CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
Kokapet(Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION
44 years

B.E (Civil Engineering) Program

B.E. Program Outcomes (PO's)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues, and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a

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member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

R-22

B.E – Civil Engineering Department Vision

To strive for excellence in academics, research and consultancy in the field of Civil Engineering and contribute to the sustainable development of the country by producing quality Civil Engineers with professional and ethical values.
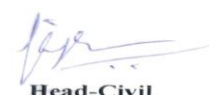
Department Mission

1. Maintaining high academic standards to develop analytical thinking and independent judgment among the students so that they are fit for industry and higher studies.

2. Promoting skills and values among the students to prepare them as responsible global citizens who can solve complex problems.

3. Preparing the students as good individuals and team members with professional attitude, ethics, concern for environment and zeal for lifelong learning who can contribute to society.

B.E – Civil Engineering Engineering Program Educational Objectives (PEO's):

The PEOs are to facilitate the graduating students to

1. **PEO1**: Acquire basic knowledge and expertise necessary for professional practice in Civil Engineering for higher studies and research.

2. **PEO2**: Attain and practice technical skills to identify, analyze and solve complex problems and issues related to Civil Engineering.

3. **PEO3**: Possess a professional attitude as an individual or a team member to work for the betterment of the society and environment.

4. **PEO4**: Work with professional ethics as refined technocrats with a thirst for lifelong learning.

B.E – Civil Engineering Program Specific Outcomes (PSO's):

The Graduates of this program will:

- **PSO1:** Effectively apply engineering fundamentals for the development and management of eco-friendly civil engineering systems which benefit the society at large.

- **PSO2:** Develop the ability to provide solutions to complex problems in civil engineering through individual and team work with a spirit for lifelong learning

- **PSO3:** Develop the competence to plan, build and maintain sustainable infrastructural facilities like housing, water management, transportation and geotechnical services.

Department of Civil Engineering
Course Outcomes
Academic Year 2022-2023

S. No.	Year/ Sem	Name of the Course
1	I/I	**22MTC02 - Calculus**
		22MTC02.1 — Apply the Matrix Methods to solve system of linear equations.
		22MTC02.2 — Analyze the geometrical interpretation of Mean value theorems and curvature.
		22MTC02.3 — Determine the extreme values of functions of two variables.
		22MTC02.4 — Find the shape of the curve, surface areas and volumes of revolution.
		22MTC02.5 — Examine the convergence and divergence of infinite Series
2	I/I	**22CYC01- CHEMISTRY**
		22CYC01.1 — Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
		22CYC01.2 — Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
		22CYC01.3 — Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
		22CYC01.4 — Classify the various methods used in treatment of water for domestic and industrial use.
		22CYC01.5 — Outline the synthesis of various Engineering materials & Drugs.
3	I/I	**22EEC01- Basic Electrical Engineering**
		22EEC01.1 — Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
		22EEC01.2 — Predict the steady state response of RLC circuits with AC single phase/three phase supply.
		22EEC01.3 — Infer the basics of single-phase transformer
		22EEC01.4 — Describe the construction, working principle of DC machine and 3-phase Induction motor.
		22EEC01.5 — Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations.
4	I/I	**22CSC01- PROBLEM SOLVING AND PROGRAMMING**
		22CSC01.1 — Understand real world problems and develop computer solutions for those problems.
		22CSC01.2 — Understand the basics of Python
		22CSC01.3 — Apply Python for solving basic programming solutions.
		22CSC01.4 — Create algorithms/flowcharts for solving real-time problems.
		22CSC01.5 — Build and manage dictionaries to manage data.
		22CSC01.6 — Handle data using files

5	I/I	**22CYC02 - CHEMISTRY LAB**	
		22CYC02.1	Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
		22CYC02.2	Estimate the amount of chemical substances by volumetric analysis.
		22CYC02.3	Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
		22CYC02.4	Calculate the concentration and amount of various substances using instrumental techniques.
		22CYC02.5	Develop the basic drug molecules and polymeric compounds.
6	I/I	**22MBC02 - Community Engagement**	
		22MBC02.1	Gain an understanding of Rural life, Culture and Social realities.
		22MBC02.2	Develop a sense of empathy and bonds of mutuality with Local Communities.
		22MBC02.3	Appreciate significant contributions of Local communities to Indian Society and Economy.
		22MBC02.4	Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.
		22MBC02.5	Utilise the opportunities provided by Rural Development Programmes
7	I/I	**22CSC02 - PROBLEM SOLVING AND PROGRAMMING LAB**	
		22CSC02 .1	Understand various Python program development Environments
		22CSC02 .2	Demonstrate the concepts of Python.
		22CSC02 .3	Implement algorithms/flowcharts using Python to solve real-world problems.
		22CSC02 .4	Build and manage dictionaries to manage data.
		22CSC02 .5	Write Python functions to facilitate code reuse.
		22CSC02 .6	Use Python to handle files and memory.
8	I/I	**22MEC37- Robotics & Drones Lab**	
		22MEC37.1	Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
		22MEC37.2	Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
		22MEC37.3	Demonstrate knowledge of robot controllers.
		22MEC37.4	Use Linux environment for robotic programming.
		22MEC37.5	Write Python scripts to control robots using Python and Open CV
9	I/I	**22EEC02- Basic Electrical Engineering Lab**	
		22EEC02.1	Comprehend the circuit analysis techniques using various circuital laws and theorems.
		22EEC02.2	Analyse the parameters of the given coil and measurement of power and energy in AC circuits
		22EEC02.3	Determine the turns ration/performance parameters of single-phase transformer
		22EEC02.4	Infer the characteristics of DC shunt motor different tests.
		22EEC02.5	Illustrate different parts and their function of electrical components,

