SurTech

DR. SUDHIR CHANDRA SUR INSTITUTE OF TECHNOLOGY AND SPORTS COMPLEX
(Formerly known as Dr. Sudhir Chandra Sur Degree Engineering College)

SARADINDU PANDA

Digitally signed by SARADINDU PANDA
DN: C=IN, O=PERSONAL, OID.2.5.4.65=50dc17bda7694c6faf2a681ef8cb299e, Phone=dc051023d5ef6eedc0adf77e0795389f7704e418ab0283139cd404733ecded2d, PostalCode=700084, S=West Bengal, SERIALNUMBER=89a2a0f5fedf43b7ecc8806032fe07cfca4a8bce88543469bec7f95be812409f, CN=SARADINDU PANDA
Reason: I am the author of this document
Location:
Date: 2024-04-10 12:40:42

COs for Civil Engineering Department (3rd to 8th Semester)

3RD Semester

Course Name: Biology for Engineers
Course Code: CE (BS) 301
Course Type: Theory
Course Designation: Compulsory

Course Outcomes	Details/Statement
BSC CE301.1	Students will be able to Describe how biological observations of 18th Century that leadto major discoveries.
BSC CE301.2	Students will be able to Find that classification per se is not what biology is all about buthighlight the underlying criteria, such as morphological, biochemical and ecological.
BSC CE301.3	Students will be able to Classify the concepts of recessiveness and dominance duringthe passage of genetic material from parent to offspring.
BSC CE301.4	Students will be able to Examine that all forms of life have the same building blocks andyet the manifestations are as diverse as one can imagine and biological processes at the reductionistic level.
BSC CE301.5	Students will be able to Justify enzymes and distinguish between different mechanismsof enzyme action and Apply thermodynamic principles to biological systems.
BSC CE301.6	Students will be able to Identify DNA as a genetic material in the molecular basis ofinformation transfer and microorganisms.

Course Name: MATHEMATICS III
Course Code: CE(BS) 301
Semester of Study: 3rdCourse Type: Theory
Course Designation: Compulsory

Course Outcomes	Details/Statement
CE(BS) 302.1	Students will be able to Learn the tools of Laplace Transform, Fourier Transform and Z-Transform to analyze engineering problems.
CE(BS) 302.2	Students will be able to Learn the ideas of functions, relation and algebraic structure and their applications in engineering environment.
CE(BS) 302.3	Students will be able to Understand the concept of Logic, partially ordered set and apply the Counting technique in the problems of engineering fields.
CE(BS) 302.4	Students will be able to Learn Basics of Graph Theory which are useful to solve engineering problems.

Course Name: Engineering Mechanics
Course Code: CE(ES)301
Semester of Study: 3rd (Semester III)
Course Type: Theory Course Designation: Compulsory

Course Outcomes	Details/Statement
CE(ES)301.1	Students will be able to Illustrate system of forces and its resultant and free body diagram of forces.
CE(ES)301.2	Students will be able to List the types and laws of friction and analyze truss by method of joints and method of sections.
CE(ES)301.3	Students will be able to Locate the centroid of simple figures and composite sections.
CE(ES)301.4	Students will be able to Identify the principles of Virtual Work and Energy method and solve problems
CE(ES)301.5	Students will be able to Demonstrate particle dynamics and kinematics of rigid bodies.
CE(ES)301.6	Students will be able to Recognize mechanical Vibration and solve problems related to vibration and pendulum.

Course Name: Energy Science and Engineering Course Code: CE(ES)302
Semester of Study: 3rd (Semester III)
Course Type: Theory

Course Outcomes	Details/Statement
CE(ES)302.1	Students will be able to discuss the ideas of scientific principles, energy systems and various non-renewable and renewable resources for energy.
CE(ES)302.2	Students will be able to describe different energy generation systems and their environmental impacts.
CE(ES)302.3	Students will be able to develop the idea about the role of civil engineering in energy sources.
CE(ES)302.4	Students will be able to use the concepts about green building LEED ratings, energy audit of facilities and optimization of energy consumption.
CE(ES)302.5	Students will be able to relate the global policy initiatives and meet the emerging challenges with sustainable technological solutions in the field of energy and environment.
CE(ES)302.6	Students will be able to relate the ideas of energy, environment and economic system.

Course Name: Humanities 1. (Effective Technical Communication)
Course Code: CE (HS) 301
Semester of Study: THIRD
Course Type: Theory

Course Outcomes	Details/Statement
CE HS 301.1.	Students will be able to Understand the dynamics of Verbal and Non Verbal aspects of technical communication
CE HS301.2.	Students will be able to Practice multi-step writing process to plan, draft, and revise reports, correspondence, and presentations
CE HS 301.3	Students will be able to Illustrate and examine the knowledge of ethical aspects of engineering
CE HS 301.4.	Students will be able to Demonstrate and explain social and professional etiquettes
CE HS301.5..	Students will be able to Plan self-development and practice self-assessment to function on multi-disciplinary teams
CE HS 301.6.	Students will be able to Organize and write business correspondence properly and correctly, using appropriate formats, grammar, vocabulary, and syntax, and demonstrate effective writing and editing skills.

Course Name: Introduction to Civil Engineering Course
Code: CE(HS)302
Semester of Study: 3rd (Semester III)
Course Type: Theory

Course Outcomes	Details/Statement
CE(HS)302.1	Students will be able Describe the basic of civil engineering.
CE(HS)302.2	Students will be able Summarize the History of Civil engineering, National Planning for Construction and Infrastructure Development, Fundamentals of Architecture & Town Planning, Fundamentals of Building Materials.
CE(HS)302.3	Students will be able Discuss the Basics of Construction Management & Contracts Management, Environmental Engineering & Sustainability, basics of Geotechnical Engineering.

