Name of the Programme : B.Tech Civil 2019-23

**CO-PO mapping of the Courses**

| Semester | Course Code | Course Name | urse Outcome | Course Outcome | PO1 Engineering knowledge | PO2 Problem analysis | PO3 Design/ development of solutions | PO4 Conduct investigations of complex problems | PO5 Modern tool usage | PO6 The engineer and society | PO7 Environment and sustainability | PO8 Ethics | PO9 Individual and team work | PO10 Communication | PO11 Project management and finance | PO12 Life-long learning | PSO1 competence of creating and providing sustainable infrastructure, housing, water and waste water services | PSO2 apply engineering fundamentals for the development and management of civil engineering solutions that are sensitive owards the environment |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CO1 | understand different terms and numericals related to water treatment, and apply different techniques for the same | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | understand the basic concept in polymer chemistry and describe types, mechanism and properties of polymers and composites | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | apply the concepts related to various spectroscopic analysis techniques | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | describe different thermodynamic concepts and solve basic problems in electrochemistry | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | understand the basic concepts related to Green chemistry, environmental chemistry and non-conventional energy sources | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 70121101 | Chemistry | CO6 | describe the concepts related to fuel chemistry, solve numerical problems and understand the basic concepts in Energy science and Nanomaterials | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | examine water samples for different parameters through experimentation | 3 | 3 | 2 | 2 | - | 1 | - | - | 2 | - | - | - | - | |
| | | | CO2 | understand the preparation of condensation polymers and finding molecular weight of polymer | 3 | 2 | - | - | - | - | - | - | 1 | - | - | - | - | |
| | | | CO3 | understand basic experimentation related to adsorption and chromatography | 3 | - | - | - | - | - | - | - | 1 | - | - | - | - | |
| | | | CO4 | apply basic concepts in spectroscopic analysis | 3 | 1 | - | - | - | - | - | - | 1 | - | - | - | - | |
| 1 | 70121102 | Chemistry Lab | CO5 | write effectively the results of experimentation and develop team working skills | - | 1 | - | - | - | - | - | - | 1 | - | - | - | - | |
| | | | CO1 | Apply successive differentiation to find nth derivative, indeterminate forms and series expansion of functions. | 3 | 1 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO2 | Apply the concepts of partial differentiations to solve problems on homogeneous functions. Jacobians and maxima & minima. | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO3 | Evaluate integrals using reduction formulae and improper integral using DUIS rule and beta-gamma function. | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO4 | Test the convergence of series of positive terms, by using appropriate tests and find Fourier series expansion of periodic functions. | 3 | 3 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| 1 | 70121103 | Engineering Mathematics-I | CO5 | Evaluate rank of a matrix, Eigen values and Eigen vectors. Find inverse using Caley Hamilton theorem and solve system of simultaneous equations. | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO1 | Determine the components of a force in rectangular or non-rectangular co-ordinates, determine resultants and apply conditions of static equilibrium to plane force systems. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Draw complete and correct free-body diagrams and determine resultants and apply conditions of static equilibrium to plane force systems. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Determine the support reactions of structures, recognize frictional forces acting on a body and analyze these forces | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Applythe basic concepts of kinematics for the application of rectilinear motion | 3 | - | | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Applythe knowlwdge of Work-Energy principle and Impulse-Momentum principle. | 3 | - | | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 70121104 | Engineering Mechanics | CO6 | Apply the basic concepts of dynamic equilibrium concept on Curvilinear motion | | | | | | | | | | | | | | |
| | | | CO1 | Illustrate law of parallelogram of forces/ polygon of forces. | 3 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| | | | CO2 | Support reaction of simple beam and compound beam | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Determine coefficient friction of belt/inclined plane | 3 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| | | | CO4 | Illustrate law of moment using Bell crank lever | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Demonstrate curvilinear motion | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO6 | Understand basics of compound pendulumn through experiment | 3 | - | - | - | - | - | - | - | 1 | - | - | - | - | - |
| 1 | 70121105 | Engineering Mechanics Lab | CO7 | Understand basics of moment of Inertial withuse os flywheel | | | | | | | | | | | | | | |
| | | | CO1 | Develop a clear understanding and acquire the knowledge of basic principles, working and applications of DC machines and single phase transformer. | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand basics of semiconductor physics, diode, Zener Diode and BJTs, their different configurations and applications. | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Develop a clear understanding of digital circuits like half adder, full adder and logic gate | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 70121106 | Basic Electrical and Electronics Engineering | CO4 | Understand the need of various safety precautions to be undertaken while working with electrical equipment and learn different wiring components and wiring schemes. | 2 | 1 | - | - | 3 | - | - | - | 3 | 1 | - | 1 | | 1 |
| | | | CO1 | Apply the knowledge of relevant laws and principles and familiarize with different theorems and analytical approaches for solving a given electric circuit. | 3 | 3 | - | - | 3 | - | - | - | 3 | 1 | - | 1 | | 1 |
| | | | CO2 | Develop a clear understanding of the characteristics of basic semiconductor devices like, pn junction diode, Zener Diode and BJTs, their different configurations and applications. | 3 | 3 | - | - | 3 | - | - | - | 3 | 1 | - | 1 | | 1 |
| | | | CO3 | Use and understand different controls of equipment's like CRO and DMM. | 2 | 2 | - | - | 3 | - | - | - | 3 | 1 | - | 1 | | 1 |
| 1 | 70121107 | Basic Electrical and Electronics Engineering Lab | CO4 | Understand and develop Computational Thinking concepts | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Understand and draw projections of points (0D) located in four quadrants | 3 | | | | | | | | | | | | | |
| | | | CO2 | Visualize, plan and draw projections of lines (1D) and planes (2D) (inclined to both planes of projection) | 3 | 1 | | | | | | | | | | | | |
| | | | CO3 | Visualize and draw projections of regular solids (3D) (inclined to both planes of projection) and sections of regular solids (front view, top view and true shape) | 3 | 2 | | | | | | | | | | | | |
| | | | CO4 | Visualize and communicate 3D regular/irregular shapes as 2D engineering drawings and vice versa using orthographic/isometric/development principles | 3 | 1 | | | | | | | | | | | | |
| 1 | 70121108 | Engineering Graphics Lab | CO5 | | | | | | | | | | | | | | | |
| | | | CO1 | Introduce concepts of computational thinking modern computer systems, python IDE | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 | - | 1 |
| | | | CO2 | Get acquainted to python programming basics by learning and practicing the coding | 1 | 2 | 3 | 1 | 2 | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Evaluation and analysing using functions and modules to simplify and automate the | 1 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| 1 | 70121109 | Programing and Problem Solving | CO4 | Using classes to create representations of real world objects and simulate them in I | 1 | 2 | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| | | | CO1 | Understand and develop Computational Thinking concepts | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| | | | CO2 | Express a problem-solving strategy to breakdown a complex problem into a series c | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| | | | CO3 | Describe python programs that appropriately utilize built-in functions and control flov | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| | | | CO4 | Use functions for structuring Python programs. | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| | | | CO5 | Represent compound data using Python lists, tuples, dictionaries | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| 1 | 70121110 | Programming and Problem Solving Lab | CO6 | Understand and apply object oriented programming concepts. | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| | | | CO1 | Make better decisions based on logical thinking. | - | 3 | 1 | 2 | - | - | - | - | 1 | - | - | 2 | - | - |
| | | | CO2 | Identify and evaluate facts in an argument. | - | 3 | 1 | 2 | - | - | - | - | 1 | - | - | 2 | - | - |
| | | | CO3 | Derive truth , ambiguity, vagueness and fallacy in arguments | - | 2 | 1 | 1 | - | - | - | - | - | - | - | 2 | - | - |
| 1 | 70121111 | Critical Thinking | CO4 | Design questions to reach conclusions. | - | 1 | 1 | 1 | - | - | - | - | - | - | - | 1 | - | - |
| | | | | | | | | | | | | | | | | | | |
| | | | CO1 | understand the basic principles of heat transfer and evaluate the thermal performance of buildings with reference to the environment. | 2 | 2 | 1 | - | 1 | 2 | 3 | - | 1 | - | - | 3 | | |
| | | | CO2 | demonstrate the knowledge of fundamental concept of simple harmonic oscillations | 3 | 3 | 1 | - | - | - | - | - | 1 | - | - | 1 | | |
| | | | CO3 | understand the theory of superposition principle and comprehend and interpret the c | 2 | 3 | 3 | - | - | - | - | - | 1 | - | - | 1 | | |
| | | | CO4 | realize the importance of light phenomena of diffraction and the concept of resolving | 2 | 3 | 3 | - | - | - | - | - | 1 | - | - | 1 | | |
| 2 | 70121201 | Physics | CO5 | learn the principle of lasing and working of various types of lasers and understand tl | 1 | 1 | 1 | - | - | 2 | - | - | 1 | - | - | 3 | | |
| | | | CO1 | Enhancing the problem analyzing aptitude by means of learning troubleshooting electrical circuits or setting of optical instruments | 3 | 3 | - | 2 | - | 1 | - | 2 | 3 | - | - | 2 | | |
| | | | CO2 | Data analysis, interpretation and drawing inferences | 3 | 2 | - | - | - | - | - | 1 | 3 | - | - | 2 | | |
| | | | CO3 | Promoting individual and team work skills | 3 | 2 | - | 2 | - | - | - | - | 1 | - | - | 2 | | |
| | | | CO4 | Inculcating ethics while recording (true) observations | 1 | - | - | - | - | - | - | - | 1 | - | - | 1 | | |
| 2 | 70121202 | Physics Lab | CO5 | Teaching project management by learning to make the best use of available resourc | 1 | 2 | - | 2 | - | - | - | - | 1 | - | - | 1 | | |
| | | | CO1 | Evaluate multiple integral in different coordinate system. | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO2 | Apply multiple integralto find area, volume and centre of mass and gravity. | 3 | 2 | 1 | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO3 | Identify and solve linear differential equations using suitable method and apply for s | 3 | 3 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO4 | Evaluate gradient, divergence, curl, directional derivatives and applyGreen's theore | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| 2 | 70121203 | Engineering Mathematics - | CO5 | Evaluate Laplace transform of various function and solve linear differential equatior | 3 | 2 | 1 | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO1 | Understand about sustainable technologies for resource conservation | 3 | 1 | 1 | - | - | 2 | 3 | 1 | 1 | - | - | 2 | 1 | 1 |
| | | | CO2 | Identify sources, effects and remedial measures for different pollutions | 1 | - | - | - | - | 1 | 1 | - | 1 | - | - | 1 | 2 | |
| | | | CO3 | Identify and formalize a generalized water and wastewater treatment process | 2 | 2 | 1 | 2 | 1 | 3 | 3 | - | - | - | - | 2 | 3 | 3 |
| | | | CO4 | Identify various sources of solid wastes, their effects and latest management techn | 3 | 1 | 1 | 2 | 2 | 2 | 3 | - | - | - | - | - | 3 | 3 |
| 2 | 70121204 | Environmental Science | CO5 | Know about existing environmental laws and legislations and related case studies. | 2 | 1 | - | 1 | - | 2 | 2 | - | - | 1 | - | 1 | - | - |
| | | | CO1 | Classify the types of surveys based on methods and instruments used. | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Define the necessity and principles of surveying. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Execute linear measurements by direct, optical and electronic method. | 2 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Use prismatic compass and theodolite for angular measurements. | 2 | - | - | - | 2 | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Understand the social responsibility to maintain ecological balance and to minimize | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 70121205 | Basics of Civil Engineering | CO6 | Identify environmental issues related with construction activity. | - | - | - | - | - | 3 | - | 2 | 2 | - | - | - | 2 | 2 |
