewage and stormwater flow – Flow fluctuations – Sewer types – Design of circular sewers – Sewer appurtenances – Sewer cleaning and ventilation – House plumbing – Characteristics of sewage – BOD and first-order kinetics – Preliminary and primary treatment units. | |
| | | |
| **UNIT-V**<br>**(10 Hrs)** | Secondary treatment of Wastewater: Activated sludge process – Design and operational aspects – Trickling filters: types, design, maintenance – Oxidation ponds – Septic tanks – Introduction to other biological treatment methods. | |
| | | |

| **Textbooks** | |
|---|---|
| 1. | Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie |
| 2. | Environmental Engineering (Vol I) - Water Supply Engineering" – S.K.Garg, Khanna Publishers. |
| **Reference Books** | |
| 1. | Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985. |
| 2. | Water Supply and Sanitary Engineering – S.C.Rangwala |
| 3. | Wastewater Engineering: Treatment and Resource Recovery, Metcalf & Eddy / Tchobanoglous, G, McGraw-Hill Education |
| | |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/103107084 |
| 2. | https://nptel.ac.in/courses/103107215 |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3204 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## STRUCTURAL ANALYSIS II
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Analyze the indeterminate truss by force method and energy Method |
| 2. | Analyze the continuous beams and indeterminate rectangular portal frame by Moment Distribution Method and Kani's Method. |
| 3. | Analyze the determinate and indeterminate Arches. |
| 4. | Analyze the determinate and indeterminate Suspension Bridges. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Calculate** the axial forces in the statically indeterminate trusses using method of consistent deformation of unit load method and Castigliano'stheorm – II | K3 |
| 2. | **Compute** the member end moments and shears due to applied loads and yielding of supports for continuous beams and statically indeterminate rigid frames by Moment distribution method. | K3 |
| 3. | **Find** the member end moments and shears due to applied loads and yielding of supports for continuous beams and statically indeterminate rigid frames by Kani's Method. | K3 |
| 4. | **Determine** the horizontal thrust and vertical reactions at the supports, as well as the orthogonal components axial thrust, radial shear and the resultant force at any point for three hinged and two hinged arches. | K3 |
| 5. | **Predict** the shape of the cable, horizontal component of the axial tension in the cable and the length of the cable as well as the shear force and bending moment for three hinged and two hinged stiffening girder. | K3 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I** (10 Hrs) | **Analysis of statically indeterminate trusses by force method:** Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) external redundant supports (b) internal redundant members using (i) method of consistent deformation of unit load method (ii) Castigliano's theorem – II. |
| **UNIT-II** (10 Hrs) | **Analysis of Statically indeterminate beam and rigid frames by Moment Distribution Method:** Analysis of statically indeterminate three span continuous beams due to applied load Analysis of statically indeterminate three span continuous beams for uneven support settlements. Analysis of statically indeterminate rigid frames (without sidesway and with sidesway) |

| | |
|---|---|
| **UNIT-III**<br>**(10 Hrs)** | **Analysis of Statically indeterminate beam and rigid frames by Kani's Method:**<br>Analysis of statically indeterminate three span continuous beams due to applied loads.<br>Analysis of statically indeterminate three span continuous beams for uneven support settlements.<br>Analysis of statically indeterminate rigid frames (without sidesway and with sidesway. |
| | |
| **UNIT-IV**<br>**(10 Hrs)** | **Analysis of Arches:**<br>Introduction, Geometrical Properties, Basic Mechanics, Arch Action, Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches. Moving Loads and Influence Lines on three hinged and two hinged parabolic Arches. Secondary Effects-Temperature effect in two hinged arch, Effects of rib-shortening and Effects of yielding of supports. |
| | |
| **UNIT-V**<br>**(10 Hrs)** | **Cables and Suspension Bridges:**<br>Introduction, Properties of a suspended cable, cable subjected to concentrated load and distributed loads with the supports at same and different levels. Support system, Suspension Bridge with three hinged stiffening girders. Suspension Bridge with two hinged stiffening girders. |

| **Textbooks** | |
|---|---|
| 1. | Statically indeterminate structures – C.K. Wang, Mc Graw Hill Education PVT.LTD |
| 2. | Structural Analysis- T.S. Thandavamoorty, Oxford University Press, New Delhi |

| **Reference Books** | |
|---|---|
| 1. | Theory of Structures Volume II, S.P Gupta, G.S Pandit, R. Gupta –Tata McGraw-Hill Publishing Company Limited, New Delhi |
| 2. | Basic Structural Analysis, C.S. Reddy,  Mc Graw Hill Education(India)  PVT.LTD |
| 3. | Mechanics of structures Vol. II- S.B.Junnarkar and Dr.H.J.shah, Charotar Publishing House. |
| 4. | Structural analysis – Devdas Menon, Narosa Publishing House PVT.LTD |

| **e-Resources** | |
|---|---|
| 1. | https://archive.nptel.ac.in/courses/105/106/105106050/ |
| 2. | https://onlinecourses.nptel.ac.in/noc25_ce110 |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3205 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## SUSTAINABLE MATERIALS AND METHODS FOR CONSTRUCTION

