## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV701T | Estimation and Costing | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To understand different techniques of preliminary & detailed estimation of buildings & roads.<br>2. To analyse rates for different items of works.<br>3. To interpret the drawings and estimate the quantities of various items in civil engineering structures.<br>4. To understand departmental procedures and take measurement of completed work.<br>5. To differentiate the types of estimation, adopt specification and unit rates. | At the end of the course, students will be able to:<br>1. Prepare the preliminary and detailed estimate for administrative approval & technical sanction for a civil engineering project.<br>2. Prepare the bar bending schedule, tender documents, fill the contracts, and make use of knowledge of different contract submission & opening in awarding the work to the contractor.<br>3. Write the specification of the works to be undertaken in preparing the tender documents.<br>4. Use the technique of Rate analysis in estimating the exact cost of material & manpower.<br>5. Arrive at the exact value of the property using different valuation techniques. |

| **Unit I** | **[10 Hrs]** |
|---|---|
| **Introduction:** Importance and Purpose of Estimation in Civil Engineering, Units of measurement as per I.S.1200. Items of work and their description.<br>**Preliminary Estimation:** Objectives and its methods, Earthwork estimates in road, hill roads and canals. | |
| **Unit II** | **[10 Hrs]** |
| **Detailed Estimation:** Load bearing and framed structures<br>**Bar Bending Schedule:** Calculation of reinforcing steel for various components of building. | |
| **Unit III** | **[8 Hrs]** |
| **Specifications:** Necessity, Importance and Types, Writing detailed specifications of important Items of work.<br>**Tenders:** Necessity, Tender documents, Notice Inviting Tender, Methods for Carrying out tender Work.<br>**Contract:** Essentials, Types, Contract documents, General & Special Conditions of Contract. | |
| **Unit IV** | **[8 Hrs]** |
| **Rate Analysis:** Necessity, Introduction, Procedure, Factors deciding Rate Analysis, Labour Guidelines from National Building Code, Market rates of Material and Labour, Rate Analysis of major items of work. | |
| **Unit V** | **[8 Hrs]** |
| **Valuation:** Introduction, Purpose, Factors affecting value of property, Types of Value, Calculation of Depreciation and its methods, Capitalised value, Year's Purchase, Sinking Fund, Net & Gross income, Rent fixation.<br>**Cost Accounting:** Importance, Scope, Objectives, Classification of cost, Distribution of overheads, M.A.S. Account, Issue rates and Stores accounts. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Estimating and Costing in Civil Engg | B.N. Dutta | 28th | CBS Publishers |
| 2 | Estimating, Costing, Specification & Valuation In Civil Engineering | M. Chakraborti | 15th | Chakraborti |
| 3 | A Textbook of Estimating and Costing (Civil) | D.D. Kohli, Ar. R.C. Kohli | 13th | S Chand |
| 4 | Civil Estimating & Costing | A.K. Upadhyay | 5th | Katson Books |
| 5 | Estimating, Costing And Valuation | Rangwala | 4th | Charotar Publishing |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Engineer's Duties and Accounts | S.K. Hussain | | Satya Prakashan |
| 2 | Professional Practice | Dr. Roshan Namavati | | |

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| | | July 2024 | 1.0 | Applicable for 2024-25 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV701P | Estimation and Costing Lab | - | - | 2 | 1 | 25 | 25 | 50 |

| Course Objectives | Course Outcomes |
|---|---|
| | At the end of the course, students will be able to:<br>1. Prepare the preliminary and detailed estimate for administrative approval & technical sanction for a civil engineering project.<br>2. Prepare the bar bending schedule for various components of buildings.<br>3. Write the tender documents, fill the contracts, and make use of knowledge of different contract submission & opening in awarding the work to the contractor<br>4. Use the technique of rate analysis in estimating the exact cost of material & manpower.<br>5. Arrive at the exact value of the property using different valuation techniques. |

