## OBE & CBCS

## CIVIL ENGINEERING BOARD

**Course Title: CONSTRUCTION MANAGEMENT AND ENTREPRENEURSHIP**

**As per Choice Based Credit System (CBCS) scheme]**

**SEMESTER:V**

| | | | |
|---|---|---|---|
| **Subject Code** | **18CV51** | **IA Marks** | **40** |
| **Number of Lecture Hours/Week** | **04** | **Exam Marks** | **60** |
| **Total Number of Lecture Hours** | **50** | **Exam Hours** | **03** |
| **CREDITS –03** | | **Total Marks - 100** | |

Course Objectives: This course will enable students to

1. Understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.
2. Inculcate Human values to grow as responsible human beings with proper personality.
3. Keep up ethical conduct and discharge professional duties.

Module -1

Management: Characteristics of management, functions of management, importance and purpose of planning process, types of plans

Construction Project Formulation: Introduction to construction management, project organization, management functions, management styles

Construction Planning and Scheduling: Introduction, types of project plans, work breakdown structure, Grant Chart, preparation of network diagram- event and activity based and its critical path-critical path method, concept of activity on arrow and activity on node.

**L1,L2,L3**

Module -2

Resource Management: Basic concepts of resource management, class of labour, Wages & statutory requirement, Labour Production rate or Productivity, Factors affecting labour output or productivity.

Construction Equipments: classification of construction equipment, estimation of productivity for: excavator, dozer, compactors, graders and dumpers. Estimation of ownership cost, operational and maintenance cost of construction equipments. Selection of construction equipment and basic concept on equipment maintenance

Materials: material management functions, inventory management.

**L1,L2,L3**

Module -3

Construction Quality , safety and Human Values:

Construction quality process, inspection, quality control and quality assurance, cost of quality, ISO standards. Introduction to concept of Total Quality Management

HSE: Introduction to concepts of HSE as applicable to Construction. Importance of safety in construction , Safety measures to be taken during Excavation , Explosives , drilling and blasting , hot bituminous works , scaffolds / platforms / ladder , form work and equipment operation.Storage of materials. Safety through legislation, safety campaign. Insurances.

Ethics : Morals, values and ethics, integrity, trustworthiness , work ethics, need of engineering ethics,Professional Duties, Professional and Individual Rights, Confidential and Proprietary Information, Conflict of Interest Confidentiality, Gifts and Bribes, Price Fixing, Whistle Blowing.

**L1,L2,L3**

Module -4

Introduction to engineering economy :

Principles of engineering economics, concept on Micro and macro analysis, problem solving and decision making.

Interest and time value of money: concept of simple and compound interest, interest formula for: single payment, equal payment and uniform gradient series. Nominal and effective interest rates, deferred annuities, capitalized cost.

Comparison of alternatives : Present worth, annual equivalent , capitalized and rate of return methods , Minimum Cost analysis and break even analysis

**L1,L2,L3**

Module -5

Ent repreneurship: Evolution of the concept, functions of an entrepreneur, concepts of entrepreneurship, stages in entrepreneurial process, different sources of finance for entrepreneur, central and state level financial institutions.
Micro, Small & Medium Enterprises (MSME): definition, characteristics, objectives, scope, role of MSME in economic development, advantages of MSME, Introduction to different schemes: TECKSOK, KIADB, KSSIDC, DIC, Single Window Agency: SISI, NSIC, SIDBI, KSFC
Business Planning Process: Business planning process, marketing plan, financial plan, project report and feasibility study, guidelines for preparation of model project report for starting a new venture. Introduction to international entrepreneurship opportunities , entry into international business , exporting , direct foreign investment , venture capital

**L1,L2,L3**

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

1. Understand the construction management process.
2. Understand and solve variety of issues that are encountered by every professional in discharging professional duties.
3. Fulfill the professional obligations effectively with global outlook

Program Objectives:

1. Engineering knowledge
2. Problem analysis
3. Interpretation of data

Question Paper Pattern:

1. The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
2. There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
3. Each full question shall cover the topics as a module
4. The students shall answer five full questions, selecting one full question from each

Text Books:


1. P C Tripathi and P N Reddy, “Principles of Management”, Tata McGraw-Hill Education
2. Chitkara, K.K, “Construction Project Management: Planning Scheduling and Control”, Tata McGraw- Hill Publishing Company, New Delhi.
3. Poornima M. Charantimath , “Entrepreneurship Development and Small Business Enterprise”, Dorling Kindersley (India) Pvt. Ltd., Licensees of Pearson Education
4. Dr. U.K. Shrivastava “Construction Planning and Management”, Galgotia publications Pvt. Ltd. New Delhi.
5. Bureau of Indian standards – IS 7272 (Part-1)- 1974 : Recommendations for labour output


Reference Books:


1. Robert L Peurifoy, Clifford J. Schexnayder, Aviad Shapira, Robert Schmitt, “Construction Planning, Equipment, and Methods (Civil Engineering), McGraw-Hill Education
2. Harold Koontz, Heinz Weihrich, “Essentials of Management: An International, Innovation, and Leadership perspective”, T.M.H. Edition, New Delhi
3. Frank Harris, Ronald McCaffer with Francis Edum-Fotwe, “ Modern Construction Management”, Wiley-Blackwell
4. Mike Martin, Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill Education
5. Chris Hendrickson and Tung Au, “Project Management for Construction - Fundamentals Concepts for Owners, Engineers, Architects and Builders”, Prentice Hall, Pitsburgh
6. James L.Riggs , David D. Bedworth , Sabah U. Randhawa “ Engineerng Economics” 4 ed tata Mc Graw hill.

**TITLE OF THE COURSE: ANALYSIS OF INDETERMINATE STRUCTURES**
**B.E., V Semester, Civil Engineering**
**[As per Choice Based Credit System (CBCS) scheme]**

| | | | |
|---|---|---|---|
| **Course Code** | **18CV52** | **CIE Marks** | **40** |
| **Number of Lecture Hours/Week** | **04** | **SEE Marks** | **60** |
| **Total Number of Lecture Hours** | **50 (10 Hours per Module)** | **Exam Hours** | **03** |

**Credits – 04**

**Course Objectives:** This course will enable students to

1. Apply knowledge of mathematics and engineering in calculating slope, deflection, bending moment and shear force using slope deflection, moment distribution method and Kani's method.
2. Identify, formulate and solve problems in structural analysis.
3. Analyze structural system and interpret data.
4. use the techniques, such as stiffness and flexibility methods to solve engineering problems
5. communicate effectively in design of structural elements

**Module-1**

**Slope Deflection Method:** Introduction, sign convention, development of slope deflection equation, analysis of continuous beams including settlements, Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy≤3

**L2, L4,L5**

**Module-2**

**Moment Distribution Method:** Introduction, Definition of terms, Development of method, Analysis of continuous beams with support yielding, Analysis of 08 Hours orthogonal rigid plane frames including sway frames with kinematic indeterminacy ≤3

**L2, L4,L5**

**Module-3**

**Kani's Method:** Introduction, Concept, Relationships between bending moment and deformations, Analysis of continuous beams with and without settlements, Analysis of frames with and without sway

**L2, L4,L5**

**Module-4**

**Matrix Method of Analysis ( Flexibility Method) :** Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy ≤3

**L2, L4,L5**

**Module-5**

**Matrix Method of Analysis (Stiffness Method):** Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic

indeterminacy ≤3

**L2, L4,L5**

**Course outcomes:** After studying this course, students will be able to:

1. Determine the moment in indeterminate beams and frames having variable moment of inertia and subsidence using slope defection method
2. Determine the moment in indeterminate beams and frames of no sway and sway using moment distribution method.
3. Construct the bending moment diagram for beams and frames by Kani's method.
4. Construct the bending moment diagram for beams and frames using flexibility method
5. Analyze the beams and indeterminate frames by system stiffness method.

**Text Books:**


**1.** Hibbeler R C, **" Structural Analysis",** Pearson Publication

**2.** L S Negi and R S Jangid, **"Structural Analysis",** Tata *McGraw-Hill* Publishing Company Ltd.

**3.** D S Prakash Rao, **"Structural Analysis: A Unified Approach"** , Universities Press

**4.** K.U. Muthu, H.Narendra etal, **"Indeterminate Structural Analysis",** IK International Publishing Pvt. Ltd.


**Reference Books:**


1. Reddy C S, **"Basic Structural Analysis",** *Tata McGraw-Hill* Publishing Company Ltd.
2. Gupta S P, G S Pundit and R Gupta, **"Theory of Structures"**, Vol II, Tata McGraw Hill Publications company Ltd.
3. V N Vazirani and M M Ratwani, **"Analysis Of Structures** ", Vol. 2, Khanna Publishers
4. Wang C K, **"Intermediate Structural Analysis",** McGraw Hill, International Students Edition.
5. S.Rajasekaran and G. Sankarasubramanian, **"Computational Structural Mechanics",** PHI Learning Pvt. Ltd.,