			equipment and machines
10	I/II	**22MTC05- Vector Calculus and Differential Equations**	
		22MTC05.1	Apply the vector differential operators to Scalars and Vector functions.
		22MTC05.2	Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
		22MTC05.3	Calculate the solutions of first order linear differential equations.
		22MTC05.4	Solve higher order linear differential equations.
		22MTC05.5	Find solution of algebraic, transcendental and ODE by Numerical Methods
11	I/II	**22PYC05-Mechanics and Materials Science**	
		22PYC05.1	Compare the various types of oscillations
		22PYC05.2	Demonstrate rotational motion of rigid body
		22PYC05.3	Classify different types of crystals and their imperfections
		22PYC05.4	Identify magnetic and dielectric materials for engineering applications
		22PYC05.5	Make use of lasers and superconductors in technological applications
12	I/II	**22CEC01- Engineering Mechanics**	
		22CEC01.1	Calculate the components and resultant of coplanar forces system and draw free body diagrams to analyze the forces in the given structure
		22CEC01.2	Understand the mechanism of friction and can solve friction problems
		22CEC01.3	Analyse simple trusses for forces in various members of a truss.
		22CEC01.4	Determine the centroid of plane areas, composite areas and centres of gravity of bodies.
		22CEC01.5	Determine moments of inertia, product of inertia of plane and composite areas and mass moments of inertia of elementary bodies
13	I/II	**22EGC01- English**	
		22EGC01.1	Illustrate the nature, process and types of communication and communicate effectively without barriers.
		22EGC01.2	Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
		22EGC01.3	Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
		22EGC01.4	Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
		22EGC01.5	Critique passages by applying effective reading techniques
14	I/II	**22PYC08 - Mechanics and Materials Science Laboratory**	
		22PYC08.1	Estimate the error in an experimental measurement
		22PYC08.2	Make use of lasers and optical fibers in engineering applications
		22PYC08.3	Recall the physical properties of dielectrics and magnetic materials
		22PYC08.4	Find the mechanical properties of solids and viscosity of liquids
		22PYC08.5	Demonstrate the motion of electrons in electric and magnetic fields

15	I/II	**22EGC02-English lab**	
		22EGC02.1	Define the speech sounds in English and understand the nuances of pronunciation in English
		22EGC02.2	Apply stress correctly and speak with the proper tone, intonation and rhythm.
		22EGC02.3	Analyze listening comprehension texts to enhance their listening skills.
		22EGC02.4	Determine the context and speak appropriately in various situations.
		22EGC02.5	Design and present effective posters while working in teams, and discuss and participate in Group discussions
16	I/II	**22MEC01- CAD and Drafting**	
		22MEC01.1	Become conversant with appropriate use of CAD software for drafting.
		22MEC01.2	Recognize BIS, ISO Standards and conventions in Engineering Drafting.
		22MEC01.3	Construct the projections of points, lines, planes, solids
		22MEC01.4	Analyse the internal details of solids through sectional views
		22MEC01.5	Create an isometric projections and views
17	I/II	**22MEC38- Digital Fabrication Lab**	
		22MEC38.1	Understand safety measures to be followed in workshop to avoid accidents.
		22MEC38.2	Identify various tools used in carpentry, house wiring and plumbing.
		22MEC38.3	Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3d modeling using solid works software for Additive Manufacturing
		22MEC38.4	Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
		22MEC38.5	Conceptualize and produce simple device/mechanism of their choice.
18	II/I	**20MTC08- Partial differential Equations and Statistics**	
		20MTC08.1	Find solution of initial value problems of ODE by Numerical Method.
		20MTC08.2	Solve Linear and Non-Linear PDE's.
		20MTC08.3	Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
		20MTC08.4	Use the basic probability for fitting the Random phenomenon.
		20MTC08.5	Analyze the random fluctuations of probability distribution and Principles of Least Squares
19	II/I	**20CE C03- Surveying - I**	
		20CE C03.1	To select basic surveying instruments such as chains, tapes etc., to measure areas
		20CE C03.2	To Apply the principles of levelling and prepare contour maps to estimate volumes of earthwork using Simpsons and/or trapezoidal rules.
		20CE C03.3	To apply the principles of tacheometry on the field.
		20CE C03.4	To Operate modern instruments like Total Station and GPS in the field.