| | | | CO1 | Define linear measurements in surveying | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Identify parts of Prismatic Compass | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Apply knowledge of distance and bearing measurements to make a compass traver | - | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Illustrate environmental issuesrelated to construction. | - | - | - | - | - | 2 | 3 | 1 | - | - | 1 | 2 | 2 | 2 |
| | | | CO5 | Explain different types of scales and their conversion | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO6 | Compare different types of maps | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO7 | List different parts of theodolite | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO8 | Find vertical angle by using theodolite | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2 | 70121206 | Basics of Civil Engineering | CO9 | Apply knowledge of measurements of horizontal and vertical angles to make theodo | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Relate fundamental concepts/laws of science and engineering | 2 | 1 | - | - | - | - | - | - | 3 | 1 | - | 1 | 1 | - |
| | | | CO2 | Practice pre-achieved skills on hardware and devices | 1 | - | - | - | - | - | - | - | 1 | 1 | - | 1 | 1 | - |
| | | | CO3 | Take apart and reassemble and/or repairing of engineering gadgets | 1 | - | - | - | - | - | - | 1 | 1 | - | - | 1 | - | - |
| | | | CO4 | Explore various aspects of tinkered devices/instruments | 1 | - | - | - | - | - | - | - | 2 | - | - | 2 | - | - |
| 2 | 70121207 | Tinker Lab | CO5 | Design and make models out of creativity using raw material | 1 | - | - | 1 | - | - | - | - | 3 | 2 | - | - | - | - |
| | | | CO1 | Communicate/ express effectively in correspondence. | - | - | - | - | - | - | - | 2 | 3 | 3 | - | 3 | - | - |
| | | | CO2 | Identify/ Recognize the barriers to effective communication in accordance with all ty | - | - | - | - | - | - | - | 2 | 3 | 3 | - | 3 | - | - |
| | | | CO3 | Employ etiquettes and effective communication in written communication. | - | - | - | - | - | - | - | 2 | 1 | 3 | - | 2 | - | - |
| | | | CO4 | Compose or create formal reports, memos, agenda, minutes and notices. | - | - | - | - | - | - | - | 2 | 1 | 3 | - | 3 | - | - |
| 2 | 70121208 | Communication Skills | CO5 | Create and deliver effective presentations. | - | - | - | - | - | - | - | - | 2 | 3 | - | 2 | - | - |
| | | | CO1 | Express ideas and concepts well through vocabulary building, aptitude tests, mind n | - | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | - | - |
| | | | CO2 | Demonstrate linguistic competence- through accuracy in grammar, pronunciation ar | - | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | - | - |
| | | | CO3 | Employ etiquettes in oral and written communication. | - | - | - | - | - | - | - | - | 3 | 3 | 1 | 1 | - | - |
| | | | CO4 | Modify their listening skills. | - | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | - | - |
| 2 | 70121209 | Communication Skills Lab | CO5 | Sketch their articulation while participating in Group discussions, debate or job inter | - | - | - | - | - | - | - | - | 2 | 2 | 1 | 1 | - | - |
| | | | CO1 | | | | | | | | | | | | | | | |
| | | | CO2 | | | | | | | | | | | | | | | |
| | | | CO3 | | | | | | | | | | | | | | | |
| | | | CO4 | | | | | | | | | | | | | | | |
| 2 | 70121210 | Creative Thinking | CO5 | | | | | | | | | | | | | | | |
| | | | CO1 | Create formula with absolute and realtive cell references using MS-Excel tool | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | 1 | - | - |
| | | | CO2 | Understand the functioning of various MS-Excel command | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Demonstrate the ability to use PowerPoint and its application | 3 | 3 | 2 | 1 | - | - | - | - | 3 | 2 | - | 1 | - | - |
| | | | CO4 | Analyze the data by using statistical fuctions using MS-Excel tool | 3 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | 1 | - | - |
| 2 | 70121211 | Software Tools | CO5 | Create microsoft outlook profiles to configure it with an email account. | 3 | 3 | 2 | 1 | 3 | - | - | - | - | - | - | 1 | - | - |
| | | | | | | | | | | | | | | | | | | |
| | | | CO1 | Demonstrate different types of scales, lines, dimensioning patterns, abbreviations and symbols as per IS codes | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Illustrate line plan and preparing working drawings for residential buildings | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Illustrate line plan and preparing working drawings for Public buildings | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Prepare different elevation drawings for aesthetic and sectional details | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| 3 | 70121306 | Computer Aided Civil Engineering Drawing | CO5 | Study and draw perspective drawing of various objects. | - | - | 3 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Apply basic conceptsof properties of fluids andthe fundaments of dimensional analysis and application of Buckingam -theorem insolving practical problems | 3 | 2 | | | | | | | | | | | | |
| | | | CO2 | Understand the significance of basic principles of fluid statics and application ofhydrostatic law in determining forces on surfaces and hydraulic structures, floatation andstability of floating bodies. | 3 | 2 | | | | | | | | | | | | |
| | | | CO3 | Understand the principles of kinematics with specific emphasis on application ofcontinuity equation, stream function etc. | 3 | 2 | | | | | | | | | | | | |
| | | | CO4 | Apply the principles of Bernoulli's equation in measurement of discharge in pipes, andin other pipe flow problems. | 3 | 2 | | | | | | | | | | | | |
| | | | CO5 | Develop basic concept related to laminar flow and apply for various applications | 3 | 2 | | | | | | | | | | | | |
| 3 | 70121305 | Introduction to Fluid Mechanics | CO6 | Apply fundamental concepts of fluid mechanics in solving fluid flow problems in pipes and analysis of pipe networks | 3 | 2 | | | | | | | | | | | | |
| | | | CO1 | Calibrate flow measuring devices used in pipes and plot flownets | 3 | 2 | | | | | | | | | | | | |
| | | | CO2 | Characterize laminar and turbulent flows | 3 | | | | | | | | | | | | | |
| | | | CO3 | Study of stability of floating bodies | 3 | 2 | | | | | | | | | | | | |
| | | | CO4 | Define dimensional parameters and state its application. | 3 | 2 | | | | | | | | | | | | |
| 3 | 70121309 | Introduction to Fluid Mechanics Lab | CO5 | State and verify Bernoulli's Theorem. | 3 | 2 | | | | | | | | | | | | |
| | | | 1 | Describe the mechanism behind each component of hydrologic cycle such as precipitation, evaporation, infiltration and runoff. | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Illustrate runoff, modeling of runoff, and hydrograph. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Explain forecasting, control of flood and concept of Muskingum method | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Recognize the effect of urbanization on hydrological cycle. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Discuss the parameters to quantify yield from aquifers | 3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| 3 | 70121303 | Hydrology and Water Resource Engineering | 6 | Find out necessity of water resources development and managing it for its optimal usage. | 3 | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO1 | Memorize various components of building, their functional requirements and their specification | 1 | - | - | - | - | 1 | - | - | 1 | - | - | 1 | - | - |
| | | | CO2 | Design and cast concrete cubes in required mix proportions and perform strength tests on it. | 3 | 2 | 3 | 1 | - | 1 | - | - | 2 | - | - | - | - | - |
| | | | CO3 | Classify shallow and deep foundation into categories and select appropriate foundation for specific scenario. | 2 | - | - | - | - | 1 | - | - | - | - | - | - | - | - |
| | | | CO4 | Identify the need of damp proofing and outline the methods for accomplishing it. | 2 | 1 | - | - | - | 1 | - | -- | - | - | - | - | - | - |
| | | | CO5 | Explain the properties, types, construction procedure of super structure building elements. | 2 | - | - | - | - | - | - | - | 1 | - | - | 1 | - | - |
| | | | CO6 | Apply the procedures for testing quality of materials. | 1 | 2 | - | 2 | 1 | - | - | - | 1 | - | - | 1 | - | - |
| | | | CO7 | Outline the necessity and brief idea of sustainable building concepts. | 2 | | - | 1 | - | 2 | 2 | - | - | - | - | 1 | 1 | 1 |
| 3 | 70121301 | Building Construction Technology | CO8 | Interpret the damages caused in a building and devise methods to repair/retrofit it. | 3 | 2 | 2 | 2 | | 1 | - | - | 1 | - | 1 | 2 | - | - |
| | | | CO1 | To determine safe working stresses for components and moment of inertia for various cross-sections. | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | CO2 | Calculate direct normal, shear, and bearing stresses. | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | CO3 | Describe stress vs. strain graph and determine yield strength, ultimate strength, and modulus of elasticity. | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | CO4 | Determine bending stress and shear stress relative to beam design. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| 3 | 70121304 | Introduction to Solid Mechanics | CO5 | Calculate buckling of axially and eccentrically loaded columns. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CO1 | Reproduce the quality testing for aggregates | 2 | - | 2 | 3 | 1 | 2 | 3 | - | 2 | - | - | 1 | 3 | 2 |
| | | | CO2 | Sketch manually the sectional drawing of a building with all the detailing in appropriate scale | 3 | - | 3 | - | 3 | 1 | - | - | 2 | - | - | 1 | - | - |
| | | | CO3 | Sketch the building elements using drafting software, AutoCAD. | 2 | - | 3 | - | 3 | 1 | - | - | 3 | - | - | - | - | - |
| | | | CO4 | Interpret the process in a precast construction industry and summarize it in the form of a report. | 3 | 3 | 3 | 2 | 3 | 3 | - | - | 1 | - | - | - | - | - |
| 3 | 70121307 | **Building Construction Technology Lab** | CO5 | Outline the process to be followed for green certification of a building . | 3 | - | 2 | 3 | 3 | 3 | 3 | 1 | - | - | - | 2 | 2 | 2 |
| | | | CO1 | Operate different hardness testing machines and distinguish between the hardness testing techniques developed by Rockwell, Brinell and Vicker. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | 2 | - | 1 | 1 | 1 |
| | | | CO2 | Determine the hardness values for different materials and calculate ultimate tensile strengths by the aid of conversion tables. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | 2 | - | 1 | 1 | 1 |
| | | | CO3 | Determine toughness of material by conducting Izod impact test. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | 2 | - | 1 | 1 | 1 |
| | | | CO4 | Understand the behaviour of the wooden specimen under bending and determine elastic strength, moment of resistance, modulus of elasticity and modulus of rupture. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | 2 | - | 1 | 1 | 1 |
| 3 | 70121308 | **Introduction to Solid Mechanics Lab** | 5 | Determine tensile strength on a mild steel specimen and determine yield strength, ultimate strength, Young's modulus of elasticity, percentage elongation and percentage reduction in area. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | 2 | - | 1 | 1 | 1 |
| | | | CO1 | Use Cauchy's residue theorem, Cauchy's integral theorem and Cauchy's integral formula to e | 3 | 1 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO2 | Represent the given function in Fourier integral representation, find Fourier transforms and i | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO3 | Apply Z-transform to solve difference equations. | 3 | 2 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| 3 | 70121302 | **EM-III** | CO4 | Describe the nature of partial differential equations and solve partial differential equations. | 3 | 3 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | 1 | Demonstrate and handle survey instruments like dumpy and auto level, 10", 20" and electronic theodolite, and Total Station etc. | 2 | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | 2 | Develop skills and logic for carrying out different methods of surveying with above mentioned instruments. | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Carry out survey to establish controls & locate details over a property/estate & find out its area | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Design a route for roads, railways etc by using survey. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Carry out survey for alut sections and curved sections of road and railways. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| 4 | 70121406 | **Advanced Surveying Lab** | 6 | Plot & prepare survey plans/maps & sections. | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Evaluate geotechnical investigation meethods suitable at a particular site based on soil conditions. | 3 | 1 | - | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe petrology and interpret occurrence of structural features. | - | 1 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Infer index properties of soil and interpret soil behaviour. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Assess the importance of seepage and permeability and asses this property in soil. | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Relate Compaction and consolidation properties of soil to overall soil mass behaviour on foundation. | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | - | - |
