



Savitribai Phule Shikshan Prasarak Mandal's
SKN SINHGAD COLLEGE OF ENGINEERING

(Approved by AICTE, Recognized by DTE (MS) & Affiliated to Solapur University)

Accredited 'A' Grade by NAAC

DTE Code : EN-6643

Department of Civil Engineering

Course Outcomes

S.Y. B. Tech Civil – Part I	
Subject:	CV31 – SURVEYING & GEOMATICS
CO No.	Course Outcomes:
1	Carry out temporary adjustments of modern surveying equipment's.
2	Use the surveying instruments namely levels, theodolite, EDM, total station for surveying measurements such as horizontal/ vertical/inclined distance, horizontal/ vertical angles, bearings, reduced levels, and coordinates.
3	Develop plans, draw maps and draft reports for surveying projects of Civil Engineering works.
4	Use the modern surveying techniques namely remote sensing, Global positioning system and Geographic information system for Civil Engineering applications.
5	Demonstrate the attributes of leadership, working in the team and professional ethics while performing the surveying projects.
Subject:	CE32: FLUID MECHANICS AND FLUID MACHINES
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CO No.	Course Outcomes:
1	Identify and obtain values of fluid properties and relationship between them.
2	Carry out calibration of discharge measuring equipment's.
3	Carry out hydraulic design of notched, weirs and spillways
4	Analyse fluid flows and will be able to design pipe networks.
5	Explain the working of Pelton, Francis and Kaplan turbines and pumps along their performance parameters.
6	Apply dimensional analysis to predict physical parameters that influence the flow in fluid mechanics.
Subject:	CE33: CONCRETE TECHNOLOGY, MATERIAL TESTING & EVALUATION
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CO No.	Course Outcomes:
1	Perform laboratory testing of various ingredients of concrete for determining their physical properties
2	Explain properties of fresh and hardened concrete and apply this knowledge on field.

3	Select appropriate type of concrete, admixture and chemicals for specific requirements.
4	Design a concrete mix of required strength and durability, for given field conditions, using suitable ingredients
5	Evaluate properties of construction materials viz. steel, bricks, timber, tiles etc. in laboratory for the quality assurance
Subject: -	CE34: BUILDING CONSTRUCTION AND DRAWING
CO No.	Course Outcomes:
1	Elucidate functional requirements of buildings and types of foundation and its suitability.
2	Draw neat drawings of different building components such as doors, windows, stairs etc with the suitable scale using CADD software.
3	Design different types of staircases commonly used in residential and public buildings.
4	Draw neat perspective view drawings of an object and given small residential building.
5	Select appropriate ventilation systems and building finishes.
Subject: -	CE35C: STRUCTURAL MECHANICS-I
CO No.	Course Outcomes:
1	Employ the knowledge of structural mechanics to depict the behavior of structures.
2	Identify principal planes and find principal stresses in beams and effect of combined bending and torsion
3	Identify all potential failure modes of an item
4	Draw Shear force diagrams and bending moment diagrams of statically determinate beams.
5	Evaluate bending and shear stresses in beams.
6	Analyse the behaviour of structure under moving load using Influence line diagrams
Subject: -	CE410 L: LAB PRACTICE
CO No.	Course Outcomes:
1	Architectural floor plan of a small residential building
2	The geometric constructions, multi-view, sectional view, dimensioning and detail drawings of typical 2-D engineered objects.
3	Views like elevation, section, furniture plan for a small residential building
4	Detailed formatted and dimensioned Civil Engineering drawings.

S.Y. B. Tech Civil – Part II	
Subject: -	CE41: ENVIRONMENTAL ENGINEERING-I
CO No.	Course Outcomes:
1	Plan and design water conveyance systems for a rural/urban area based on population forecasts.
2	Design various water treatment units and plan their operations on the basis of raw water quality and water demand.
3	Apply knowledge of advanced water treatment processes for individual water purification units.
4	Plan and design water distribution systems and identify operation and maintenance problems in water supply systems and suggest suitable solutions.
Subject: -	CE42: BUILDING PLANNING & DESIGN
CO No.	Course Outcomes:
1	Plan residential and public buildings, according to the prevalent building byelaws
2	Prepare „Municipal building permission drawings“ of residential buildings using CADD software tools.
3	Plan appropriate building services for a building
4	Design a rain water harvesting system for a building.
5	Plan appropriate acoustics, sound insulation and firefighting arrangements for a building
Subject: -	CE43: STRUCTURAL MECHANICS-II
CO No.	Course Outcomes:
1	Employ the knowledge of structural mechanics to describe the behaviour of structures under combined direct and bending and also behaviour of long columns.
2	Evaluate slope and deflection in beams and analysis of 3 hinged arch
3	Analyse determinate and indeterminate structural members subjected to different types of loadings.
4	Discretize simple structures; identify static and kinematic degrees of freedom
5	Analyse beams, trusses and frames for joint displacements, and forces in members, by force method and displacement method.
6	Select and use appropriate application software for structural analysis.
Subject: -	CE44: ENGINEERING MATHEMATICS - III