		20CE C03.5	To Make use of principles of trigonometric levelling for measuring elevations of required objects
20	II/I	**20CE C04 - Solid Mechanics**	
		20CE C04.1	Evaluate the strength of various materials, against structural actions such as compression, tension.
		20CE C04.2	To analyze statically determinate beams and sketch SFD and BMD.
		20CE C04.3	Able to draw variation of shear and bending stresses
		20CE C04.4	Able to evaluate direct and bending stresses, compound stresses
		20CE C04.5	To design thin and thick cylinders for resisting internal and external pressures.
21	II/I	**20CE C05- Fluid Mechanics**	
		20CE C05.1	To evaluate the various properties of fluid, analyze fluid flow and forces.
		20CE C05.2	To Apply the various laws and principles governing fluid flow to practical problems.
		20CE C05.3	To Measure pressure, velocity and discharge of fluid flow in pipes, channels, and tanks.
		20CE C05.4	To apply laws related to laminar and turbulent flow in pipes
		20CE C05.5	To Evaluate water hammer effect in pipes and to apply dimensional and model laws to fluid flow applications.
22	II/I	**20CE C06- BUILDING CONSTRUCTION PRACTICE & CONCRETE TECHNOLOGY**	
		20CE C06.1	To identify the traditional building materials and select suitable type for given situation.
		20CE C06.2	To determine the properties of the ingredients of concrete and adjudge their suitability.
		20CE C06.3	To know various properties of fresh and hardened concrete.
		20CE C06.4	To know the concepts of building planning and various practices adopted and different types of roofs, doors, windows and stairs
		20CE C06.5	To know different types of masonry, types of bonds used in construction of walls of buildings.
23	II/I	**20EG M03- Universal Human Values – II Understanding Harmony**	
		20EG M03.1	Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
		20EG M03.2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
		20EG M03.3	They would have better critical ability.
		20EG M03.4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
		20EG M03.5	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
24	II/I	**20CE C07- SOLID MECHANICS LAB**	

		20CE C07.1	To understand the stress strain behavior of mild steel bar under direct tension.
		20CE C07.2	To compute the modulus of elasticity of given materials by conducting deflection tests on different types of beams.
		20CE C07.3	To determine the impact/ shear strength of steel specimen.
		20CE C07.4	To determine the rigidity modulus of a given material by conducting torsion test and deflection test on helical spring
		20CE C07.5	To determine the compressive strength of brick and concrete cube.
25	II/I	**20CE C08- Fluid Mechanics Lab**	
		20CE C08.1	Ability to find the co-efficient of discharge for flows through various flow measuring devices.
		20CE C08.2	To differentiate between laminar and turbulent flows and identify the governing parameters for both.
		20CE C08.3	Applies the concept of Bernoulli's energy principle.
		20CE C08.4	Applies the concept of hydrostatic forces on flat and curved surfaces.
		20CE C08.5	Ability to find the stability and metacentre of floating body.
		20CE C08.6	To differentiate between viscous and non-viscous flows and identify the governing parameters for both.
26	II/II	**20CE C09- Hydraulic Engineering**	
		20CE C09.1	Apply the concepts of open channel flow and design the efficient channel cross section.
		20CE C09.2	Apply the concepts of non-uniform open channel flow to the field problems.
		20CE C09.3	Interpret the basics of computation of drag and lift forces in the field of aerodynamics, boundary layer effect.
		20CE C09.4	Design the impulse turbines, run the turbines under efficient conditions.
		20CE C09.5	Design the reaction turbines, draw characteristic curves of turbines and centrifugal pump
27	II/II	**20CE C10 - Surveying II**	
		20CE C10.1	To execute setting of simple and compound curves on the field by overcoming obstructions in curve ranging
		20CE C10.2	To select suitable transition curves based on real world conditions and execute it on field
		20CE C10.3	To apply the concepts of photogrammetry for solving problems in civil engineering
		20CE C10.4	To choose appropriate remote sensing technique for data acquisition and image processing techniques for identification of ground features accurately
		20CE C10.5	To be able to adjust the errors that are cropping while carrying surveying and adopt LiDAR survey for acquiring topographic data at high speed.
28	II/II	**20CE C11- STRUCTURAL ANALYSIS-I**	
		20CE C11.1	Compute slopes and deflections in determinate beams, under various types of static loads, using a suitable method.
		20CE C11.2	Analyze the propped cantilevers and fixed beams subjected to various types of loads.
		20CE C11.3	Analyze and design circular shafts subjected a given torque and bending.

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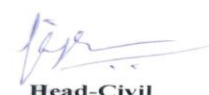|		20CE C11.4	To determine the strain energy in members under various loading situations, and to analyze various types of springs.
		20CE C11.5	Analyze various types of columns with different end conditions
29	II/II	**20CE C12- Reinforced Concrete Design - I**	
		20CE C12.1	Use and suggest Reinforced concrete for various practical applications, interpret the clauses of IS: 456 and apply the working stress method of design for rectangular beams.
		20CE C12.2	Design RC beams of rectangular and flanged sections/ for flexure using limit state method and check for serviceability.
		20CE C12.3	Design RC beams for shear, torsion and bond.
		20CE C12.4	Analyse and design solid rectangular RC slabs of one way (cantilever, simply supported and continuous) and two way (simply supported and continuous).
		20CE C12.5	Design RC short columns for axial loads and moments and axially loaded isolated footings.
30	II/II	**20CE C13-Computer Aided Civil Engineering Drafting**	
		20CE C13.1	Create basic 2D geometry shapes.
		20CE C13.2	Draft elevation and sections of doors and windows.
		20CE C13.3	Develop plan, section and elevations of buildings.
		20CE C13.4	Draft plan and section of a staircase.
		20CE C13.5	Draft RCC detailing of beams and footings.
31	II/II	**20CEC14-HYDRAULIC ENGINEERING LAB**	
		20CEC14.1	To compute the open channel rugosity coefficient in uniform flows and Froude number, energy losses in non-uniform flows.
		20CEC14.2	To differentiate between uniform, non-uniform flows and flow in curved channel.
		20CEC14.3	To determine work done by fluid jet on vane, compute work done and draw performance characteristic curves for turbines and centrifugal pumps
		20CEC14.4	To determine the coefficient of discharge of a venturi flume.
32	II/II	**20CE C15- SURVEYING AND GEOMATICS LAB**	
		20CE C15.1	To use simple as well as modern surveying instruments.
		20CE C15.2	To develop L.S and C.S for road works, Canal works, using Auto levels and to develop contour map of the given area.
		20CE C15.3	To use Total Station for locating ground details and plotting.
		20CE C15.4	To set simple curves using Total Station.
		20CE C15.5	To locate ground features using GPS.
33	II/II	**20EGM01-INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES**	
		20EGM01.1	Understand the making of the Indian Constitution and its features.
		20EGM01.2	Identify the difference among Right To equality, Right To freedom and Right to Liberty.