| 4 | 70121404 | **Geology and Soil Mechanics** | CO6 | Infer shear test results and determine factor of safety for slopes alone. | 3 | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | State and identify various igneous rocks, sedimentary rocks, metamorphic rocks. | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Analyze geological maps and extract information for structural features. | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Perform dry sieve analysis in order to determine the particle size distribution of a given soil sample. | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Classify and define consistency limits of a given clay sample using Casagrande method. | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Distinguish the procedure of constant head and falling head method for determining permeability characteristics of a given soil sample. | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO6 | Explain Standard proctor test for estimating dry density of a soil sample. | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | **Geology and Soil Mechanics** | CO7 | Determine relative density of cohesion less soil. | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| 4 | 70121409 | **Lab** | CO8 | Interpret the type of cohesive soil based on grain size analysis | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Understand and apply basic terminology of open channel flow and solve problems involving energy balance. | 3 | 2 | 1 | 1 | - | - | 1 | - | - | - | - | - | 1 | 2 |
| | | | CO2 | Classify various types of flow based upon the channel bed and conditions on downstream of the channel. | - | 1 | 2 | - | - | - | - | - | - | - | - | - | 1 | 1 |
| | | | CO3 | Explain the phenomenon of hydraulic jump and its uses | 3 | - | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| | | | CO4 | Utilize exact and integral solutions to the boundary layer equations to estimate boundary layer thickness and overall drag. | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | - | 1 |
| | | | CO5 | Apply integral form of the boundary layer equations to derive expressions for boundary. layer thickness, displacement thickness, momentum thickness and overall drag. | | | | | | | | | | | | | - | 1 |
| | | | CO6 | Explain the concept of drag, lift and forces acting on submerged bodies . | 3 | 3 | -- | - | - | - | - | - | - | - | - | - | - | 2 |
| 4 | 70121405 | **Open Channel Flow** | CO7 | Illustrate various types of notches and weir . | 3 | 3 | - | 2 | - | - | - | - | - | - | - | - | 1 | 2 |
| | | | CO1 | Determine Manning's roughness coefficient for the given open channel | 3 | - | 1 | - | - | - | - | - | - | - | - | - | 3 | - |
| | | | CO2 | Examine flow around a circular cylinder and air foil | 3 | 1 | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Study of velocity distribution in open channel flow. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO4 | Estimate flow rate by using different notches | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO5 | Study of uniform flow formulae in open channel | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO6 | Study of specific energy curve in open channel | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO7 | calibration of Standing Wave Flume / Venturi / Parshal flume. | 3 | - | 1 | | | | | | | | | | 1 | |
| | | | CO8 | Examine Hydraulic Jump as Energy Dissipator | 3 | 2 | 1 | | | | | | | | | | 1 | |
| | | | CO9 | Study of Ogee Profiles over a Sharp Crested Weir | 3 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| 4 | 70121410 | **Open Channel Flow Lab.** | CO10 | Test calibration of Sharp Crested, Broad Crested and Ogee Weir. | 3 | - | 3 | - | 1 | - | - | - | - | - | - | - | 1 | - |
| | | | 1 | To define the structure, classify types of structures based on structural forms and the different types of joints displacements of structures. | 3 | 1 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 2 | To analyze and calculate the slope and deflection of structures by methods like Macaulay's method, moment area method and conjugate beam method. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 3 | To analyze indeterminate structures by the methods like Castigliano's Energy theorems, three moment theorem | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 4 | To analyze the determinate and indeterminate truss by Castigliano's theorem. | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 5 | To understand plastic analysis of determinate and indeterminate beams, single bay single storied portal frame | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| 4 | 70121403 | **Structural Analysis-I** | 6 | To define the influence line for structures and application of the Muller-Breslau's principle for influence line diagram of simply supported, overhanging and cantilevered beams. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | CO1 | Use numerical methods to solve algebraic and transcendental equations. | 3 | 3 | - | - | - | - | - | - | 3 | - | - | 2 | | |
| | | | CO2 | Apply interpolation formulae to predict the value of any intermediate term and evaluate integration by numerical methods. | 3 | 3 | 2 | 1 | - | 1 | - | - | 3 | - | - | 2 | | |
| | | | CO3 | Determine numerical solutions of ordinary differential equations. | 3 | 3 | 2 | 1 | - | 1 | - | - | 3 | - | - | 2 | | |
| | | | CO4 | Calculate measures of dispersion, coefficient of variation, coefficient of correlation. | 3 | 3 | 2 | 1 | - | 1 | - | - | 3 | - | 1 | 2 | | |
| | | **SPNM (Statistics, Probability** | CO5 | Estimate the value of dependent variable using regression analysis. | 3 | 3 | 2 | 1 | - | 1 | - | - | 3 | - | 1 | 2 | | |
| 4 | 70121402 | **and Numerical Methods)** | CO6 | Compute probabilities using probability distributions (discrete and continuous). | 3 | 3 | 3 | 2 | - | 1 | 1 | - | 3 | - | - | 2 | | |
| | | | 1 | To analyze continuous beam by displacement method like slope and deflection. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 2 | To analyze continuous beam by displacement method like moment distribution. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 3 | To analyze two and three hinged arches through the procedure for the determination of horizontal thrust, radial shear and normal thrust. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 4 | To analyze continuous beam and frame by flexibility method. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 5 | To analyze continuous beam and frame by stiffness method. | 3 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| | | | 1 | To define the properties of materials used in reinforced concrete design,different methods of structural design such as working stress method, Limit state method | 3 | 2 | 3 | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 2 | To determine the flexure, shear, torsion and bond for singly and doubly reinforced beam. | | | | | | | | | | | | | | |
| | | | 3 | Able to design the beam. | 3 | 2 | 3 | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 4 | Able to design slabs and staircase. | 3 | 2 | 3 | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| 5 | 70121504 | **Structural Design-I** | 5 | Able to design columns and footing. | 3 | 2 | 3 | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 1 | To understand design and detailing the RCC building using IS codes. | 3 | 2 | 3 | - | 3 | 1 | 1 | - | 2 | 2 | 2 | 1 | 2 | 1 |
| 5 | 70121510 | **Structural Design-I Lab** | 2 | To understand design and detailing the water tank using IS codes. | 2 | 2 | 2 | - | 3 | 1 | 1 | - | 2 | 2 | 2 | 1 | 2 | 1 |
| | | | 1 | To understand the principle of prestressing. | 3 | 2 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 2 | Computation of section properties, critical sections under working load for pre-tensioned and post tensioned members . | 3 | 1 | 1 | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 3 | Able to design pre-stressed concrete sections for flexure | 3 | 2 | 3 | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 4 | To calculate limit-state of collapse for both sections cracked and un-cracked in shear. | 3 | 2 | 2 | - | - | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 5 | Understand the concept of End zone stresses in pre-stressed concrete members . | 3 | 1 | 1 | - | - | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| 5 | 70121526 | **Prestressed Concrete** | 6 | Application of pre-stressing to continuous beams, linear transformation and concordance of cables, design of flat slabs . | 3 | 2 | 3 | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 1 | To understand the concept of indeterminacy, flexibility and stiffness matrix. | 3 | 2 | - | 2 | - | 1 | - | - | 2 | - | - | 1 | 1 | 1 |
| | | | 2 | To apply the concept of flexibility matrix on beams, rigid and pin-jointed frames. | 3 | 2 | - | 2 | - | 1 | - | - | 2 | - | - | 1 | 1 | 1 |
| | | | 3 | To apply the concept of stiffness matrix on beams, rigid and pin-jointed frames. | 3 | 2 | - | 2 | - | 1 | - | - | 2 | - | - | 1 | 1 | 1 |
| | | **Structural Analysis by Matrix** | 4 | To learn the concept of elementary approach. | 3 | 2 | - | 2 | - | 1 | - | - | 2 | - | - | 1 | 1 | 1 |
| 5 | 70121525 | **Methods** | 5 | To understand various techniques used to save the memory requirements. | 3 | 3 | - | 3 | 3 | 1 | - | - | 3 | - | - | 1 | 1 | 1 |
| | | | CO1 | Describe the statistical properties of a digital image and use them to apply appropriate spectral image enhancement techniques for qualitative and quantitative analysis. | 3 | 1 | - | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| | | | CO2 | Distinguish between supervised and unsupervised classification methods for remote sensing data analysis. | 2 | 2 | 1 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Explain radiometric and geometric preprocessing of remotely sensed images | 1 | 2 | - | 1 | 2 | 1 | - | - | 1 | - | - | - | - | - |
| | | | CO4 | Apply understanding of the basic concepts of two-dimensional signal acquisition use image processing software to analyze temporal, spectral and spatial differences. | 2 | 2 | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| | | | CO5 | Demonstrate and understanding of the fundamental image enhancement algorithms such as histogram modification, contrast manipulation, and edge detection for remotely sensed data. | 2 | 2 | 1 | 1 | 3 | 1 | - | - | - | - | - | 1 | - | - |
| | | **Digital Image Processing in** | CO6 | Interpret outputs based on processing of satellite imageries for various studies. | 3 | 2 | 1 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| 5 | 70121518 | **GIS** | CO7 | Compare and contrast different image formats used in digital image processing. | 2 | 2 | - | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| | | | CO1 | Describe the raster data model and explain how it differs from the vector data model | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO2 | List several different approaches to spatial analysis and differentiate between them | 1 | 1 | - | 1 | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Describe interpolation using kriging with reference to the Semivariogram | 2 | 2 | - | 1 | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Explain the concepts involved in spatial analysis and modelling and how point patterns, including clustering, can be identified and understood as realizations of spatial processes. | 1 | 1 | 1 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Identify the relevance and validity of results from a specific spatial analysis and modelling task. | 2 | 1 | - | 1 | 2 | 1 | - | - | 1 | - | - | - | - | - |
| | | | CO6 | Illustrate the central role that spatial autocorrelation plays in spatial analysis and explain how it helps and hinders the use of current tools. | 1 | 1 | - | 1 | 2 | - | - | - | - | - | - | 1 | - | - |
| | | | CO7 | Apply and choose appropriate analytical operations and techniques needed for specific GIS applications. | 3 | 2 | 2 | 2 | 3 | 1 | 1 | - | 2 | 1 | 2 | 2 | - | - |
| | | **Spatial Modelling and** | CO8 | Demonstrate how different concepts about nearness and neighborhood result in a variety of interpolation methods that produce different results. | 3 | 2 | 2 | 2 | 3 | - | - | - | 1 | 1 | - | - | - | - |
| | | | CO1 | To understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making | 2 | 2 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| | | | CO2 | To understand the theoretical and practical principles of design of sensor systems | 1 | | | | | | | | | | | | | |
| | | | CO3 | To understand the transducer characteristics for acoustic, current, temperature | 3 | 1 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | - |
| | | | CO4 | Pressure, electric, magnetic, gravity, salinity, concentration of contaminants, velocity, heat flow, and critical devices. | 3 | 2 | 3 | 2 | 3 | 2 | 1 | - | 2 | 2 | 2 | 2 | - | - |
| | | | CO5 | To understand limitations on these devices imposed by building/structure/pavement environments; signal conditioning and recording; noise, sensitivity, and sampling limitations; and standards | 3 | 2 | 2 | 2 | 3 | 1 | 1 | 1 | 2 | - | - | 1 | - | - |
| | | **Application of sensor** | CO6 | To understand the principles of state-of-the-art systems being used in physical infrastructure/bridges/buildings/pavements, etc. | 3 | 3 | 3 | 2 | 3 | 2 | 1 | - | 2 | 1 | 2 | 2 | - | - |