| Expt. No. | Title of the experiment |
|---|---|
| 1 | Preliminary estimate using plinth area method. |
| 2 | Detailed estimate of earthwork of road. |
| 3 | Detailed estimate of load bearing structure. |
| 4 | Detailed estimate of framed structure. |
| 5 | Calculation of steel with bar bending schedule. |
| 6 | Draft a tender notice for a major civil engineering project. |
| 7 | Calculation of annual and total depreciation and book value at the end of each year. |
| 8 | Fixation of standard rent of property. |
| 9 | Analyse the unit rate of 8 major items of work. |
| 10 | Market survey for material and labour rates for various items. |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Estimating and Costing in Civil Engg | B.N. Dutta | 28th | CBS Publishers |
| 2 | Civil Estimating & Costing | A.K. Upadhyay | 5th | Katson Books |
| 3 | Estimating, Costing And Valuation | Rangwala | 4th | Charotar Publishing |

## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV702T | Construction Management & Law | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. Gain a comprehensive understanding of the various phases of construction projects, including planning, design, procurement, construction, and project completion.<br>2. Learn project management methodologies and techniques tailored to the construction industry, including scheduling, budgeting, resource allocation, risk management, and quality control.<br>3. Explore the legal framework governing construction projects, including contract law, tort law, property law, and regulations specific to the construction industry. | At the of the course, students will be able to:<br>1. Understand project characteristics and various stages of a project.<br>2. Create a construction project plan, cost estimates and project schedules, application of information system in management of construction projects.<br>3. Achieve the knowledge of various types' of equipment's to be used in the construction and its operational cost estimates, understand manpower requirement, planning, resources utilization and management.<br>4. know the quality control aspects in planning & management, safety provisions and equipments.<br>5. Analyze the legal aspects in construction projects through the understanding of various laws pertaining to civil engineering and architectural planning & sanctioning, provisions of arbitration, litigations and various laws. |

| **Unit I** | **[8 Hrs]** |
|---|---|
| **BASIC STUDIES IN CONSTRUCTION PROJECT**<br>Type of Project & its Financing, Detailed Project Report Analysis and Feasibility, Time of Completion,<br>Provisions of Escalation in Time and Cost, Choice of Technology and Construction Methodologies &Techniques, Site Planning (Case Studies). | |
| **Unit II** | **[9 Hrs]** |
| **CONSTRUCTION SCHEDULING**<br>Network Analysis:- The Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT),Bar Chart, Resource Oriented Scheduling, Allocation, Leveling, Crashing and Time/Cost Tradeoffs, Line of Balance. MIS in Construction Project, Project Management System-MS Project., BIM. | |
| **Unit III** | **[8 Hrs]** |
| **MANPOWER** – Requirement and methods of calculating Productivity, Staffing, planning, directing & controlling. Organizational Charts, Duties and Responsibility of Personal Manager<br>**MATERIAL** – Requirement, Procuring, Storing & Delivery. Quality Checks, Inventory Control techniques, construction Waste generation and Management.<br>**MACHINERY** – Different type of construction equipment and their applications- Excavators, Dozer, Rollers, Hoisting and Hauling equipments, Cost & Working Hour analysis, Depreciation analysis. | |
| **Unit IV** | **[6 Hrs]** |
| **QUALITY AND SAFETY MANAGEMENT**<br>Concept of Total Quality Management, Safety Provisions as per National Building Code of India, Safety equipment. Advanced Techniques of Monitoring & Assessment | |
| **Unit V** | **[7 Hrs]** |
| **LEGAL ASPECTS IN CONSTRUCTION PROJECTS AND VARIOUS RELATED ACTS**<br>Town Planning Requirements, Acts and codes related to planning, Regional Town Planning, Housing Development Act, Highway Act, Irrigation Act, Local Acts (Gunthewari), Environmental (Protection) Act, Forest Conservation - Water Pollution and air pollution, Transfer of property Act– Sale, purchase, lease. Land Acquisition and Rehabilitation Act, Indian Contract Act. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Construction Planning and Management | Peurifoy | - | McGraw-Hill Education |
| 2 | Construction Planning and Management | Dr U K Shrivastava, Galgotia Publ. | - | Galgotia Publications Pvt Ltd |
| 3 | Laws related to buildings and engineering contracts in India | Gajaria G T, LexisNexis | - | Butterworths India Publisher, 2000 |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Project Planning & Management | B C Punmia | - | Laxmi Publications Pvt Ltd |