		20EGM01.3	Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
		20EGM01.4	Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
		20EGM01.5	Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies
34	II/II	**20EGM02-INDIAN TRADITIONAL KNOWELDGE**	
		20EGM02.1	Understand philosophy of Indian culture
		20EGM02.2	Distinguish the Indian languages and literature
		20EGM02.3	Learn the philosophy of ancient, medieval and modern India
		20EGM02.4	Acquire the information about the fine arts in India
		20EGM02.5	Know the contribution of scientists of different eras.
35	II/II	**Professional Elective-1 (PE-1)** **20CE E01- Green Building Technologies**	
		20CE E01.1	Be able to identify the fundamentals of energy use and energy processes in building.
		20CE E01.2	Be able to identify the energy requirement and its management.
		20CE E01.3	Apply the knowledge about Sun-earth relationship vis-a-vis its effect on climate.
		20CE E01.4	Be able to deal with the end-use energy requirements.
		20CE E01.5	Be familiar with the audit procedures of energy.
36	II/II	**20CE E02- Principles of Geographical Information Systems**	
		20CE E02.1	The student is able to apply the principles of GIS to various field problems and take decisions under uncertain conditions.
		20CE E02.2	The student is able to understand advantages and disadvantages of using vector GIS and raster GIS.
		20CE E02.3	The student is able to apply the methods of data Compression using GIS.
		20CE E02.4	Can perform the data modeling and analysis using GIS.
		20CE E02.4	Is able to apply the Cartographic modelling techniques for Watershed modeling, Environmental Modeling and for Watershed Management, visibility analysis.
37	II/II	**20CE E03- SOLIDAND HAZARDOUSWASTEMANAGEMENT**	
		20CE E03.1	Characterize the solid waste according to the legislations.
		20CE E03.2	Apply the steps in waste reduction at source, collection techniques, resource recovery/recycling, transport and disposal options.
		20CE E03.3	Characterize the hazardous waste and decide on transport methods of the same.
		20CE E03.4	Select the site for disposal of hazardous waste and suggest remediation measures for disposal sites
		20CE E03.5	Apply various legislations pertaining to hazardous waste management according to the situations.
38	II/II	**20CE E04- GROUND WATER ENGINEERING**	
		20CE E04.1	Assess groundwater potential and head.

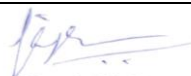|			
		20CE E04.2	Estimate hydraulic conductivity and storage coefficient for time variant flow.
		20CE E04.3	Investigate groundwater availability for a given area.
		20CE E04.4	Plan and design artificial recharge.
		20CE E04.5	Construct model and analyze groundwater flow
38	III/I	**20CE C16 - Transportation Engineering**	
		20CEC16.1	Understand the types of highways, patterns, master plans, alignment finalization and components of highway projects.
		20CEC16.2	Apply various IRC Standards for the Geometric design of highways
		20CEC16.3	Organize collection of traffic related data and analyzing the data for different applications
		20CEC16.4	Apply the design concepts to flexible and rigid pavements as per IRC standards
		20CEC16.5	Execute construction of pavements as per IRC standards and evaluate of pavement condition to recommend suitable remedial measures.
39	III/I	**20CE C17 - GEOTECHNICAL ENGINEERING**	
		20CEC17.1	Identify various types of soils and determine their properties.
		20CEC17.2	Estimate coefficient of permeability, stresses in soils under various soil conditions and compute discharge in soil
		20CEC17.3	Modify the properties of soil by using various compaction methods and compute the settlement of compressible soils
		20CEC17.4	Estimate the shear strength of different soils under various loading conditions.
		20CEC17.5	Evaluate earth pressures and slope stability under different field conditions
40	III/I	**20CE C18 - Structural Analysis II**	
		20CEC18.1	Develop the ILD's for reactions, shear force and bending moment at a section, determine the maximum SF and BM for various positions of the moving point loads and uniformly distributed loads.
		20CEC18.2	Construct the ILD's for forces in the members of trusses and evaluate the maximum forces for various positions of the moving point loads and uniformly distributed loads
		20CEC18.3	Apply slope – deflection method for indeterminate beams with and without sinking of supports subjected to point loads and UDL on the entire span and analyse rigid jointed plane frames with and without lateral sway using slope deflection method.
		20CEC18.4	Apply moment distribution method for indeterminate beams with and without sinking of supports subjected to point loads and UDL on the entire span and analyse rigid jointed plane frames with and without lateral sway using moment distribution method.
		20CEC18.5	Apply matrix, flexibility and stiffness method to continuous beams
41	III/I	**20CE C19 - DESIGN OF STEEL STRUCTURES - I**	
		20CEC19.1	Understand the material properties, loads and design philosophies, design bolted and welded connections