| | | | CO1 | Apply the knowledge of soil mechanics and transportation engineering in the analysis and design of foundations and (shallow and deep), earth retaining structures and pavement. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Identify materials for construction of various civil engineering facilities. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand the concepts of foundation and retaining wall and its design. | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Apply theoretical, empirical and numerical analysis and design techniques to retaining structure and foundation engineering problems. | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Prepare the site-investigation reports. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121517 | **Geotechnical Design** | CO6 | Relate the soil properties to functional suitability for a structure | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Appraise the nature and ecosystem, relate it to infrastructure. | - | - | - | - | - | 3 | 3 | 3 | 1 | 1 | - | 3 | - | 3 |
| | | | CO2 | Outline the laws and policies for sustainable development | - | - | - | - | - | 3 | 3 | 3 | 2 | 2 | 2 | 3 | - | 3 |
| | | | CO3 | Summarize case studies addressing carbon footprint and relate the methodological and modelling aspects. | 2 | 2 | - | - | - | 3 | 3 | 2 | 2 | 2 | 2 | 3 | - | 3 |
| | | | CO4 | Relate trade with pollution and evaluate measures for wild life conservation. | - | - | - | - | - | 3 | 3 | 3 | 1 | - | - | 3 | - | 3 |
| | | | CO5 | International Humanitarian Law and Environment and conflict management | - | - | - | - | - | 3 | 3 | 2 | 1 | - | - | 3 | - | 3 |
| | | **Environmental laws and** | CO6 | Judge the protocols set up by global governing bodies and discuss on its country specific suitability. | 2 | 2 | - | - | - | 3 | 3 | 2 | 2 | 2 | 3 | 3 | - | 3 |
| | | | CO1 | Understand the characteristics of subgrade soil, various tests on subgrade soil | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the characteristics of aggregates, various tests on aggregates | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand the characteristics of bituminous materials, various tests on bituminous materials | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Learn bituminous mix , basic principles of super-pave technology of bituminous mixes | 3 | - | 3 | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121522 | **Pavement Materials** | CO5 | Understand the cement concrete mix designs and construction process of cement concete pavement | 3 | - | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Understand concepts of Transportation planning, various modes, transit systems and their suitability | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Explain about network planning consideration and evaluating plans | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand the transit scheduling | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Understand the concepts of transit economics | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121521 | **Public Transportation systems** | CO5 | Design public transport facilities | - | - | 3 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Understand the urban morphology considered in planning process | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe the various processes considered in Urban Transportation Planning | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand the trip generation and analyse the various aspects of the trip generation models | 1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Understand the application and selection of various trip distribution models | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Understand the transportation network and select the suitable method of traffic assignment | 3 | 2 | | | | | | | | | | | | |
| | | **Urban Transportation** | CO6 | Suggest the non transport solutions for the transport problems, describe the process of project evaluation and overall project planning | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Identify various natural sources available and examine their suitability for water supply. | 2 | | | | | 2 | 2 | | | | | | | 2 |
| | | | CO2 | Define and study different infiltration galleries and brake works. | 3 | | | | | 3 | 1 | | | | | | | |
| | | | CO3 | Estimate demand of water and list the various types of demands and fluctuations in demand | 3 | 2 | | | | | 1 | | | | | | | |
| | | | CO4 | Forecast population using different population forecast methods and compare them | 3 | 3 | | | | | | | | | | 3 | | |
| | | | CO5 | List different types of water distribution systems and their working. | 3 | 3 | 2 | | - | | | | | | | 2 | | |
| | | | CO6 | List the various causes of wastage of water in water distribution system and study the measures of prevention. | 3 | 2 | | | | | | | | | | | | |
| | | | CO7 | State various water qualities -Indian Standards and World Health Organization. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO8 | State principles of water treatments processes and list various flow diagrams and layouts of different water treatment works. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO9 | State and define the design parameters for various units of water treatment and working principle of Aeration. | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO10 | Understand the principal of sedimentation and filtration and various zones in sedimentation tank and functioning of these units. | 3 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO11 | List the operational difficulties in filtration process. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121501 | **Environmental Engineering -I** | CO12 | Define the backwashing process of filters and disinfection, demineralization and water softening. | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | State applications of incompressible fluid mechanics in civil engineering | 3 | 2 | - | - | - | - | - | 3 | 1 | 1 | - | 3 | - | 3 |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CO2 | Explain principal of continuity, momentum and energy | 3 | 2 | 2 | - | - | - | 3 | 3 | 3 | 2 | 2 | - | 3 | - | 3 |
| | | | CO3 | State stream function and it's significance | 3 | 2 | | - | - | - | 3 | 3 | 2 | 2 | 2 | - | 3 | - | 3 |
| 5 | 70121512 | **Environmental Fluid Mechanics** | CO4 | Illustrate boundary layer formation | 3 | 2 | - | - | - | - | 3 | 3 | 2 | 1 | - | - | 3 | - | 3 |
| | | | CO1 | Analyse and design the water distribution network | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Explain the optimum design of water distribution network. | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Make use of software for analysis and design of WDN | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Discuss various pipe appurtenances | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121513 | **Pipeline Engineering** | CO5 | Explain water auditing | 3 | - | - | - | - | - | - | 2 | - | - | - | - | 2 | 2 | 3 |
| | | | CO1 | Explain the components of river morphology | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| | | | CO2 | Summarize sediment transport mechanism in rivers | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| | | | CO3 | Explain physical river model | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | 2 |
| | | | CO4 | Illustrate various measurement techniques for measuring various parameters | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| 5 | 70121514 | **River Engineering** | CO5 | Explain the importance and working od river protection working of river protection work | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 2 |
| | | | CO1 | Understand purpose of quantity estimates. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO2 | Study purpose and principles of specification writing, developing detailed specification, estimate quantities onf items of work | 3 | - | - | 3 | 3 | 1 | - | - | - | 1 | - | - | - | - | 1 |
| | | | CO3 | Carry out rate analysis of various construction entities and use unit prices for appraising the project | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| | | | CO4 | Estimate quantity of earth work in roads including hill road. | - | - | - | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Carry out detailed valuation of buildings. | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121507 | **Quantity Surveying and Valuation** | CO6 | Classify tendering and contracting methods and understand basics of contracting process | - | 3 | - | - | - | - | - | - | - | - | - | 1 | - | - | - |
| | | | CO1 | Describe the most important environmental systems analysis methods | 3 | 2 | 1 | 1 | 1 | - | 1 | 3 | - | - | - | - | 2 | 2 | 2 |
| | | | CO2 | Dissect the strengths weaknesses and suitability of important environmental systems in different situations. | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| | | | CO3 | Carry out either (i) a Life Cycle Assessment by aid of a simple computer based tool, (ii) a simple environmental Impact assessment by aid of a specific EIA guideline or (iii) a Cost-Benefit Analysis for a pre-defined concrete decision situation. | 3 | 3 | 1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | 1 | 1 | 1 |
| | | | CO4 | Examine an environmental system using simple mathematical modelling. | 3 | 3 | 3 | 3 | 3 | 3 | - | 2 | - | - | - | - | 1 | 1 | 1 |
| | | | CO5 | Assess an environmental system by carrying our economic analysis. | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | 2 |
| 5 | 70121516 | **Environmental Systems** | CO6 | List environmental policies and understand the intricacies while framing of policies. | 3 | 1 | - | 1 | 1 | 1 | - | 1 | 1 | 1 | - | - | 1 | 1 | 1 |
| | | | CO1 | Understand emerging issues in urban governance | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - | 2 | - |
| | | | CO2 | Explain provision of Constitution & Constitutional approach | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - |
| | | | CO3 | Relate governance to services in smart cities | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO4 | Illustrate the planning process and policies at various levels | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - | - | - |
| 5 | 70121524 | **Smart cities: context policy and governance** | CO5 | Compare role of different stake holders in urban planning and legislation | - | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO1 | 1. Understand the physical characteristics of water | 3 | | | | | | | | | | | | | | |
| | | | CO2 | 2. Perform common environmental experiments relating to water quality. | 3 | | | | | | | | | | | | | | |
| | | | CO3 | 3. Suggest and perform appropriate experiments for given water sample | 3 | | | | | | | | | | | | | | |
| | | | CO4 | 4. Statistically analyze and interpret laboratorial results | 3 | | | | | | | | | | | | | | |
| | | | CO5 | 5. Apply the laboratorial results to problem identification, quantification, and basic environmental design and technical solutions. | 3 | | | | | | | | | | | | | | |
| | | | CO6 | 6. Understand and use the water sampling procedures and sample preservations | 3 | | | | | | | | | | | | | | |
| | | | CO7 | 7. Obtain the necessary background for subsequent courses in environmental engineering | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO8 | 8. Demonstrate the ability to work in groups | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO9 | 9. Understand the impact of water treatment on people and the environment. | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO10 | 10. Define water quality standards I.S. and WHO. | 3 | 1 | - | - | - | 2 | - | - | - | - | - | - | - | - | - |
| | | | CO11 | 11. Outline the program for analysis of water distribution system. | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 70121509 | **Environmental Engineering-I Lab.** | CO12 | 12. State and identify Most Probable Number (MPN) for defining bacteriological properties. | 3 | - | - | - | - | - | 2 | 2 | - | - | - | - | - | - | 2 |
| | | | 1 | Identify grades of steel and list various rolled steel sections available for construction of steel design.analyze tension member for strength due to yielding, rupture and block shear | 3 | 1 | 1 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 2 | Able to design flexural member and beam to beam and beam to column connections by bolt or weld. | 3 | 2 | 3 | - | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 3 | Able to design of slab base, gusseted base, column base for axial load and uniaxial bending. | 3 | 2 | 3 | - | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| | | | 4 | Able to design welder plate girder. | 3 | 2 | 3 | - | - | 3 | 1 | 1 | - | 2 | - | 2 | 1 | 2 | 1 |
| 6 | 70121603 | **Structural Design-II** | 5 | To understand assessment of various kind of loads on purlin and roof truss and to design. | 3 | 2 | 2 | - | - | - | 1 | 1 | - | 2 | - | - | 1 | 2 | 1 |
| | | | 1 | To understand measurement of uncertainty | 2 | 1 | - | - | - | 2 | 1 | - | - | 2 | - | - | 2 | 1 | 1 |
| | | | 2 | To understand qualitative methods and quantitative methods. | 2 | 1 | - | - | - | 2 | 1 | - | - | 2 | - | - | 2 | 1 | 1 |
| 6 | 70121619 | **Modeling and Analysis of Uncertainty Lab** | 3 | To find various physical properties. | 2 | 1 | - | - | - | 2 | 1 | - | - | 2 | - | - | 2 | 1 | 1 |
