Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE209PC	Surveying	3	45 Hrs	3 Hours	60

Course Description:
Subject Code 4CE209PC Surveying is a compulsory Programme Core Course for Second Year B. E. Civil Engineering.

Course Objectives:
The objective of the Surveying course aims to equip students with the knowledge and skills to perform land surveys, measure distances, and create accurate maps for construction projects using modern and traditional methods.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	Classify the types of survey in the field of civil engineering.
CO2	Determine linear and angular measurements using chains, tapes, and compasses.
CO3	Describe the types and applications of levelling, characteristics of contours.
CO4	Illustrate theodolite principles and tacheometric methods for accurate angle measurement in land surveying.
CO5	Describe traversing methods for data collection, balancing, and coordinate computation.
CO6	Apply the working principles of GPS and total station.

Details of Syllabus:

Unit 1	**Introduction to Surveying**: Definition and scope of surveying, Surveying Principles, Importance of surveying in civil engineering: construction, land management, Applications of surveying in urban planning, transportation, construction, and environmental engineering , Types of surveying (topographical, cadastral,geodetic, etc.) , Plane Table (Overview), Surveying units and conversions (e.g., distance, angles, elevations)	7Hrs
Unit 2	**Measurement Techniques:** Introduction to linear measurement, Types of tapes/chains/EDM used in surveying, Procedures for chain surveying, Types of errors in surveying (systematic, random, and gross errors), Measurement errors and correction techniques, Importance of angular measurements in surveying, Use of prismatic and surveyor's compass Bearings and angles, local attraction errors and adjustments.	8 Hrs
Unit 3	**Measurement of Elevation**: Various terms, Methods of height determination, Spirit leveling, different types of levels, booking and reduction of data, profile leveling, cross sectioning,collimation errors and reciprocal leveling. Contours and its	8Hrs

	characteristics, uses and methods of contouring.	
Unit 4	**Theodolite Surveying:** Detailed study of theodolites: parts, operation, and adjustments, Methods of using theodolites for angle measurement in horizontal and vertical planes, Theodolite traversing and its applications in land surveying	8Hrs
Unit 5	**Traversing Surveying:** Purpose and classification of each; Compass and theodolite traverses, methods of observation and booking of data, balancing of traverses, computation of coordinates, Gale's traverse table, Adjustment methods (Bowditch method, Transit method).	7Hrs
Unit 6	**Advanced Surveying Techniques:** Total station and its working principle, Advantages of total stations over conventional instruments, Global Positioning System (GPS), Fundamentals of GPS and its applications in surveying, Introduction to Remote Sensing and GIS for Surveying.	7Hrs

Text Books:

1. R. Agor, Surveying and Levelling, Khanna Publisher, New Delhi.
2. P. Venugopala Rao, Surveying, PHI Learning Private Limited, New Delhi.

Reference Books:

1. Introduction to Surveying and Levelling by S. K. Duggal, McGraw-Hill Education (India) Private Limited, New Delhi.
2. Surveying Vol. 1 & II by B.C. Punmia, Laxmi Publications (P) Limited, New Delhi.
3. Surveying and Levelling" by S. S. Bhavikatti, I. K. International Publishing House, New Delhi.
4. Surveying and Levelling" by N.N. Basak, McGraw-Hill Education (India) Private Limited, New Delhi.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE210PC	Transportation Engineering	3	45 Hrs	3 Hours	60

Course Description:

Subject Code 4CE210PC Transportation Engineering is compulsory Programme Core Course for Second Year B. E. Civil Engineering.

Course Objectives:

The objective of this course is to provide knowledge of transportation systems, highway and pavement design, railway, airport, waterway, and bridge engineering for efficient infrastructure planning and development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Classify the types of transportation system and its role in economic development.
CO2	Determine the sight distance, gradient using highway planning principle.
CO3	Design flexible and rigid pavements.
CO4	Describe the fundamentals of railway track components.
CO5	Describe the principles of airport and waterway engineering for efficient transportation systems.
CO6	Identify the components of bridge engineering.

Details of Syllabus:

Unit 1	**Introduction to Transportation Systems** Definition, scope, and importance of transportation engineering, Types of transportation modes: Road, Rail, Air and Water, Transportation and its role in economic development, Principles of highway planning and alignment.	7Hrs
Unit 2	**Geometric Design** Geometric Design: cross sectional elements, Rightof way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEVTheory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.	8Hrs
Unit 3	**Pavement Design** Components of pavements, Pavement Types and Materials: Flexible and rigid pavements, Materials used in pavement construction (bitumen,	8Hrs

	cement concrete, aggregates), Pavement design considerations (subgrade, traffic load, climatic conditions). Pavement Design Methods: IRC, Structural design of flexible and rigid pavements.	
Unit 4	**Railway Engineering** Fundamentals of railway track components: rails, sleepers, ballast, and fastenings, Track geometry and alignment, stations and yard planning.	7Hrs
Unit 5	**Airport and Waterway Engineering** Components of an airport: Runways, taxiways, terminals, and aprons, Airport layout and air traffic control systems, Airport capacity and demand forecasting, Basics Sof ports, harbours, and shipping logistics, Design of dockyards, terminals, and harbour facilities, Navigation aids and their role in water transport.	8 Hrs
Unit 6	**Bridge Engineering** Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board, different structural form – culverts, types of foundation, abutments, piers and wing wall.	7Hrs