		20CEC19.2	Know, how yielding & buckling takes place, design simple and built-up compression members and column bases.
		20CEC19.3	Understand the modes of failure of tension members, design tension members using limit state method, design tension and compression members using working stress method as per IS: 800-2007
		20CEC19.4	Classify structural steel sections, distinguish between laterally supported and laterally unsupported beams, design simple flexural members including secondary considerations.
		20CEC19.5	Estimate the loads on roof trusses and design purlins and members of trusses.
42	III/I	**20CE C20 - TRANSPORTATION ENGINEERING LAB**	
		20CEC20.1	Conduct various tests on bitumen, define its quality and decide its suitability for its use in pavements.
		20CEC20.2	Conduct various tests on aggregates, define its quality and decide its suitability for its use in roads
		20CEC20.3	Organize various traffic studies and analyze the data by applying statistical tools
		20CEC20.4	Prepare representative samples for various tests on aggregates
		20CEC20.5	Generate technical report based on the studies carried in the laboratory and field studies
43	III/I	**20CE C21 - GEOTECHNICAL ENGINEERING LAB**	
		20CEC21.1	Identify soils with reference to their characteristics
		20CEC21.2	Evaluate and classify soils according to IS classification
		20CEC21.3	Calculate seepage volume for different soils.
		20CEC21.4	Examine methods to improve soil stability of soils.
		20CEC21.5	Conduct tests according to IS laboratory standards and procedures
44	III/I	**20CE M01- ENVIRONMENTAL SCIENCE**	
		20CE M01.1	Identify the natural resources and realize the importance of water, food, forest, mineral, energy, land resources and effects of over utilization.
		20CE M01.2	Understand the concept of ecosystems and realize the importance of interlinking of food chains
		20CE M01.3	Contribute for the conservation of bio-diversity.
		20CE M01.4	Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
		20CE M01.5	Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.
45	III/I	**Professional Elective-2 (PE-2)** **20CE E05- Applications of Artificial Intelligence in Civil Engineering**	
		20CE E05.1	Recall fundamental knowledge on artificial intelligence.
		20CE E05.2	Understand neural networks and their types and apply neural networks in the domain of civil engineering
		20CE E05.3	Understand and apply fuzzy controllers to solve real-world civil engineering problems.

		20CE E05.4	Explain basic concepts of support vector machines and choose appropriate techniques relevant to Civil engineering
		20CE E05.5	Develop a regression model for civil engineering problems.
46	III/I	**20CE E06 - PRESTRESSED CONCRETE**	
		20CEE06.1	Understand the general mechanism of pre stressed concrete members, types of pre stressing
		20CEE06.2	Analyze and understand the behaviour of pre stressed concrete beams.
		20CEE06.3	Identify and apply design concepts for the pre stressed concrete beams under flexure and shear.
		20CEE06.4	Analyze the stresses in anchorage zones and design the end anchorages
		20CEE06.5	Understand the fundamental concepts of primary and secondary moments in continuous beams
47	III/I	**20CE E07- HAZARDS AND MANAGEMENT**	
		20CE E07.1	Identify and understand the fundamental terminologies in disaster management.
		20CE E07.2	Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structural mitigation measures
		20CE E07.3	Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems
		20CE E07.4	Analyze various mechanisms and consequences of human induced disasters
		20CE E07.5	Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels
48	III/I	**20CE E08 - DESIGN OF MASONRY STRUCTURES**	
		20CE E08.1	Explain engineering properties, uses of masonry units, defects, crack in masonry and its remedial measures and factors affecting compressive strength of masonry units.
		20CE E08.2	Explain the different masonry elements, permissible stresses, design considerations and criteria as per IS: 1905 and SP-20
		20CE E08.3	Design different types of masonry walls subjected to axial loads ; UDL and concentrated axial loads.
		20CE E08.4	Design different types of masonry walls subjected to eccentric loads, lateral loads and transverse loads
		20CE E08.5	Design infill walls of frames and implement the design principles and detailing aspects to ensure seismic safety of unreinforced and reinforced masonry walls
49	III/II	**20CE C22-Hydrology and Water Resource Engineering**	
		20CE C22.1	Understand the interaction among various processes in the hydrologic cycle and Rain Gauge networks.
		20CE C22.2	Analyze hydrograph and different irrigation efficiencies
		20CE C22.3	Estimate different aquifer parameters, yield of an open well, yield and life of a reservoir.
		20CE C22.4	Design lined and unlined canals using Kennedy's and Lacey's theory