CO No.	Course Outcomes:
1	Solve higher order linear differential equation with constant coefficient
2	Solve partial differential equation of first order
3	Express a function in terms of sine and cosine components so as to model simple periodic functions.
4	Apply Laplace and inverse Laplace transforms for solving linear differential equations.
5	Find the relation between two variables for the given data using regression
6	Sketch and explain various probability distribution functions
Subject: -	CE45: ENGINEERING GEOLOGY
CO No.	Course Outcomes:
1	To describe issues concerning the geological formations and geological structure of a region
2	To distinguish the characteristics of the most important geological formations and problems that may arise in the various civil engineering projects in such formations.
3	To interpret and explain the geological structures in the geological maps and cross sections.
4	To assess and appropriately adjust the results of geological study in order to ascertain secure construction and operation of a civil engineering projects like dams, reservoirs hilly roads and railway tracks.
5	To receive, analyze and evaluate data and appropriately and solve technical as well as ground water related problems.
Subject: -	CE48: COMPUTER PROGRAMMING & NUMERICAL METHODS
CO No.	Course Outcomes:
1	Various Civil Engineering Problems
2	Matrix operations, which are necessary for structural analysis.
3	Calculating Roots of equation, Numerical Integration, ordinary differential equations and their various applications in Civil Engineering.
4	Carrying out statistical analysis of data for various statistical methods, with applications from Civil Engineering domain.
Honors Degree in Infrastructure Engineering with B. Tech.(Civil Engineering)	
Subject: -	Hn- 411- Applications of Information Technology and Information Systems
CO No.	Course Outcomes:
1	Connect digital tools to construction practice and apply techniques to calculate cost of different structures.

2	Solve Linear Programming Problems, Material Transportation and Work Assignment problems using MS Office tools.
3	Learn inventory management and planning using AutoCAD software.
4	Work on Linear scheduling of Project using with optimized solutions using various software's.
5	Create models with applications of Building Information Modelling (BIM) software's.

T.Y. B. Tech Civil – Part I	
Subject:-	CE51C- DESIGN OF STEEL STRUCTURES
CO No.	Course Outcomes:
1	Understand the Philosophy and design criteria, Select appropriate load combinations for 'Limit State' design of various elements of steel structures for strength and serviceability
2	Analyze and design simple connections between structural members including Bolted and welded connections
3	Analyze and design Tension members, Compression members, and their connections.
4	Analyze and design of flexural members by limit state method.
5	Plastic analysis of (flexural members) beams.
6	Design Columns, Column base (slab base, gusseted base) for given loading conditions.
Subject:-	CE52C- GEOTECHNICAL ENGINEERING
CO No.	Course Outcomes:
1	Determine various index properties of soil in the laboratory to characterize and classify the soil.
2	Estimate the permeability and seepage through soil mass by applying basic hydraulic flow principles.
3	Draw stress contours in soil mass by applying stress distribution theory.
4	Determine shear strength parameters of soil under various drainage conditions
5	Determine compaction properties and consolidation settlement of soil for given loading conditions.
6	Determine earth pressure for earth retaining structure.
Subject:-	CE53C- HIGHWAY AND TUNNEL ENGINEERING
CO No.	Course Outcomes:
1	Choose the ideal alignment for highways after thorough understanding of planning and different surveys.
2	Design various geometric elements of highway as per IRC standards.
3	Evaluate the pavement materials through various tests in the laboratory and design the crust thickness of flexible and rigid pavements as per IRC standards.
4	Recognize different layers of pavement and illustrate the construction process and also suggest maintenance activities for flexible and rigid pavement.
5	Select appropriate method of tunnel construction in different types of soils.
Subject:-	CE54C-HYDROLOGY AND WATER RESOURCE ENGINEERING
CO No.	Course Outcomes:
1	Estimate runoff, based on rainfall data and watershed characteristics.

2	Estimate design flood for a civil engineering project.
3	Calculate yield of open well and tube well for various types of aquifers using knowledge of ground water hydrology.
4	Elaborate National and State Water Policies.
5	Select appropriate water application technique of irrigation, depending upon type of crop, soil moisture and water availability.
6	Select suitable soil & water conservation techniques for particular watershed.
Subject:-	CE55C- DESIGN OF CONCRETE STRUCTURES-I
CO No.	Course Outcomes:
1	Interpret the basic concept of limit state method.
2	Design appropriate type of slab for a given condition.
3	Analyze and Design suitable type of beam for a given condition.
4	Analyze and Design beam subjected to combined bending, shear and torsion.
5	Analyze and Design axially as well as eccentrically loaded columns.
Subject:-	CE56C- ENVIRONMENTAL ENGINEERING-II
CO No.	Course Outcomes:
1	Plan the layout of sewage collection system, matching with topography of the region and characterization of sewage.
2	Select aerobic or anaerobic wastewater treatment processes and decide their sequence.
3	Design of aerobic and anaerobic wastewater treatment units and disposal of treated wastewater into the streams.
4	Elaborate the novel decentralized wastewater treatment systems.
5	Select appropriate methods of Solid waste Disposal and Management of hazardous waste based on their characteristics.
6	Analyze air pollution and adopt various measures to control air pollution.
Subject:-	CE59L- PLANNING & DESIGN OF PUBLIC BUILDING
CO No.	Course Outcomes:
1	Plan and design a “Public Building” according to requirements adhering to National Building Code norms and standards.
2	Prepare “Permission Drawing” for public buildings for obtaining building permission from competent authority by using suitable ‘Computer Aided Drawing and Design’ application software.
3	Plan and design appropriate building services layout for “Furniture requirement, Electrification points, Water supply and Drainage System” for a building as per standards norms by using suitable ‘Computer Aided Drawing and Design’ application software.
4	Prepare “Perspective drawing of the Building” and “Line plan of any two Public Buildings” by using suitable ‘Computer Aided Drawing and Design’ application software.
5	Prepare a report on selected Public Building.
Subject:-	SL5- ELECTIVE (SELF LEARNING MODE) PROFESSIONAL ETHICS & HUMAN VALUE
CO No.	Course Outcomes:
1	Inculcate the human values in their behavior.
2	Demonstrate the Engineering ethics in their professional practice.