| | | | 1 | To understand the concept of uncertainity | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| | | | 2 | To understand the various techniques for measurement of uncertainity. | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| | | | 3 | To understand the various problems occurring while measurement of uncertainity. | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| | | | 4 | To learn the organization of data to maximize and minimize information. | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| | | | 5 | To develop and evaluate models | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| 6 | 70121617 | **Modeling and Analysis of Uncertainty** | 6 | To apply the concept of uncertainty to various engineering problems. | 1 | 2 | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | 1 | 1 |
| | | | 1 | To Determine displacements and internal forces of statically indeterminate structures by matrix methods | 3 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | 1 | 1 |
| | | | 2 | To Determine stresses in domes | 3 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | 1 | 1 |
| | | | 3 | To Determine collapse load for indeterminate structures | 3 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | 1 | 1 |
| 6 | 70121634 | **Advanced Structural Analysis** | 4 | Come to know the application of FEM | 3 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - | 1 | 1 |
| | | | 1 | Detailing of sections | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| | | | 2 | **Detailing of steel structures** | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| | | | 3 | **Design of eccentrically loaded columns** | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| | | | 4 | Design of welded plate girder | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| | | | 5 | Design of axially loaded compressive member | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| 6 | 70121638 | **Advanced Structural Analysis Lab** | 6 | Design of roof truss | 3 | 2 | 3 | 2 | 2 | 3 | - | - | - | 2 | - | - | - | 2 | 1 |
| | | | CO1 | Compute discharges and design layout of storm water drain for a given catchment and sewer network for given population. | 3 | 2 | | | | | | | | | | | | 1 | 1 |
| | | | CO2 | Describe the physical, chemical and biological characteristics of waste water and understand the objectives and steps of preliminary treatment of waste water | 3 | 2 | 1 | | | | | | | | | | | 1 | 1 |
| | | | CO3 | Describe the purpose and steps in secondary treatment of waste water by biological methods. | 3 | 2 | 1 | | | | | | | | | | | 1 | 1 |
| | | | CO4 | List the characteristics of solid waste and propose different low cost waste water treatment methods | 3 | 2 | | | | | | | | | | | | | |
| | | | CO5 | Characteristics & disposal of solid wastes | 3 | 2 | | | | | | | | | | | | | |
| 6 | 70121601 | **Environmental Engineering II** | CO6 | Illustrate different methods of industrial waste treatment | 3 | 2 | | | | | | | | | | | | | |
| | | | CO1 | Understand Soil and Water characteristics of expansive soil. | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO2 | To demonstrate Swell and Shrinkage properties of expasive soils. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO3 | Predict effect of liquefaction on Built Environment and to evaluate liquefaction susceptibility for liquefaction hazard mitigation. | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO4 | Relate swelling potential of soils to devise suitable ground improvement methods. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO5 | List down the methods to improve strength characteristics of soil | 3 | 2 | | | | | | | | | | | | | |
| 6 | 70121620 | **Soil Mechanics II** | CO6 | To demonstrate Slope Stability Analysis | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO1 | Learn diverse types and methods of soil investigation to identify the properties of founding strata to select the type of foundation. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO2 | Understand the concept of stress distribution and analyse the same. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO3 | Evaluate earth pressure in Soils. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO4 | Apply bearing capacity theories to find out actual bearing capacity of the soil and also to learn the provisions given by IS 6403 for finding out the bearing capacity of soil. | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO5 | Identify the causes of settlement of foundation and to calculate the consolidation and elastic settlement in accordance with IS 8009. | 3 | 2 | | | | | | | | | | | | | |
| 6 | 70121628 | **Foundation Engineering** | CO6 | Calculate load carrying capacity of pile and to understand the tests carried on the piles such as initial pile load test, working pile load test etc. | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO1 | Creating Plan an Irrigation System | 3 | | | | | | | | | | | | | | |
| | | | CO2 | Analyzing gravity and earth dam | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO3 | Creating Plan and design of diversion head works | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO4 | Analyzing irrigation canals and canal network for design | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | CO5 | Analyzing Design irrigation canal structures | 3 | 2 | 1 | | | | | | | | | | | | |
| 6 | 70121635 | **Design of Hydraulic Structures** | CO6 | Understanding the basics of well irrigation | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Determine specific gravity of given soil sample. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO2 | Determination of Sand density by Sand replacement Method. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO3 | Determine shear strength and comment on results obtained | 3 | 2 | | | | | | | | | | | | | |
| 6 | 70121636 | **Soil Mechanics II Lab** | CO4 | Use soft tools for analyzing soil conditions for given load conditions for assessing soil behaviour. | 3 | 2 | | | | 1 | | | | | | | | | |
| | | | CO1 | Sketch the cross-section of a dam showing all components giving due importance to drainage detailing. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO2 | Outline the causes of failure of earth dam and explain it diagrammatically. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO3 | Compute the reservoir capacity from the annual inflow and outflow data. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO4 | Sketch the diagram of canal masonry structures such as regulatory and cross drainage works. | 3 | 2 | | | | 1 | | | | | | | | | |
| | | | CO5 | Compute the critical forces acting on a dam section, two dimensionally, check for its stability. | 3 | 2 | | | | | | | | | | | | | |
| | | | CO6 | Compute and sketch the elementary and practical profile of a gravity dam. | 3 | 2 | | | | 1 | | | | | | | | | |
| 6 | 70121639 | **Design of Hydraulic Structures Lab** | CO7 | Apply Kennedy's and Lacey's theories for the design of lined canals and sketch the cross-section. | 3 | 2 | 1 | | | | | | | | | | | | |
| | | | 1 | Explain scientific methods of measurement technology. | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Explain field scale the experiment design . | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Summarize protocols and instruments for water quality sampling. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Examine the water quality and find the source of contamination. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121606 | **Water Resources Field Methods** | 5 | Discuss the various water quality parameters. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 1 | Analyze different Hydrograph | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Measure soil suction by using Tensiometer. | 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| | | | 3 | Calculate the loss due to seepage in a canal. | 3 | 2 | - | - | - | 1 | - | - | - | - | - | - | - | - | - |
| | | | 4 | Synthesize Unconfined Aquifer | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Prepare and keep a book for irrigation schedule | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 6 | Design a branch canal. | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121608 | **Water resources field methods Lab** | 7 | Analyze Hydrologic Data | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 1 | List the major Energy Efficiency areas for Building – Green Materials | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Explain how Pre-Engineered Construction can be cost effective | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Compare Initial Cost of green buildings V/s Conventional Building | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Apply principles of sustainable development in Building Design | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Evaluate a building performance using Building rating systems. | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| 6 | 70121622 | **Green Building Technology** | 6 | Run building performance simulations in a software to optimize energy efficiency. | 3 | 2 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 2 | 2 |
| | | | 1 | Explain the concept of GIS and different data formats in GIS | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Demonstrate digital data preparation using GIS software | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Prepare map with all its components on any of the GIS application | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Describe energy interactions in the atmosphere and energy interaction with the earth surface features. | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Explain the fundamentals of all three forms of remote sensing viz. Optical, Microwave and Hyperspectral | 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| 6 | 70121624 | **Introduction to Remote Sensing and GIS** | 6 | Illustrate remote sensing information extraction. | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 1 | Summarize the basic concept and terminologies associated with water resources engineering | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Identify the role of disciplines of ecology and socioeconomics play in management of water resources. | 3 | - | - | - | - | - | 3 | 3 | 2 | - | - | - | - | 2 | 2 |
| | | | 3 | Define the concept of Integrated Water Resources Management within the broader context of development. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Distinguish blue and green water and its role in food production | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121630 | **Integrated Water Resources Management** | 5 | Illustrate the principles of international and national law in the area of water management. | 3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | 1 | Summarize the basic concept and terminologies associated with water resources engineering | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Identify the role of disciplines of ecology and socioeconomics play in management of water resources. | 3 | - | - | - | - | - | 3 | 3 | 2 | - | - | - | - | 2 | 2 |
| | | | 3 | Recognize and explain the links between water and human health. | 3 | - | - | - | - | - | 2 | 3 | 2 | - | - | - | - | 2 | 2 |
| 6 | 70121645 | **Water Resource Planning and Management** | 4 | Illustrate the principles of international and national law in the area of water management. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Define theoretical and practical basics of satellite positioning by the global systems: GPS, GLONASS, Galileo, etc. | 3 | 1 | - | - | - | 3 | 2 | - | - | 1 | - | - | - | - | - |
| | | | CO2 | Define selective availability as well as the causes and significance of error in the GPS. | 2 | 3 | 1 | 1 | 1 | 3 | 1 | 1 | - | 1 | - | - | 1 | - | - |
| | | | CO3 | Describe the principle of satellite positioning methods, the main components in a satellite nav | 3 | 1 | 1 | 1 | 1 | 3 | 1 | - | - | 1 | - | - | - | - | - |
| | | | CO4 | Explain the use of GPS and understand GPS point positioning using pseudorange measureme | 3 | - | 1 | 1 | 1 | 3 | 1 | - | - | 1 | - | - | - | - | - |
| | | | CO5 | Analyze the influence of different error sources on the positioning precision and real time kin | 2 | 3 | 1 | 2 | 2 | 3 | 1 | - | - | 2 | 1 | 2 | 2 | - | - |
| | | | CO6 | Categorize different GPS parameters required for data analysis. | 2 | 2 | 1 | 1 | 1 | 3 | 1 | - | - | 1 | 1 | 1 | 1 | - | - |
| | | | CO7 | Compare and contrast similarities/differences between different ground and satellite based na | 3 | 2 | 1 | 2 | 2 | 3 | 1 | - | - | 1 | 1 | 1 | 1 | - | - |
| | | | CO8 | Distinguish coordinate systems used with GPS, overview of map projections, datum's and co | 3 | 2 | 3 | 1 | 1 | 1 | 1 | 1 | - | 1 | - | - | 1 | - | - |
| 6 | 70121611 | **Global Navigation and Satellite Systems** | CO9 | Discuss the configurations, signal structure and frequencies in context to GPS. | 3 | 2 | 1 | 1 | 1 | 3 | - | - | - | 1 | - | - | 1 | - | - |
| | | | CO1 | To determine a geodetic location using the handheld GPS | 3 | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 1 | 2 | 1 | - | - |
| | | | CO2 | To test the relationship between session length and (a) accuracy, and (b) precision | 3 | 2 | 2 | 2 | 2 | 3 | - | - | - | 1 | 1 | 1 | 1 | -- | - |
| 6 | 70121612 | **Global navigation satellite systems Lab** | CO3 | To understand the analysis of area using GPS | 3 | 2 | 1 | 2 | 2 | 3 | 1 | - | - | 1 | - | - | - | - | - |
| | | | CO1 | Describe the most important environmental systems analysis methods | 3 | 2 | 1 | 1 | 1 | - | 1 | 3 | - | - | - | - | 2 | 2 | 2 |
| | | | CO2 | Dissect the strengths weaknesses and suitability of important environmental systems in different situations. | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | - | - | 1 | - | - |