CE(HS)302.4	Students will be able Explain fundamentals of Hydraulics, Hydrology &Water Resources Engineering, Ocean Engineering, Power Plant Structures, surveying techniques, & Geomatics, Traffic &Transportation Engineering, Repairs & Rehabilitation of Structures, Computational Methods, IT, IoT in Civil Engineering.
CE(HS)302.5	Students will be able Analyze the cases of large civil engineering projects by industry professionals, covering comprehensive planning to commission.
CE(HS)302.6	Students will be able Summarize Basics of Professionalism.

Course Name: Basic Electronics
Course Code: CE (ES)391
Semester of Study: 3rd Semester
Course Type: Laboratory
Course Designation: Compulsory

Course Outcome	Details/Statement
CE(ES)391.1	Students will be able to Analyze behavior of passive electrical components such as resistors, capacitors and inductors and understand carrier transport phenomenon in semiconductors
CE(ES)391.2	Students will be able to Illustrate the principle of operation of measuring instruments such as volt meters, ammeters power supplies, CRO etc. used to measure electrical parameters according to the range selected..
CE(ES)391.3	Students will be able to Illustrate the characteristics and working principles of semiconductor diodes and determine their parameters.
CE(ES)391.4	Students will be able to Bias the transistor such as BJT, JFET and MOSFET in the desired operating region using any of the available biasing techniques.
CE(ES)391.5	Students will be able to Analyze the characteristics of Integrated circuits and its use in several applications in electronics circuits particularly the IC Op - Amp and 555 timer, IC voltage regulators etc.
CE(ES)391.6	Students will be able Design combinational and sequential circuits for a given functions using logic gates.

Course Name: Computer Aided Civil Engineering Drawing
Course Code: CE(ES)392
Semester of Study: 3rd (Semester III)
Course Type: Practical Course Designation: Compulsory

Course Outcomes	Details/Statement
CE(ES)392.1	Students will be able to Discuss the basic concepts of drawing.
CE(ES)392.2	Students will be able to Differentiate the various signs and symbols used in AUTOCAD.
CE(ES)392.3	Students will be able to Sketch the site plan, floor plan, elevation and section drawing of small residential buildings.
CE(ES)392.4	Students will be able to Illustrate isometric, perspective view of building and fundamentals of Building Information Modelling.
CE(ES)392.5	Students will be able to Describe the types of masonry bonds.
CE(ES)392.6	Students will be able to Construct an Industrial building and roof truss.

Course Name: Life Science Laboratory;
Code: CE(ES)393
Semester of Study: 3rd (Semester III)
Course Type: Practical
Course Designation: Compulsory

Course Outcomes	Details/Statement
CE(ES)393.1	Students will be able Describe about Ecosystems- Components, types, flow of matter and energy in an ecosystem Biotic & food chain, food web, ecological pyramids
CE(ES)393.2	Students will be able Explain about Plant Physiology: like Transpiration; Mineral nutrition
CE(ES)393.3	Students will be able Recognize the Structures of DNA and RNA; Concept of Gene, Gene regulation
CE(ES)393.4	Students will be able Identify the Basic concepts: of Tot potency and Cell manipulation; Plant &Animal tissue culture- Methods and uses in agriculture, medicine and health; Recombinant DNA Technology- Techniques and applications
CE(ES)393.5	Students will be able Calculate Value Index of a species in a plant community and its importance
CE(ES)393.6	Students will be able draw Comparison of stomata index in different plants

4TH Semester

Course Name: Introduction to Fluid Mechanics
Course Code: CE(ES)401
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(ES)401.1	Students will be able to Define basic terms, values and laws in the areas of fluids properties.
CE(ES)401.2	Students will be able to Use the basic equations of fluid statics to solve problems on submerged planes and manometers.
CE(ES)401.3	Students will be able to Identify the concept and application of fluid kinematics and fluid dynamics
CE(ES)401.4	Students will be able to Relate dimensional analysis principle for problems in fluid mechanics
CE(ES)401.5	Students will be able to Use fundamental theories of fluid flow for the analysis of flow through the pipeline system.
CE(ES)401.6	Students will be able to Design components of hydraulic machines, turbines, and pumps; and study their characteristics

Course Name: Introduction to Solid Mechanics
Course Code: CE(ES)402
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(ES)402.1	To identify different degrees of freedoms for support conditions, equilibrium conditions and elastic properties of axially loaded bars through stress-strain and force displacement curves.
CE(ES)402.2	To calculate the bending moment diagram, shear force diagram, bending and shear stresses and deflection of beams for uniformly distributed, concentrated, linearly varying and external concentrated moment.
CE(ES)402.3	To identify strain energy due to bending moment, axial force, shear force and the concepts of principal stresses, principal planes, and Mohr's circle.
CE(ES)402.4	To calculate the member forces in plane trusses; hoop and meridonial stresses in thin cylinders and

	spherical shells.
CE(ES)402.5	To identify torsional moment and twist on a circular shaft and calculate the shear stress.
CE(ES)402.6	To calculate the buckling load of columns using Euler's theory for different support constraints.

Course Name: Civil Engineering- Societal & Global Impact
Course Code: CE(HS)401
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(HS)401 .1	Students will be able to Discuss the change in trends of civil engineering from the past to present and future in Indian as well as global scenario.
CE(HS)401 .2	Students will be able to The impact, which Civil Engineering projects have on the Society and identifying the ancient and modern marvels of civil engineering to plan for a better world.
CE(HS)401 .3	Students will be able to Recognize the different infrastructural requirements of civil engineering related to megacities, smart cities, energy generation and communication.
CE(HS)401 .4	Students will be able to Classification of environmental engineering including waste managements, flood control, pollution control to build a sustainable society.
CE(HS)401 .5	Students will be able to Identify the built environment and factors influencing the quality of life ensuring sustainability.
CE(HS)401 .6	Students will be able to Understand the EIA procedures and apply advanced engineering techniques to contribute to GDP and generate employment.