**TITLE OF THE COURSE: DESIGN OF RC STRUCTURAL ELEMENTS**
**B.E., V Semester, Civil Engineering**
**[As per Choice Based Credit System (CBCS) scheme]**

| | | | |
|---|---|---|---|
| **Course Code** | **18CV53** | **CIE Marks** | **40** |
| **Number of Lecture Hours/Week** | **03:02** | **SEE Marks** | **60** |
| **Total Number of Lecture Hours** | **50 (10 Hours per Module)** | **Exam Hours** | **03** |

**Credits – 04**

**Course objectives:** This course will enable students to

1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading.
2. Follow a procedural knowledge in designing various structural RC elements.
3. Impart the culture of following the codes for strength, serviceability and durability as an ethics.
4. Provide knowledge in analysis and design of RC elements for the success in competitive examinations.

**Module-1**

**Introduction to Limit State Design and Serviceability:** Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety.

Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.

Limiting deflection, short term deflection, long term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.

**L1, L2**

**Module-2**

**Limit State Analysis of Beams:**
Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear

**L2, L4**

**Module-3**

**Limit State Design of Beams:** Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456

**L2, L4**

**Module-4**

**Limit State Design of Slabs and Stairs:** Introduction to one way and two way slabs, Design of cantilever, simply supported and one way continuous slab. Design of two way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.

**L2, L4**

**Module-5**

**Limit State Deign of Columns and Footings:** Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment

**L2, L4**

**Course outcomes:** After studying this course, students will be able to:

1. understand the design philosophy and principles
2. solve engineering problems of RC elements subjected to flexure, shear and torsion
3. demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings
4. owns professional and ethical responsibility

- The designs are as per IS-456 and SP (16) relevant charts to be provided in the question paper

**Text Books:**


1. Unnikrishnan Pillai and Devdas Menon, " **Reinforced Concrete Design"** , McGraw Hill, New Delhi
2. Subramanian, " **Design of Concrete Structures"** , Oxford university Press
3. H J Shah, **"Reinforced Concrete Vol. 1 (Elementary Reinforced Concrete)"** , Charotar Publishing House Pvt. Ltd.


**Reference Books:**


1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publisher s
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

**TITLE OF THE COURSE: BASIC GEOTECHNICAL ENGINEERING**
**B.E., V Semester, Civil Engineering**
**[As per Choice Based Credit System (CBCS) scheme]**

| | | | |
|---|---|---|---|
| **Course Code** | **18CV54** | **CIE Marks** | **40** |
| **Number of Lecture Hours/Week** | **04** | **SEE Marks** | **60** |
| **Total Number of Lecture Hours** | **50 (10 Hours per Module)** | **Exam Hours** | **03** |

**Credits – 03**

**Course objectives:** This course will enable students to

1. To appreciate basic concepts of soil mechanics as an integral part in the knowledge of civil engineering. Also to become familiar broadly with geotechnical engineering problems such as, foundation engineering, flow of water through soil medium and terminologies associated with geotechnical engineering.
2. To know the basic engineering properties and the mechanical behaviour of different types of soil. This includes strength-deformation characteristics under shearing stresses. Also consolidation properties of clayey soils.
3. To determine the improvement in mechanical behaviour by densification of soil deposits using compaction.
4. To know how the properties of soils that can be measured in the lab

**Module-1**

Introduction: Introduction, origin and formation of soil, Phase Diagram, phase relationships, definitions and their inter relationships.

Determination of Index properties-Specific gravity, water content, in-situ density and particle size analysis (sieve and sedimentation analysis)

Atterberg's Limits, consistency indices, relative density, activity of clay, Plasticity chart, unified and BIS soil classification.

**L1,L2,L3**

**Module-2**

Soil Structure and Clay Mineralogy

Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering

Compaction of Soils: Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control - compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipments and their suitability.