Text Books:

1. "Principles of Transportation Engineering" by Partha Chakroborty and Animesh Das
2. "Transportation Engineering: An Introduction" by Dr. S.P. Chandramouli

Reference Books:

1. Khanna S.K. & Justo C.E. : Highway Engineering
2. Saxena &Arora : Railway Engineering.
3. Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
4. BindraS.P. : Principles & Practice of Bridge Engg.

Draft of Syllabus

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE211PC	Building Planning, Designing	2	30 Hrs	3 Hours	60

Course Description:
Subject Code 4CE211PC Building Planning, Designing is a compulsory Programme Core Course for Second Year B.E. Civil Engineering

Course Objectives:
This course aims to develop skills in interpreting building drawings, applying standards, designing buildings, understanding bye-laws, and creating detailed working and submission drawings with structural and layout plans.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	Identifythe fundamentalprinciples of building planning**.**
CO2	Classify varioustypes of buildingsand structural systems.
CO3	Apply building bye-laws, NBC standards, and fire safety regulations.
CO4	Design sustainable layouts for residential and public buildings.
CO5	Identify structural safety, building services, and construction materials**.**
CO6	Apply drafting and rendering tools techniques for building plans and elevations.

Details of Syllabus:

Unit 1	**Introduction to Building Planning:** Principles of Planning: Aspect, Prospect, Orientation, Circulation, Privacy, Architectural Principles: Balance, Proportion, Scale, Aesthetics.	5Hrs
Unit 2	**Building Components and Structural Overview:** Classification of Buildings: Residential, Commercial, Institutional,Industrial, Functional Requirements of Buildings, Overview of Structural Systems: Load-Bearing, Framed, Composite Structures.	5Hrs
Unit 3	**Building Bye-Laws and Regulation:** Introduction to National Building Code: NBC, ZoningLaws, Floor Space Index (FSI), Setbacks, Basics of Fire Safety Regulations.	5Hrs
Unit 4	**Planning of Residential and Public Buildings:** Residential Buildings: Apartments, Bungalows, Row Houses, Functional Space Requirements and Room Layout Design, Layout, Public Buildings: Schools, Hospitals, Offices, Auditoriums, Preparation of Residential & Commercial Building Plans.	5 Hrs

Unit 5	**Building Services and Safety Considerations:** Plumbing Applications: Water Supply and Drainage Systems, Ventilation and Natural Lighting, Introduction to Electrical &HVAC Systems. Fire Safety Planning.	5 Hrs
Unit 6	**Design and Drafting of Buildings:** Introduction to drafting and rendering softwares for Building Design, Basics of Manual and Digital Building Drawings, Overview of Conceptual Design and Presentation of Architectural Plans.	5 Hrs

Reference Books:

1. Shah, Kale & Patki, Building Planning & Drawing, Tata McGraw-Hill Publication.
2. Kumar Swamy & Rao Swamy, Building Planning & Drawing, Charotar Publications.
3. Chery R, Auto-CAD Pocket Reference, BPB Publication.
4. National Building Code of India (NBC)
5. S.C. Rangwala, *Building Planning and Drawing*
6. M.G. Shah, C.M. Kale, *Building Drawing and Planning*
7. N. Kumara Swamy, *Building Construction & Planning*

Level	Semester	Course Code	Course Name	Credits	Practical Hours	Exam Duration	Maximum Marks
5	IV	4CE212PC	Surveying Lab	1	30 Hrs	-	25

Course Description:

Subject Code 4CE212PC Surveying Lab is a compulsory Laboratory Program Core Course for Second Year B.E. Civil Engineering.

Course Objectives:

The objective of the Surveying Laboratory demonstrates hands-on experience with instruments and techniques for accurate field measurements, data collection, and map creation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Choose the technique for setting up and handling surveying instruments like thelevelling equipment, theodolite and total station
CO2	Select methods for finding Levels and detecting local attractions to correct bearings.
CO3	Adopt appropriate surveying methods such as chain, tape, and total station for accurate field measurements
CO4	Apply contour surveying techniques for mapping elevations and generating topographic maps.