Course Name: Soil Mechanics – I
Course Code: CE(PC)401
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)401.1	Classify soil as per grain size distribution curve and understand the index properties of soil.
CE(PC)401.2	Implement the concept of total stress, effective stress and pore water pressure for solving geotechnical problems.
CE(PC)401.3	Assess the permeability of different types of soil and solve flow problems.
CE(PC)401.4	Estimate the seepage loss, factor of safety against piping failure using flow net related to any hydraulic structure.
CE(PC)401.5	Explain vertical stress on a horizontal plane within a soil mass subjected to different types of loading on the ground surface and also the maximum stressed zone or isobar below a loaded area.
CE(PC)401.6	Use the concept of shear strength to analyze different geotechnical problems and determine the shear strength parameters from lab and field tests.

Course Name: Environmental Engineering-I
Course Code: CE(PC)402
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)402.1	Students will be able to Define the basic concepts and terminologies of water supply engineering and solid waste management.

CE(PC)402.2	Students will be able to Describe different surface and groundwater sources; and composition and characteristics of municipal solid waste.
CE(PC)402.3	Students will be able to Implement the methods of quantifying water requirement and MSW generation.
CE(PC)402.4	Students will be able to Solve different mathematical problems regarding different components of water supply systems, distribution networks and MSW management systems.
CE(PC)402.5	Students will be able to Compare between different water samples based on their physical, chemical and biological characteristics.
CE(PC)402.6	Students will be able to Design different unit processes and operations involved in wastewater treatment.

Course Name: Surveying & Geomatics
Course Code: CE(PC)403
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)403.1	Students will be able to explain and state the scope of surveying and geomatics in civil engineering
CE(PC)403.2	Students will be able to demonstrate the basic principles of surveying and geomatics engineering
CE(PC)403.3	Students will be able to solve the problems using different methods of surveying and geomatics to measure the features of interest
CE(PC)403.4	Students will be able to examine the traditional and advanced methods of surveying
CE(PC)403.5	Students will be able to relate the different techniques of surveying and geomatics in solving real world problems.
CE(PC)403.6	Students will be able to develop and construct solutions for real-world problems related to surveying and geomatics.

Course Name: Concrete Technology
Code: CE(PC)404
Semester of Study: 4th (Semester IV)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)404.1	Students will be able to Explain the composition, manufacturing process, chemical compounds and types of cement, along with influence of aggregate and water in concrete making.
CE(PC)404.2	Students will be able to Examine the properties of materials required for concrete making and the properties of concrete at fresh and hardened state as per IS code and its strength characteristics.
CE(PC)404.3	Students will be able to Select the admixture as per requirement for concreting, its role and properties.
CE(PC)404.4	Students will be able to Design the concrete mix as per latest IS code methods
CE(PC)404.5	Students will be able to Apply the basic knowledge of non-destructive testing in field operations.
CE(PC)404.6	Students will be able to Analyze various special types of concrete and their applications.

Course Name: Fluid Mechanics Laboratory
Course Code: CE(ES)491
Semester of Study: 4th (Semester IV)
Course Type: Practical

Course Outcomes	Details/Statement
CE(ES)491.1	Students will be able to prepare the Coefficient of discharge, calibration of the notch and orifice meter.

CE(ES)491.2	Students will be able to Evaluate the performance of pump and turbine.
CE(ES)491.3	Students will be able to Calculate the various hydraulic coefficients.
CE(ES)491.4	Students will be able to Examine the minor losses through pipes.
CE(ES)491.5	Students will be able to Inspect the water surface profile due to formation of hydraulic jump.
CE(ES)491.6	Students will be able to Inspect the water surface profile for flow over Broad crested weir.

Course Name: Solid Mechanics Laboratory
Course Code: CE(ES)492
Semester of Study: 4th (Semester IV)
Course Type: Practical

Course Outcomes	Details/Statement
CE(ES)492.1	Students will be able to Demonstrate the method and findings of tension and compression tests on ductile, brittle materials and explain the method of bending tests on mild steel beam and concrete beam.
CE(ES)492.2	Students will be able to Demonstrate the method and findings of Torsion test on mild steel circular bar, concrete beam.
CE(ES)492.3	Students will be able to Interpret the concept of hardness and explain the procedure and findings of Brinnel and Rockwell tests.
CE(ES)492.4	Students will be able to Demonstrate the concept, procedure and calculation of spring constant and execute its use in Civil Engineering.
CE(ES)492.5	Students will be able to Demonstrate the method and findings of Izod and Charpy impact tests.
CE(ES)492.6	Students will be able to Explain the concepts of fatigue test.

Course Name: Engineering Geology Laboratory
Course Code: CE(ES)493
Semester of Study: 4th (Semester IV)
Course Type: Laboratory

Course Outcomes	Details/Statement
CE(ES)493.1	Students will be able to Define and state the role of engineering geology in civil engineering.
CE(ES)493.2	Students will be able to Identify the origin of rocks and geologic structures.
CE(ES)493.3	Students will be able to Use different tools to identify rocks and minerals in hand specimens and under the microscope.
CE(ES)493.4	Students will be able to Relate the geological structures by drawing the cross sections from the geological maps.
CE(ES)493.5	Students will be able to Interpret the results obtained from different geological experiments.
CE(ES)493.6	Students will be able to Investigate the natural hazards/disasters that are caused by geological reasons.

Course Name: Surveying & Geomatics Laboratory;
Code: CE(PC) 493
Semester of Study: 4th (Semester IV)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(PC) 493.1	Students will be able to Interpret the interdependency and advancement of different surveying methods
CE(PC) 493.2	Students will be able to Explain the working principles of different surveying and geomatics instruments and experiments
CE(PC) 493.3	Students will be able to Execute the different methods of surveying and geomatics to measure the

	features of interest
CE(PC) 493.4	Students will be able to Examine the results obtained from the surveying and geomatics experiments
CE(PC) 493.5	Students will be able to Assess the different techniques of surveying and geomatics in measuring and assessing the features of interest
CE(PC) 493.6	Students will be able to Design and construct solutions for real world problems related to surveying and geomatics.