| | | | CO3 | Carry out either (i) a Life Cycle Assessment by aid of a simple computer based tool, (ii) a simple environmental Impact assessment by aid of a specific EIA guideline or (iii) a Cost-Benefit Analysis for a pre-defined concrete decision situation. | 3 | 3 | 1 | 3 | 3 | 2 | 1 | 1 | - | - | - | - | 1 | 1 | 1 |
| | | | CO4 | Examine an environmental system using simple mathematical modelling. | 3 | 3 | 3 | 3 | 3 | 3 | - | 2 | - | - | - | - | 1 | 1 | 1 |
| | | | CO5 | Assess an environmental system by carrying our economic analysis. | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | - | - | 1 | 1 | 1 | 2 |
| 6 | 70121625 | **Environmental Systems** | CO6 | List environmental policies and understand the intricacies while framing of policies. | 3 | 1 | - | 1 | 1 | 1 | - | 1 | 1 | 1 | - | - | 1 | 1 | 1 |
| | | | CO1 | Sample the waste water using waste water sampling technic | 3 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | - | 1 | - | - | 1 | 1 | 1 |
| | | | CO2 | Determine the presence of different types of phosphorus and nitrate contents present in waste | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | 1 | 1 | 1 |
| | | | CO3 | Calculate the biological of oxygen demands of waste water | 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | 1 | - | - | 1 | 1 | 2 |
| | | | CO4 | Analyze the chemical of oxygen demands of waste water | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| | | | CO5 | Compare the electrical conductivity for waste water sample collected. | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| | | | CO6 | Determine the turbidity of waste water and discuss on the results. | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| | | | CO7 | Determine the pH value of waste water and discuss on the results. | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| | | | CO8 | Discuss the different types of sewers appurtenances like storm water inlets, overflows, inverte | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| 6 | 70121637 | **Environmental Systems Lab** | CO9 | Determine the sludge volume index of given waste water sample | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | - | - | - | 2 | 1 |
| | | | CO1 | Describe the components of bridges, standard specifications used in bridges analysis and design | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Analyse and design the types of culverts | | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Analyse and design the T.beams and Slabs of the bridges | | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Analyse and design the bridge substructure | | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121621 | **Bridge Engineering** | CO5 | Analyse and design the bridge fordations-open well and pile foundations | | 3 | 3 | | | | | | | | | | | | |
| | | | CO1 | Understand the importance and limitations of air transportation, describe the components of aeroplane, understand the terminologies associated with the aircraft | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the aircraft characteristics, planning and site selection for airports | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand layouts of airports and their requirements. | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Understand Airport classifications, runways and taxiways orientations and their standards | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121623 | **Airport Planning and Design** | CO5 | Design the airport pavement using PCA methods | | | 3 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CO1 | Understand the role of Glass Facades in the building envelope, Explain the factors on the basis of which the selection of glass can be made for any structure, Describe the manufacturing of various glasses | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understandime Glass facade, Types of Glazing & Amelications in structures | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Analyse and design the glass facade for the structures | | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Describe the types of tests to be carried out on glass and procedure of testing of glass as per the standards | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121627 | **Glass Facade Engineering** | CO5 | Describe the procedures for erection of glass at site | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Describe the pavement structure and the objectives of providing each layer. Compute the stresses induced in flexible and rigid pavement due to the wheel load and temperature variation. Apply layer theories to find out stresses in flexible pavements | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the material characteristics and selection criteria for the use in pavement design | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Apply the procedures followed in California Bearing Ratio (CBR), Indian Road Congress (IRC), American Association of Transportation and State Highway Officials(AASHO) and/asphalt institute methods, for the optimal design of flexible pavements. | | | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Design the airport pavement using corps engineerings and IRC methods | | | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Explain the principles of good drainage taking due consideration of moisteities. | 3 | | | | | | | | | | | | | | |
| 6 | 70121629 | **Pavement Design** | CO6 | Explain the techniques and principles followed in concrete road construction. | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Classify different transit modes for urban passengers, Know the uses of different modes of transport in urban areas | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the different land use models of transport State-wide and Regional Transportation Planning, Understand the Urban Freight Transportation and rapid transit system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand the evaluation methods for transit system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Understand the planning, analysing and management of city traffic | 3 | 3 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121632 | **Urban Transport Engineering** | CO5 | Understand the demand management techniques intersection management techniques for urban traffic. | 3 | | | | | | | | | | | | | | |
| | | | CO1 | understand the concepts and applications of the elements involved in Highway Infrastructure Design | 2 | - | - | - | - | 1 | - | - | - | - | 1 | - | 1 | - |
| | | | CO2 | acquire scientific knowledge about the social, technical, environmental and economic factors affecting regional development | 3 | - | - | - | - | 1 | - | - | - | - | - | - | 1 | - |
| | | | CO3 | synthesize working of systems like sanitation, drainage, fire protection, electricity and water supply | - | 2 | - | - | - | - | 1 | - | - | - | - | - | - | - | 2 |
| | | **Infrastructure Planning and** | CO4 | survey the emerging trends in infrastructure | - | - | 1 | - | - | - | - | - | - | - | 1 | - | - | - | - |
| 6 | 70121613 | **Design** | CO5 | understand the working of various infrastructure sectors | 2 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO1 | Understand the infrastructure components. | 3 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO2 | Plan working drawing elements. | - | - | - | 3 | - | - | - | - | - | - | - | - | 2 | - | - |
| | | | CO3 | Plan a road network for existing infrastructure. | - | - | - | 2 | - | - | - | - | 1 | - | - | - | 2 | - | - |
| | | **Infrastructure Planning and** | CO4 | Analyse a layout plan. | - | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| 6 | 70121614 | **Design Lab** | CO5 | Plan various service units. | - | - | - | 1 | - | - | - | - | 1 | - | - | - | 2 | - | 1 |
| | | | CO1 | Explain what Internet of Things is. | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe key technologies in Internet of Things. | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand building state of the art architecture in IoT. | 2 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO4 | Explain resource management in the Internet of Things. | - | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121615 | **IOT for smart cities** | CO5 | Understand data aggregation for the IoT in Smart Cities | 2 | - | - | - | - | - | - | - | 1 | - | - | - | 1 | - | - |
| | | | CO1 | Describe the concept of a smart city and key challenges/problems facing professionals in India and other countries around the world. | - | - | 1 | - | - | 2 | - | - | - | - | - | - | - | - | 2 |
| | | | CO2 | Understand the roles and functions of various technologies (sensors, RFID, cloud computing) that can be used for implementing smart cities and how they are related to each other to achieve the sustainability goals. | 1 | - | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Learn the different fields of technology applications in smart and sustainable cities; criticize the solutions and plans proposed by others. | 2 | - | - | - | - | - | - | - | - | - | 1 | - | 2 | - | - |
| 6 | 70121616 | **IOT for smart cities Lab** | CO4 | Apply the existing technologies to design a solution and develop a plan to move a current city towards a smart and sustainable one. | 2 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | 2 |
| | | | CO1 | State the objectives and principles of town planning. | 3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO2 | Discuss different planning standards for the physical planning of a town. | - | - | - | 2 | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Describe the spatial aspects of planning for rural and urban settlements. | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - | - |
| | | | CO4 | Discuss the different levels in planning like development plan, regional plan with their characteristics. | - | - | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO5 | Explain different types of landscaping with application in modern and historical areas. | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| 6 | 70121633 | **Smart Cities Planning and Development** | CO6 | Locate and prepare the layout plans, neighbourhood plans, town planning schemes for the different case studies. | - | - | - | 2 | - | - | - | - | - | - | - | - | 1 | - | 1 |
| | | | CO1 | State the objectives and principles of town planning. | 3 | - | - | - | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO2 | Discuss different planning standards for the physical planning of a town. | - | - | - | 2 | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Describe the spatial aspects of planning for rural and urban settlements. | - | - | - | - | - | - | - | - | 1 | - | - | - | 2 | - | - |
| | | | CO4 | Discuss the different levels in planning like development plan, regional plan with their characteristics. | - | - | - | 1 | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO5 | Explain different types of landscaping with application in modern and historical areas. | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 |
| 6 | 70121644 | **Smart Urban Planning** | CO6 | Locate and prepare the layout plans, neighbourhood plans, town planning schemes for the different case studies. | - | - | - | 2 | - | - | - | - | - | - | - | - | 1 | - | 1 |
| | | | CO1 | Distinguish various structural features, and have an enhanced understanding of earth dynamic | 3 | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the origin and mechanisms of formation of faults, fractures, and folds. | 3 | 2 | - | - | - | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO3 | Organize and record the observations of mesoscopic rock features in the field. | 3 | - | - | - | - | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO4 | Analyze geological maps and propose alternatives. | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Evaluate strain, deformation in earth dynamics and mechanics. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 70121609 | **Structural geology** | CO6 | Recognize shearzones and kinematically classify shear zones. | 3 | 2 | 2 | 2 | - | - | - | - | 1 | 1 | - | - | - | - | - |
| | | | CO1 | Categorize various Ore forming minerals. | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe igneous, sedimentary and metamorphic rocks based on their characteristics. | 2 | - | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO3 | List various rocks falling in igneous, sedimentary and metamorphic categories. | 2 | - | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO4 | Describe and list minerals based on their appearance. | 2 | - | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO5 | Identify Structural features. | - | - | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO6 | Explain significance of structural features for each Engineering projects. | 2 | 1 | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO7 | Investigate geological maps. | 2 | 2 | 2 | 2 | - | - | - | - | 2 | 2 | - | - | - | - | - |
| 6 | 70121610 | **Structural Geology Lab** | CO8 | Study structural geological model. | 2 | - | - | - | - | - | - | - | 2 | 2 | - | - | - | - | - |
| | | | CO1 | understand the concept of nanoscale materials and quantum effects governing the behavior of these materials. | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | | | |
| | | | CO2 | understand the nature and properties of nanomaterials. | 2 | - | - | - | - | - | - | - | - | - | - | 2 | | | |
| | | | CO3 | describe top-down and bottom-up approaches to synthesize various types of nanomaterials. | 2 | 2 | 2 | - | - | - | - | - | 2 | - | - | 2 | | | |