		20CE C22.5	Design gravity dams, earth dams and understand the functioning of spillways.
50	III/II	**20CE C23- ESTIMATION SPECIFICATIONS AND COSTING**	
		20CE C23.1	Prepare detailed estimates for load bearing and RCC framed building using long and short wall method
		20CE C23.2	Prepare detailed estimates for load bearing and RCC framed building using centre line method
		20CE C23.3	Prepare the detailed estimate of steel qualities and bar bending schedule for RCC framed works.
		20CE C23.4	Estimate the earth work for – bituminous roads, WBM roads, CC roads, irrigation canals and prepare the detailed estimate of single cell rectangular box culvert, septic tank.
		20CE C23.5	Do the rate analysis for different items of works of buildings and understand the general and detailed specifications of works
51	III/II	**20CE C24- REINFORCED CONCRETE DESIGN-II**	
		20CE C24.1	Develop the plan layout, design and detail rectangular & trapezoidal combined footings
		20CE C24.2	Analyze for stability, design, the various components and detail cantilever and counter fort type retaining walls.
		20CE C24.3	Interpret the specifications from relevant codes, determine the design forces, design various components and detail rectangular and circular water tanks including hinge tanks
		20CE C24.4	Understand the clauses from relevant IRC codes, design and detail the various components of Solid slab bridge.
		20CE C24.5	Analyze the slab panels using effective width method/ Pigeaud"s curves, girders using Courbon"s method and design & detail the various components of T-Beam bridges.
52	III/II	**20CE C25 - ENVIRONMENTAL ENGINEERING**	
		20CE C25.1	Identify an appropriate population forecasting method and estimate quantity of water to be supplied and plan &design conveyance components.
		20CE C25.2	Design water treatment units for a water treatment plant
		20CE C25.3	Estimate quantity of sewage and storm water & characteristics of sewage, design sewers and plan sewer appurtenances
		20CE C25.4	Design components of waste water treatment plant and sludge digestion systems.
		20CE C25.5	Understand and judge methods for control of particulate matter and gaseous pollutants in the atmosphere, outline noise pollution control methods
53	III/II	**20CE C26-ENVIRONMENTAL ENGINEERING LAB**	
		20CE C26.1	Demonstrate skills to use equipment in conducting the test procedures
		20CE C26.2	Evaluate water quality and summarize the suitability in accordance with IS: 10500- 2012, Drinking Water specifications.
		20CE C26.3	Evaluate characteristics of wastewater and summarize the suitability for disposal/reuse as per standards
		20CE C26.4	Measure air quality and classify the level of pollution based on standards

			set by Pollution Control Board
		20CE C26.5	Evaluate and analyse bacteriological quality of water.
54	III/II	**20CE C27-ENGINEERING GEOLOGY LAB**	
		20CE C27.1	Identify the minerals, rocks and various
		20CE C27.2	Identify structural features like folds, faults and unconformities.
		20CE C27.3	Measure the electrical resistivity of rocks, soil etc.
		20CE C27.4	Interpret the topographic maps.
		20CE C27.5	Identify the geological and geotechnical features of given places
55	III/II	**20EG CO3 - EMPLOYABILITY SKILLS**	
		20EG CO3.1	Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context.
		20EG CO3.2	Write resumes, prepare and face interviews confidently
		20EG CO3.3	Be assertive and set short term and long-term goals, learn to manage time effectively and deal with stress
		20EG CO3.4	Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics.
		20EG CO3.5	Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.
56	III/II	**Professional Electives (PE-3)** **20CE E09- Foundation Engineering**	
		20CE E09.1	Compute the stress distribution in the ground under different loading conditions
		20CE E09.2	Estimate the bearing capacity of different soils for shallow foundation.
		20CE E09.3	Design the deep foundation by piles or wells
		20CE E09.4	Deal with the field problems in laying cofferdams and different dewatering techniques and sampling methods
		20CE E09.5	Interpret and implement the Concepts of Coffer dams, Caissons and Timbering of Excavations
57	III/II	**20CE E10– RIVER ENGINEERING**	
		20CE E10.1	Understand about river morphology
		20CE E10.2	Apply knowledge on river aggradation and degradation
		20CE E10.3	Evaluate different models of river flow hydraulics
		20CE E10.4	Analyse hydraulic geometry and execute river protection and training works
		20CE E10.5	Design river training and river bank protection
58	III/II	**20CE E11– URBAN TRANSPORTATION PLANNING**	
		20CE E11.1	Apply the fundamental knowledge for forecasting and creating the transportation infrastructure facilities scientifically and ethically by collecting the appropriate sample data.
		20CE E11.2	Identify the procedures for collecting the traffic related data for generating and validating transport demand models.