Course Name: Concrete Technology Laboratory
Course Code: CE(PC)494
Semester of Study: 4th (Semester - IV)
Course Type: Practical

Course Outcomes	Details/Statement
CE(PC)494.1	Students will be able to Demonstrate the method and findings of tension ad compression tests on concrete.
CE(PC)494.2	Students will be able to Describe the concepts of different test on hardened concrete and different properties of cement.
CE(PC)494.3	Students will be able to Calculate the specific gravity of concrete ingredients.
CE(PC)494.4	Students will be able to Calculate the mix proportion of high grade of concrete.
CE(PC)494.5	Students will be able to Measure the workability of concrete mix.
CE(PC)494.6	Students will be able to Investigate the quality of concrete.

5TH Semester

Course Name: Design of RC Structures
Course Code: CE(PC)501
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)501.1	Students will be able to identify material properties and design methodologies for reinforced concrete structures.
CE(PC)501.2	Students will be able to Assess different type of loads and prepare layout for reinforced concrete structures.
CE(PC)501.3	Students will be able to apply the applicable industrial design codes relevant to the design of reinforced concrete members.
CE(PC)501.4	Students will be able to analyze and design various structural elements of reinforced concrete building like beam, slab, column, footing, and staircase
CE(PC)501.5	Students will be able to Assessment of serviceability criteria for reinforced concrete beam and slab
CE(PC)501.6	Students will be able to Prepare structural drawings and detailing and produce design calculations and drawing in appropriate professional format

Course Name: Engineering Hydrology
Course Code: CE(PC)502
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)502.1	Students will be able to Explain the source, occurrence, movement and distribution of water which is a prime resource for development of a nation.
CE(PC)502.2	Students will be able to Interpret to Estimate and process the precipitation data.

CE(PC)502.3	Students will be able to Analyze the functioning of reservoirs and estimation of storage capacities.
CE(PC)502.4	Students will be able to Calculate to estimate the passage of floods through rivers and reservoirs.
CE(PC)502.5	Students will be able to Design the flood volumes and flood hazards for various structures
CE(PC)502.6	Students will be able to Estimate the measurement of flow in rivers.

Course Name: Structural Analysis – I
Course Code: CE(PC)503
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)503.1	Students will be able to Distinguish between stable and unstable and statically determinate and indeterminate structures.
CE(PC)503.2	Students will be able to Solve equations of equilibrium to structures and compute the reactions.
CE(PC)503.3	Students will be able to Interpret the internal forces in cable and arch type structures.
CE(PC)503.4	Students will be able to Develop and draw the influence lines for reactions, shears and bending moments in beams due to moving loads.
CE(PC)503.5	Students will be able to Use approximate methods to solve statically indeterminate structures
CE(PC)503.6	Students will be able to Sketch the deflections of truss structures and beams.

Course Name: Soil Mechanics-II
Course Code: CE(PC)504
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)504.1	Students will be able to Assess the compaction and consolidation characteristics of soil for solving geotechnical problems.
CE(PC)504.2	Students will be able to Calculate earth pressure on rigid retaining walls on the basis of classical earth pressure theories
CE(PC)504.3	Students will be able to Interpret the concept of different methods in design, construction of the pavement.
CE(PC)504.4	Students will be able to Solve the bearing capacity of shallow foundation by applying established theory.
CE(PC)504.5	Students will be able to Estimate settlement in soils by different methods.
CE(PC)504.6	Students will be able to Design safety of dams and embankments on the basis of various methods of slope stability analysis.

Course Name: Environmental Engineering-II
Course Code: CE(PC)505
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)505.1	Students will be able to Recognize the basic concepts and terminologies of waste water engineering and hazardous waste management.
CE(PC)505.2	Students will be able to Describe different home plumbing systems for water supply and wastewater disposal
CE(PC)505.3	Students will be able to Implement the methods of quantifying sanitary sewage and storm sewage.
CE(PC)505.4	Students will be able to Solve different mathematical problems regarding different components of

	sewerage system.
CE(PC)505.5	Students will be able to Compare between different wastewater samples based on their physical, chemical and biological characteristics
CE(PC)505.6	Students will be able to Design different unit processes and operations involved in wastewater treatment

Course Name: Transportation Engineering
Course Code: CE(PC)506
Semester of Study: 5th (Semester V)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)506.1	Students will be able to Summarize the knowledge of planning, design and the fundamental properties of highway materials in highway engineering.
CE(PC)506.2	Students will be able to Apply the knowledge of geometric design and draw appropriate conclusion.
CE(PC)506.3	Students will be able to Interpret the concept of different methods in design, construction of the pavement.
CE(PC)506.4	Students will be able to Interpret traffic parameters by applying the knowledge in traffic planning and intersection design.
CE(PC)506.5	Students will be able to Define the various pavement materials, types of pavement and their typical cross- sections; Design parameters and design the Flexible Pavement rigid Pavement: with Design of rigid Pavement thickness.
CE(PC)506.6	Students will be able to Illustrate the scope of adoption of sustainable construction techniques by using recyclable hazardous materials.

Course Name: RC Design Sessional
Course Code: CE(PC)591
Semester of Study: 5th (Semester V)
Course Type: Practical

Course Outcomes	Details/Statement
CE(PC)591.1	Students will be able to Identify material properties and design methodologies for reinforced concrete structures.
CE(PC)591.2	Students will be able to Examine different type of loads and organize layout for reinforced concrete structures.
CE(PC)591.3	Students will be able to Identify and use the applicable industrial design codes relevant to the design of reinforced concrete members.
CE(PC)591.4	Students will be able to Design various structural elements of reinforcedconcrete building like beam, slab, column, footing, and staircase.
CE(PC)591.5	Students will be able to Examine serviceability criteria for reinforced concrete beam and slab.
CE(PC)591.6	Students will be able to Develop structural drawings and detailing in appropriate professional format.