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To introduce the concept of sustainability and its relevance to civil engineering practices. |
| 2. | To familiarize students with sustainable materials and their selection based on performance, environmental impact, and lifecycle costs. |
| 3. | To enable learners to apply sustainability principles in evaluating and designing construction processes and materials. |
| 4. | To expose students to national and international green building frameworks, energy codes, and emerging technologies in sustainable construction. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Apply** the concept of sustainability and its significance to civil engineering. | K3 |
| 2. | **Appraise** sustainability practices in the building and construction industry. | K3 |
| 3. | **Select** and assess sustainable construction materials based on environmental and international norms. | K3 |
| 4. | **Implement** innovative and sustainable construction practices on project sites. | K3 |
| 5. | **Examine** green building rating systems and their role in sustainable development | K3 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I** (10 Hrs) | **Sustainability and Human kind:** Definition and scope of sustainability – Sustainable Development Goals (SDGs) – Agenda of sustainability – Sustainable consumption and production (SCP) – Environmental impacts of consumerism – Role of the United Nations in sustainability advocacy. |
| **UNIT-II** (10 Hrs) | **Sustainability and the Building Industry:** Concept of sustainability in buildings – Embodied energy and operational energy – Life cycle energy and ecological footprint – Sustainable Materials - Role of materials in sustainable construction – Carbon emissions from cement – Alternative cementitious materials – Sustainability challenges for concrete. |
| **UNIT-III** (10 Hrs) | **Sustainable Construction Materials:** Reduction in natural resource usage – High-volume fly ash concrete – Geopolymer concrete – Recycled aggregates – Water-efficient concrete – Slag blended subgrades – Waste plastic and crumb rubber in pavements – |

| | Earthen materials in indoor comfort – Lifecycle assessment – Challenges in sustainable material adoption. |
|---|---|
| **UNIT-IV (10 Hrs)** | **Energy Conservation for Sustainability in Construction:** Operational energy in buildings – Role of material properties (e.g., thermal conductivity) – Energy conservation in cement and aggregate industries – Energy Codes (ECBC) – OTTV (Overall Thermal Transfer Value) – Indoor air quality and its sustainability relevance. |
| | |
| **UNIT-V (10 Hrs)** | **Sustainable Construction Techniques:** Sustainable and modular construction – Zero energy buildings – Flexible space design – Green building principles – Building-integrated photovoltaics (BIPV) – Use of renewable energy – Tree cover and microclimate design – Green rating systems: LEED, GRIHA and others. |

| **Textbooks** | |
|---|---|
| 1. | The Philosophy of Sustainable Design, Jason F. McLennan, Ecotone Publishing Co., 2004 |
| 2. | Sustainable Development Goals: Their Impacts on Forests and People, Pia Katila, Carol J. Pierce Colfer, Wil De Jong, Glenn Galloway, Pablo Pacheco and George Winkel, Cambridge University Press, First edition 2020. |
| **Reference Books** | |
| 1. | Sustainability in Engineering Design and Construction, J.K.Yates, Daniel Castro-Lacouture, CRC Press, Taylor & Francis Group, 2018. |
| 2. | Sustainable Construction – Green Building Design and Delivery, Charles J. Kibert, Wiley Publishers, Fourth edition 2016. |
| 3. | Sustainable Construction, Sandy Halliday, Routledge Publisher, Second edition, 2019. |
| 4. | Sustainable Development in Architecture, Urbanism and Engineering, Pilal Mercader-Moyano, Springer International Publishing, 2017. |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/105102195 |
| 2. | https://onlinecourses.swayam2.ac.in/arp19_ap75/preview |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3206 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## BUILDING SERVICES
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Introduce the various electro-mechanical systems that are found in modern buildings |
| 2. | Explain the role of various Mechanical, Electrical, Plumbing, Firefighting systems in providing occupant comfort, safety and security in their working and living environment. |
| 3. | Emphasize the role of resource conservation in reducing the impact of built environment by integration of renewable energy, resource recycling and biophilic design. |

**Course Outcomes** After completion of the course, the student will be able to

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Identify** the functional requirements of various types of buildings and rooms in buildings. | K2 |
| 2. | **Apply** the significance of fire safety systems and their regular audit in buildings. | K3 |
| 3. | Develop the Layout of plumbing and drainage systems for different types of buildings | K2 |
| 4. | **Integrate** lighting, ventilation, and acoustic design elements to optimize occupant comfort and building performance. | K3 |
| 5. | **Formulate** resource conservation strategies appropriate for sustainable building operations. | K2 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (8 Hrs)** | **Introduction** Types of buildings, functional requirements – Role of building Service professionals.<br>**Vertical Transportation**<br>Lifts: Different types of lifts and its uses – Component parts of Lift – Lift Well, Travel, Pit, Hoist way, Machine, Buffer, Lift Car, landing, door, Call indicators, Design Provisions for basic size calculations of enclosure space.<br>Escalators: Different types of escalators and their uses – Components, space calculation, safety measures<br>Ramp: Necessity, gradient calculation, special features to aid movement of physically challenged and elderly. |
| **UNIT-II (8 Hrs)** | **Fire Safety**<br>Fire protection requirements for multi-storeyed building. Causes of fire in buildings. Fire detection and fighting systems. Working principles of various fire protection systems. Safety<br>requirements in various types of buildings – Fire resistant design and materials – Fire inspection – Provisions for evacuation |