Details of Syllabus:

Minimum Eight practical from the list mentioned below.

1. Distance measurement by chain tape and EDM.
2. To Find RL of given points by using differential levelling.
3. Profile and cross sectioning of road for the minimum distance of 100 m length.
4. Contour survey of a small plot of land.
5. Measurement of bearings with prismatic compass.
6. Chain and compass traversing.
7. Local attraction detection- correction of bearings.
8. measurement horizontal and vertical angle by using a repetition method of theodolite.
9. Theodolite Traversing.
10. Measurement of irregular area by using Digital Planimeter.
11. Measurement of distances, angles and elevation by using total station.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE213PC	Transportation Engineering Lab	1	30 Hrs	-	25

Course Description:
Subject Code 4CE213PC Transportation Engineering Lab is a compulsory Laboratory Program Core course for Second Year B.E Civil Engineering.

Course Objectives:
The objective of this course is to provide hands-on experience in material testing, pavement evaluation, traffic studies, and total station surveying for effective transportation engineering and infrastructure planning.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	Carry out Abrasion and impact test on aggregates.
CO2	Conduct tests like softening point, viscosity and ductility on bitumen.
CO3	Carryout various traffic and road survey studies.
CO4	Identify the components of bridge, railway and airport.

Details of Syllabus:

Minimum eight experiments from the list should be perform

1. Determination of Aggregate Impact value.
2. Determination of Flakiness and Elongation Index of Aggregate.
3. Determination of Abrasion value of Aggregates.
4. Determination of Aggregate Crushing value.
5. Determination of softening point of bituminous material.
6. Determination of viscosity of bitumen.
7. Determination of ductility of bitumen.
8. Pavement Condition Survey.
9. Conduct surveys to collect origin-destination data for a specific region and use it to plan transportation improvements.
10. Conduct Field Visit to Railway Stations/Airport.
11. Conduct Field visit to study bridge components.
12. Carryout the road density survey.

Level	Semester	Course Code	Course Name	Credits	Teaching &Practical Hours	Exam Duration	Maximum Marks
5	IV	4CE215VS	Computer Aided Planning, Design	2 (T- 1 P- 1)	45 Hrs	-	50

Course Description:

Subject Code 4CE215VS Computer Aided Planning, Design is a compulsory Vocational & Skill Enhancement Course for Second Year B.E. Civil Engineering.

Course Objectives:

The course aims to develop skills in drafting building elements, interpreting drawings, creating residential and public building plans, operating CAD software, and designing multi-storeyed buildings, adhering to standards and regulatory requirements.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Draw residential and public building line plans with essential features.
CO2	Apply drafting tools and techniques for building plans, elevations and 3D views.

Unit 1	**Fundamentals of Building Design:** Overview of basic building elementsload-bearing and framed structures: line conventions, graphical symbols, and freehand sketching techniques, residential drawings: room orientation and structural details, Principles of drafting line plans for residential and public buildings	6 Hrs
Unit 2	**Building Drawing and Drafting Tools:** Role of CAD tools in modern building design, Basics of drafting softwares: interface, commands, editing, and dimensioning tools, Elements of submission drawings: plans, sections, elevations, and structural notes	6 Hrs

Details of Syllabus:

Minimum four Practical on drafting software,

1. Develop line plans for residential buildings, incorporating essential features like rooms, staircases, WC, and bathrooms.

2. Create line plan layouts for public buildings.
3. Prepare detailed submission drawings for a single-story load-bearing residential building, including plans, sections, and notes.
4. Draft multi-storeyed building plans with structural details.
5. Prepare a site layout plan.
6. Prepare 3D rendered drawing for residential block.
7. Prepare Mechanical, Electrical and Plumbing (MEP) plan for residential building.

Reference Books

1. Building Planning and Drawing" by S.S. Bhavikatti and M.V. Chitawadag
2. "Civil Engineering Drawing and House Planning" by B.P. Verma
3. "Planning and Designing Buildings" by Y.S. Sane

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE217EM	Entrepreneurship in Civil Engineering	2	30Hrs	2 Hrs	30

Course Description:
Subject Code 4CEC309EM Entrepreneurship in Civil Engineering is a compulsory Humanities Social Science and Management course for Second Year B.E. Civil Engineering.