Course Name: Soil Mechanics Laboratory'
Course Code: CE(PC)594
Semester of Study: 5th (Semester V)
Course Type: Practical

Course Outcomes	Details/Statement
CE(PC)594.1	Students will be able to Classify the types of soil and determine its natural moisture content

	alongwith specific gravity.
CE(PC)594.2	Students will be able to Estimate in-situ density of soil by core cutter and sand replacement method.
CE(PC)594.3	Students will be able to Develop grain size distribution curve and Atterberg limits for soil.
CE(PC)594.4	Students will be able to Demonstrate laboratory tests to determine permeability and compaction characteristics of soil.
CE(PC)594.5	Students will be able to Calculate the shear strength parameters of soil by using UCS, Vane Shear, Direct Shear & Triaxial Test.
CE(PC)594.6	Students will be able to Calculate the California Bearing Ratio (CBR) of soil.

Course Name: Environmental Engineering Laboratory
Course Code: CE(PC)595
Semester of Study: 5th (Semester V)
Course Type: Practical

Course Outcomes	Details/Statement
CE(PC)595. 1	Students will be able to Test the various physical characteristics for a given sample of water and waste water.
CE(PC)595. 2	Students will be able to Recognize the various chemical characteristics for a given sample of water and waste water.
CE(PC)595. 3	Students will be able to Examine the bacteriological characteristics for a given sample of water and waste water.
CE(PC)595.4	Students will be able to Assess the suitability of a few treatment options for a given sample of water and waste water.
CE(PC)595. 5	Students will be able to Compare the determined quality parameters with standards to decide on the suitability of use for the tested water and disposal of tasted wastewater.
CE(PC)595. 6	Students will be able to Use the most appropriate technique to purify and control water contamination.

Course Name: Transportation Engineering Laboratory
Course Code: CE(PC)596
Semester of Study: 5th (Semester V)
Course Type: Laboratory

Course Outcomes	Details/Statement
CE(PC)596.1	Students will be able to Classify and examine of aggregates through differenttests.
CE(PC)596.2	Students will be able to Examine the Specific Gravitytest, Penetration test, and Static or Kinematic viscosity test on Bitumen.
CE(PC)596.3	Students will be able to Examine Softening point test, Flash and Fire Point test andDuctility test on Bitumen.
CE(PC)596.4	Students will be able to Calculate the CBR value ofsub-grade (Soaked and Unsoaked).
CE(PC)596.5	Students will be able to design the bituminous mixwith Marshall stability test.
CE(PC)596.6	Students will be able to Demonstrate on striping value, Loss on heating, Benkelman beam and Bump integrator test.

Course Name: Computer Applications in Civil Engineering
Course Code: CE(PC)597
Semester of Study: 5th (Semester - V)
Course Type: Practical

Course Outcomes	Details/Statement

CE(PC)597.1	Students will be able to Use the computer as a problem-solvingtool.
CE(PC)597.2	Students will be able to Identify and formulate Civil Engineering problems solvable bycomputers.
CE(PC)597.3	Students will be able to Solve Civil Engineering problems by illustrating linear algebra and matrix operations and their applications.
CE(PC)597.4	Students will be able to Solve sets of linear equations and determine roots and nonlinearequations.
CE(PC)597.5	Students will be able to Construct, interpret and solve simpleoptimization problems.
CE(PC)597.6	Students will be able to Develop programs for Civil Engineering analysis and design problems and with the help of various software, analysis and design are donefor industries.

6TH Semester

Course Name: Soft Skills And Interpersonal Communication-1
Course Code: CE(OE)601 A
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE OE 601A.1	Students will be able to Analyze the dynamics ofbusiness communicationand communicate accordingly.
CE OE 601A.2	Students will be able to Write business letters andreports
CE OE 601A.3	Students will be able to Learn to articulate opinionsand views with clarity
CE OE 601A.4	Students will be able to Appreciate the use of language to create beautifulexpressions
CE OE 601A.5	Students will be able to Analyze and appreciate literature.
CE OE 601A.6	Students will be able to Communicate in an official and formal environment.

Course Name: Construction Engineering & Management
Code: CE(PC)601
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)601.1	Students will be able to Prepare well planned building which balances all aspects of building such as space conditioning, ventilation, privacy etc.maintain building bye-laws regulations with respect to building side spaces and fire protections.
CE(PC)601.2	Students will be able to Inspect the project planning and control activities in the construction projects byusing the techniques of PERT and CPM.
CE(PC)601.3	Students will be able to Apply the concept of wall panels, slabs, columns during erection of prefabricated buildings evaluate and choose appropriate shoring and scaffolding techniques for construction projects, understand the constructionsequence of silos, chimneys and sky scrapers.
CE(PC)601.4	Students will be able to Choose construction equipment for earthwork, material handling and miscellaneous purposes.
CE(PC)601.5	Students will be able to Interpret the elements and types of contracts Contract formation,Potential contractual problems, Comparison of actions and laws, Powers and duties of arbitrator and types of laws, justify the legal requirements to solve contractual problems for managing construction contracts, achieve awareness on arbitrations, powers and duty of an arbitrator
CE(PC)601.6	Students will be able to List the idea of hierarchy, work responsibility of the administrator.