3	Practice the safety and responsibility and professional rights in their professional practice.
4	Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE
Honors Degree in Infrastructure Engineering with B. Tech.(Civil Engineering)	
Subject:-	Hn512: Planning and Design of Rural Roads
CO No.	Course Outcomes:
1	Able to elaborate significance of low-cost roads.
2	Capable of analysing the problem associated with planning of low volume roads, preparing master plan of rural road network.
3	Capable of conducting surveys for rural road alignment and remembering specifications of various geometric features of road.
4	Capable of selecting and analysing different materials and equipment's required for rural road construction.
5	Able to design various drainage structures and cross drainage works giving due importance to maintenance activities.



T.Y. B. Tech Civil – Part II	
Subject:-	CE61C- FOUNDATION ENGINEERING
CO No.	Course Outcomes:
1	Evaluate bearing capacity of soil by various analytical and experimental approaches by obtaining the data from soil exploration.
2	Perform geotechnical design of shallow foundation such as isolated footing, combined footing, raft foundation.
3	Apply suitable ground improvement techniques for construction of footing in difficult soil.
4	Perform geotechnical design of deep foundation such as Pile foundation and Caisson foundation
5	Investigate slope stability of embankments
Subject:-	CE62C - HYDRAULIC STRUCTURES AND WATER POWER ENGINEERING
CO No.	Course Outcomes:
1	Plan and design the reservoirs depending upon the water resources potential.
2	Analyze and design Gravity dams and Earth dams (Simple Designs).
3	Elaborate the design principles of Arch dams.
4	Carry out Hydraulic Design of spillways
5	Select appropriate method of river training depending upon river characteristics
6	Estimate water power potential at a site.
Subject:-	CE63E- PROFESSIONAL ELECTIVE COURSE-I STRUCTURAL ANALYSIS BY MATRIX METHODS
CO No.	Course Outcomes:
1	Describe the concepts of flexibility and stiffness method of analysis for simple problems.
2	Analyze continuous beams, rigid frames and trusses by using element flexibility method.
3	Analyze continuous beams, rigid frames and trusses by using element stiffness method.
4	Analyze continuous beams, trusses by direct stiffness method.
5	Evaluate secondary stresses.
Subject:-	CE63E- PROFESSIONAL ELECTIVE COURSE-I STRUCTURAL DYNAMICS
CO No.	Course Outcomes:
1	Develop mathematical models for engineering structures using knowledge of structural Dynamics.
2	Apply different theories for vibration study of structures.
3	Interpret dynamic analysis results for design, analysis and research purposes

4	Apply structural dynamics theory to earthquake analysis and design of structures.
Subject:-	CE63E- PROFESSIONAL ELECTIVE COURSE-I ADVANCED CONCRETE TECHNOLOGY
CO No.	Course Outcomes:
1	Select proper admixtures to obtain concrete of desired properties
2	Use of additions in concrete to enhanced properties
3	Adopt appropriate type of special concrete for desired results
4	Design a concrete mix of required strength and workability properties
5	Adopt appropriate method for repairs and rehabilitation of concrete structures
Subject:-	CE63E- PROFESSIONAL ELECTIVE COURSE-I SOLID AND HAZARDOUS WASTE MANAGEMENT
CO No.	Course Outcomes:
1	Develop solid waste management systems with respect to its physical properties, and associated critical considerations in view of emerging technologies.
2	Select and adopt the appropriate methods for solid waste collection, transportation, redistribution and disposal.
3	Identify the types of hazards and describe methods of disposal of hazardous solid waste.
4	Implement legal, political and administrative considerations in design and operation of solid and hazardous waste management.
Subject:-	CE64C DESIGN OF CONCRETE STRUCTURES-II
CO No.	Course Outcomes:
1	Analyze and Design of RCC Stairs and Column Footings.
2	Analyze and Design of RCC Retaining walls and Water tanks.
3	Analyze Pre stress concrete sections.
4	Determine Loss of Pre stress and Design of Pre stress Beams.
5	Analyze and Design the End Block of post tensioned PSC girder.
Subject:-	CE65C PRINCIPLES OF MANAGEMENT AND QUANTITATIVE TECHNIQUES
CO No.	Course Outcomes:
1	Demonstrate decision making and communication as a member of a team as well as Lead a team for effective management of construction projects.
2	Apply the Optimization techniques for decision making in construction industry.
3	Explain the lean construction technique and its use in construction industry
4	Carry out ABC analysis, Break even analysis and calculate EOQ and Inventory costs for construction project.
5	List the various types of master libraries in the ERP system.
6	Use Statistical Methods and Control charts (X, R, p, c charts) for quality control of materials and workmanship in Civil Engineering projects.
Subject:-	CE66C-RAILWAY, AIRPORT & HARBOUR ENGINEERING
CO No.	Course Outcomes:
1	Identify various components of Permanentway and know the constructions process of railway track.
2	Acquires capability of choosing alignment and also design geometric aspects of railway system.