Course Objectives:
The objective of this course is to equip students to integrate entrepreneurship in civil engineering, addressing challenges, analysing and evaluating business plans.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	Apply entrepreneurial traits to innovate, solve challenges, and value entrepreneurship.
CO2	Identify the opportunities and creativity in construction industry.
CO3	Illustrate market feasibility and value intellectual property in construction business planning

Details of Syllabus:

Unit 1	**Concept of Entrepreneurship:** Introduction to Entrepreneurship, Traits of successful Entrepreneur: perception, consistency, creativity, decision making. Importance of Entrepreneurship in civil engineering, Civil Engineering industry overview (trends, challenges, opportunities), Types of entrepreneurships (businesses and startups).	9Hrs
Unit 2	**Idea Generation and Opportunities:** Recent Trends in civil engineering, Role of innovation and creativity in entrepreneurship, Techniques of Generation of ideas: Brainstorming, SWOT analysis, research, Identification of Opportunities in construction industry, Evaluating Idea and competition in industry.	10Hrs
Unit 3	**Feasibility study of Idea & Market Conditions:** Construction industry research and opportunities, Evaluating and analysing feasibility of idea as per market conditions, Intellectual Property rights, Case study on Business plan, project management consultancy services, successful contractor firms, successful architecture firms	11Hrs

Text Books:

1. Entrepreneurship Development and Business Communication, by S. S. Khanka, S. S. Chand & Company
2. Civil Engineering Systems, by A. K. Gupta, New Age International Publications
3. Creativity and Innovation for Engineers, Peter H. Williams, Pearson Educations

Reference Books:

1. Intellectual Property Rights: Unleashing the Knowledge Economy, by PrabuddhaGanguli, Tata McGraw-Hill Education
2. Brainstorming and Beyond: A User-Centered Design Method, by Chauncey Wilson

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5	IV	4CE214MD	Water Purification And Supply	2	30 Hrs	2 Hours	30

Course Description:

Subject Code 4CE214MD Water Purification and Supply (Multidisciplinary Minor-II) is a course for minor in Civil Engineering for Second Year.

Course Objectives:

The objective of this course is to develop knowledge of water supply systems by understanding water demand, sources, treatment processes, and distribution systems, and to cultivate analytical and responsible approaches to sustainable water management.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Identify the importance of planned water supply, water demand types, influencing factors, and intake structures.
CO2	Describe water impurities, purification processes, and appreciate the significance of safe and treated water.
CO3	Classify various distribution system layouts, types, water conveyance conduits, and pumps for water lifting.

Details of Syllabus:

Unit 1	**Water Supply And Demand:** Importance & Necessity of planned water supplies, Various types of water demand, Per capita demand, Variation in water demand, Factors affecting water demand. Sources of water-Surface & sub-surface sources, Intake structure, Various types of intake structure, Factors governing selection of intake structure.	9 Hrs
Unit 2	**Water Treatment Process:** Analysis of water, Impurities present in water,variousprocesses of water purification: Screening, Plain sedimentation, Sedimentation with coagulation, Filtration, Disinfection, Water Softening, Miscellaneous treatment.	11 Hrs
Unit 3	**Distribution System:**Requirements of a good distribution system, Variouslayoutof distribution system, Methods of distribution,Detection of leakage in the distribution pipes.	10 Hrs

Text Books:

1. Garg S.K. Water Supply Engineering,Khanna Publication.
2. Punmia B.C. Water Supply Engineering,Laxmi Publication.
3. Birde G.S. Water Supply And Sanitary Engineering,DhanpatRai& Sons Delhi.

Reference Books:

1. Steel E.W. Water Supply And Sewerage Mc-Graw Hill.
2. Kshirsagar S.R. Water Supply Engineering Roorkee Pub house, Roorkee.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5.0	IV	4CE216OP1	Fundamental of Vastushastra	2	30 Hrs	2 Hours	30

Course Description:

Subject Code 4CE216OP1 Fundamental of Vastushastrais Open Elective for Second Year.

Course Objectives:

The objective of this course is to introduce the principles of Vastushastra, its historical and cultural significance, and its application in modern construction, fostering sustainable and harmonious designs by integrating traditional knowledge with contemporary engineering practices.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Identify the fundamentals and historical relevance of Vastushastra.
CO2	Apply Vastushastra principles to create efficient and harmonious layouts.
CO3	Apply sustainable practices inVastushastra.

Details of Syllabus:

Unit 1	**Introduction to Vastushastra and Its Fundamentals:** Definition, origin, and evolution of Vastushastra, Significance of Vastushastra in civil engineering and modern construction practices, five elements (Panchabhutas) and their role in design principles, Vastupurusha Mandala and its applications in spatial arrangement.	9Hrs
Unit 2	**Application of Vastushastra in Building Design:** Principles of orientation and layout: Residential, commercial, and institutional buildings, Placement of key elements (rooms, doors, windows) as per Vastushastra, Importance of natural ventilation, lighting, and energy flow, Examples of Vastushastra-compliant structures in modern architecture.	10Hrs
Unit 3	**Sustainable Practices in Vastushastra:** Implementing Vastushastra in modern civil engineering projects, Balancing traditional principles with contemporary design needs and technologies. Remedial Vaastu - Identifying the Vastu Defects, Rectification of Vastu Defects in Existing Building, Color therapy, Discussion on different building plans. Design a small-scale structure adhering to Vastushastra principles.	11Hrs