Course Name: Engineering Economics, Estimation & Costing
Course Code: CE(PC)602
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)602.1	Students will be able to Have an idea of Economics in general, Economics of Indiaparticularly for public sector agencies and private sector businesses.
CE(PC)602.2	Students will be able to differentiate presentworth, future worth and annual worth analyses on one of more economic alternatives.
CE(PC)602.3	Students will be able to sketch benefit/cost, life cycle and breakevenanalyses on one or more economic alternatives.
CE(PC)602.4	Students will be able to explain the technicalspecifications for various worksto be performed for a project and how they impact the cost of a structure.
CE(PC)602.5	Students will be able to weigh the worth of astructure by evaluating Quantities of constituents, derive their cost rates and build up the overall cost of the structure.
CE(PC)602.6	Students will be able to explain how competitive bidding works and how to submit a competitive bid proposal.

Course Name: Water Resources Engineering
Course Code: CE(PC)603
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)603.1	Students will be able to Explain the fundamentals of flow in open channels.
CE(PC)603.2	Students will be able to Describe the concepts of irrigation
CE(PC)603.3	Students will be able to Estimate the quantity of waterrequired by different crops in different seasons, and accordingly the irrigation water requirement.
CE(PC)603.4	Students will be able to Designcanals and otherirrigation structures required for irrigation and other water-management projects.
CE(PC)603.5	Students will be able to Design drains required for land drainage, soil conservation,flood control.
CE(PC)603.6	Students will be able to Define about ground waterresources, aquifers and wells.

Course Name: Design of Steel Structures
Course Code: CE(PC)604
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PC)604.1	Students will be able to Identify the material properties of structural steel.
CE(PC)604.2	Students will be able to Design different bolted and welded connections for axial and eccentric loads.
CE(PC)604.3	Students will be able to Design the tension, compression & column bases member under axial and combined loading.
CE(PC)604.4	Students will be able to Differentiate between laterally supported and unsupported flexure members and Design the flexuremembers using Indian codes of practice.
CE(PC)604.5	Students will be able to Examine shear force and bendingmoment on plate girders, and finally design it following Indian standarddesign guidelines.

CE(PC)604.6	Students will be able to Identify different components of gantrygirders, examine lateral and vertical loads acting on the gantry girders and design them.

Course Name: Foundation Engineering
Course Code: CE(PE)601B
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)601B.1	Students will be able to Classify the shallow and deep foundation Determine the load carrying capacity of pilefoundation.
CE(PE)601B.2	Students will be able to Calculate the efficiency and settlement ofpile group.
CE(PE)601B.3	Students will be able to Express different subsoil exploration methods and interpret field and laboratory test data to obtain design parameters for geotechnical analysis.
CE(PE)601B.4	Students will be able to Categorize bearing capacity of shallow foundation from field test data.
CE(PE)601B.5	Students will be able to Analyze and design sheet pile structure onthe basis of earth pressure theories.
CE(PE)601B.6	Students will be able to Identify and apply various types of groundimprovement methods for solving complex geotechnical problems.

Course Name: Structural Analysis – II
Code: CE(PE)602B
Semester of Study: 6th (Semester VI)
Course Type: Theory

Course Outcomes	Details/Statement
CE (PE)602B.1	Students will be able to Apply the Slope Deflection and Moment Distribution Method to analyze indeterminate structures.
CE (PE)602B.2	Students will be able to Develop and analyze the concept of suspension bridgeand stiffness girders
CE (PE)602B.3	Students will be able to Apply and analyze the concepts of curved beam analysis in hooks, rings and bow girders. Develop theconcept bending in unsymmetrical beams.
CE (PE)602B.4	Students will be able to Develop the fundamental concepts of plastic analysis using kinematic method and apply them in frames andcontinuous beam analysis.
CE (PE)602B.5	Students will be able to Develop and analyze the portal frames using Portal and Cantilever method.
CE (PE)602B.6	Students will be able to Develop and analyze the indeterminate structures (continuous beams and frames) using flexibility andstiffness matrix method.

Course Name: Water resources Engineering Laboratory
Course Code: CE(PC)693
Semester of Study: 6th (Semester VI)
Course Type: Laboratory

Course Outcomes	Details/Statement
CE(PC)693.1	Students will be able to Prepare a diagram of the catchment area for any waterbody manually or using DEM.
CE(PC)693.2	Students will be able to Calculate the average rainfallover a catchment.
CE(PC) 693.3	Students will be able to Measure the rainfall data using different types of rain-gauges.
CE(PC) 693.4	Students will be able to Measure the rate of infiltration of water throughthe soil.
CE(PC) 693.5	Students will be able to Measure the evaporation using evaporimeter.
CE(PC) 693.6	Students will be able to Measure the sunshine hours ina particular day.

Course Name: Steel Structure Design Sessional
Code: CE(PC)694
Semester of Study: 6th (Semester VI)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(PC)694.1	Students will be able to Identify the material properties ofstructural steel. Moreover, the students will identify different bolted and welded connections, analyze and design them for axial and eccentric loads.
CE(PC)694.2	Students will be able to Design different steel sections subjected to axial compression and tension following Indian codes ofpractices.
CE(PC)694.3	Students will be able to Identify the differences between laterally supported and unsupportedflexure members. Designing of theflexure members using Indian codes of practice.
CE(PC)694.4	Students will be able to Analyze and design rolled and built upcompression members along with base connection subjected to axialcompression, bending and tension.
CE(PC)694.5	Students will be able to Calculate shear force and bendingmoment on rolled and built up girders, dimension the section and finally design it following Indian standard design guidelines.
CE(PC)694.6	Identify different components of gantry system, calculate lateral and vertical loads acting on the system, dimension the components and designthem. Design different components of an industrial building.