| | | | CO4 | categorize nanomaterials and understand their structure and properties using data from analytical tools like XRD and UV-Vis. | 3 | 2 | - | - | - | - | - | - | 1 | - | - | 2 | | | |
| 6 | 70121653 | **Nanotechnology** | CO5 | demonstrate the knowledge of properties of nanomaterials and their application in current technology development | 3 | - | - | - | - | - | - | - | 3 | - | - | 2 | | | |
| | | | 1 | To formulate and solve the engineering problems. | 2 | 2 | - | 2 | 2 | 1 | - | - | 2 | - | - | 1 | 1 | 1 | 1 |
| | | | 2 | To understand mathematical modeling | 2 | 2 | - | 2 | 2 | 1 | - | - | 2 | - | - | 1 | 1 | 1 | 1 |
| | | **Systems Engineering &** | 3 | To apply various optimization techniques to engineering problem | 2 | 2 | - | 2 | 2 | 1 | - | - | 2 | - | - | 1 | 1 | 1 | 1 |
| 7 | 70121749 | **Economics** | 4 | To learn simulation and dynamic programming | 2 | 2 | - | 2 | 2 | 1 | - | - | 2 | - | - | 1 | 1 | 1 | 1 |
| | | | 1 | To Plan industrial structures for functional requirements. | 3 | 2 | 2 | 1 | 3 | 2 | 1 | - | 2 | 1 | 1 | 1 | 2 | 2 | 1 |
| | | | 2 | To Design of chimneys, Silos and Bunkers, Rectangular bunkers | 3 | 2 | 3 | | 3 | 2 | 1 | - | 2 | 1 | 1 | 1 | 2 | 1 | 1 |
| | | | 3 | To analyze and design Concrete Shell Structures | 3 | 2 | 3 | 2 | 3 | 2 | 1 | - | 2 | 1 | 1 | 2 | 2 | 2 | 1 |
| | | | 4 | To analyze and design foundation for machinery | 3 | 2 | 3 | 2 | 3 | 2 | 1 | - | 2 | 1 | 1 | 1 | 2 | 2 | 1 |
| 7 | 70121748 | **Industrial Structures** | 5 | To design industrial structures | 3 | 2 | 3 | 2 | 3 | 2 | 1 | - | 2 | 1 | 1 | 1 | 2 | 1 | 1 |
| | | | CO1 | Gain knowledge of fate and transport mechanism of contaminant in air and water system | 3 | 2 | | | | | | | | | | | | | |
| 7 | 70121707 | **Water and Air Quality Modelling** | CO2 | Application of knowledge of Systems Modeling to various environmental engineering systems. | 3 | | | | 1 | | | | | | | | | | |
| | | | CO1 | Types of foundations and various construction methodswith respect to sustainability. | 3 | 1 | | | | | | | | | | | | | |
| | | | CO2 | Basics construction methods for steel structures for tall structures and for Bridges | 3 | | | | | | | | | | | | | | |
| | | | CO3 | Demonstrate an ability to evaluate and/or design whole or parts of projects, taking into account not only the financial and economic issues but also the social and environmental impacts affecting the sustainability of infrastructure. | 3 | 1 | | | | | | | | | | | | | |
| | | **Sustainable Construction** | CO4 | Understand the basics of green construction projects. | 3 | 1 | | | | | | | | | | | | | |
| 7 | 70121713 | **Methods** | CO5 | Preparation for the LEED Green Associate professional licensing. | 3 | 1 | | | | | | | | | | | | | |
| | | | 1 | Explain the basic concepts of Natural Disaster Management and institutional mechanism for Geo-information data and services particular to Disaster Management | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Explain the potential role of Remote Sensing and GIS for holistic disaster risk reduction and management. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Describe application of RS, GPS and GIS for Applications in Disaster Management for mapping / monitoring, analysis of hazard, vulnerability & risk assessment, early warning and damage assessment | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | **Geo–informatics Application** | 4 | Implement functionalities of Remote Sensing & GIS software for disaster management through hands on training and demonstrations | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121709 | **for Emergency Response Management** | 5 | Explain the role of local, state, and central government in emergency response management. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 1 | Define GIS system | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | Relate spatial data base management system with conventional DBMS | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 3 | Interrate GIS with telecommunication. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 4 | Apply GIS in logistics | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 5 | Create spatial data base for tourism planning. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121726 | **GIS Applications** | 6 | Select suitable site for restaurant, hotel, commercial office by using GIS. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | 1 | Explain GIS for natural resource management. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | 2 | List out the sensors used for monitoring environmental parameters and managing of natural resources. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Geoinformatics Applications** | 3 | Apply statistical approach to derive vegetation indices from spectral reflectance in order to monitor changes in existing biodiversity. | 3 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | **in Natural Resource** | 4 | Illustrate and analyze application of Geoinformatics in managing water resources, like run-off | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121744 | **Management** | 5 | Assess soil degradation using remote sensing and GIS. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Understand in detail concrete making materials including supplementary cementitious materia | 3 | - | - | - | 1 | 1 | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Make appropriate decision regarding ingredient selection and use of concrete | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Explain and execute mix proportioning of concrete. | 3 | 3 | 3 | 2 | - | - | - | - | 2 | - | 1 | - | - | - | - |
| | | | CO4 | Estimate engineering properties of concrete. | 3 | - | - | 2 | - | - | - | - | 1 | - | - | - | - | - | - |
| | | **Advanced Concrete** | CO5 | Summarize the tests to be conducted on fresh and hardened concrete. | 3 | 1 | - | - | 1 | - | - | - | 1 | 1 | - | - | - | - | - |
| 7 | 70121708 | **Technology** | CO6 | Discuss about the usability of concrete designed for special purposes. | 3 | - | 1 | - | 2 | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO1 | Illustrate major hydropower plants in India and abroad | 3 | - | - | - | 1 | 1 | 1 | - | - | - | - | 1 | - | - | - |
| | | | CO2 | Classify hydel plants based on turbine head and hydraulic characteristics | 3 | 2 | - | - | 2 | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO3 | Define and estimate important terms connected with hydropower such as water power potenti | 3 | 3 | 2 | 2 | 2 | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO4 | Define and describe principle components of a hydro- electric scheme such as intake structure | 3 | - | - | - | 2 | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO5 | Explain the hydraulics of flow and discharging capacities of pressure conduits such as penstoc | 3 | 3 | - | 3 | - | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO6 | Review the characteristics of surge tank, its classification and hydraulic design | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO7 | Discuss the requirements of intake structure and its components. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO8 | Describe the general layout, approximate specification of a power house. | 3 | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121719 | **Water Power Engineering** | CO9 | Illustrate the different non- conventional sources of energy such as wind, tidal, geothermal an | 3 | - | - | 2 | 3 | 1 | 1 | 1 | 1 | - | - | 1 | - | - | - |
| | | | CO1 | Classify hydel plants based on turbine head and hydraulic characteristics. | 3 | | | 2 | 1 | - | - | - | 1 | | | | | | |
| | | | CO2 | Will be able to calculate hydropower terminologies such as water power potential, design head, load factor, roundane factor, primary power and secondary power. | 3 | 3 | 3 | 3 | 1 | - | - | - | 2 | 1 | - | - | - | - | - |
| | | | CO3 | Define and describe principle components of a hydro- electric scheme such as intake structure, penstocks, surge tank, turbines and tail race. | 3 | 1 | 1 | 1 | 1 | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO4 | Will be able to find out efficiency of Centrifugal pump | 3 | 2 | 1 | 2 | 1 | - | - | - | 1 | - | - | - | - | - | - |
| | | | CO5 | Will be able to classify various types of turbines | 3 | - | - | - | 1 | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121723 | **Water Power Engineering lab** | CO6 | Understand working principle of surge tank and power house | 3 | - | 2 | 2 | 2 | - | - | - | 2 | - | - | - | - | - | - |
| | | | CO1 | Enhance the knowledge of Docks and Harbour Engineering for the water transportation in the context of regional and intercontinental transportation. | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe the natural phenomenons of the various factors affecting the port and harbors | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Describe the techniques of planning and designing the infrastructures required for Harbour and Port area | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Understand the environmental and other impacts impended due to water transportation and port activities, describe the facilities at port | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Port and Harbour** | CO5 | Describe the cargo and passenger demand forecasting, cargo handling capacity of ports and economic evaluation of port project. | 3 | 1 | | | | | | | | | | | | | |
| 7 | 70121706 | **Engineering** | CO1 | Describe the traffic characteristics, factors affecting road traffic and the design of intersection. Explain the sampling methods and conducting of various surveys and carry out their analysis | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Apply the concepts of passenger car units for mixed traffic flow, design hourly volume, critical hour, Price-volume relationships and demand functions in design of traffic facilities. | 3 | 3 | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Explain traffic movements, types of intersections, islands, crossings and their designs. | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Recall the traffic regulations, pollutions caused by traffic and the method of controlling pollution | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Illustrate the design of signals and explain the redesigning of existing signals, Evaluation and design of road lighting. | | 3 | 3 | | | | | | | | | | | | |
| 7 | 70121717 | **Traffic Engineering** | CO6 | Understand the fundamentals of traffic management system, Describe the traffic management process for the areas | 3 | 2 | | | | | | | | | | | | | |
| | | | CO1 | Understand and appreciate the concepts related to ITS technologies and industry applications of the field | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the methods of field data collection and management | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand and describe the vehicles monitoring system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Intelligent Transportation** | CO4 | Describe the process of user need and service based travel and traffic management | 3 | 2 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121727 | **Management** | CO5 | Understand the concepts of automated highway systems implementation globally | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Understand and appreciate the concepts related to ITS technologies and industry applications of the field | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the methods of field data collection and management | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand and describe the vehicles monitoring system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Intelligent Transportation** | CO4 | Describe the process of user need and service based travel and traffic management | 3 | 2 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121745 | **Systems** | CO5 | Understand the concepts of automated highway systems implementation globally | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Understand the principles and methods of economic analysis | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Describe the process of project formulation and economic evaluation highway infrastructure projects. | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Formulate and prepare Detailed Project Report for a highway project. | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Apply the methods of economic analysis for highway projects. | 3 | 3 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121746 | **Transportation Economics** | CO5 | Prepare Environmental Impact Assessment Report | 3 | 3 | | | | | | | | | | | | | |
| | | | CO1 | Understand and appreciate the concepts related to ITS technologies and industry applications of the field | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the methods of field data collection and management | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand and describe the vehicles monitoring system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Intelligent Transportation** | CO4 | Describe the process of user need and service based travel and traffic management | 3 | 2 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121745 | **Systems** | CO5 | Understand the concepts of automated highway systems implementation globally | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Understand and appreciate the concepts related to ITS technologies and industry applications of the field | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Understand the methods of field data collection and management | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand and describe the vehicles monitoring system | 3 | | | - | - | - | - | - | - | - | - | - | - | - | - |