**L1,L2,L3**

**Module -3:**

Flow through Soils: Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena

Seepage Analysis: Laplace equation, assumptions, limitations and its derivation. Flow nets- characteristics and applications. Flow nets for sheet piles and below the dam section.
Unconfined flow, phreatic line (Casagrande's method –with and without toe filter), flow through dams, design of dam filters.
Effective Stress Analysis:
Geostatic stresses, Effective stress concept-total stress, effective stress and Neutral stress and impact of the effective stress in construction of structures, quick sand phenomena

**Module -4:**

**Consolidation of Soil**: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations. Derivation of Governing differential Equation
Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils.
Consolidation characteristics of soil ($C_c$, $a_v$, $m_v$ and $C_v$. Laboratory one dimensional consolidation test, characteristics of e-log(σ') curve,
Determination of consolidation characteristics of soils- compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.

**Module-5**

**Shear Strength of Soil:** Concept of shear strength, Mohr–Coulomb Failure Cri terion, Modified Mohr–Coulomb Criterion
Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotrophy and sensitivity,
Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions. Total and effective stress paths.**L1, L2, L3 L4**

**Course outcomes:** On the completion of this course students are expected to attain the following outcomes;

1. Ability to plan and execute geotechnical site investigation program for different civil engineering projects
2. Understanding of stress distribution and resulting settlement beneath the loaded footings on sand and clayey soils
3. Ability to estimate factor of safety against failure of slopes and to compute lateral pressure distribution behind earth retaining structures
4. Ability to determine bearing capacity of soil and achieve proficiency in proportioning shallow isolated and combined footings for uniform bearing pressure
5. Capable of estimating load carrying capacity of single and group of piles

**Text Books:**

1. Gopal Ranjan and Rao A.S.R., Basic and Applied Soil Mechanics, New Age International (P) Ltd., New Delhi.
2. Punmia B C, Soil Mechanics and Foundation Engineering, Laxmi Publications co., New Delhi.
3. Murthy V.N.S., Principles of Soil Mechanics and Foundation Engineering, UBS Publishers and Distributors, New Delhi.
4. Braja, M. Das, Geotechnical Engineering; Thomson Business Information India (P) Ltd., India

**Reference Books:**

1. T.W. Lambe and R.V. Whitman, Soil Mechanics-, John Wiley & Sons
2. Donald P Coduto, Geotechnical Engineering- Phi Learning Private Limited, New Delhi
3. Shashi K. Gulathi & Manoj Datta, Geotechnical Engineering-. , Tata McGraw Hill Publications
4. Debashis Moitra, “Geotechnical Engineering”, Universities Press.,
5. Malcolm D Bolton, “A Guide to soil mechanics”, Universities Press.,
6. Bowles J E , Foundation analysis and design, McGraw- Hill Publications

**MUNICIPAL WASTE WATER TREATMENT**
**B.E IN CIVIL ENGINEERING(CV-2018-19)**
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**
**SEMESTER - V**

| | | | |
|---|---|---|---|
| Course Code | 18CV55 | CIE Marks | 40 |
| Teaching Hours/Week (L:T:P) | (3:0:0) | SEE Marks | 60 |
| Credits | 03 | Exam Hours | 03 |

**Course objectives:** This course will enable students to;
1. Understand the varies water demands and population forecasting methods .
2. Understand and design different unit operations and unit process in involved in waste water treatment process
3.Understand the concept and design of various physicochemical treatment units
4. Understand the concept and design of various biological treatment units
5. Understand the concept of various advance waste water and low cost treatment processes for rural areas.