**SEVENTH SEMESTER**

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV703T(i) | Professional Elective -IV<br>Advanced Concrete Structures | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. Design interior panel of flat slab<br>2. To identify and design the slender column<br>3. To design combined footing - Rectangular and Raft<br>4. To design Water tank resting on ground | At the of the course, students will be able to:<br>1. Design interior panel of fat slab<br>2. Design the slender column<br>3. Design the combined footing<br>4. Design water tank resting on ground |

| | |
|---|---|
| **Unit I** | **[ 6 Hrs]** |
| **Design of interior panel of Flat slab using Direct Design Method:**<br>Limitations, Components,Total Design moment,Distribution of moments,Shear in Flat Slab,Check for shear as per IS456:2000<br>Detailing of reinforcement | |
| **Unit II** | **[6 Hrs]** |
| **Design of Slender Columns:**<br>Identify slender columns,minimum eccentricity,Additional Moments,Bi-axial moments,Safety conditions as per IS456:2000 | |
| **Unit III** | **[8 Hrs]** |
| **Design of combined footing - Rectangular type and Raft:**<br>Need,Situation,Concept,Area of footing,design for bending moment,shear force,detailing of reinforcement | |
| **Unit IV** | **[6 Hrs]** |
| **Design of circular water tank resting on ground:**<br>Components - roof slab/ roof dome,ring beam,wall,base slab - design using IS3370 : 2021<br>Detailing of Reinforcement | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Limit State Design of Reinforced Concrete (As per IS456:2000) | Dr.B.C.Punmia,Ashok Kumar Jain,Arun Kumar Jain | ---- | Laxmi Publications (P) Limited,New Delhi |
| 2 | Limit State Theory and Design of Reinforced Concrete.IS456:2000 | Dr.V.L.Shah,Late Dr S.R.Karve | ----- | Structures Publications,Pune |
| 3 | Advanced R.C.C.Design (R.C.C.Volume-II) | S.S.Bhavikatti | ----- | New Age International (P) Limited,New Delhi |

**Indian Standard Codes of Practice**

| S.N | Title | Publisher |
|---|---|---|
| 1 | IS 456:2000 - Plain and Reinforced Concrete - Code of Practice | Bureau of Indian Standards,New Delhi |
| 2 | IS 3370(Part1):2021 - Concrete Structures for Retaining Aqueous Liquids-Code of Practice - Part1General Requirements | Bureau of Indian Standards,New Delhi |
| 3 | IS 3370(Part2):2021 - Concrete Structures for Retaining Aqueous Liquids-Code of Practice - Part2 -Plain and Reinforced Concrete | Bureau of Indian Standards,New Delhi |
| 4 | IS 3370(Part4/Sec3):2021 - Concrete Structures for Retaining Aqueous Liquids-Code of Practice - Part4 -Design Tables - Section3 Circular Tanks | Bureau of Indian Standards,New Delhi |
| 5 | IS2950(Part I ) - Code of Practice for Design and Construction of Raft Foundations - Part I :Design | Bureau of Indian Standards,New Delhi |