| | |
|---|---|
| **UNIT-III**<br>**(8 Hrs)** | **Plumbing systems for water supply and sanitation**<br>Types and function of plumbing fixtures, sizes, capacities, traps, interceptors. Storage of water, hot and cold-water supply systems. Drainage systems – One Pipe System, Two Pipe Systems, Vents and purpose of venting, wastewater reclamation. |
| | |
| **UNIT-IV**<br>**(8 Hrs)** | **Lighting - Ventilation and Acoustics**<br>Natural and electrical lighting, Different lighting schemes, direct light, diffuse light, glare. Different control mechanisms for achieving comfortable light conditions. Lumen and Lux considerations in selecting luminaires- Case studies on natural light utilization (Philippines) Natural Ventilation and Mechanical Ventilation. Concept of Thermal comfort, Cooling Degree Days, Air changes.<br>Building Acoustics, Acoustic design of buildings and appropriate materials selections |
| | |
| **UNIT-V**<br>**(8 Hrs)** | **Natural Resource Conservation**<br>Rainwater Harvesting. Components – Catchments, gutters, conduits, filters, storage, recharge or storage structures. Potential of RWH for various locations and building roof and landscape designs, Case studies on RWH in India – Domestic Hot Water from Solar Water heaters – Basics of heat transfer, passive and direct heating systems, sizing, cost benefit analysis of using solar water heaters |

**Textbooks:**

| | |
|---|---|
| 1. | Principle of Fire Safety Engineering: Understanding Fire and Fire Protection, Akhil Kumar Das, PHI Learning Pvt. Ltd. New Delhi |
| 2. | Plumbing Design and Practise, Deolalikar, S.G. McGraw hill, New Delhi |

**Reference Books:**

| | |
|---|---|
| 1. | The A – Z of practical building construction and its Management, Mantri, Sandeep, Satya Prakashan, New Delhi |
| 2. | Textbook Of Refrigeration And Air-Conditioning, R S Khurmi, S.Chand Publishers |
| 3. | National Building Code Part 1, 4, 8, 9 Bureau of Indian Standards |
| 4. | IS 12783 (Part 1) Code of Practise for plumbing in multistoried buildings, Bureau of Indian Standards, 2008 Uniform Plumbing Code – India , Bureau of Indian Standards |

**e-Resources**

| | |
|---|---|
| 1. | https://codes.iccsafe.org/content/IPC2021P1 |
| 2. | https://energyplus.net/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3207 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## VALUATION AND QUANTITY SURVEY
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To develop the valuation of properties and preparation of reports for estimation of various items of work |
| 2. | To provide the student with the ability to estimate the quantities of item of works involved in buildings & road works |
| 3. | To Equip the student with the ability to do rate analysis |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Use** various methods to find out the valuation of a property & contracts | K3 |
| 2 | **Explain** various components, estimations and units of measurement for different works | K2 |
| 3 | **Apply** the method of building estimate to find out the quantities of various items of work | K3 |
| 4 | **Determine** the rate per unit of various items of work and their specifications | K3 |
| 5 | **Calculate** the estimation of various roads and related items | K3 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I**<br>**(12 Hrs)** | **Valuation of buildings:** Purpose, different methods of building valuation; different terms used in valuation and their meaning, Types of contracts. |
| **UNIT-II**<br>**(08 Hrs)** | Definitions-Importance of estimation and costing, Standard units, Units of measurement of different items of work., Different types of estimates, Data required for preparation of estimate, Different technical terms in estimation- Contingencies, Work charged Establishments, measurement book, schedule of rates and related terms in the estimate, different types of approvals. |
| **UNIT-III**<br>**(12 Hrs)** | **Detailed estimate of buildings:** Different items of work in building. Estimation of an Reinforced Concrete framed structure. |
| **UNIT-IV**<br>**(08 Hrs)** | **Specifications:** Meaning, purpose, types of specifications, general specification, detailed specifications of different items of buildings and other structures – Rate analysis –Data sheet for materials and various items of work in buildings and other structures, schedule of rates. |

| UNIT-V (08 Hrs) | Estimate of earth work in roads; different formulae for calculations, Estimate of Earthen & Metalled roads |
|---|---|
|  |  |

| Textbooks | |
|---|---|
| 1 . | Estimating and Costing in Civil Engineering by B.N. Dutta. |
| 2 . | Estimation, Costing, Specifications and Valuation in civil Engineering by M. Chakraborti. |

| Reference Books | |
|---|---|
| 1 . | Textbook of Estimating and Costing by G.S. Birdie. |
| 2 . | Textbook on Estimating, Costing and Accounts by D.D. Kohli and R.C. Kohli. |
|  |  |