Course Name: Quantity Survey Estimation & Valuation
Course Code: CE(PC)695
Semester of Study: 6thSemester VI)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(PC)695. 1	Students will be able to Explain about QuantitySurveying, different types of estimates, items of work and their units.
CE(PC)695. 2	Students will be able to Analyze the schedule of rates
CE(PC)695. 3	Students will be able to Prepare the specification ofmaterials & works.
CE(PC)695. 4	Students will be able to Prepare bar bending schedule for RCC structure
CE(PC)695. 5	Students will be able to Interpret the fundamentalconcept of valuation
CE(PC)695. 6	Students will be able to Estimate the detailed quantity of material consumption andabstracts for constructions for single storied building, road, Underground reservoir,Surface drain, Septic tank

7TH Semester

Course Name: Cyber Law and Ethics
Course Code: CE(OE)701C
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(OE)701C.1	Students will be able to Explain the fundamental concepts of cybersecurity and its significance in today's digital world
CE(OE)701C.2	Students will be able to Demonstrate a solid understanding of cyber laws, regulations, and international treaties governing cyberspace
CE(OE)701C.3	Students will be able to Examine privacy laws and regulations, including IT Act, IT Audit Standard, ISMS, SoA, BCP, RA and their implications for data protection
CE(OE)701C.4	Students will be able to Analyze ethical dilemmas related to online activities, including issues of privacy, surveillance, and digital ethics
CE(OE)701C.5	Students will be able to Understand cybersecurity policies, standards, and best practices for

	organizations and individuals to safeguard information and systems
CE(OE)701C.6	Students will be able to Apply ethical principles and decision-making frameworks to real-world cybersecurity scenarios.

Course Name: Hydraulic Structures
Course Code: CE(PE)701C
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)701C.1	Students will be able to Identify the characteristics of various type of dams and their selection procedure.
CE(PE)701C.2	Students will be able to Operate the reconnaissance survey and geophysical investigations necessary forselection of suitable dam site.
CE(PE)701C.3	Students will be able to Examine forces acting on gravity dams an develop stability analysis.
CE(PE)701C.4	Students will be able to Examine the seepage loss through embankment dams and construct necessary remedial measures.
CE(PE)701C.5	Students will be able to Describe various diversion head works and their components, including creep infoundation.
CE(PE)701C.6	Students will be able to Examine the discharge through the overflow section and design the appropriate energy dissipation structures.

Course Name: Prestressed Concrete
Course Code: CE(PE)702A
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)702A.1	Students will be able to Learn the introduction ofrestressed concrete member and its deflection properties.
CE(PE)702A.2	Students will be able to Develop the design criteria ofprestressed concrete section for flexure and shear properties.
CE(PE)702A.3	Students will be able to Designthe anchorage zone stress for post-tensioned members.
CE(PE)702A.4	Students will be able to Use the methods for Analysis ofStatically Indeterminate Structures.
CE(PE)702A.5	Students will be able to Explain the compositeconstruction of Prestress and In-situ concrete.
CE(PE)702A.6	Students will be able to Design the Prestressed concretepoles and sleepers and introduction of partial prestressing.

Course Name: Air and Noise Pollution and Control
Course Code: CE(PE)703A
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)703.1	To explain the basic concepts and terminologies regarding air pollution and noise pollution
CE(PE)703.2	To demonstrate the physics of air pollution and noise pollution
CE(PE)703.3	To use the methods to solve the air pollution and noisepollution measurements
CE(PE)703.4	To examine different conceptsof air and noise pollution for solving mathematical problems
CE(PE)703.5	To investigate air and noise quality with allowable standards and limits
CE(PE)703.6	To select and design proper techniques for air pollution,noise pollution, and control

Course Name: Structural Dynamics
Course Code: CE(PE)704A
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)704A.1	Students will be able to gain a deep understanding of fundamental concepts related to structural dynamics, including concepts such as natural frequencies, modes of vibration, damping, and dynamic loads
CE(PE)704A.2	Students will be able to Develop the ability to analyze and model complex structural systems subjected to dynamic loads, such as earthquakes, wind, or machinery-induced vibrations.
CE(PE)704A.3	Students will be able to Determine mode shapes and natural frequencies for structures to understand their dynamic behavior
CE(PE)704A.4	Students will be able to Understand methods for reducing the dynamic response of structures through techniques like damping, base isolation, and tuned mass dampers.
CE(PE)704A.5	Students will be able to Understand methods for reducing the dynamic response of structures through techniques like damping, base isolation, and tuned mass dampers
CE(PE)704A.6	Students will be able to get Familiarize with experimental techniques for dynamic testing and validation of structural models

Course Name: Railway and Airport Engineering
Course Code: CE(PE)705A
Semester of Study: 7th (Semester VII)
Course Type: Theory

Course Outcomes	Details/Statement
CE(PE)705.1	Students will be able to Explain the basics in planning functional components of Railway and Airport.
CE(PE)705.2	Students will be able to Illustrate the engineering concepts of construction, operation and maintenance of Railway and Airport components.
CE(PE)705.3	Students will be able to Interpret the geometric design parameters of Railway.
CE(PE)705.4	Students will be able to determine the runway orientation of proposed runway on the basis of previous wind data analysis.
CE(PE)705.5	Students will be able to Assess the basic runway length parameters.

Course Name: Industrial Internship
Code: CE(IN)791
Semester of Study: 7th (Semester VII)
Course Type: Practical/Sessional

Course Outcomes	Details/Statement
CE(IN)791.1	Students will be able to Apply fundamental principles of engineering to find solutions based on a systems approach which integrate theory with practice.
CE(IN)791.2	Students will be able to Demonstrate skills to work in a teamand understand to work with people from diverse backgrounds.
CE(IN)791.3	Students will be able to Develop the skills required in a profession to become updated with the latest technicaladvancements and adapt to the changes of the industry.
CE(IN)791.4	Students will be able to Develop communication and interpersonal skills as per the Industry standards.
CE(IN)791.5	Students will be able to Evaluate leadership skills by accomplishing the tasks assigned by the industry.
CE(IN)791.6	Students will be able to Analyze the challenges and future ofpotential career in an organization in

	particular and the sector in general.

