DEPARTMENT OF CIVIL ENGINEERING

COURSE OUTCOMES (CO's)

C101	Mathematics – I (Calculus & Differential Equations)

Course Outcomes (Cos)

C101.1	utilize mean value theorems to real life problems (L3)
C101.2	solve the differential equations related to various engineering fields (L3)
C101.3	familiarize with functions of several variables which is useful in optimization (L3)
C101.4	apply double integration techniques in evaluating areas bounded by egion (L3)
C101.5	Students will also learn important tools of calculus in higher dimensions.

C102	COMMUNICATIVE ENGLISH

Course Outcomes (Cos)

C102.1	Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
C102.2	Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
C102.3	Help improve speaking skills through participation in activities such as ole plays, discussions and structured talks/oral presentations
C102.4	Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
C102.5	Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

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C103	ENGINEERING PHYSICS

Course Outcomes (Cos)

C103.1	Explain the need of coherent sources and the conditions for sustained interference (L2) Identify engineering applications of interference (L3)¬ Analyze the differences between interference and diffraction with applications
C103.2	Understand the basic concepts of LASER light Sources (L2) Apply the concepts to learn the types of lasers (L3)¬ Identifies the Engineering applications of lasers
C103.3	Explain the concept of dielectric constant and polarization in dielectric materials (L2)¬ Summarize various types of polarization of dielectrics
C103.4	Explain how sound is propagated in buildings (L2) Analyze acoustic properties of typically used materials in buildings

C104	ENGINEERING DRAWING

Course Outcomes (Cos)

C104.1	The student is able draw the mechanical designs also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

C105A	Engineering Geology (theory)

Course Outcomes (Cos)

C105.1	Identify and classify the geological minerals
C105.2	Measure the rock strengths of various rocks
C105.3	Classify and measure the earthquake prone areas to practice the hazard zonation
C105.4	Classify, monitor and measure the Landslides and subsidence
C105.5	Prepares, analyses and interpret the Engineering Geologic maps
C105.6	Analyses the ground conditions through geophysical

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	surveys
C105.7	Test the geological material and ground to check the suitability of civil engineering project construction
C105.8	Investigate the project site for mega/mini civil engineering projects. Site selection for mega engineering projects like Dams, Tunnels, disposal sites etc.

Course Outcomes (Cos)

C105.1	Identify Megascopic minerals & their properties.
C105.2	Identify Megascopic rocks & their properties
C105.3	Identify the site parameters such as contour, slope & aspect for topography.
C105.4	Know the occurrence of materials using the strike & dip problems

C106	ENGLISH COMMUNICATION SKILLS LABORATORY

Course Outcomes (Cos)

C106.1	Vowels, Consonants, Pronunciation, Phonetic Transcription
C106.2	Word stress-did-syllabic words, poly-syllabic words
C106.3	Stress in compound words, rhythm, intonation, accent neutralization
C106.4	Listening to short audio texts and identifying the context
C108.5	Newspapers reading; Understanding and identifying key terms and structures useful for writing reports.

C107	ENGINEERING PHYSICS LAB

Course Outcomes (Cos)

C107.1	Knowledge on different lasers
C107.2	Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee's method.

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C107.3	Determination of ultrasonic velocity in given liquid (Acoustic grating)
C107.4	The variation of B versus H by magnetizing the magnetic material (B-H curve).

C108	Basics of Civil Engg. Work Shop (Lab)

Course Outcomes (Cos)

C108.1	Identify various components of a building and give lump-sum estimate
C108.2	Determine distances and irregular areas using conventional survey instruments like chain, tape, cross-staff and compass
C108.3	Identify different soils
C108.4	Know various traffic signs & signals
C108.5	Determine centre of gravity and moment of inertia of channel and I-sections.
C108.6	Set out a signal room building as per given plan
C108.7	Install simple sanitary filling and find discharge/velocity in a water pipe line as density of water
C108.8	Know to the process of making cement mortar / concrete for nominal mix

I Year - II Semester

Course Outcomes (Cos)

C1109	MATHEMATICS –II (LINER ALGEBRA & NUMERICAL METHODS)

C1109.1	develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
C1109.2	solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
C1109.3	evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5
C1109.4	apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
C1109.5	apply numerical integral techniques to different Engineering problems (L3)

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C1109.6	apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