| e-Resources | |
|---|---|
| 1. | https://nptel.ac.in/courses/105103093 |
| 2. | https://onlinecourses.swayam2.ac.in/nou20_cs11/preview |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3209 | ES | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## GROUND IMPROVEMENT TECHNIQUES
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To understand and apply various in-situ densification techniques for improving both granular and cohesive soils, including methods like vibration, preloading, sand drains, stone columns, vacuum consolidation, and thermal techniques. |
| 2. | To gain knowledge of grouting techniques, including types of grouts (suspension and solution), equipment, injection methods, and their practical applications in ground improvement. |
| 3. | To explore the use of geosynthetics such as geotextiles and geogrids, including their types, functions, testing procedures, and applications in soil reinforcement and stabilization. |
| 4. | To study the principles and methods of soil reinforcement and stabilization, including reinforced soil structures and mechanical, cement, lime, and bituminous stabilization techniques, along with design and construction practices. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Understand** the principles and applications of in-situ densification techniques for improving both granular and cohesive soils. | K2 |
| 2. | **Understand** the types, procedures, and field applications of grouting methods used in ground improvement. | K2 |
| 3. | **Understand** the functions, types, and uses of geosynthetics such as geotextiles and geogrids in soil stabilization. | K2 |
| 4. | **Understand** the concept and components of reinforced soil systems and their relevance in geotechnical engineering. | K2 |
| 5. | **Understand** various soil stabilization techniques including mechanical, cement, lime, and bituminous methods for improving soil properties. | K2 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I** **(10 Hrs)** | **In-situ densification Methods:** Granular soils – Introduction of vibration at the ground surface, Impact at the ground surface, vibration at depth, impact at depth, field compaction control; Cohesive soils - introduction, preloading or dewatering, drain walls, sand drains, sand wicks, geodrains/band drains, lime columns, Stone columns: construction practice, comparison with lime column, design principles, vibro floatation techniques and other techniques like dynamic replacement etc., forced vacuum preconsolidation, thermal methods |
| **UNIT-II** **(10 Hrs)** | **Grouting:** Introduction, grout injections, suspension and solution grouts, grouting equipment and methods, applications. |

| | |
|---|---|
| **UNIT-III** **(10 Hrs)** | **Geosynthetics:** Geotextiles: Introduction, types of geotextiles; Functions and their application, tests for geotextile, Geogrids: Introduction, types, functions and applications, tests for geogrids. |
| | |
| **UNIT-IV** **(10 Hrs)** | **Reinforced Soil:** Principles, components of reinforced soil, functions, determination of angle of interfacial friction, factors effecting angle of interfacial friction, application of reinforced soil technique. |
| | |
| **UNIT-V** **(10 Hrs)** | **Stabilization:** Mechanical stabilization, Soil aggregate mixture, properties and proportioning techniques, soft aggregate stabilization. Cement stabilization, Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques. Lime and Bituminous Stabilization: types of admixtures, mechanism, factors affecting, construction methods. |
| | |

| **Textbooks** | |
|---|---|
| 1. | Construction and Geotechnical Methods in Foundation Engineering, Robert M. Koerner: McGraw Hill. |
| 2. | Purushothama Raj. P, "Ground Improvement Techniques", 2nd ed., Laxmi Publications (p) Ltd., New Delhi, 1998. |
| **Reference Books** | |
| 1. | Engineering with Geosynthetics by G.VenkatappaRao and G.V.S. SuryanarayanaRaju – Tata McGraw Hill, New Delhi, 1990. |
| 2. | Fundamentals of Geosynthetic Engineering by Sanjay Kumar Shukla, Jian-Hua Yin, CRC Press. |
| | |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/105108075 |
| 2. | https://archive.nptel.ac.in/courses/105/105/105105210/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3210 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## AIR POLLUTION AND CONTROL
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | Introduce the fundamental concepts of air pollution and its classification. |
| 2. | Explain meteorological phenomena that influence pollutant dispersion and plume behavior. |
| 3. | Assess the impacts of air pollution on human health, ecology, and infrastructure. |
| 4. | Describe procedures for air quality monitoring, sampling, and emission inventories. |
| 5. | Familiarize students with industrial air pollution control technologies and their applications. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1. | **Describe** the pollutants of atmosphere based on various criteria | K2 |
| 2. | **Explain** the different meteorological conditions and phenomena that influence the dispersion of the pollutants and plume behavior | K2 |
| 3. | **Summarize** the effects of air pollution on plants, animals, human beings and built environment | K2 |
| 4. | **Explain** the processes of sampling and monitoring of air pollution | K2 |
| 5. | **Explain** various pollution control equipment or methods to control emissions | K2 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (06 Hrs)** | **Introduction to Air Pollution:** Definition of air pollution – Factors affecting air pollution – Classification of pollutants: particulates and gases – Sources of pollution – Industrial siting considerations – Ambient air quality standards. |
| **UNIT-II (08 Hrs)** | **Meteorology and Pollutant Dispersion:** Meteorological parameters: wind rose diagrams, temperature lapse rates, mixing depth – Atmospheric dispersion – Plume behavior types – Pollutant accumulation – Effective stack height – Gaussian plume models (concept only). |
| **UNIT-III (08 Hrs)** | **Impacts of Air Pollution:** Effects on human health, animals, vegetation, materials, and visibility – Major air pollution episodes (London, Bhopal, Delhi, etc.) – Seasonal variations and crop calendar links to pollution events in India. |
| **UNIT-IV (10 Hrs)** | **Sampling and Monitoring:** Air pollution sampling techniques – Ambient air quality monitoring and stack sampling – Collection of gaseous and particulate pollutants – Isokinetic sampling – Air quality surveys – Introduction to air pollution simulation models. |