		20CE E11.3	Apply four stage transportation demand modelling by creating mathematical models to understand the travel pattern and behavior of road users
		20CE E11.4	Apply the mathematical knowledge in solving the transportation planning related problems by Analyzing transportation data
		20CE E11.5	Evaluate highway projects by using different economic methods and understand the role of computer applications in transportation planning.
59	III/II	**20CE E12– BASICS OF EARTHQUAKE ENGINEERING**	
		20CE E12.1	Apply the fundamentals of engineering seismology; classify the characteristics and effects of strong motion earthquakes
		20CE E12.2	Develop the concepts of damped and un-damped vibrations in single and multi-degrees of freedom systems
		20CE E12.3	Estimate the seismic loads on structures and analyse using seismic coefficient and response spectrum methods
		20CE E12.4	Examine the causes of damages of urban and rural buildings and interpret the design provisions from IS1893 part - I (2016) and IS - 13920(2016)
		20CE E12.5	Asses the use of various earthquake resistant devices; apply suitable construction techniques for retrofitting
60	IV/I	**18CE C24-CONSTRUCTION ENGINEERING AND MANAGEMENT**	
		18CE C24.1	Employ a suitable type of construction method and project delivery system for successful project completion.
		18CE C24.2	Plan the construction project, choosing a suitable technique for the construction project.
		18CE C24.3	Monitor and control construction projects with respect to time and cost and optimize projects based on costs.
		18CE C24.4	Implement construction safety and quality management systems in construction field.
		18CE C24.5	Select proper equipment for the execution of different operations in construction and deal with various issues of contracting.
61	IV/I	**18CE C25- HYDROLOGY AND WATER RESOURCES ENGINEERING**	
		18CEC25.1	Analyse the components of hydrologic cycle and determine rain gauge network.
		18CEC25.2	Interpret various methods to estimate runoff and understand reservoir planning.
		18CEC25.3	Identify aquifer types, understand the process of sustainable groundwater management and evaluate the performance of irrigation system.
		18CEC25.4	Understand canal systems and design canals using regime concept.
		18CEC25.5	Analyse the stability of dams and understand spillways.
62	IV/I	**18CE C26- ESTIMATION, SPECIFICATIONS AND COSTING**	
		18CE C26.1	Prepare approximate estimates, detailed estimates for simple and complex buildings.
		18CE C26.2	Understand the RCC drawings and estimate the steel qualities to prepare BBS of various items of the buildings – beams, columns, slabs, footings and other civil engineering structures.

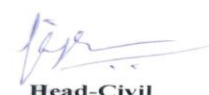|			
		18CE C26.3	Apply engineering knowledge to estimate quantities of roads, culverts, canals and septic tanks
		18CE C26.4	Understand the work force required for the quantities estimated, as per TSSDSR and apply rate analysis to compute unit cost for different items of works of buildings, concrete and bituminous road works.
		18CE C26.5	Understand general and detailed specifications of works and record details of measurements in the M-Book and work force details in muster roll.
63	IV/I	**18CE E17-DESIGN OF STEEL STRUCTURES-II**	
		18CE E17.1	Understand the phenomenon of shear buckling in beams with larger depths, design and detail welded plate girder for various structural actions.
		18CE E17.2	Estimate the loads on gantry girders, design and detail gantry girder including connections.
		18CE E17.3	Identify suitable bridge type, design roller & rocker bearings for railway bridges
		18CE E17.4	Develop the layout of the bridge, design and detail deck type riveted plate girder bridge including wind effects.
		18CE E17.5	Choose the appropriate truss configuration, develop layout of the bridge, and design & detail truss girder bridges.
64	IV/I	**18CE E18-AIRPORT ENGINEERING**	
		18CE E18.1	Understand the structure of airport system.
		18CE E18.2	Understand the components of aircraft and airport.
		18CE E18.3	Apply engineering knowledge for selection of airport sites, plan airports and facilities as per international standards and also understand the corrections to be applied for runway.
		18CE E18.4	Design airports as per ICAO standards and develop the facilities required for passengers and aircrafts.
		18CE E18.5	Create the facilities required for the airport traffic management and understand the importance of the drainage system and its design in airports.
65	IV/I	**18CE E19-RIVER ENGINEERING**	
		18CE E19.1	Define basic terms and understand the concepts of river morphology.
		18CE E19.2	Determine scour depth of hydraulic structure and identify methods of stage measurement.
		18CE E19.3	Understand hydraulic river models.
		18CE E19.4	Identify river training works and understand protective measures.
		18CE E19.5	Design flood protection structures.
66	IV/I	**18CE E20-WATER AND AIR QUALITY MODELING**	
		18CE E20.1	Develop and validate mathematical models for stream water quality and perform cost benefit analysis.
		18CE E20.2	Assess water quality of rivers using models such as Streeter Phelps model and determine oxygenation coefficients, oxygen consumption by the sediments in rivers.
		18CE E20.3	Develop models for estuaries for their continuous quality monitoring and

			understand transport mechanisms
		18CE E20.4	Apply knowledge of plume characteristics and diffusion of stack emissions in modelling.
		18CE E20.5	Derive models for air quality monitoring, Gaussian plume equation and compute stack height.
67	IV/I	**18CE E22-APPLICATION OF DATA ANALYTICS IN CIVIL ENGINEERING**	
		18CE E22.1	Define the descriptive, predictive and prescriptive models and select suitable tools or techniques for application in civil engineering problems
		18CE E22.2	Identify the discrete and continuous random variables and select appropriate mathematical models which support decision making under uncertainty
		18CE E22.3	Design data collection process required for descriptive and exploratory models for problems in civil engineering
		18CE E22.4	Relate estimators and estimates to process of estimation and thus implement the various modeling techniques to uncover the patterns in the civil engineering related data
		18CE E22.5	Formulate hypothesis and their corresponding confidence intervals for various count data based and discrete choice models along with goodness of fit measures
68	IV/I	**18CE C27- CONCRETE TECHNOLOGY LAB**	
		18CE C27.1	Determine the properties of given cement sample and assess its suitability for use in construction.
		18CE C27.2	Determine the properties of fine and coarse aggregate samples to assess their suitability for use in construction works
		18CE C27.3	Measure the workability of concrete and recommend its suitability for structural works
		18CE C27.4	Design a suitable concrete mix proportion as per the code provisions for the specified grade
		18CE C27.5	Conduct destructive and non-destructive tests to evaluate the quality and strength of concrete
69	IV/I	**18CE C28 - COMPUTER APPLICATIONS LAB**	
		18CE C28.1	Develop a model of framed structure and analyze using STAAD-Pro
		18CE C28.2	Design the components of a framed structure including isolated footings using STAAD-Pro and STAAD Foundation.
		18CE C28.3	Evaluate stability of slope using Slip Circle method and design a cantilever retaining wall using GEO5
		18CE C28.4	Analyze pipe networks using EPANET and sewer networks using SEWER Gems
		18CE C28.5	Develop geo-referenced thematic maps and carry out overlay analysis using ArcGIS/QGIS
70	IV/I	**18CE C29- PROJECT: PART-1**	
		18CE C29.1	Identify the domain of one's interest through critical review of literature
		18CE C29.2	Define a problem in the domain of interest and understand its scope and also develop the skill of coordinating with the team in the form of discussions during the progress of finding the solution
		18CE C29.3	Examine various approaches and build a preliminary approach to the problem on chosen topic