| **Modules** | **Teaching in Hours** | **RBT Level** |
|---|---|---|
| **Module-1** | | |
| Introduction, need for sanitation, methods of sewage disposal, types of sewerage systems, dry weather flow, wet weather flow, factors effecting dry and wet weather flow on design of sewerage system, estimation of storm flow, time of concentration flow, material of sewers, shape of sewers, laying and testing of sewers, ventilation of sewers.<br>Sewer appurtenances, manholes, catch basins, basic principles of house drainage, typical layout plan showing house drainage connections | 10 | L1,L2,L3 |
| **Module-2** | | |
| Design of sewers, hydraulic formula for velocity, effects of variation on velocity, regime velocity, design of hydraulic elements for circular sewers for full flow and partial flow conditions. Reaction kinetics(zero order, 1st order and 2nd order)<br>Disposal of effluents by dilution, self-purification phenomenon, oxygen sag curve, zones of purification, sewage farming, sewage sickness, numerical problems on disposal of effluents, Streeter-Phelps equation. | 10 | L1,L2,L3 |
| **Module-3** | | |
| Waste water characteristics, sampling, significance and techniques, physical, chemical and biological characteristics, flow diagram for municipal waste water treatment, unit operations.<br>Theoretical principles and design: screens, equalization basin, grit chamber, primary and secondary settling tanks. | 10 | L1,L2,L3 |
| **Module-4** | | |
| Working principles and design: Suspended growth system - conventional activated sludge process and its modifications. Attached growth system – trickling filter, bio-towers and rotating biological contactors. Principles and design of stabilization ponds. Sequential batch reactors, moving bed bio reactors Sludge Processing: Separation - sludge thickeners, volume reduction, co nditioning and digestion – aerobic and anaerobic. | 10 | L1,L2,L3 |
| **Module-5** | | |
| Advanced Wastewater Treatment: Need and technologies used. Nitrification and Denitrification Processes, Phosphorous removal. Advance oxidation rocesses (AOPs), Elecrtocoagulation, Numerical Problems.<br>Rural wastewater systems: Septic tanks, two-pit latrines, eco-toilet, soak pits and numerical problems. | 10 | L1,L2,L3 |

**Course outcomes:**
After studying this course, the students will be able to:
1. Select the appropriate sewer appurtenances and materials in sewer network.
2. Design the sewers network and understand the self purification process in flowing water.
3.Deisgn the varies physic- chemical treatment units
4. Design the various biological treatment units
5. Design various AOPs and low cost treatment units.

**Graduate Attributes (As per NBA)**
**Program Objectives:**
- Engineering knowledge
- Problem analysis

- Interpretation of data

**Question paper pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60**

- The question paper will have ten questions.
- Each full question consists of 20 marks.
- There will be 2full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- Students will have to answer 5 full questions, selecting one full question from each module.

| Sl No | Title of the Book | Name of the Author/s | Name of the Publisher | Edition |
|---|---|---|---|---|
| **Textbook/s** | | | | |
| 1 | Environmental Engineering -. New York, 2000 | Howard S. Peavy, Donald R. Rowe, George T | Tata McGraw Hill | Indian Edition, 2013 |
| 2. | "Wastewater Engineering - Treatment and Reuse", , Publishing Co. Ltd., New Delhi. | Metcalf and Eddy Inc | Tata McGraw Hill | 4th Edition, 2009 |
| 3 | Environmental Engineering vol-II, | B C Punmia | Laxmi Publications | 2nd, 2016 |
| 4 | "Wastewater Treatment Concepts and Design Approach" | Karia G.L., and Christian R.A., | Prentice Hall of India Pvt. Ltd., New Delhi. | 3rd. Edition, 2017 |
| 5 | Environmental Engineering vol-II, Water supply Engineering | S.K.Garg, | Khanna Publishers, – New Delhi | 28th edition and 2017 |
| **Reference Books** | | | | |
| 1 | CPHEEO manual on sewage treatment | Ministry of Urban Development, Government of India, New Delhi. | | 1999 |
| 2 | Water & Waste Water Technology, | Mark.J Hammer, | John Wiley & Sons Inc., New York, | 2008 |
| 3 | Biological Process Design for Wastewater Treatment | Benefield R.D., and Randal C.W | Prentice Hall, Englewood Chiffs, New Jersey | 2012 |

**Course Title: Highway Engineering**
**As per Choice Based Credit System (CBCS) scheme]**
**SEMESTER:V**

| | | | |
|---|---|---|---|
| **Subject Code** | **18CV56** | **IA Marks** | **40** |
| **Number of Lecture Hours/Week** | **04** | **Exam Marks** | **60** |
| **Total Number of Lecture Hours** | **50** | **Exam Hours** | **03** |
| **CREDITS –03** | | **Total Marks- 100** | |

Course objectives: This course will enable students to;

1. Gain knowledge of different modes of transportation systems, history, development of highways and the organizations associated with research and development of the same in INDIA.
2. Understand Highway planning and development considering the essential criteria's (engineering and financial aspects, regulations and policies, socio economic impact).
3. Get insight to different aspects of geometric elements and train them to design geometric elements of a highway network.
4. Understand pavement and its components, pavement construction activities and its requirements.