| UNIT-V (10 Hrs) | **Control of air pollution:** Particulate pollutant control equipment: settling chambers, cyclones, scrubbers (wet, centrifugal, spray towers), ESPs – Gaseous pollutant control: absorption, adsorption, combustion (afterburners) – Design concepts and limitations. |
|---|---|

| **Textbooks** | |
|---|---|
| 1. | Air Pollution and Control Engineering, Y Anjanaeyulu, BS Publications / BSP Books; 2nd edition (1 January 2020) |
| 2. | Air Pollution and Control by K.V.S.G. Murali Krishna, University Science Press |

| **Reference Books** | |
|---|---|
| 1. | Fundamentals of Air Pollution by Dr. B.S.N. Raju, CBS Publishers and Distributors Pvt Ltd (16 August 2018) |
| 2. | Air Pollution, M.N.Rao, H.V.N.Rao, 1st Edition, McGraw Hill Education. |

| e-Resources | |
|---|---|
| 1. | https://nptel.ac.in/courses/105107213 |
| 2. | https://nptel.ac.in/courses/105104099 |

| Course Code | Category | L | T | P | C | I.M | E.M | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3211 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## RAILWAYS, AIRPORT AND HARBOUR ENGINEERING

### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1 | To learn about the various modes of transportation with their relative merits and demerits. |
| 2 | To learn about the design of various geometric elements of a railway track. |
| 3 | To learn about the factors in site selection for an airport. |
| 4 | To learn about the design guidelines for various elements of a harbor. |
| 5 | To learn about the urban mass transportation in developing countries and compare the various modes of urban mass transportation systems. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Explain** and compare the various modes of transportation with their relative merits and demerits. | K2 |
| 2 | **Design** the geometric elements of a railway track | K3 |
| 3 | **Assess** the suitable location for an airport and design the landing area | K3 |
| 4 | **Explain** design guidelines for the various elements within the harbor | K2 |
| 5 | **Explain** the need of urban mass transportation in developing countries and compare the various modes of urban mass transportation systems. | K2 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (6 Hrs)** | **Introduction:** Importance of transportation systems, Different modes, characteristics, their integration and comparison. Role of railways in transportation, Advantages of railways, Indian railways, classification, present scenario of railway development in India. Overview of air transportation, Role of FAA and ICAO, air transport in India, types of airports. |
| **UNIT-II (6 Hrs)** | **Railway Engineering:** Components and Geometrical Design of Railways – Horizontal Curves, Radius, Super elevation, Cant Deficiency, Transitional Curves, Different types of Gradients, Grade Compensation, Points and Crossings and their Design; Signaling & Interlocking. |
| **UNIT-III (8 Hrs)** | **Airport Engineering:** Factors affecting site selection and spacing of airports. Components of an airport and their functions. Typical layout. Geometrical Design Considerations – Taxiways, Runways and Aprons. Basic Runway Length and corrections – Runway Orientation. |

| UNIT-IV (8 Hrs) | **Harbour Engineering:** Harbour related terminology, Type of harbours, Site selection, accessibility, size and shape of harbour, Navigational aids: Fixed and Floating Signals, lighthouse, Beacons, Buoys, Fog Signals |
|---|---|
| | |
| UNIT-V (8 Hrs) | **Urban transportation systems:** Importance of collective transportation v/s individual transportation, freight transportation, Physical system components of urban transportation, Overview of Mass rapid transit, Light rail transit, Personal rapid transit, guided way systems, Para transit systems, Mono rail, bus rapid transit systems |

| Text Books | |
|---|---|
| 1 | Satish Chandra and M. M Agarwal, Railway Engineering, Oxford university Press, Second Edition 2013. |
| 2. | Rangwala, "Airport Engineering", Charotar Publishing House, 17th Edition 2018. |
| **Reference Books** | |
| 1 | R Srinivasan, "Harbour, Dock and Tunnel Engineering", Charotar Publishing House, 2012. |
| 2 | S.P. Arora & S.C. Saxena, A text Book of Railway Engineering Srinivasan, Docks, Harbors and Tunnels. |
| **e-Resources** | |
| 1. | https://nptel.ac.in/courses/105107123 |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23CE3212 | PE | 3 | -- | -- | 3 | 30 | 70 | 3 Hrs. |