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| | | July 2024 | 1.0 | Applicable for 2024-25 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV703T(ii) | Traffic Engineering | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To introduce the students with the principles and practice of transportation engineering which focuses on traffic and transportation engineering and highway engineering.<br>2. To enable the students to have a strong analytical and practical knowledge of planning, designing and solving the transportation problems.<br>3. To introduce the recent advancements in the field of sustainable urban development, traffic engineering and management, systems dynamics approach to transport planning, highway design and construction, economic and environment evaluation of transport projects.<br>4. To strength the student knowledge and technical knowhow to be efficient transport engineers. | At the end of the course, students will be able to:<br>1. Students should be able to Define and describe various traffic studies and traffic characteristics.<br>2. Students should be able to describe terms related to highway capacity and have knowledge of statistical tools in traffic engineering.<br>3. Students should be able to explain various theories related to traffic flow. |

| | |
|---|---|
| **Unit I** | **[7 Hrs]** |
| **Traffic Studies & Forecast:** Traffic studies, Methods of traffic forecast, Demand relationships, Design hourly volume, Congestion costing, Critical hour concept. | |
| **Unit II** | **[7 Hrs]** |
| **Highway Capacity:** Capacity studies, Factors affecting capacity, Level of service, Intersections, Mixed traffic flow. | |
| **Unit III** | **[7 Hrs]** |
| **Accident Analysis**: Accidents analysis, Methods of representing accident rate, Factors affecting traffic accidents, Road safety and Road safety models (World Bank), Accident coefficients, Black spot definition & identification . Introduction to road safety audit. | |
| **Unit IV** | **[6 Hrs]** |
| **Traffic Design:** Intersections, Interchanges, Designs of Signals, Traffic Rotary, Design of Parking lot, Parking Study**.** | |
| **Unit V** | **[6 Hrs]** |
| **Traffic Events**: Statistical method for Interpretation, Regression, Application Of Binomial, Normal And Poisson's Distributions, Continuous Distribution Of Traffic Flow, Chi-Square & 'T'test. | |

### Text Books

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Transport planning and Traffic Engineering | C A O'Flaherty | I | Butterworth Heinemann |
| 2 | Introduction to Transportation Engineering | James H Bank | I | Tata McGraw Hill Publications |
| 3 | Transportation Engineering an Introduction | C. Jotin Khisty | I | PHI Publication |

### Reference Books

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Highway Engineering | Khanna S.K. and Justo C.E.G | 1991 | Nem Chand & Bro |
| 2 | Traffic engineering and transportation planning | L.R. Kadiyali | 1987 | Khanna Publications |

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|---|---|---|---|---|
|  |  | July 2024 | 1.0 | Applicable for 2024-25 |
| Chairman - BoS | Dean – Academics | Date of Release | Version | |

## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| 21CV703T(iii) | Professional Elective-IV: Remote Sensing & GIS | 3 | - | - | 3 | CA | ESE | Total |
| | | | | | | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To provide students an exposure to Integration of Remote Sensing and GIS.<br>2. To learn about Satellite Sensors.<br>3. To understand the basic concepts of Atmospheric characteristics.<br>4. To acquire knowledge about EMR interaction with different materials. | At the end of the course, students will be able to:<br>1. Understand the basic concepts of Remote Sensing.<br>2. Understand the different Earth Resources Satellites.<br>3. Understand the basic concepts behind the organizational context in GIS.<br>4. Acquire knowledge about maps and projections used for GIS.<br>5. Learn about application of Remote Sensing and GIS. |