3	Illustrate different types of signals, explain the working principles of railway interlocking system.
4	Analyze and design the elements for orientation of runways, taxiways and passenger facility systems.
5	Understand the various features in Harbours and Ports, their construction and coastal protection works.
Subject:-	CE67L PROJECT ON STEEL STRUCTURES
CO No.	Course Outcomes:
1	Selection of roof truss / Portal frame. Decide various parameters to complete Geometry truss / Portal frame of
2	Analyze the steel structure using standard structural engineering application software
3	Design of various components of Industrial shed with roof truss or portal frame or gable Frame using relevant software and prepare their detailed computer aided drawing.
4	Design the various components of Building frame/Foot bridge/Welded plate girder and prepare their detailed computer aided drawing
5	Create report for the structure as per Analysis and Design.
Subject:-	CE69L MINI PROJECT USING APPLICATION SOFTWARE
CO No.	Course Outcomes:
1	Identification and Selection of problems.
2	Define aims and objectives of selected problem
3	Decide various relevant parameters
4	Find appropriate solution
5	Generate technical report
Honors Degree in Infrastructure Engineering with B. Tech.(Civil Engineering)	
Subject:-	Hn613: Roads and Highway Project Development
CO No.	Course Outcomes:
1	Prepare project report for new and up-gradation type road works by conducting necessary feasibility/detailed studies.
2	Conduct the soil and material investigations to understand their behaviour and performance.
3	Analyze the surveys and investigations and select geometry of road
4	Understand the contract document, evaluation and contract management for road projects Analyse the social impact of road projects and also determine the economic feasibility analysis for justification of investments.
5	Understand constructions of non-bituminous, bituminous & cement concrete pavements for flexible & rigid pavements
6	Prepare DPR on road projects with relevant drawings and get the knowledge of tendering process for the construction.

Final Year B. Tech Civil – Part I	
SUBJECT	CV- 411 ENGINEERING ECONOMICS, ESTIMATION & COSTING
CO NO	Course Outcomes
1	Analyze and evaluate economic alternatives for civil engineering projects.
2	Write technical specifications for civil engineering works.
3	Carry out rate analysis based on market rates , schedule of rates and other relevant standard documents and codes.
4	Take off quantities of items of construction for civil engineering works.
5	Prepare tender documents and explain contract procedures.
6	Prepare the valuation reports for land and buildings.
SUBJECT	CV- 412 CONSTRUCTION ENGINEERING, MANAGEMENT & CONSTRUCTION PRACTICES
CO NO	Course Outcomes
1	Plan the project and prepare Bar chart and Network to optimize the project duration and cost
2	Update the network and re evaluate the resources.
3	Use appropriate project management application software for planning, tracking and reporting progress of civil engineering projects.
4	Calculate output of earthmoving, hoisting, dredging equipments.
5	Adopt appropriate safety measures for various Civil Engineering Projects.
6	Explain prefabricated constructions, Diaphragm wall constructions, advanced formwork and Hot Mix Plant.
SUBJECT	CV- 413 DESIGN OF CONCRETE STRUCTURES-II
CO NO	Course Outcomes
1	Analyze and Design of RCC Stairs and Column Footings.
2	Analyze and Design of RCC Retaining walls and Water tanks.
3	Analyze Pre stress concrete sections.
4	Determine Loss of Pre stress and Design of Pre stress Beams.
5	Analyze and Design the End Block of post tensioned PSC girder.
SUBJECT	CV- 414 EARTHQUAKE ENGINEERING
CO NO	Course Outcomes
1	Apply the principles of Earthquake resistant philosophy in planning, design and construction of building.
2	Perform the dynamic analysis of structures under earthquake load.
3	Incorporate the Earthquake resistant features for various types of construction.
4	Adopt the provisions of IS 1893-2016 and IS 13920- 2016 Codes.
5	Incorporate the ductility features in the structures.
SUBJECT	CV- 415 PROFESSIONAL ELECTIVE COURSE-II
CO NO	415 (A) METAL STRUCTURE BEHAVIOUR- I
CO NO	Course Outcomes