| Modules | Teaching Hours | Revised Bloom's Taxonomy (RBT) Level |
|---|---|---|
| Module -1 | | |
| Principles of Transportation Engineering: Importance of transportation, Different modes of transportation and comparison, Characteristics of road transport Jayakar committee recommendations, and implementation – Central Road Fund, Indian Roads Congress, Central Road Research Institute Highway Development and Planning: Road types and classification, road patterns, planning surveys, master plan – saturation system of road planning, phasing road development in India, problems on best alignment among alternate proposals | 10 hours | L1,L2 |
| Module -2 | | |
| Highway Alignment and Surveys: Ideal Alignment, Factors affecting the alignment, Engineering surveys-Map study, Reconnaissance, Preliminary and Final location & detailed survey, Reports and drawings for new and re-aligned projects Highway Geometric Design: Cross sectional elements–width, surface, camber, Sight distances–SSD, OSD, ISD, HSD, Design of | 10 Hours | L2,L3,L4 |
| Module -3 | | |
| Pavement Materials: Subgrade soil - desirable properties- HRB soil classification-determination of CBR and modulus of subgrade reaction with Problems Aggregates- Desirable properties and tests, Bituminous materials- Explanation on Tar, bitumen, cutback and emulsion-tests on bituminous material Pavement | 10 Hours | L3,L4,L5 |
| Module -4 | | |
| Pavement Construction: Design of soil aggregate mixes by Rothfuch's method. Uses and properties of bituminous mixes and cement concrete in pavement construction. Earthwork; cutting and Filling, Preparation of subgrade, Specification and construction of i) Granular Sub base, ii) WBM Base, iii) WMM base, iv) Bituminous Macadam, v) Dense Bituminous Macadam vi) Bituminous Concrete, vii) Dry Lean Concrete sub base and PQC viii) concrete roads | 10 Hours | L2,L3,L4 |

| Module -5 | | |
|---|---|---|
| Highway Drainage: Significance and requirements, Surface drainage system and design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location<br>Highway Economics: Highway user benefits, VOC using charts | 10 Hours | L1,L2,L3 |

Course outcomes: After studying this course, students will be able to:

1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
2. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
3. Design road geometrics, structural components of pavement and drainage.
4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Program Objectives:

- Engineering knowledge
- Problem analysis
- Interpretation of data

Text Books:

1. S K Khanna and C E G Justo, " Highway Engineering", Nem Chand Bros, Roorkee
2. L R Kadiyali, "Highway Engineering", Khanna Publishers, New Delhi.
3. R Srinivasa Kumar, "Highway Engineering", University Press.
4. K.P.subramanium, "Transportation Engineering", SciTech Publications, Chennai.

Reference Books:

1. Relevant IRC Codes
2. Specifications for Roads and Bridges-MoRT&H, IRC, New Delhi.
3. C. JotinKhisty, B. Kent lal, "Transportation Engineering", PHI Learning Pvt. Ltd. New Delhi.

**Course Title: SURVEYING PRACTICE**
**[As per Choice Based Credit System (CBCS) scheme]**
**SEMESTER – V**

| | | | |
|---|---|---|---|
| **Subject Code** | **18CVL57** | **IA** | **40** |
| **Number of Lecture Hours/Week** | **03** | **Exam** | **60** |
| **Total Number of Lecture Hours** | **42** | **Exam** | **03** |

**CREDITS – 02**

Course objectives: This course will enable students to

1. Apply the basic principles of engineering surveying and measurements
2. Follow effectively field procedures required for a professional surveyor
3. Use techniques, skills and conventional surveying instruments necessary for engineering practice..