| **Unit I** | **[7 Hrs]** |
|---|---|
| **Introduction to Remote Sensing**: Concept, Principles, Components and Elements of Remote Sensing; Characteristics of Electromagnetic Radiation; Observation Platforms; Types; Sensors; Applications. | |
| **Unit II** | **[6 Hrs]** |
| **Fundamentals of Remote Sensing**: Systems; Scanner; Satellite Characteristics, Principle Steps; Data Reception; Transmission and Processing; Remote Sensing in India. | |
| **Unit III** | **[7 Hrs]** |
| **Fundamentals of GIS:** Definition; Architecture; Components; Workflow; Operations and Objective.<br>**GIS Data Models**: Types; Spatial Data and Attribute Data; Image Data. | |
| **Unit IV** | **[6 Hrs]** |
| **GIS Data Collection and Management**: Data Acquisition in GIS; Analog Maps; Aerial Photographs; Satellite Imagery.<br>**Spatial Analysis**: Introduction; Classification; Overlay Function. | |
| **Unit V** | **[6 Hrs]** |
| **Integrated Applications of Remote sensing and GIS**: Applications in Environmental planning; Urban planning and management; Health; Disaster Management and Emergency Response. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Surveying Vol. II | Dr. B.C. Punmia, Er. Ashok K. Jain, Dr. Arun K. Jain | 16th edition | Laxmi Publications (P) Ltd. |
| 2 | Advanced Surveying | Satheesh Gopi, R. Sathikumar, N. Madhu | 2nd edition | Pearson |
| 3 | Textbook of Remote Sensing and Geographical Information Systems | M. Anji Reddy | 4th edition | BS Publications |
| 4 | Remote Sensing & Geographical Information Systems | S. K. Singh, Surendra Pal Singh | 1st edition | AKN Learning Learning |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Remote sensing and Geographical Information System | A.M. Chandra, S.K. Ghosh | 2nd edition | Narosa Publications |
| 2 | Remote sensing and Geographical Information System | Ajay Prakash | 2nd edition | Academic Aspirations |

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|---|---|---|---|---|
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**SEVENTH SEMESTER**

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| 21CV704T(i) | Professional Elective - V<br>Ground Improvement | 3 | - | - | 3 | CA<br>30 | ESE<br>70 | Total<br>100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To recognise the necessity of ground improvement.<br>2. To identify the suitability of ground improvement techniques.<br>3. To understand the emerging techniques of ground improvement. | At the of the course, students will be able to:<br>1. Explain the necessity of ground improvement techniques.<br>2. Describe the suitability of various techniques to improve soil properties..<br>3. Understand the innovative ways of ground improvement. |

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|---|---|
| **Unit I** | **[8 Hrs]** |
| **Introduction to ground improvement techniques:**<br>Need for ground improvement and ground improvement techniques, economic considerations and suitability<br>**Grouting:** Materials and methods of grouting grout volume and grouting pressure, grout requirements and tests. | |
| **Unit II** | **[8 Hrs]** |
| **Stone Column:** Application, layout feature, procedures of installation, rammed & floated column, quality control in construction, methods of improving the effectiveness of stone column, skirted and cemented stone column technique, geosynthetic encased stone column | |
| **Unit III** | **[7 Hrs]** |
| . **Reinforced soil and Geo-synthetics:**<br>Basic theory of reinforced soil, concept of reinforced soil wall and slope, geo-synthetics types, application and function in civil engineering, Application of Geofoam & Geocell. | |
| **Unit IV** | **[7 Hrs]** |
| **Ground Anchor and Soil Nailing:**<br>Concept , Design features , types, construction procedure, Functions, Application, Advantages. Limitations of soil nailing system and ground anchor<br>Construction sequence, cement slurry wall, Design features, Functions, applications, Case study on Diaphragm wall.<br>**Deep soil mixing –** Concept, procedure, Advantages and limitations. | |
| **Unit V** | **[6 Hrs]** |
| **Prefabricated Vertical Drains**<br>**Emerging & Innovative Topics:** Sustainable Development and energy geotechnology, Microbial Geotechnology and ground improvement, nan-technology in ground improvement and site remediation | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Geotechnical Engineering, Principles & Practices of Soil Mechanics and Foundation Engineering | V N S Murthy | - | - |
| 2 | Soil Mechanics and Foundation Engineering: | K.R. Arora | - | Standard Publisher and Distributor |
| 3 | Soil Mechanics and Foundation Engineering | B.C. Punmia | - | Laxmi Publications Pvt. Ltd |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Basic and Applied soil mechanics: | Gopal Ranjan & A.S. Rao | - | New Edge International Ltd. |
| 2 | https://nptel.ac.in/courses/105108075 | Dr. G.L. Sivakumar Babu | - | NPTEL |