1	Able to design bolted and welded connections for tension and compression members and beams
2	Able to analyze beam column behaviour
3	Able to understand behaviour of Light gauge steel members
4	Able to understand design concepts of cold formed/unrestrained beams
5	Able to understand Fire resistance concept required for present days.
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (B) ADVANCED STRUCTURAL ANALYSIS
CO NO	Course Outcomes
1	Draw ILD for indeterminate structures
2	Analyze the beams curved in plan and beams resting on elastic foundation
3	Analyze the Beam column
4	Analyze the structures using structure oriented stiffness method.
5	Analyze the structures using member oriented stiffness method
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (C) FINITE ELEMENT METHOD
CO NO	Course Outcomes
1	Find solution to problems using direct approach methods like Rayleigh – Ritz or Galerkin’s Method
2	Analyze 1-D problems related to structural analysis like Bars, Trusses, Beams and Frames using finite element approach.
3	Solve 2-D & 3D problems using knowledge of theory of elasticity.
4	Apply Shape function, Natural Co-Ordinate systems, and classification of Isoparametric & Axisymmetric elements
5	Analyze plate & shell elements
6	Students will be able to implement the knowledge of numerical methods in FEM to find the solution to the various problems in statics and dynamics.
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (D) TRAFFIC ENGINEERING AND MANAGEMENT
CO NO	Course Outcomes
1	Undertake various traffic studies and analysis of traffic data including parking studies and calculation of parking demand.
2	Explain relation between flow, density, speed, concept of level of service for urban and rural area.
3	Explain the regulations on vehicle, driver and speed and Vehicle as per Motor Vehicle Rules.
4	Design intersections and signals and propose various traffic signs, road marking and lighting at various locations.
5	Explain applications and principles of various modern instruments used in traffic studies.
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (E) GEOSYNTHETICS AND SOIL STRUCTURES
CO NO	Course Outcomes
1	Identify the different types of geo textile and their suitability for the soil reinforcement structures;
2	Perform the laboratory testing of Geo synthetics
3	Design RE retaining structures
4	Design the soil reinforcement for erosion control, Drainage and filtration
5	Design soil reinforcement using Geo synthetic for pavement application and landfills

CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (F) ADVANCED RAILWAY TRACK
CO NO	Course Outcomes
1	Supervise a set of workers in the rectification of track defects including use of track machines
2	Carry out special repairs to formation, track or bridges.
3	Identify and quantify track defects
4	Analyse slewing of curves.
5	Inspect various track sites like Points and Crossings, curves level crossings and be able to fill the proforma in the inspection registers.
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (G) CONSTRUCTION PRODUCTIVITY
CO NO	Course Outcomes
1	Assess productivity effects & reasons of low productivity in construction industry.
2	Differentiate responsibilities & roles of project participants to improve productivity.
3	Measure and analyze productivity using classical methods of data gathering.
4	Apply advance construction management approaches to improve productivity.
5	Present and implement productivity improvement findings.
6	Explore impact factors affecting productivity and quantity lost productivity.
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (H) ENVIRONMENTAL SYSTEMS
CO NO	Course Outcomes
1	To understand the concept of modeling & its classification
2	To introduce about ecological modeling, single and multi-species modeling in brief.
3	To study modeling waste water management system
4	To study equations of continuity
Final Year B. Tech Civil – Part I	
CV- 415 PROFESSIONAL ELECTIVE COURSE-II	
SUBJECT	415 (I) WATER POWER ENGINEERING
CO NO	Course Outcomes
1	Estimate the available hydropower in a project
2	Select suitable types of hydro-power system for particular site conditions
3	Design penstock and anchor blocks
4	Analyze the different types of loads on power plants
5	Design the components of Tidal power plant
SUBJECT	CV- 416 PROJECT ON R. C. C. STRUCTURES
CO NO	Course Outcomes
1	Apply codal provisions in the analysis and design of structures in accordance with relevant IS codes.
2	Prepare detailed drawing of R.C.C section of designed building.
3	Perform the analysis using relevant application software.
SUBJECT	CV- 417 SEMINAR
CO NO	Course Outcomes
1	To expose the students to a variety of subjects and research activities in Civil Engineering in order to enrich their academic experience.
2	To acquaints department members with all final year students within the department and learn about each students' seminar activities.

3	To give an opportunity for students to develop skills in presentation and discussion of various topics in a public forum.
SUBJECT	CV- 418 PROJECT WORK
CO NO	Course Outcomes
1	To carry out a thematic design project in one of the specializations of civil engineering
2	To carry out a project that will make the students aware of the different facets of civil engineering.
SUBJECT	CV- 419 ASSESSMENT OF REPORT ON FIELD TRAINING-II
CO NO	Course Outcomes
1	Gain direct field/ practical experience with the actual civil engineering work processes such as Surveying, marking out, Mixing, Quality control, Reinforcement (i.e., cutting, bending and placement), Measurements, advance construction equipment, Curing, Centering etc. 2. It is intended that the students understand how theoretical aspects are put into actual action in the form of field activities.
2	It is intended that the students understand how theoretical aspects are put into actual action in the form of field activities.
	CV- 421 PROFESSIONAL ELECTIVE COURSE-III
SUBJECT	421 (A) INDUSTRIAL STRUCTURES
CO NO	Course Outcomes
1	Plan different types of industrial structures.
2	Analyze shed using single storey portal frame with and without gantry
3	Analyze and design pressed circular steel tanks.
4	Analyze steel chimney.
5	Analyze and design steel towers.
6	Analyze and design foundation for rotary machine and impact machine.
	CV- 415 PROFESSIONAL ELECTIVE COURSE-III
SUBJECT	415 (B) REPAIRS & REHABILITATION OF STRUCTURES
CO NO	Course Outcomes
1	Understand the fundamentals of maintenance and repair strategies.
2	Identify for serviceability and durability aspects of concrete.
3	Know the materials and techniques used for repair of structures.
4	Decide the appropriate repair and retrofitting techniques.
	Final Year B. Tech Civil – Part II
	CV- 421 PROFESSIONAL ELECTIVE COURSE-III
SUBJECT	421 (C) PUBLIC TRANSPORTATION SYSTEMS
CO NO	Course Outcomes
1	Understand fundamentals of Public Transportation Systems.
2	Differentiate different PTS user services
3	Select appropriate technology depending upon site specific conditions.
4	Design and implementation of Public Transportation Systems.
5	Apply the various methodologies for Public Transportation Systems.
6	Define the significance of Public Transportation Systems under Indian conditions
	CV- 421 PROFESSIONAL ELECTIVE COURSE-III
SUBJECT	421 (D) AIRPORT PLANNING AND DESIGN
CO NO	Course Outcomes