| Modules | Teaching Hours | Revised Bloo m's Taxonomy (RBT) |
|---|---|---|
| 1. a) Measurements of distances using tape along with horizontal planes and slopes, direct ranging. | 03 | L3, L4 |
| 2. Obstacles in chaining and ranging – Chaining but not ranging, ranging but not chaining, both ranging and chaining | 03 | L3 |
| 3. Measurements of bearings / directions using prismatic compass, setting of geometrical figures using prismatic compass | 03 | L3 |
| 4. Measurement of bearings of sides of a closed traverse and adjustment of closing error by | 03 | L3 |
| 5. Determination of distance between two inaccessible points using compass and | 03 | L4 |
| 6. Determination of reduced levels of points using dumpy level/auto level (simple leveling) | 03 | L4 |
| 7. Determination of reduced levels of points using dumpy level/auto level (differential leveling and inverted leveling) | 03 | L4 |
| 8. To determine the difference in elevation between two points using Reciprocal leveling and to determine the collimation error | 03 | L4 |
| 9. To conduct profile leveling, cross sectioning and block leveling. Plotting profile and cross sectioning in excel. Block contour on graph | 03 | L3 |
| 10. Measurement of horizontal angle by repetition and reiteration methods and Measurement of vertical angles using | 03 | L4 |

| | | |
|---|---|---|
| 11. Determination of horizontal distance and vertical height to a base inaccessible object using theodolite by single plane and double | 03 | L4 |
| 12. To determine distance and elevation using tachometric surveying with horizontal and inclined line of sight | 03 | L3 |
| 13. Closed traverse surveying using Theodolite and applying corrections for error of closure by transit rule | 03 | L3 |
| 14. Demonstration of Minor instruments like Clinometer, Ceylon Ghat tracer, Box sextant, Hand level, Planimeter | 03 | L3 |

Course outcom es:

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

1. Apply the basic principles of engineering surveying and for linear and angular measurements.
2. comprehend effectively field procedures required for a professional surveyor.
3. Use techniques, skills and conventional

Program Objecti ves (as per NBA)

1. *Engineering Knowledge.*
2. *Problem Analysis.*
3. *Interpretation of data.*

Question paper pattern:

- All are individual experiments.
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

Text Books:


1. B.C. Punmia, “Surveying Vol.1”, Laxmi Publications pvt. Ltd., New Delhi – 2009.
2. Kanetkar T P and S V Kulkarni , Surveying and Levelling Part I, Pune VidyarthiGrihaPrakashan , 1988


Reference Books:


1. S.K. Duggal, “Surveying Vol.1”, Tata McGraw Hill Publishing Co. Ltd. New Delhi. – 2009.
2. K.R. Arora, “ Surveying Vol. 1” Standard Book House, New Delhi. – 2010

**TITLE OF THE COURSE: CONCRETE AND HIGHWAY MATERIALS LABORATORY**

**B.E., V Semester, Civil Engineering**

**[As per Choice Based Credit System (CBCS) scheme]**

| | | | |
|---|---|---|---|
| **Course Code** | **18CVL58** | **CIE Marks** | **40** |
| **Number of Lecture Hours/Week** | **03=(1 Hour Instruction + 2 Hours Laboratory)** | **SEE Marks** | **60** |
| **Total Number of Hours** | **40** | **Exam Hours** | **03** |
| **RBT Levels** | **L1, L2, L3,** | | |

**Credits – 02**

**Course objectives:** This course will enable students

1. To learn the principles and procedures of testing Concrete and Highway materials and to get hands on experience by conducting the tests and evolving inferences.

**Modules**

**Part A: Concrete Lab**

1. Tests on Cement:
    a. Normal Consistency
    b. setting time
    c. compressive strength
    d. fineness by air permeability test
    e. specific gravity
2. Tests on Concrete:
    a. Design of concrete mix as per IS-10262
    b. Tests on fresh concrete:
        i. slump,
        ii. compaction factor and
        iii. Vee Bee test
    c. Tests on hardened concrete:
        i. compressive strength test,
        ii. split tensile strength test,
        iii. flexural strength test
    d. NDT tests by rebound hammer and pulse velocity test.
3. Tests on Self Compacting Concrete:
    **a.** Design of self compacting concrete,
    **b.** slump flow test,
    **c.** V-funnel test,
    **d.** J-Ring test,
    **e.** U Box test and
    **f.** L Box test

**Part B: High way materials Lab**

1. Tests on Aggregates
    a. Aggregate Crushing value
    b. Los Angeles abrasion test
    c. Aggregate impact test
    d. Aggregate shape tests (combined index and angularity number)
2. Tests on Bituminous Materials

a. Penetration test
b. Ductility test
c. Softening point test
d. Specific gravity test
e. Viscosity test by tar viscometer
f. Bituminous Mix Design by Marshall Method (Demonstration only)

3. Tests on Soil
   a. Wet sieve analysis
   b. CBR test

**Course outcomes:** During this course, students will develop expertise in;

1. 1. Conduct appropriate laboratory experiments and interpret the results
2. Determine the quality and suitability of cement
3. Design appropriate concrete mix
4. Determine strength and quality of concrete
5. Test the road aggregates and bitumen for their suitability as road material.
6. Test the soil for its suitability as sub grade soil for pavements.