		18CE C29.4	Defend their approach by healthy interactions with the participants and modify, if necessary and cultivate the culture of ethical practices.
		18CE C29.5	Develop the technical skill in preparing a well-structured report and present.
71	IV/II	**18CE E23- Earthquake Resistant Design of Structures**	
		18CE E23.1	Relate the fundamentals of engineering seismology, understand the characteristics and effects of strong motion earthquakes.
		18CE E23.2	Understand the concepts of damped and un-damped vibrations in single and multi-degrees of freedom systems.
		18CE E23.3	Estimate the seismic loads on structures and analyse using seismic coefficient and response spectrum methods
		18CE E23.4	Examine the causes of damages of urban and rural buildings and interpret the design provisions from IS-1893 part - I (2016) and IS - 13920(2016).
		18CE E23.5	Know the use of various earthquake resistant devices, apply suitable construction techniques for retrofitting.
72	IV/II	**18CE E24- GROUND IMPROVEMENT TECHNIQUES**	
		18CE E24.1	Review the importance of ground improvement techniques and types, for different soils.
		18CE E24.2	Apply suitable chemical stabilization and grouting techniques to address the field problems.
		18CE E24.3	Modify the cohesionless soil properties to required degree by using suitable vibration techniques.
		18CE E24.4	Identify suitable ground improvement techniques for cohesive soils in a specific project.
		10	Explain different advanced stabilizing techniques for slopes.
73	IV/II	**18CE E25-DESIGN OF HYDRAULIC STRUCTURES**	
		18CE E25.1	Analyse and design surplus weir.
		18CE E25.2	Analyse and design direct sluice.
		18CE E25.3	Identify types of falls and design glacis type canal drop.
		18CE E25.4	Understand and design cross regulator.
		18CE E25.5	Identify types of spillways and design energy dissipators.
74	IV/II	**18CE E256- RURAL WATER SUPPLY AND ONSITE SANITATION SYSTEM**	
		18CE E256.1	Solve the issues related to rural water supply and sanitation.
		18CE E256.2	Relate the needs for water treatment and develop different stages of water treatment and sanitation system for rural community.
		18CE E256.3	Plan wastewater collection system in rural areas and identify compact wastewater treatment units.
		18CE E256.4	Develop occupation related onsite sanitation and hygiene system and identify occupational hazards.
		18CE E256.5	Design an effluent disposal mechanism; develop solid waste management system in rural areas.
75	IV/II	**18CEE27-APPLICATIONS OF BLOCKCHAIN TECHNOLOGY IN CIVIL ENGINEERING**	
		18CEE27.1	Gain a clear understanding of the concepts that underlie Blockchain and Blockchain and types of Blockchain.
		18CEE27.2	Understand key mechanisms like decentralization, transparency and trust, immutability.

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		18CEE27.3	Understand the importance of Blockchain in construction industry apply the concepts of smart contracts using Blockchain technology.
		18CEE27.4	Understand and apply the project management systems using Blockchain technology.
		18CEE27.5	Apply the concepts of building information modelling using Blockchain technology
76	IV/II	**18CE C30-TECHNICAL SEMINAR**	
		18CE C30.1	Identify their domain interest through critical review of literature.
		18CE C30.2	Develop the technical skill in preparing a well-structured report on the chosen topic of Civil Engineering by following ethical practices.
		18CE C30.3	Develop the skill of presenting a structured seminar using Power Point presentation tools.
		18CE C30.4	Improve communication skills.
		18CE C30.5	Defend one's presentation by healthy interactions with the participants.
77	IV/II	**18CE C31-PROJECT: PART-2**	
		18CE C31.1	Examine the chosen problem with a deeper insight and identify a path to problem solving while developing the skill of coordinating with the team.
		18CE C31.2	Develop and demonstrate problem solving skills through detailed Analysis/ Modeling / Simulation/ Experimental works.
		18CE C31.3	Evaluate the results based on deeper studies and draw conclusions along with scope for further studies to facilitate continuous learning.
		18CE C31.4	Develop the art of technical report writing by following ethical practices.
		18CE C31.5	Defend the work through a well-structured presentation