1	Elaborate various components of an airport and aircraft characteristics affecting the design of airports.
2	Design the runway and taxiway geometrics based on the likely aircrafts using the airport.
3	Plan the requirements of terminal area and suggest an optimum layout for the terminal area based on passenger and baggage volume.
4	Suggest a suitable method of grading and leveling work involved in the area along with drainage provisions for surface and subsurface water flows.
5	Understand the various air traffic control aids required for safe landing and take-off of aircrafts at the airport.
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (E) HIGH SPEED RAIL ENGINEERING
CO NO	Course Outcomes
1	Introduced the regional planning for an HSR
2	Explain the significance of HSR as a mode of transport.
3	Demonstrate the basic design of HSR
4	Carry out Structural Design of HRS system
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (F) CONSTRUCTION COST ANALYSIS
CO NO	Course Outcomes
1	Analyze various elements of the cost associated with the engineering project
2	Estimate cost using estimating models
3	Measure progress and track the cost of engineering projects
4	Execute the cost management of project
5	Explain value management process and relate Project Value and Risk
6	carry out earned value analysis in an engineering project
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (G) CONSTRUCTION EQUIPMENT & AUTOMATION
CO NO	Course Outcomes
1	Compare the Construction equipments in terms of its suitability, efficiency and economy.
2	Explain the 3D printing construction process and components.
3	Explain the application of building management system and automation in on and off site projects.
4	Solve the construction issues through robotic techniques and Apply Robotics in Construction
5	Apply computer in construction Information processing and explain the concepts of Communication and office automation system
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (H) RURAL WATER SUPPLY & ONSITE SANITATION SYSTEMS
CO NO	Course Outcomes
1	Identify the problems pertaining to rural water supply and sanitation.
2	Design water supply and sanitation system for rural community.
3	Design low cost waste management systems for rural areas.
4	Plan and design an effluent disposal mechanism.
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (I) AIR AND NOISE POLLUTION AND CONTROL
CO NO	Course Outcomes

1	Proper understanding about the various air pollutants, their source of generation, their impacts, their effect on human, plants, environment and materials.
2	Apply knowledge of meteorology for controlling air pollution and Design air pollution controlling equipments.
3	Apply knowledge of legislation for prevention and control of air pollution.
4	Knowledge to analyze quality of air in the form of air quality index and dispersion modeling.
5	Basic information about Noise and its control.
6	Hands on experience on sampling and measurements of air Pollutants
CV- 421 PROFESSIONAL ELECTIVE COURSE-III	
SUBJECT	421 (J) SURFACE HYDROLOGY
CO NO	Course Outcomes
1	Conduct Rainfall-Runoff Analysis, Solve Problems.
2	Analyze hydrological and probabilistic data.
3	Conduct frequency analysis, Learn Unit Hydrograph Theory.
4	Determine catchment yield
5	Learn the use of hydrological models and carry out flood routing. learn the use of instruments for the collection of Hydrological Field Data
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (A) METAL STRUCTURE BEHAVIOUR- II
CO NO	Course Outcomes
1	To understand the design of connections
2	Analyze and design a Roof truss for given loading conditions
3	To understand the analysis and design concept of round tubular structures
4	To understand the design concept of different type of steel water tank
5	To understand the design concept of lattice tower and steel chimney.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (B) DESIGN OF BRIDGES
CO NO	Course Outcomes
1	Identify the various elements of bridges along with evaluation of various loads acting on the bridges as per the IRC bridge code
2	Design the Solid Deck slab and T Beam Bridge superstructure for two lane and four lane bridges.
3	Design various components of substructure such as Pier, Abutments, foundations
4	Design Bearing and expansion joint
5	Carry out maintenance and repair of the bridge.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (C) INFRASTRUCTURE PLANNING AND DESIGN
CO NO	Course Outcomes
1	Apply Infrastructure Engineering concepts and a understand Project life cycle.
2	Apply the principles of Public private partnership in Infrastructure
3	Explain different risks involved in infrastructure projects and apply risk mitigation techniques.
4	Explain policies and technologies prevailing in infrastructural engineering and the social aspects of infrastructure development.
5	Apply the Information Technology and Systems tools for successful infrastructure Management.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (D) TRANSPORTATION ECONOMICS