| | | **Intelligent Transportation** | CO4 | Describe the process of user need and service based travel and traffic management | 3 | 2 | | - | - | - | - | - | - | - | - | - | - | - | - |
| 7 | 70121745 | **Systems** | CO5 | Understand the concepts of automated highway systems implementation globally | 3 | | | | | | | | | | | | | | |
| | | | CO1 | Summarize the impact of developmental projects | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | 3 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | CO2 | Explain different methodologies for environmental impact prediction and assessment | 3 | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | | CO3 | Plan environmental impact assessments and environmental management plans | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | | CO4 | Evaluate environmental impact assessment reports | 3 | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | | CO5 | Evaluate risk associated with an infrastructure project | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | 3 |
| | | **Environmental Impact** | CO6 | Understand basics of environmental audits | 3 | 3 | | | | | | | | | | | | 3 |
| 7 | 70121716 | **Assessment** | CO7 | Explain various laws related to environmental protection and pollution control | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | | CO1 | Describe sources, generation, storage, collection, transport, processing and disposal of municipal solid waste. | 3 | - | - | - | - | - | 2 | - | - | - | - | - | - | 2 |
| | | | CO2 | Describe the characterization of municipal solid waste. | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO3 | Estimate the quantity of solid waste generation | 3 | - | - | - | - | - | 2 | - | - | - | - | - | - | 2 |
| | | | CO4 | List and define various types of hazardous waste | 3 | | | | | | 2 | | | | | | | 2 |
| | | | CO5 | Discuss various energy recovery methods from solid waste. | 3 | | | | | | 2 | | | | | | | 2 |
| | | | CO6 | List various types of collection and transportation methods for Municipal solid waste. | 3 | | | | | | 1 | | | | | | | 2 |
| | | | CO7 | List the precaution to be taken during handling and transport of hazardous waste. | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO8 | Discuss the effects of poor waste management. | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| 7 | 70121721 | **Waste Management Systems** | CO9 | Discuss sustainable waste management and waste as resource | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO1 | Discuss various sources and components of municipal solid waste | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO2 | List the key technologies for SWM | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO3 | Explain the various parameters for site selection for waste disposal | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO4 | Compare various waste disposal technologies | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO5 | Illustrate earthen lining for waste disposal | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO6 | Estimate typical waste disposal costs. | 3 | | | | | | 1 | | | | | | | 2 |
| 7 | 70121724 | **Waste Management Systems Lab** | CO7 | Identify recycling and reuse options (composting, source separation, and re-use of shredded tires, screened glass, fly ash, etc.). | 3 | - | - | - | - | - | 1 | - | - | - | - | - | - | 2 |
| | | | CO1 | Explain the concept of similarity mechanics and various related laws | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO2 | Make use of various similarity laws for model development | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO3 | Illustrate the gravity dominated models | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO4 | Develop gravity – friction model | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO5 | Explain river modelling | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| 7 | 70121740 | **Hydraulic Modelling** | CO6 | State the limitations for hydraulic modelling | 3 | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| | | | CO1 | Categorize Solid Waste and propose suitable treatment process. | 3 | - | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| | | | CO2 | Classify technics in Integrated Solid waste management | 3 | - | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| | | | CO3 | Plan for management of Municipal, Bio-medical, , Nuclear, Electronic and Industrial Solid W | 3 | - | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| | | | CO4 | Recommend suitable technic for management of Hazardous waste. | 3 | - | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| | | **Solid and Hazardous Waste** | CO5 | Investigate Ground water contaminants and propose testing. | 3 | - | - | - | - | - | 3 | - | - | - | - | - | - | 3 |
| 7 | 70121742 | **Management** | CO6 | Investigate and outline for Environmental Audit. | 3 | | | | | | 3 | | | | | | | 3 |
| | | | CO1 | analyse a complex environmental problem and develop an experimental design that will obtain data that adequately addresses the objectives of the study in a timely manner. | 3 | 2 | | | | | 2 | | | | | | | 3 |
| | | | CO2 | comprehend the scientific principles behind the protocols and measurement technologies that are used for field-scale hydrologic and environmental studies. | 3 | | | | | | 2 | | | | | | | 3 |
| | | | CO3 | apply knowledge to select appropriate instruments and methods from the complex assortment of available options. | 3 | 2 | | | | | 2 | | | | | | | 3 |
| | | | CO4 | apply knowledge use the selected instruments and protocols properly | 3 | 2 | | | | | 1 | | | | | | | 3 |
| | | | CO5 | evaluate the sampling designs, measurement technologies, and protocols used | 3 | 2 | | | | | 2 | | | | | | | 3 |
| 7 | 70121747 | **Urban Hydrology and Hydraulics** | CO6 | determine the adequacy of the resulting data to address hydrologic and environmental questions. | 3 | | | | | | 2 | | | | | | | 3 |
| | | | CO1 | Define system and its implementation in civil engineering. | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - | - |
| | | | CO2 | Implement optimization techniques in civil engineering problems. | 1 | - | | - | - | - | - | - | - | - | - | - | - | 1 |
| | | | CO3 | Apply linear programming methods to maximize or minimize objective (Simplex, Two phase, Big M etc). | - | - | - | - | 3 | - | - | - | - | - | 1 | - | - | - |
| | | | CO4 | Define transportation and assignment problem and develop solution | 2 | - | - | - | 2 | - | - | - | - | - | 1 | - | 1 | - |
| 7 | 70121718 | **Optimization in Civil Engineering** | CO5 | Apply stochastic methods like queuing theory, simulation, sequencing from various day to day situations to complex problems. | 3 | - | - | - | - | - | - | - | - | - | 1 | - | - | 1 |
| | | | CO1 | Classify various methods of tenders and contracts. | - | 2 | - | - | - | - | - | - | - | - | 1 | - | - | - |
| | | | CO2 | Define various laws related to construction practices. | 1 | - | - | - | - | 1 | - | - | - | - | - | 1 | - | - |
| | | | CO3 | Understand contract documents in preparation for competitive bidding and improve technical communication through tender document and other technical document drafting. | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - | - | - |
| | | | CO4 | Understand construction law and arbitration practice. | 2 | - | - | - | - | 1 | - | - | - | - | - | - | 1 | - |
| | | **Professional Practices in** | CO5 | Understand the probable risks and safety measures to be followed on a project. | 3 | - | - | - | - | 1 | - | - | - | - | 1 | - | - | - |
| 7 | 70121710 | **Construction** | CO6 | Exhibit professional ethics and know the professional rights. | - | - | - | - | - | - | - | 2 | - | 1 | - | 1 | 1 | - |
| | | | CO1 | Discuss various facets of project and its management. | 1 | - | - | - | - | - | - | - | - | - | 1 | - | - | - |
| | | | CO2 | Explain principles of project management Discuss appropriate technique like CPM & PERT for project management. | 3 | - | - | 3 | - | - | - | - | - | - | 1 | - | 1 | - |
| | | | CO3 | Discuss project economics and finance | - | - | - | 2 | - | - | - | - | - | - | 1 | 1 | - | - |
| | | | CO4 | Understand smart cities and urban infrastructure and their components, Elaborate on Urban designs and decisions | 2 | - | - | 1 | - | - | - | - | - | - | - | - | - | 1 |
| 7 | 70121711 | **Project management in smart cities** | CO5 | Explain the importance and practicing the concept of inclusive urban planning and will have sensitization towards implementing contributions in sustainable development | 2 | - | - | - | - | - | - | - | - | - | - | - | - | 3 |
| | | | CO1 | Examine geophysical investigation report and rate on the structural feature. | 3 | 2 | 2 | 2 | - | - | - | - | 2 | 2 | - | - | - | - |
| | | | CO2 | Interpret rock quality designation report, and appraise the physico-mechanical properties of ro | 3 | 3 | 3 | 3 | - | - | - | - | 2 | 2 | - | - | - | - |
| | | | CO3 | determine the In situ stresses, induced stresses after excavation, formulate stress variation Str | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Choose appropriate underground excavation techniques and describe it. | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Select appropriate support design and instrumentation technic in tunnel construction scenario | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| 7 | 701214712 | **Rock Mechanics** | CO6 | Assess the problems and suggest remedies in the rock engineering works. | 3 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Identify plane stress and plane strain problems and choose appropriate method of finite element | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Workout interpolation polynomials for bar and beam elements. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Solve a problem using Numerical Integration technic - Gaussian Quadrature | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Apply Galerkin's Method to Structural Elements, Bar Element, Beam Element | 3 | 1 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | **Introduction to finite element** | CO5 | Analyse constant strain problems over Three-dimensional Tetrahedral elements, triangular El | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| 7 | 701214714 | **methods** | CO6 | Perform Strain and Stress Computation, and appraise applications for seepage flow | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Identify contaminant transport mechanisms in soils. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Specify site investigation techniques in the characterization of the contaminated site | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand principles of various soil treatment techniques. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Design liners for containment of contaminants | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Summarize stabilization technics of contaminated soil. | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 3 |
| 7 | 70121715 | **Environmental geotechniques** | CO6 | Propose in-situ and ex-situ soil stabilization tehcnics by observing geo-investigation data | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Identify contaminant transport mechanisms in soils. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Specify site investigation techniques in the characterization of the contaminated site | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Understand principles of various soil treatment techniques. | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO4 | Design liners for containment of contaminants | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO5 | Summarize stabilization technics of contaminated soil. | 3 | 2 | - | - | - | - | - | - | - | - | 1 | - | - | 2 |
| 7 | 70121743 | **Environmental geotechnology** | CO6 | Propose in-situ and ex-situ soil stabilization tehcnics by observing geo-investigation data | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Explain transport of pollutants in surface and subsurface flow | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | | CO2 | Explain various Numerical methods for computation | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | | CO3 | Apply various numerical methods to flow problems | 3 | 2 | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | **Basics of Computational** | CO4 | Explain the software based on CFD | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| 7 | 70121741 | **Methods** | CO5 | Determine various flow parameters using CFD software | 3 | - | - | - | 3 | - | - | - | - | - | - | - | - | - |
| | | | CO1 | Describe the importance of smart materials on the basis of their applications. | - | - | - | - | - | 2 | 1 | - | - | - | - | 2 | | |
| | | | CO2 | Understand the structure, electrical and magnetic properties of materials. | 3 | 3 | - | - | - | - | - | - | 1 | - | - | 2 | | |
| | | | CO3 | Classify the smart materials in terms of their unique electric and magnetic properties. | - | 3 | - | - | - | - | - | - | 1 | - | - | 2 | | |
| | | | CO4 | Identify some special smart materials. | - | - | 2 | - | - | 2 | - | - | 3 | - | - | 1 | | |
| 7 | 70121730 | **Smart Material** | CO5 | Understand some important applications of smart materials | - | - | - | - | - | 2 | - | - | 2 | - | - | 2 | | |
| | | | | | | | | | | | | | | | | | | |
| 8 | 70121801 | **Internship Semester** | | | | | | | | | | | | | | | | |