**SEVENTH SEMESTER**

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV704T(ii) | Professional Elective - V<br>Pavement Design | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. Design appropriate pavement for roads.<br>2. To understand the construction procedure of roads<br>3. To understand the maintenance of the roads.<br>4. To know new techniques in the road construction. | At the of the course, students will be able to:<br>1. Evaluate the physical properties of highway material<br>2. Design the flexible and rigid pavements.<br>3. Construct the flexible and rigid pavement as per standard specifications.<br>4. Evaluate the necessity of required maintenance and suggest suitable treatment,<br>5. Adapt new technology in the highway construction. |

| **Unit I** | **[8 Hrs]** |
|---|---|
| **Pavement Materials and Characterization:**<br>**Soil:** Characterization of soil as construction material. Effective CBR, Modulus of resilience of subgrade,<br>**Aggregate:** Characterization of road aggregates used for road construction, Aggregate characteristics and gradation, Concept of Modulus of resilience of sub base and base course as per IRC 37,<br>**Bituminous material:** Properties of bitumen and bituminous mix, concept of modulus of resilience per IRC 37, Quality control and Quality Assurance plan for highway construction. | |
| **Unit II** | **[8 Hrs]** |
| **Design of Highway Pavement:**<br>**Flexible Pavement:** Factors affecting pavement design, ESWL, Stress analysis – Boussinesq's theory, Burmister's two- and three-layer theory, Flexible pavement design as performance criteria. Overview on Pavement design for low volume road using locally available material as per IRC SP-72. Drainage consideration in pavement design<br>**Rigid Pavement:** Design factors, Westergaard's stress analysis, IRC-58 design method, Design of joints, Overview on Pavement design for low volume road as per IRC SP-62 | |
| **Unit III** | **[7 Hrs]** |
| **Construction of Pavement :**<br>**Flexible pavement:** Construction procedure of flexible pavements, Lime stabilized, cement stabilized (Granular layer) roads, Bituminous mix – Binder course and wearing course, its selection, its gradation, compaction and density requirements. Selection of different bituminous mix treatment as per functional and structural requirements of Construction procedure as per specification of MORTH<br>**Rigid pavement:** Construction procedure, Pavement quality requirements as per IRC:15 and IRC:58 and MORTH, Interlocking Concrete Block Pavement (ICBP) and Its procedure of laying, requirements, Pattern of blocks, Strength requirement as per guidelines of IRC SP 63. | |
| **Unit IV** | **[7 Hrs]** |
| **Maintenance of pavement**<br>**Flexible pavement:** IRC-82, need of maintenance, types, planning, types of defects and treatment. Preventive and periodical renewals.<br>**Rigid pavement:** Maintenance and its methodology as per IRC: SP:83, Design of overlay. | |
| **Unit V** | **[6 Hrs]** |
| **Introduction to New Technology:**<br>Recycle aggregate pavement as per IRC:120 (RAP), Cold in place (CIP), Hot in place (HIP), plant mix technology, Methodology of construction | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Principles & Practice of Highway Engineering | Kadiyali L. R. and Lal, N. B | - | Khanna Publishers, Delhi. |
| 2 | Principles, Practice and Design of Highway Engineering | S.K. Sharma | - | S. Chand and Co. |
| 3 | Highway Engineering | Martin Rogers, Bernard Enrigh | - | Willey Blackwell |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Pavement Analysis and Design | Huang Y. H | - | Englewood Cliffs, New Jersey, USA |
| 2 | Principles of Pavement Design | Yoder E. J. and Witczak M. W | - | John Wiley and Sons |

## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV704T(iii) | Professional Elective - V Advanced Steel Structure | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To design the structures used for works shop building foot bridges, road bridge.<br>2. To understand the necessity for designing steel structures.<br>3. Learn the behavior, design of structural steel components and apply the same in designing steel structures. | At the of the course, students will be able to:<br>1. Critique and optimize various steel structures such as gantry girders, industrial buildings.<br>2. Describe types of bridge, and design the components.<br>3. Understand the basic concepts of storage structures.<br>4. Application of scientific and technological principles of planning, analysis, design of steel buildings<br>5. Importance of pre-engineered building and implementation in industry. |

| | |
|---|---|
| **Unit I** | **[8 Hrs]** |
| Gantry Girders: Cranes, Electrically operated overhead, Design consideration, Gantry girder design.<br>Industrial building frames<br>i. Upto two bay single storeyed, foundations, connections, detailing of steel connections. | |
| **Unit II** | **[8 Hrs]** |
| Bridges: Types of bridges, foot bridge and road bridge. Rolled beam bridges, plate girder bridges, IRC loading.<br>Design of a foot bridge, design of components of road bridges.<br>Bearings: Types of bearings, bearing pads, design of rocker and roller bearings. | |
| **Unit III** | **[8 Hrs]** |
| General concepts, design of bunker and silo. | |
| **Unit IV** | **[8 Hrs]** |
| Composite construction, General concepts, Properties, Steel – concrete composite design of encased beams, shear connectors. | |
| **Unit V** | **[8 Hrs]** |
| Introduction to Pre-Engineered building (PEB), types of PEB. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Design of Steel Structures | Subramanian, N | | OXFORD University Press |
| 2 | Limit State Design of Steel Structures; | Duggal, S.K.; | | Tata McGraw Hill Education Private Limited; 2011. |
| 3 | Design of Steel Structures | V.L. Shah & S R Gore | - | Structures Publication |

**Reference Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Design of Steel Structures | Gaylords, E.H. & Gaylords, C. N | | McGraw Hill Publ, 1998. |
| 2 | Steel Designers Manual | Owens, G.W. & Knowles, P.R. | | Blackwell, 1994 |

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| | | July 2024 | 1.0 | Applicable for 2024-25 |
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## SEVENTH SEMESTER

| Course Code | Course Name | Th | Tu | Pr | Credits | Evaluation | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | CA | ESE | Total |
| 21CV761O | Open Elective – III Transportation Systems | 3 | - | - | 3 | 30 | 70 | 100 |

| Course Objectives | Course Outcomes |
|---|---|
| 1. To understand the need of Transportation system.<br>2. To know various Transportation systems.<br>3. To compare suitability of various Transportation systems. | 1. Understand the highway systems, basic geometrics.<br>2. Understand Railway systems with basic geometrics<br>3. Understand Airports and their basic systems..<br>4. Understand docks and harbours and their basic systems<br>5. Understand modern transportation systems. |

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|---|---|
| **Unit I** | **[8 Hrs]** |
| **Highway Systems:**<br>Planning and Geometrics required for a good highway. | |
| **Unit II** | **[8 Hrs]** |
| **Railway Systems:**<br>Railway components, geometrics, hauling capacity of a locomotive, stations and yards, signalling. | |
| **Unit III** | **[7 Hrs]** |
| **Airport systems:**<br>Components of an airport, Runway length, Runway orientation, Runway and Taxiway marking and lighting, Instrumental Landing System; | |
| **Unit IV** | **[7 Hrs]** |
| **Docks and Harbour systems:**<br>Components of docks and harbours, jetties, navigational aids | |
| **Unit V** | **[6 Hrs]** |
| **Modern Systems:**<br>BRTS, Metro, Intelligent Transportation Systems Case studies. | |

**Text Books**

| S.N | Title | Authors | Edition | Publisher |
|---|---|---|---|---|
| 1 | Highway Engineering | Khanna and Justo | - | Tata McGraw Hill |
| 2 | Railway Engineering | Saxena and Arora | - | Dhanpat Rai and Sons |
| 3 | Airport Engineering | Saxena and Saxena | | McGraw Hill |
| 4 | Docks and Harbours | Oza and Oza | | Charotar Publications |