## FINITE ELEMENT METHODS

(For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To understand the fundamental principles, methods, and procedures involved in Finite Element Analysis and its application in engineering problems. |
| 2. | To analyse one-dimensional bar elements, simple trusses and beams by deriving shape functions, formulating the stiffness matrices, assembling the global stiffness matrix, and applying boundary conditions. |
| 3. | To analyse the two-dimensional finite elements using the CST concept. |

**Course Outcomes:** Students will be able to

| S. No. | Outcome | Knowledge Level |
|---|---|---|
| 1. | Understand the fundamental concepts, methods, and finite element analysis procedures to solve engineering problems. | K2 |
| 2. | Analyze one-dimensional bar elements by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions. | K3 |
| 3. | Analyze trusses by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions. | K3 |
| 4. | Analyze beam elements by formulating and assembling the global stiffness matrix using shape functions and applying boundary conditions. | K3 |
| 5. | Implement the formulation techniques to solve two-dimensional problems using triangle elements (CST) | K3 |

## SYLLABUS

| | |
|---|---|
| **UNIT-I (10Hrs)** | **Basic concepts of Finite Element analysis:** Fundamental concepts of Finite Element Analysis: Need – Applications – Stresses and Equilibrium – Boundary conditions – Stress-Strain relations, Interpolation functions, Methods of Engineering Analysis: Experimental – Analytical - Numerical methods, Numerical methods: Variational method - Weighted residual methods - concept of potential energy. **Introduction to Finite Element Method:** Basic steps of Finite Element Analysis, Elements and their types, Characteristics of finite element, Location of nodes, Node numbering scheme, Degree of freedom, Shape functions, Coordinate systems: Global - local coordinate systems, boundary conditions. |
| **UNIT-II (10 Hrs)** | **Analysis of One-dimensional (1D) bar elements:** Bar elements (two-stepped bars only) - shape function, derivation of stiffness matrix, |

| | assembly of global stiffness matrix, and boundary conditions. |
|---|---|
| | |
| **UNIT-III** **(10 Hrs)** | **Analysis of simple Trusses:** Derivation of stiffness matrix for truss element, Assembly of global stiffness matrix, boundary conditions. |
| | |
| **UNIT-IV** **(10 Hrs)** | **Analysis of Beams (single span):** Derivation of stiffness matrix for beam element, Assembly of global stiffness matrix, boundary conditions. |
| | |
| **UNIT-V** **(10 Hrs)** | **Two-dimensional (2D) finite elements:** Derivation of shape functions for two-dimensional linear element, Stress-strain relationship matrix, Plane stress and plane strain, Comparison of CST and LST elements, Derivation of stiffness matrix for CST element. |
| | |

| **Textbooks:** | |
|---|---|
| 1. | Finite Elements Analysis by Dr. S. Senthil, R. Panneer dhass- Lakshmi Publications Chennai. |
| 2. | Finite Elements Methods in Engineering by Tirupati R. Chandrupatla and Ashok D. Belegundu - Pearson Education Publications. |
| 3. | A first course in the Finite element method by Daryl L. Logan, Cengage Learning India. |
| 4. | Introduction of Finite Element Analysis by S. Md. Jalaludeen, Anuradha Publications. |
| | |

| **Reference Books:** | |
|---|---|
| 1. | Concepts and Applications of Finite Element Analysis by Robert D. Cook, David S. Malkus and Michael E. Plesha. John Wiley & Sons. |
| 2. | Finite Element Analysis – Theory & Programming by C. S. Krishna Murthy- Tata McGraw Hill Publishers. |
| 3. | Textbook of Finite Element Analysis by P. Seshu – Prentice Hall of India. |
| | |

| **e-Resources** | |
|---|---|
| 1. | https://archive.nptel.ac.in/courses/105/105/105105041/ |
| 2. | https://archive.nptel.ac.in/courses/105/106/105106051/ |

| Course Code | Category | L | T | P | C | C.I.E | S.E.E | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3214** | **PC** | -- | -- | **3** | **1.5** | **30** | **70** | **3 Hrs.** |

## ENVIRONMENTAL ENGINEERING LAB

(For CE)

**Course Objectives:**

| | |
|---|---|
| 1 | Instruct students in the standard laboratory procedures for testing physical and chemical parameters of water. |
| 2 | Emphasize the relevance of laboratory testing in evaluating environmental water quality and in designing treatment processes. |

**Course Outcomes**: At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Determine** the physical characteristics of water through standard lab techniques. | K5 |
| 2 | **Analyze** the chemical characteristics of water relevant to environmental and public health. | K5 |
| 3 | **Determine** the optimum coagulant dosage using the jar test method for sedimentation. | K5 |
| 4 | **Estimate** the total, dissolved, and settleable solids present in water samples. | K5 |