Reference Books:

1. Dr.SatyendraGautam, *VastuShastra: Science and Technology for Design and Architecture*, CBS Publishers & Distributors Pvt. Ltd.
2. Ashok K. Jain, *Architecture and VastuShastra*, DhanpatRai Publications
3. B. B. Puri, *Introduction to VastuShastra*, V&S Publishers.
4. Dr. B. K. Chaturvedi, *Vastu Science for 21st Century*, Diamond Books.
5. Ashwini Kumar, *Vaastu and Architecture: Ancient Indian Concepts and Their Relevance Today*, Sterling Publishers Pvt. Ltd.
6. RemedialVaastuforhomebyJanhaviN.SahasrabuddheandNarendraHariSahasrabuddhe

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5.0	IV	4CE216OP2	Infrastructure Planning & Management	2	30 Hrs	2 Hours	30

Course Description:

Subject Code 4CE216O2 PInfrastructure Planning & Management is Civil Engineering Open Elective for Second Year.

Course Objectives:

The objective of this course is to equip students with knowledge of infrastructure systems, project management skills, sustainability principles, and innovative technologies for effective, sustainable, and resilient infrastructure planning and management.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Explain the role of infrastructure systems in promoting sustainable economic and social development.
CO2	Understand and Apply project management tools and techniques to develop and evaluate infrastructure project plans.
CO3	Analyse Contract terms and types , Bidding process and applyemerging technologies into infrastructure planning.

Details of Syllabus:

Unit 1	**Fundamentals of Infrastructure Systems:** Types of Civil Projects: real and infrastructure , Introduction to infrastructure: Definition, types, and key components, Significance of infrastructure in economic, social, and environmental development, Principles of infrastructure planning: strategic, tactical, and operational approaches.	9Hrs
Unit 2	**Infrastructure Project Planning and Management:** Term Project, Project Life Cycle , Project development steps , Project planning fundamentals: Work Breakdown Structure (WBS), scheduling, resource allocation. Role and importance of Controlling. Introduction to Planning and Controlling tools – BAR chart and Network (CPM, PERT)	10Hrs
Unit 3	**Infrastructure Projects Contracts and Emerging Trends in Infrastructure Development:** Term Contract, types of Contracts – Cost Plus, Lump sum , Item Rate,	11Hrs

	Percentage rate, BOT, labour , Turnkey contracts ,sub contract, Bidding Process,Emerging technologies in infrastructure: IoT, AI, and smart cities.	

Reference Books:

1. Alvin S. Goodman and Makarand Hastak, *Infrastructure Planning Handbook*, McGraw-Hill Education.
2. R. Dennis Cooke, *Civil Infrastructure Systems: Analysis and Design*, Wiley-Blackwell.
3. E. R. Yescombe, *Public-Private Partnerships: Principles of Policy and Finance*, Elsevier.
4. Michael Neuman and Angela Wilkinson, *Sustainable Infrastructure: Principles into Practice*, Routledge.
5. Kief Morris, *Infrastructure as Code: Managing Servers in the Cloud*, O'Reilly Media.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Maximum Marks
5.0	IV	4CE216OP3	Principles of Management	2	30 Hrs	2 Hours	30

Course Description:

Subject Code 4CE307OP Principles of Management is Civil Engineering Open Elective for Second Year.

Course Objectives:

The objective of this course is to encompass key management principles, focusing on their application in civil engineering projects, enhancing students' ability to manage resources, teams, and construction processes efficiently while integrating sustainable practices.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Identify the fundamental concepts of management, its importance in civil engineering projects.
CO2	Apply project management tools to plan, organize, and control construction projects.
CO3	Develop leadership and communication skills for managing construction teams.

Details of Syllabus:

Unit 1	**Introduction to Management:** Definition, nature, and importance of management in engineering, Roles and responsibilities of a manager in construction projects, Basic management functions: Planning, organizing, staffing, directing, and controlling ;Introduction, importance of various types of management in construction – Humar resource, inventory, safety , quality , planning and contract management .	9Hrs
Unit 2	**Project Management and Organizational Structures:** Term Project, need and functions of project management ,Overview of project management: life cycle Phases, Scheduling, Resource allocation , project optimization concept. Organizational structures in construction: Type - Functional, projectized, and matrix organizations.	11Hrs
Unit 3	**Leadership, Risk Mitigation and Decision Making:** Leadership styles and their application in construction project teams, various risk and process of risk mitigation,Decision-making models: Rational, bounded rationality, and intuitive decision-making, Conflict resolution and negotiation skills in project management.	10Hrs

Reference Books:

1. Harold Koontz and Heinz Weihrich, *Essentials of Management: An International Perspective*, McGraw-Hill Education.
2. R. P. Rastogi, *Management of Construction Projects*, Alpha Science International Ltd.
3. J. K. Liker, *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*, McGraw-Hill Education.
4. R. A. K. Rao, *Principles of Management in Construction*, Oxford University Press.