**Question paper pattern:**

- All are individual experiments
- Instructions as printed on the cover page of answer script for split up of marks to be strictly followed.
- All exercises are to be included for practical examination.

**Reference Books:**


1. 1. M.L.Gambir, "Concrete Manual", Danpat Rai and sons, New Delhi
2. Shetty M.S, "Concrete Technology", S. Chand & Co. Ltd, New Delhi.
3. Mehta P.K, "Properties of Concrete", Tata McGraw Hill Publications, New Delhi.
4. Neville AM, "Properties of Concrete", ELBS Publications, London.
5. Relevant BIS codes.
6. S K Khanna, C E G Justo and A Veeraragavan, "Highway Materials Testing Laboratory Manual ", Nem Chand Bros, Roorkee
7. L R Kadiyali, "Highway Engineering ", Khanna Publishers, New Delhi

**ENVIRONMENTAL STUDIES**

**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**

**SEMESTER – V**

| | | | |
|---|---|---|---|
| Course Code | 18CIV59 | CIE Marks | 40 |
| Teaching Hours / Week (L:T:P) | 1:0:0 | SEE Marks | 60 |
| Credits | 01 | Exam Hours | 02 |

**Course objectives:** This course will enable students to

1. **To identify the major challenges in environmental issues and evaluate possible solutions.**
2. **Develop analytical skills, critical thinking and demonstrate socio-economic skills for sustainable development.**
3. **To analyze an overall impact of specific issues and develop environmental management plan.**

| **Modules** | **Teaching in Hours** | **RBT Level** |
|---|---|---|
| **Modules - 1** | | |
| **Introduction:** Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. Impacts of Agriculture & Housing Impacts of Industry, Mining & transportation Environmental Impact Assessment, Sustainable Development. | 04 | L1,L2 |
| **Modules - 2** | | |
| **Natural Resources**, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cyc le & Sulphur Cycle. Energy – Different types of energy, Conventional so urces & Non Conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy. | 04 | L1,L2 |
| **Modules - 3** | | |
| Environmental Pollution – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water & Waste Water Management. | 04 | L1,L2 |
| **Modules - 4** | | |
| Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods. | 04 | L1,L2 |
| **Modules - 5** | | |
| Introduction to GIS & Remote sensing, Applications of GIS & Remote Sensing in Environmental Engineering Practices. Environmental Acts & Regulations, Role of government, Legal aspects, Role of Non-governmental Organizations (NGOs), Environmental Education & Women Education | 04 | L1,L2 |

**Course outcomes:** After studying this course, students will be able to:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,
3. Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
4. Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues

**Question paper pattern:**

**Question Paper Pattern: The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 60**

The Question paper will have 100 objective questions.
Student will have to answer all the questions in a OMR Sheet.
The Duration of Exam will be 2 hours.

**Text Books:**


- Benny Joseph (2005), **"Environmental Studies"** , Tata McGraw – Hill Publishing Company Limited.
- S.M. Prakash, **"Environmental Studies",** 3rd Edition, Elite Publishers Mangalore, 2018.
- R Rajagopalan, **"Environmental Studies – From Crisis to Cure** ", Oxford 2005

Aloka Debi, **"Environmental Science and Engineering",** Universities Press (India) Pvt. Ltd. 2012


**Reference Books:**


1. Raman Sivakumar, **"Principals of Environmental Science and Engineering",** 2nd edition, Cengage learning Singapur, 2005.
2. G.Tyler Miller Jr., **"Environmental Science – working with the Earth"**, Eleventh Edition, Thomson Brooks /Cole, 2006
3. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, **"Text Book of Environmental and Ecology"** , Acme Learning Pvt. Ltd. New Delhi.
4. P. Meenakshi, **"Elements of Environmental Science and Engineering" ,** Prentice Hall of India Private Limited, New Delhi, 2006