## SYLLABUS
## LIST OF EXPERIMENTS

| | |
|---|---|
| 1 | Determination of Hardness of Water |
| 2 | Determination of Acidity |
| 3 | Determination of Alkalinity |
| 4 | Estimation of Chlorides |
| 5 | Determination of Dissolved Oxygen (DO) |
| 6 | Estimation of Available Chlorine in Bleaching Powder |
| 7 | Determination of Residual Chlorine in Water Samples |
| 8 | Estimation of Total Solids and Dissolved Solids |
| 9 | Measurement of Settleable Solids |
| 10 | Jar Test to Determine Optimum Coagulant Dose |

## Reference Books

| | |
|---|---|
| 1 | Environmental Engineering by S.K.Garg |
| 2 | Environmental Engineering lab manual, KVSG Murali Krishna ,Reem Publications , New Delhi,2019. |

| Course Code | Category | L | T | P | C | I.M | E.M | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3215** | **PC** | -- | -- | **3** | **1.5** | **15** | **35** | **3 Hrs.** |

## HIGHWAY ENGINEERING LAB

### (For CE)

**Course Objectives:** Student shall be able to

| 1 | Develop the testing skills of the road aggregates. |
|---|---|
| 2 | Impart the knowledge on the properties of bitumen. |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Analyze** the strength, toughness, shape, and durability characteristics of road aggregates through standard laboratory tests. | K4 |
| 2 | **Evaluate** the physical properties and performance characteristics of bituminous materials using penetration, softening point, ductility, and related tests. | K4 |
| 3 | **Assess** the quality and stability of bituminous mixes through bitumen extraction and Marshall Stability tests. | K4 |

## SYLLABUS

### LIST OF EXPERIMENTS

| 1 | Determine the strength of the aggregates by using the Aggregate Crushing Value Test. |
|---|---|
| 2 | Determine the toughness of the aggregate by using the Aggregate Impact Value Test. |
| 3 | Determine the flakiness index of the given aggregate sample. |
| 4 | Determine the elongation index of the given aggregate sample. |
| 5 | Determine the Attrition value of a given aggregate sample. |
| 6 | Determine the Abrasion value of a given aggregate sample. |
| 7 | Determine the Specific gravity & Water absorption values for a given aggregate sample. |
| 8 | Determine the Penetration value of a given bitumen sample. |
| 9 | Determine the Softening point value for a given bitumen sample. |
| 10 | Determine the Flash & fire point of a given bituminous material sample. |
| 11 | Determine the Ductility value of a given bituminous material sample. |
| 12 | Testing on Bituminous Mixes: Bitumen Extraction Test, Marshal Stability Test (Demonstration) |

**Reference Books**

| 1 | Lab manual in Highway Engineering by Ajay. K. Duggal & Vijay .P. Puri, New Age publications, New Delhi. |
|---|---|

| Course Code | Category | L | T | P | C | C.I.E | S.E.E | Exam |
|---|---|---|---|---|---|---|---|---|
| **B23CE3216** | **SEC** | **--** | **1** | **2** | **2** | **30** | **70** | **3 Hrs.** |

## CAD LAB

(For CE)

**Course Objectives:**

| | |
|---|---|
| 1 | Learn the usage of any fundamental software for design |
| 2 | Create geometries using pre-processor |
| 3 | Analyze and Interpret the results using post processor |
| 4 | Design the structural elements |

**Course Outcomes:** At the end of the course, the student will be able to

| S. No | Outcome | Knowledge Level |
|---|---|---|
| 1 | **Analyze** determinate and indeterminate structures, including beams, frames, space frames, and trusses using structural analysis software. | K4 |
| 2 | **Apply** design tools for structural components such as steel beams, built-up members, and foundations using software and spreadsheets. | K4 |
| 3 | **Analyze** structural detailing requirements for RCC and steel members as per relevant design standards. | K4 |

| | LIST OF EXPERIMENTS |
|---|---|
| 1 | Analysis & Design determinate structures using a software |
| 2 | Analysis &Design of fixed &continuous beams using a software |
| 3 | Analysis & Design of Plane Frames |
| 4 | Analysis & Design of space frames subjected to DL & LL |
| 5 | Analysis & Design of residential building subjected to all loads (DL, LL,WL,EQL) |
| 6 | Analysis & Design of Roof Trusses |
| 7 | Design and detailing of built up steel beam |
| 8 | Developing a design program for foundation using EXCEL Spread Sheet |
| 9 | Detailing of RCC beam and RCC slab |
| 10 | Detailing of Steel built up compression member |

| | Reference Books |
|---|---|
| 1 | Environmental Engineering by S.K.Garg |
| 2 | Environmental Engineering lab manual, KVSG Murali Krishna ,Reem Publications , New Delhi,2019. |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23AC3201 | AC | 2 | -- | -- | -- | 30 | -- | 3 Hrs. |

## TECHNICAL PAPER WRITING & IPR

### (Common to AI&DS, CSE, AIML, CSIT, IT, CSD, CSBS, CIC, CE, ME)

**Course Objectives:**

| | |
|---|---|
| 1. | To appreciate the difference in English used in Academic, Business, Legal and other contexts. |
| 2. | To know the fundamentals of basic technical report structure and writing. |
| 3. | To understand the filing and processing of patent application. |