Level	Semester	Course Code	Course Name	Credits
5	IV	4CE246DH1	Smart City Infrastructure and Digital Integration	4

Course Description:
Subject Code 4CE246DH1 Smart City Infrastructure and Digital Integration under Smart City is optional course to be offered as Honours for Civil Engineering Discipline and for other major discipline it may be offered as Double Minor in Second Year.

Course Objectives:
The objective of this course is to equip learners with knowledge of GIS, AI, ML, and cyber security for smart urban infrastructure.

Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	**Describe** IoT sensor types and applications in smart civil structures and infrastructure.
CO2	**Identify** suitable communication technologies for smart infrastructure applications.
CO3	**Identify** urban civil data using cloud and edge computing platforms.
CO4	**Apply** GIS and remote sensing tools for civil engineering spatial analysis and planning.
CO5	**Demonstrate** AI/ML techniques for structural, traffic, and pavement performance predictions.
CO6	**Explain** cyber security principles and legal standards for protecting smart infrastructure systems.

Details of Syllabus:

Unit 1	**IoT Applications in Civil Infrastructure:** Role of IoT in civil engineering and smart cities, Types of sensors used in civil systems: Strain gauges, accelerometers, tilt sensors, temperature and humidity sensors, Applications: Smart bridges (structural health monitoring), Buildings (energy management, occupancy), Roads and pavements (traffic sensing, rutting detection), Basics of actuators in smart construction	7Hrs
Unit 2	**Communication Technologies for Infrastructure Connectivity:** Communication needs in infrastructure systems: remote monitoring, alerts, automation, Selection of communication protocols for civil systems (MQTT, Zigbee, Modbus), Applications: Smart lighting systems, connected stormwater sensors, smart grids, Challenges: range, power consumption, signal interference in real-world construction sites	8 Hrs

Unit 3	**Data Management for Urban Civil Systems:** Introduction to civil data sources: IoT sensors, cameras, GPS, SCADA systems, Basics of cloud computing in smart city platforms (examples: AWS, Bhuvan, SmartNet), Edge computing for latency-sensitive systems: Traffic signals, flood alerts, Urban infrastructure analytics: Patterns, trends, and alerts in real-time data	7Hrs
Unit 4	**GIS and Remote Sensing for Civil Engineering:** Basics of GIS for civil engineers: map layers, attributes, spatial queries, Data sources: Satellite images, drones, LiDAR, GIS applications: Land-use planning, site selection, Utility and drainage network mapping, Flood risk zoning, urban expansion studies, Remote sensing for environmental monitoring, Hands-on introduction to open tools: QGIS, Google Earth Engine	8Hrs
Unit 5	**Artificial Intelligence and Machine Learning in Civil Systems:** Basics of AI and ML: civil-friendly definitions, Data preprocessing and civil-relevant datasets, Applications: Crack detection in pavements and buildings (image-based ML), Traffic flow prediction and congestion analysis, Structural failure prediction using past data	8 Hrs
Unit 6	**Cyber security and Data Privacy in Public Infrastructure:** Data privacy concerns in public surveillance, citizen services, Encryption, firewalls, and secure data transmission techniques, Legal frameworks: Indian IT Act, ISO 27001, BIS smart infrastructure standards, Disaster recovery and data backup plans in critical urban systems (e.g., metro control)	7 Hrs

Practicals

1. Identification and Study of IoT Sensors in Civil Applications
2. Study of IoT Communication Protocols for Civil Systems
3. GIS Mapping of Drainage or Utility Network Using QGIS
4. Case Study on Cybersecurity Challenges in Smart Infrastructure
5. Simulation of Structural Health Monitoring on Smart Bridges: Virtual Lab
6. Urban Expansion Study Using Google Earth Engine

Text Books:

1. Internet of Things (IoT): Architecture and Applications by Raj Kamal
2. Remote Sensing and GIS by B.C. Punmia, Ashok Jain
3. Applications of Artificial Intelligence in Civil Engineering by Mohd. Shadab, Ankit Kumar

Reference Books:

1. Artificial Intelligence and Machine Learning by Vinod Chandra S.S., Anand Hareendran
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belpure
3. https://upskilldevelopment.com/urban-innovation-management-and-smart-cities-course

Level	Semester	Course Code	Course Name	Credits
5	IV	4CE246DH2	**Renewable Energy**	4

Course Description:
Subject Code 4CE246DH2 Renewable Energy under Sustainability Engineering is optional course to be offered as Honours for Civil Engineering Discipline and for other major discipline it may be offered as Double Minor in Second Year.