Course Name: Project I
Course Code: CE(PROJ)792
Semester of Study: 7th (Semester VII)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(PROJ)792.1	To recognize the scope of the problemand conduct a Literature review
CE(PROJ)792.2	To use existing/new methods to apply the fundamental aspects of civil engineering and their relevance with respect to the societal benefit
CE(PROJ)792.3	To set up experimentation/design/development of models to analyze and compare theresults
CE(PROJ)792.4	To identify the modern techniques tocollect the data & solve the real-life problems
CE(PROJ)792.5	To Identify the solutions and relate them with the literature with properanalysis of the problem
CE(PROJ)792.6	To develop the ability of working in the groups and to develop skills related tocomprehensive report writing.

8TH Semester

Course Name: Professional Practice, law & Ethics
Course Code: CE(HS)801A
Semester of Study: 8th (Semester VIII)
Course Type: Theory
Course Category: Humanities and Social Sciences including Management courses

Course Outcomes	Details/Statement
CE(HS)801.1	Recognize the importance of Values and Ethics in their Personal lives and professional careers.
CE(HS)801.2	Discuss the key principles, aspects andpurpose of contract management
CE(HS)801.3	Implement the process for tender, bid evaluation, contract documentation, andcontract notices
CE(HS)801.4	Discuss Arbitration, Conciliation and ADR(Alternative Dispute Resolution) system
CE(HS)801.5	Identify the role of labour in civil engineering and methods of engaging labour
CE(HS)801.6	Identify the need for intellectual property,main forms of IP, Copyright, Trademarks, and the process of obtaining Patents.

Course Name: Ground Water Contamination
Course Code: CE(OE)801D
Semester of Study: 8th (Semester VIII)
Course Type: Theory
Course Designation: Elective

Course Outcomes	Details/Statement
CE(OE)801D.1	Student will be able to Explain the concept of hydrological properties of various water sources
CE(OE)801D.2	Student will be able to implement the concept of Darcy's law in the context of steady and unsteady flow solutions
CE(OE)801D.3	Student will be able to Estimate the ground water quality in Indian and International diaspora. .
CE(OE)801D.4	Student will be able to assess the sources of ground water pollution and explain its preventative manners.
CE(OE)801D.5	Student will be able to Identify the sources of seepage from surface water and artificial recharge
CE(OE)801D.6	Student will be able to develop various models of ground water flow models and characteristics - biodegradation kinetics, numerical flow and transport modeling, waste site characterization, etc.

Course Name: Soft Skills and Personality Development
Course Code: CE(OE)802A
Semester of Study: 8th (Semester VIII)
Course Type: Theory
Course Designation: Open Elective-IV

Course Outcomes	Details/Statement
CE(OE)802A.1	Students will be able to Communicate clearly and confidently in both written and verbal forms and apply active listening techniques to enhance comprehension and build stronger relationships.
CE(OE)802A.2	Students will be able to Recognize personal strengths, weaknesses, and areas for improvement in soft skills.
CE(OE)802A.3	Students will be able to Collaborate efficiently in group settings by understanding team dynamics and Contribute positively to team goals and outcomes.
CE(OE)802A.4	Students will be able to Analyze problems systematically and make informed decisions and Collaborate with others to find creative solutions to challenge
CE(OE)802A.5	Students will be able to Continuously assess personal soft skill development and set goals for improvement.
CE(OE)802A.6	Students will be able to Utilize the knowledge and skills acquired in this course in real-life situations, both personally and professionally

Course Name: Pavement Materials and Design
Course Code: CE(PE)801D
Semester of Study: 8th (Semester VIII)
Course Type: Theory
Course Designation: Compulsory

Course Outcomes	Details/Statement
CE(PE)801D.1	Students will be able to identify the engineering properties and characteristicsof the different materials that concern the pavement engineer
CE(PE)801D.2	Students will be able to use the modern testingtechniques of soil, granular and bituminous materials forpavement analysis and design
CE(PE)801D.3	Students will be able to implement the use ofdifferent superlative aggregate tests and requirements
CE(PE)801D.4	Students will be able to solve the design mix of rigidpavement
CE(PE)801D.5	Students will be able to discuss the relationship between key materials and their properties along with thebehavior of pavement component systems.
CE(PE)801D.6	Students will be able to select the proper pavement techniques, the deflection ofpavements, and methods of maintenance of pavements.

Course Name: Comprehensive Viva Voce
Course Code: CE(CV)881
Semester of Study: 8th (Semester VIII)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(CV)881.1	Students will be able to memorize the basic andadvanced knowledge in civil engineering
CE(CV)881.2	Students will be able to develop an idea about the environment of job market and their preparedness to defend the interview after graduation
CE(CV)881.3	Students will be able to implement their knowledge in civilengineering acquired in the last four years.
CE(CV)881.4	Students will be able to relate usefulness to the society and assess the impact of civil engineering on the environment.

CE(CV)881.5	Students will be able to recognize the properties, uses, advantages and disadvantages of different materials/construction -techniques used in civil engineering
CE(CV)881.6	Students will be able to identify the usage of thedifferent provisions given in the IS codes & schedules

Course Name: Project 2
Course Code: CE(PROJ)882
Semester of Study: 8th (Semester VIII)
Course Type: Sessional

Course Outcomes	Details/Statement
CE(PROJ)882.1	Students will be able to recognize the scope ofproblem and conduct a Literature review
CE(PROJ)882.2	Students will be able to use existing/new methodsto apply the fundamental aspects of civil engineering and their relevance with respect to the societal benefit
CE(PROJ)882.3	Students will be able to set up experimentation / design / development of models to analyze and compare the results
CE(PROJ)882.4	Students will be able to identify the moderntechniques to collect the data & solve the real-life problems
CE(PROJ)882.5	Students will be able to Identify the solutions and relate them with the literature with proper analysis of the problem
CE(PROJ)882.6	To develop the ability of working in the groups and todevelop skills related to comprehensive report writing