**Course Outcomes**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | Construct grammatically sound and concise technical write-ups. | K3 |
| 2. | Prepare the outline and structure of a technical paper with essential sections. | K3 |
| 3. | Develop a project proposal and dissertation framework aligned with academic conventions. | K3 |
| 4. | Use a word processor effectively for document formatting, citations, and version control. | K3 |
| 5. | Identify appropriate IPR mechanisms for protecting various types of intellectual creations. | K3 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (10Hrs)** | **Introduction:** An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing. **Planning and Structuring:** Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing. |
| **UNIT-II (10 Hrs)** | **Drafting report and design issues:** The use of drafts, Illustrations and graphics. **Final edits:** Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity. |
| **UNIT-III (10 Hrs)** | **Proofreading and summaries:** Proofreading, summaries, Activities on summaries. **Presenting final reports:** Printed presentation, Verbal presentation skills, Introduction to proposals and practice. |
| **UNIT-IV (10 Hrs)** | **Using word processor:** Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros |

| UNIT-V (10 Hrs) | **Nature of Intellectual Property:** Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property |
|---|---|
| | |

**Textbooks:**

| 1. | Kompal Bansal &Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016. |
|---|---|
| 2. | William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson. |

**Reference Books:**

| 1. | Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015. |
|---|---|
| 2. | Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011. |
| 3. | Day R, How to Write and Publish a Scientific Paper, Cambridge University Press(2006) |
| | |

**e-Resources**

| 1. | https://www.udemy.com/course/reportwriting/ |
|---|---|
| 2. | https://www.udemy.com/course/professional-business-english-and-technical-report-writing/ |
| 3. | https://www.udemy.com/course/betterbusinesswriting/ |

| Course Code | Category | L | T | P | C | C.I.E. | S.E.E. | Exam |
|---|---|---|---|---|---|---|---|---|
| B23MC3202 | MC | 2 | -- | -- | -- | 30 | -- | -- |

### EMPLOYABILITY SKILLS - II (Mandatory Course)
### (For CE)

**Course Objectives:**

| | |
|---|---|
| 1. | To introduce concepts required in framing grammatically correct sentences and identifying errors while using standard English. |
| 2. | To acquaint the learner of making a coherent and cohesive sentences and paragraphs for composing a written discourse. |
| 3. | To inculcate logical thinking in order to frame and use data as per the requirement. |

**Course Outcomes**

| S.No | Outcome | Knowledge Level |
|---|---|---|
| 1. | Match various vocabulary items that appear in competitive examinations with their contextual meanings accurately. | K1 |
| 2. | Identify grammatical and ungrammatical usage of English language in all the grammar related questions asked in various competitive examinations like CAT, GRE, IBPS. | K3 |
| 3. | Infer meaning from complex texts that are set as questions in different competitive examinations held for higher education or employment | K2 |
| 4. | Find solutions to complex arithmetic problems set as questions in the competitive examinations held for employment or higher education | K1 |
| 5. | Apply logical thinking abilities in solving the problems of reasoning that appear in the examinations like CAT, GRE, GATE, IBPS. | K3 |

### SYLLABUS

| | |
|---|---|
| **UNIT-I (10Hrs)** | Synonyms, Antonyms, Frequently Confused Words, Foreign Phrases, Idioms and Phrasal Verbs, Collocations. Spotting Errors, Sentence Improvement |
| **UNIT-II (10 Hrs)** | Time and work, Pipes and Cisterns. Time and Distance Problems, Problems on boats and streams. Percentages, Profit and loss, Simple interest and Compound interest. Discount Problems. |
| **UNIT-III (10 Hrs)** | Analogies, Odd One Out. (Verbal ability) Number Series, Letter Series, Analogy, Alpha Numeric Series, Order and Ranking, Directions, Data sufficiency, Syllogisms. |

| UNIT-IV<br>(10 Hrs) | Sentence Completion, Sentence Equivalence, Close Test<br>Reading Comprehension , Para Jumbles |
|---|---|
| | |
| UNIT-V<br>(10 Hrs) | Number System: Divisibility tests, finding remainders in various cases, Problems related to numbers, Methods to find LCM, Methods to find HCF. |

| Textbooks: | |
|---|---|
| 1. | *How to Prepare for Verbal Ability and Reading Comprehension for CAT* (10<sup>th</sup> edition) by Arun Sharma and Meenakshi Upadhyay,  McGraw Hill Education, 2022. |
| 2. | *How to Prepare for Quantitative Aptitude for CAT (10<sup>th</sup> edition) by* by Arun Sharma , McGraw Hill Education, 2022. |
| Reference Books: | |
| 1. | *English Collocation in Use-* Intermediate (2<sup>nd</sup> edition) by Michael McCarthy& Felicity O'Dell, CUP, 2017. |
| 2. | *Magical Book On Quicker Maths* (5<sup>th</sup> Edition) By M.Tyra, BSC Publishing Co Pvt. Ltd, 2018. |
| | |
| e-Resources | |
| 1. | www.Indiabix.com |
| 2. | www.800score.com |