Course Objectives:
The objective of this course is to enable learners to understand the environmental, economic, and technical aspects of sustainable energy systems and also to provide fundamental knowledge of various renewable energy sources, their technologies,and applications.

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Course Outcomes:
After completing the course students will be able to:

CO	Course Outcome
CO1	Explain the classification, relevance, and benefits of renewable energy sources.
CO2	Analyze solar energy systems and their integration into civil infrastructure.
CO3	*Analyze wind energy systems and evaluate site selection and civil considerations in wind farm development.*
CO4	Evaluate biomass-based energy systems and their integration in civil sectors.
CO5	Explain geothermal and hydro energy systems with their types, applications, and civil engineering components.
CO6	Evaluate emerging energy technologies like hydrogen and fuel cells.

Details of Syllabus:

Unit 1	**Introduction to Renewable Energy Sources** Need of Renewable energy, Importance and necessity of renewable energy in today's energy scenario, Environmental, economic, and social benefits,Classification and Overview of Renewable Energy Sources,Renewable energy policies in India and sustainable development goals (SDGs)	8 Hrs
Unit 2	**Solar Energy and its Applications** Solar radiation: fundamentals and measurement techniques,Principles of solar energy conversion,Solar thermal systems: solar water heating, solar dryers, space heating,Integration of solar systems in buildings and urban infrastructure,Solar energy in green building certification (LEED, GRIHA)	8 Hrs
Unit 3	**Wind Energy** Principles of wind energy conversion,Wind energy fundamentals, wind resource assessmen,Instrumentation and site selection,Types of wind turbines,Wind farms: layout, construction considerations in civil engineering	8 Hrs
Unit	**Biomass and Bioenergy**	7 Hrs

4	Biomass sources and availability in India,Conversion methods: combustion, pyrolysis, gasification, anaerobic digestion,Biogas technology: digester types, biogas properties and utilization,Role in rural sanitation and waste management	
Unit 5	**Geothermal and Hydro Energy** Principles of geothermal energy and hydroenergy conversion,Geothermal energy: types, site identification, applications in building heating and cooling, Hydro power: types (micro, mini, small, large), components of hydro plant,Run-of-river and pumped storage systems	7 Hrs
Unit 6	**Ocean Energy, Fuel cells and Hydrogen Energy** Hydrogen as an energy carrier: production, storage, transport,Fuel cells: types, working, and integration with renewable systems,Hydrogen use in green buildings and mobility,Smart grids and future trends in renewable energy	7 Hrs

List of Praticals
Minimum six practical's to be performed.

1. Identification of RES devices used in civil/urban infrastructure
2. Preparation of renewable energy plan for a rural or urban locality
3. Familiarization with different Solar Energy Gadgets
4. To study about Solar Lighting
5. Case Study: Green Building Energy Plan using Renewable Systems
6. To observe turbine types and its working
7. Study of energy-efficient civil structures (LEED/GRIHA-rated buildings)
8. Study a **case example** of a geothermal-integrated building (e.g., net-zero campus, green building, etc.).
9. Visit to Solar Farm, wind park or Biogas plant in nearby areas for live exposure
10. Identification and Classification of Biomass Types

Text Books:
1. Duffie, J. A., & Beckman, W. A. (2013). Solar engineering of thermal processes, fourth edition, Wiley.
2. Tiwari, G. N., & Ghosal, M. K. (2007). Fundamentals of renewable energy sources. Alpha Science International Limited.

Reference Books:
1. Mukherjee, D., & Chakrabarti, S. (2004). Fundamentals of renewable energy systems. New Age International.
2. Sukhatme, S. P. (2005). Solar Energy Principles of Thermal Collection and storage Tata McGraw Hill Publishing Company Ltd. New Delhi.
3. Kothari, D. P., Singal, K. C., & Ranjan, R. (2011). Renewable energy sources and emerging technologies. PHI Learning Pvt. Ltd.

Level	Semester	Course Code	Course Name	Credits
5	IV	5CE243EC	Quantity Survey & its equipment's	4

Course Description:

Subject Quantity Survey & its Equipment's is an Exit Course after Second Year B. E. Civil Engineering.

Course Objectives:

The objective of the Quantity Survey & its Equipment's is toequip students with skills in quantity surveying, rate analysis, earthwork estimation, material calculation, contract management, and equipment application.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Identify the type of construction, elements of a structure and understand the measuring unit for different construction items .
CO2	Understand types of estimation methods and prepare estimate of RCC work by different methods.
CO3	Analyse and Prepare the Quantity survey sheets for Road and Paving work
CO4	Understand part and process of rate analysis and its techniques .
CO5	Understand the process and concept of valuation.
CO6	Understand the type of contract and process of tendering. Identify and choose proper construction equipment as per utility.