C1110	ENGINEERING CHEMISTRY

Course Outcomes (Cos)

C110.1	At the end of this unit, the students will be able to
C110.2	At the end of this unit, the students will be able to Synthesize nonmaterial for modern advances of engineering technology.
C110.3	At the end of this unit, the students will be able to Differentiate petroleum, petrol, synthetic petrol
C110.4	At the end of this unit, the students will be able to Analyze the suitable methods for purification and treatment of hard water and brackish water

C111	ENIGINEERING MECHANICS

Course Outcomes (Cos)

C111.1	The student should be able to draw free body diagrams for FBDs for particles and rigid bodies in plane and space and problems to solve the unknown forces, orientations and geometric parameters
C111.2	He should be able to determine centered for lines, areas and center of gravity for volumes and their composites.
C111.3	He should be able to determine area and mass movement of inertia for composite sections
C11.4	He should be able to analyze motion of particles and rigid bodies and apply the principles of motion, work energy and impulse – momentum

C112	PROGRAMMING FOR PROBLEM SOLVING USING C

Course Outcomes (Cos)

C112.1	To write algorithms and to draw flowcharts for solving problems
C112.2	To convert flowcharts/algorithms to C Programs, compile and debug programs
C112.3	To use different operators, data types and write programs that use two-way/multi-way selection
C112.4	To select the best loop construct for a given problem

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C112.5	To design and implement programs to analyze the different pointer applications
C112.6	To decompose a problem into functions and to develop modular reusable code
C112.7	To apply File I/O operations

| C1113 | BUILDING MATERIALS AND CONCRETE TECHNOLOGY |

Course Outcomes (Cos)

C1113.1	1. Know various engineering properties of building construction materials and suggest their suitability
C1113.2	2. Identify the functional role of ingredients of concrete and apply this knowledge to concrete mix design
C1113.3	3. Acquire and apply fundamental knowledge in the fresh and hardened properties of concrete

| C1114 | ENGINEERING CHEMISTRY LABORATORY |

Course Outcomes (Cos)

| C11114.1 | The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills. |

| C1115 | PROGRAMMING FOR PROBLEM SOLVING USING C LAB |

Course Outcomes (Cos)

C1115.1	1) Gains Knowledge on various concepts of a C language.
C1115.2	2) Able to draw flowcharts and write algorithms.
C1115.3	3) Able design and development of C problem solving skills.
C1115.4	4) Able to design and develop modular programming skills.
C1115.5	5) Able to trace and debug a program

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C1116	BUILDING PLANNING AND COMPUTER AIDED BUILDING DRAWING

Course Outcomes (Cos)

C1116.1	Perform basic commands of any suitable CAD software to draw 2D drawings
C1116.2	Interpret the conventions, signs and symbols from a given drawing.
C1116.3	Prepare line plans of residential and public buildings using principles of planning. 4. Prepare submission and working drawing from the given requirement for Load Beari
C1116.4	Prepare submission and working drawing from the given requirement for Load Bearing and Framed structures

C1117	ENVIRONMENTAL SCIENCE

Course Outcomes (Cos)

C1117.1	Understanding of the natural resources.
C1117.2	Basic understanding of the ecosystem and its diversity.
C1117.3	Acquaintance on various environmental challenges induced due to unplanned and through pogenic activities.
C1117.4	An understanding of the environmental impact of developmental activities.
C1117.5	Awareness on the social issues, environmental legislation and global treaties

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C201	VECTOR CALCULUS FOURIER TRANSFORMS and PDE

Course Outcomes (Cos)

C201.1	interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
C201.2	estimate the work done against a field, circulation and flux using vector calculus (L5)
C201.3	apply the Laplace transform for solving differential equations (L3)
C201.4	find or compute the Fourier series of periodic signals (L3)
C201.5	know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
C201.6	identify solution methods for partial differential equations that model physical processes (L3)

C202	STRENGTH OF MATERIALS - I

Course Outcomes (Cos)

C202.1	The student will be able to understand the basic materials behavior under the influence of different external loading conditions and the support conditions
C202.2	The student will be able to draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
C202.3	The student will have knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams and deflections due to various loading conditions
C202.4	The student will be able to assess stresses across section of the thin and thick cylinders to arrive at optimum sections to withstand the internal pressure using Lame's equation