CO NO	Course Outcomes
1	Understand fundamentals of transportation economics
2	Select appropriate technology for economic evaluation of transportation systems depending upon site specific conditions.
3	Apply the various methodologies for Public Transportation Systems.
4	Define the significance of transportation economics under Indian conditions.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (E) RAILWAY PROJECT DESIGN & PLANNING FOR CIVIL ENGINEERING
CO NO	Course Outcomes
1	Analyse the aspects which have to be considered for planning a railway project.
2	Identify the technical parameters which have to go into a project.
3	Estimate the very broad cost of the project.
4	Assess the financial viability of the project based on inputs of revenue.
5	Analyse and make an intelligent choice between various options for type /spans for bridges, be able to plan a rough alignment on a topo sheet.
6	Plan a rough alignment on a topo sheet.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (F) GROUND IMPROVEMENT TECHNIQUES
CO NO	Course Outcomes
1	Classify ground modification techniques for various type of soil
2	Design shallow compaction system as well as deep dynamic compaction system
3	Design hydraulic modification system such as PVD system, sand drains, stone columns, dewatering systems
4	Apply various techniques of Physico-Chemical modification which suits the soil at the site
5	Apply various techniques of soil Modification by inclusions and confinement.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (G) ADVANCED CONCRETE TECHNOLOGY
CO NO	Course Outcomes
1	Select proper admixtures to obtain concrete of desired properties
2	Adopt appropriate type of special concrete for desired results
3	Design a concrete mix of required strength and workability properties
4	Adopt appropriate method for repairs and rehabilitation of concrete structures
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (H) ENTREPRENEURSHIP
CO NO	Course Outcomes
1	Exhibit skills necessary to craft strategies and initiatives which can enable growth and sustainability in an entrepreneurial venture.
2	Prepare preliminary and final project report
3	Exhibit higher-level critical thinking skills, evidenced by analysis, evaluation, and synthesis.
4	Demonstrate skills to establish and manage the accounting process, to employ break even and cost-volume-profit tools.
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (I) WATER & AIR QUALITY MODELLING
CO NO	Course Outcomes
1	To be able to understand the water quality programs and their implementation including the water sampling and analysis

2	To be able to use water sampling and analysis techniques, water quality data analysis and WQI calculations. Students are also be able to understand of water quality modelling and exposure to some of the conventionally used water quality models.
3	Learning of the techniques employed in the monitoring of particulates and gaseous pollutants in ambient air and stack gas
4	Gaining knowledge about modelling of air quality through the use of different software
CV- 422 PROFESSIONAL ELECTIVE COURSE-IV	
SUBJECT	422 (J) WATER RESOURCES FIELD METHODS
CO NO	Course Outcomes
1	Apply the knowledge of different aspects related to irrigation for better irrigation
2	Decide irrigation charges
3	Utilise proper technique of flow measurement through streams and canals.
4	Apply the appropriate method of water distribution
5	Use appropriate techniques of watershed management
SUBJECT	CV- 424 OPEN ELECTIVE-III: ECONOMIC POLICIES IN INDIA
CO NO	Course Outcomes
1	Analyze India's economic growth and development
2	Assess industrial reforms in a mixed economic set-up
3	Suggest tax reforms and financial sector reforms
4	Explain Indian banking sector developments
5	Analyze India and WTO regulations
6	Analyze recent policy initiatives
SUBJECT	CV- 425 PROFESSIONAL PRACTICE, LAW & ETHICS
CO NO	Course Outcomes
1	Explain role of various stakeholders in the Civil Engineering profession and
2	Draft and interpret contracts and contracts management in civil engineering, dispute resolution mechanisms and laws governing engagement of labour
3	Explain process of filing Intellectual Property Rights and Patents.
4	Interpret and explain fundamental ethics governing the profession society as practitioners of the civil engineering profession.
5	Explain legal and practical aspects of Civil Engineering profession

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M. Tech. Civil (Structural Engineering) - I	
SUBJECT	ADVANCED STRUCTURAL ANALYSIS
CO NO	Course Outcomes
1	Draw ILD for indeterminate structures
2	Analyze the beams curved in plan
3	Analyze the structure resting on elastic foundation
4	Analyze the skeleton structures using stiffness method
SUBJECT	ADVANCED SOLID MECHANICS
CO NO	Course Outcomes
1	Identify and Solve problems of elasticity understanding the basic concepts
2	Apply numerical methods to solve continuum problems.
3	Identify and Solve problems of plasticity understanding the basic concepts.
SUBJECT	STRUCTURAL DYNAMICS
CO NO	Course Outcomes
1	Analyze dynamic response of SDOF system using fundamental theory and equation of motion
2	Analyze dynamic response of MDOF system using fundamental theory and equation of motion
3	Analyze beams in flexure by applying the theory of free and forced vibration
SUBJECT	ELECTIVE- I: ADVANCED DESIGN OF CONCRETE STRUCTURES
CO NO	Course Outcomes
1	Analyze and Design various special types of slabs
2	Analyze and Design Combined Footing and Raft foundation
3	Analyze and Design Overhead water tanks.
4	Design of Deep beam, Corbel, Chimneys , Silos and Bunkers
SUBJECT	ELECTIVE- I: DESIGN OF FORMWORK
CO NO	Course Outcomes
1	Select proper formwork, accessories and material
2	Design the form work for Beams, Slabs, columns, Walls and Foundations.
3	Design the form work for Special Structures
4	Design the flying formwork
SUBJECT	ELECTIVE - I: ADVANCED DESIGN OF FOUNDATION
CO NO	Course Outcomes
1	Evaluate Bearing capacity of soil by various theories
2	Design wall footing, strap footing, combined footing
3	Design Pile foundation for the given loading and site conditions
4	Design simple Machine foundation
SUBJECT	ELECTIVE- I : STRUCTURAL OPTIMIZATION
CO NO	Course Outcomes
1	Use variational principle for optimization
2	Apply optimization techniques to structural steel and concrete members
3	Apply Linear and nonlinear optimization technique
SUBJECT	RESEARCH METHODOLOGY AND IPR
CO NO	Course Outcomes
1	Propose and distinguish appropriate research designs and methodologies for a specific research project.
2	Develop skills in literature review, qualitative and quantitative data analysis and presentation.
3	Describe the importance of Computers, Information Technology in research and also highlight the significance of ideas, concept, and creativity in research.
4	Illustrate the importance of Intellectual Property Rights in growth of individuals & nation.
5	Exhibit knowledge about IPR protection, providing an incentive to inventors for further research work leading to creation of new and better products.