Details of Syllabus:

Unit 1	**Introduction to Construction material and methods:** Types of Construction Projects – Load bearing and frame structures. Construction materials, their specific weight,Item of Work and measuring units,Specifications.	10Hrs
Unit 2	**Quantity surveying, its types and methods: -** Definition of Quantity surveying;Need and Duties of Quantity Surveyor; Estimation – its need and types. Formats of estimation RCC framed Single Room Quantity Surveying by Centreline method. Masonry Single room quality surveying by Long wall short wall method.	10Hrs
Unit 3	**Quantity analysis for Paving &Road work: -** Quantity analysis for 1 km stretch of Concrete Road Quantity analysis for 1 km stretch of Bitumen Road	10 Hrs

	Quantity survey for paved Footpath.	
Unit 4	**Rate Analysis:** Steps involved in the analysis of rates, factors affecting rate analysis , procedure of rate analysis- Lead and Lift, Overhead charges, water charges , contractor profit. Prepare rate analysis for: - Plain Cement Concrete, Reinforced cement concrete, brick masonry, plaster for cum or sqm.	10Hrs
Unit 5	**Valuation** – Purpose ; types of value ; term depreciation , methods of calculating deprecation.	10 Hrs
Unit 6	**Civil engineering contracts and Construction Equipment:** Contract and its types, Requirement of valid contract ; Tender and tender document,Process of Tendering. Introduction to :- Construction equipment's and their types, Excavator , Compactor , Vibrator and Crane	10Hrs

Text Books:

3. R. Agor, Surveying and Levelling, Khanna Publisher, New Delhi.
4. P. Venugopala Rao, Surveying, PHI Learning Private Limited, New Delhi.

Reference Books:

5. Introduction to Surveying and Levelling by S. K. Duggal, McGraw-Hill Education (India) Private Limited, New Delhi.
6. Surveying Vol. 1 & II by B.C. Punmia, Laxmi Publications (P) Limited, New Delhi.
7. Surveying and Levelling" by S. S. Bhavikatti, I. K. International Publishing House, New Delhi.
8. Surveying and Levelling" by N.N. Basak, McGraw-Hill Education (India) Private Limited, New Delhi.
9. "Estimating and Costing" by B.N. Dutta ,Ubs Publisher Distributors Private Ltd.

Level	Semester	Course Code	Course Name	Credits
5.0	IV	5CE244EC	Fundamentals of Structural Analysis	4

Course Description:

Subject Code _ Fundamentals of Structural Analysis is an Exit Course after Second Year B.E. Civil Engineering

Course Objectives:

The objective of this course is to introduce foundational concepts in structural analysis,.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome
CO1	Classify types of loads, supports, equilibrium conditions, significance of indeterminate structures and types of indeterminacy.
CO2	Analyse trusses using the methods of joints and sections
CO3	Apply moment distribution method for continuous beams and frames analysis.
CO4	Apply slope deflection method for continuous beams and frames analysis.
CO5	Apply energy method for Beam and single bay frame analysis.
CO6	Classify types of dynamic loads, natural frequency, resonance and damping.

Details of Syllabus:

Unit 1	**Introduction to Structural Analysis:** Types loads, Types support and equilibrium condition, significance of indeterminate structure Types of indeterminacy, degree of indeterminacy of various structure.	10Hrs
Unit 2	**Analysis of Trusses:** Analysis of planar trusses using methods of joints and sections. Analysis of indeterminate truss by using Castigliano's theorem/stiffness method etc.	10Hrs
Unit 3	**Moment Distribution method:** Analysis of continuous Beams with and without sinking support. Analysis of single bay single storey frame with and without sinking support.	10Hrs
Unit 4	**Slope Deflection Method:** Analysis of continuous Beams with and without sinking support. Analysis of single bay single storey frame with and without sinking support.	10Hrs

Unit 5	**Energy Methods in Structural Analysis:** Work and energy principles: Strain energy, work done by external forces, Castigliano's theorem and virtual work, Application of energy methods in analysing beams.	10Hrs
Unit 6	**Plastic Analysis:** Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams, single bay, single storey portals .	10Hrs

Reference Books:

1. R.C. Hibbeler, *Structural Analysis*, Pearson Education.
2. S. Ramamrutham, *Theory of Structures*, Dhanpat Rai Publishing Company.
3. Timoshenko and Young, *Theory of Structures*, McGraw-Hill Education.
4. C. S. Reddy, *Basic Structural Analysis*, McGraw-Hill Education.
5. J. M. Gere and W. Weaver, *Mechanics of Materials*, Brooks/Cole Publishing.