SUBJECT	STRUCTURAL DESIGN LAB
CO NO	Course Outcomes
1	Design and Detail all the Structural Components of Frame Buildings.
2	Design and Detail complete Multi-Storey Frame Buildings.
SUBJECT	FEM IN STRUCTURAL ENGINEERING
CO NO	Course Outcomes
1	Analyse 1-D problems related to structural analysis like Bars, Trusses, Beams and Frames using finite element approach.
2	Find solution to problems using direct approach methods like Rayleigh – Ritz or Galerkin’s Method.
3	Solve 2-D problems using knowledge of theory of elasticity.
4	Students will be able to implement the knowledge of numerical methods in FEM to find the solution to the various problems in statics and dynamics
M. Tech. Civil (Structural Engineering) - II	
SUBJECT	THEORY OF PLATES AND SHELLS
CO NO	Course Outcomes
1	Use analytical methods for the solution of thin plates.
2	Apply the numerical techniques and tools for the complex problems in thin plates.
3	Use analytical methods for the solution of shells.
4	Apply the numerical techniques and tools for the complex problems in shells.
SUBJECT	SEISMIC DESIGN OF MULTISTORIED BUILDINGS
CO NO	Course Outcomes
1	Evaluate the seismic response of the structures
2	Design the reinforced concrete buildings for earthquake resistance
3	Analyse, design and detail the multistoried buildings subjected to seismic loads.
SUBJECT	ELECTIVE- II : DESIGN OF PRESTRESSED CONCRETE STRUCTURES
CO NO	Course Outcomes
1	Study of different prestressing techniques
2	Identify structural engineering problems reviewing available literature
3	Analyze of complex structural systems
SUBJECT	ELECTIVE- II: STRUCTURAL AUDITS
CO NO	Course Outcomes
1	Strength evaluation of existing structures.
2	Evaluate the damaged structures and implement different retrofitting techniques.
3	Maintain the concrete structures in the working and safe condition.
4	Be able to take the decision of dismantling the structure, if it is deteriorated beyond the repairing.
SUBJECT	ELECTIVE- II: CONCRETE COMPOSITES
CO NO	Course Outcomes
1	Produce and test Fibre reinforced concrete
2	Design and cast ferrocement products
3	Produce Silica fume Concrete
4	Design and cast Polymer concrete
SUBJECT	ELECTIVE- II: DESIGN OF INDUSTRIAL STRUCTURES
CO NO	Course Outcomes
1	Design Steel Gantry Girders.
2	Design Steel Portal, Gable Frames.
3	Design Steel Bunkers and Silos.
4	Design Chimneys and Water Tanks
SUBJECT	ELECTIVE- III: THEORY OF STRUCTURAL STABILITY
CO NO	Course Outcomes
1	Determine stability of columns and frames
2	Determine stability of beams and plates
3	Use stability criteria and concepts for analyzing discrete and continuous systems

SUBJECT	ELECTIVE – III: DESIGN OF R. C. C. BRIDGES
CO NO	Course Outcomes
1	Select the suitable type of bridges according to the site condition.
2	Categorize IRC loads, distribution of these loads among longitudinal beams of a bridge.
3	Design Solid deck slab and T beam bridge superstructure
4	Analyze and verify the adequacy of piers and abutments.
5	Identify and design the suitable type of bearing for the given condition
SUBJECT	ELECTIVE – III: ADVANCED STEEL DESIGN
CO NO	Course Outcomes
1	Design steel structures/ components by different design processes.
2	Use the design provisions for hot-rolled and cold-formed steel structures.
3	Design Steel Beams with Web Openings.
4	Perform plastic analysis and design of portal frames and Beams.
SUBJECT	ELECTIVE- III: SOIL STRUCTURE INTERACTION
CO NO	Course Outcomes
1	Evaluate soil structure interaction for different types of structure under various conditions of loading.
2	Prepare a comprehensive numerical tool for interaction problem based on theory of subgrade reaction such as beam, footing raft etc.
3	Analyze the soil-structure interaction of framed structures
4	Evaluate action of group of piles considering soil structure interaction
SUBJECT	ADVANCED CONCRETE LAB
CO NO	Course Outcomes
1	Design high grade concrete and study the parameters affecting its performance.
2	Conduct Non Destructive Tests on existing concrete structures.
3	Apply engineering principles to understand behavior of structural elements
SUBJECT	MINI PROJECT
CO NO	Course Outcomes
1	Identify structural engineering problems reviewing available literature.
2	Study different techniques used to analyze complex structural systems.
3	Work on the solutions given and present solution by using his/her technique applying engineering principles.

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