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C203	FLUID MECHANICS

Course Outcomes (Cos)

C203.1.	To understand the properties of fluids and fluid statics
C203.2	To derive the equation of conservation of mass and its application
C203.3	To solve kinematic problems such as finding particle paths and streamlines
C203.4	To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
C203.5	To analyze laminar and turbulent flows
C203.6	To understand the various flow measuring devices
C203.7	To study in detail about boundary layers theory

C204	SURVEYING AND GEOMETRICS

Course Outcomes (Cos)

C204.1	Apply the knowledge to calculate angles, distances and levels
C204.2	Identify data collection methods and prepare field notes
C204.3	Understand the working principles of survey instruments, measurement errors and corrective measures
C204.4	Interpret survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the modern equipment and methodologies

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C205	HIGHWAY ENGINEERING

Course Outcomes (Cos)

C205.1	Plan highway network for a given area.
C205.2	Determine Highway alignment and design highway geometrics.
C205.3	Design Intersections and prepare traffic management plans
C205.4	Judge suitability of pavement materials and design flexible and rigid pavements

C206	CONCRETE TECHNOLOGY LAB

Course Outcomes (Cos)

C206.1	Determine consistency and fineness of cement.
C206.2	Determine setting times of cement.
C206.3	Determine specific gravity and soundness ofcement
C206.4	Determine compressive strength ofcement.
C206.5	Determine workability of cement concrete by compaction factor, slump and Vee – Beetests
C206.6	Determine specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
C206.7	Determine flakiness and elongation index ofaggregates.
C206.8	Determine bulking ofsand
C206.9	Understand non-destructive testing procedures on concrete.

C207	HIGHWAY ENGINEERING LAB

Course Outcomes (Cos)

C207.1	Test aggregates and judge the suitability of materials for the road construction
C207.2	Test the given bitumen samples and judge their suitability for the road construction
C207.3	Obtain the optimum bitumen content for Bituminous Concrete
C207.4	Determine the traffic volume, speed and parking characteristics
C207.5	Draw highway cross sections and intersections.

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C208	SURVEYING FILED WORK – I (Lab)

Course Outcomes (SURVEYING FILED WORK – I (Lab) **Cos**)

C208.1	Chain survey of road profile with offsets in case of road widening.
C208.2	Determination of distance between two inaccessible points by using compass.
C208.3	Finding the area of the given boundary using compass (Closed Traverse)
C208.4	finding the area of a given boundary by the method of Radiation
C208.5	Fly leveling and Fly chaining (complete field work).

C209	SKILL ORIENTED COURSE*

Course Outcomes (Cos)

C209.1	Topographic Survey with contour map (Total station/ DGPS)
C209.2	Masonry 3' height with different bonds and different thickness

C210	CONSTITUTION OF INDIA (MC)

Course Outcomes (Cos)

C210.1	Understand historical background of the constitution making and its importance for building a democratic India
C210.2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary
C210.3	Understand the value of the fundamental rights and duties for becoming good citizen of India
C210.4	Analyze the decentralization of power between central, state and local self-government.
C210.5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

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C211	COMPLEX VARIABLES AND STATISTICAL METHODS

Course Outcomes (Cos)

C211.1	apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
C211.2	find the differentiation and integration of complex functions used in engineering problems (L5)
C211.3	make use of the Cauchy residue theorem to evaluate certain integrals (L3)
C211.4	apply discrete and continuous probability distributions (L3)
C211.5	design the components of a classical hypothesis test (L6)
C211.6	infer the statistical inferential methods based on small and large sampling tests (L4)

C212	STRENGTH OF MATERIALS - II

Course Outcomes (Cos)

C212.1	The student will be able to understand the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes and design the sections.
C212.2	The student can assess stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions

C213	HYDRAULICS AND HYDRAULIC MACHINERY

Course Outcomes (Cos)

C213.1	Solve uniform and non-uniform open channel flow problems.
C213.2	Apply the principals of dimensional analysis and similitude in hydraulic model testing
C213.3	Understand the working principles of various hydraulic machineries and pumps.

C214	ENVIRONMENTAL ENGINEERING

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Course Outcomes (Cos)

C214.1	Select a source based on quality and quantity and Estimate design population and water demand
C214.2	Design a water treatment plant for a village/city
C214.3	Design a sewer by estimating DWF and Strom water flow and plumbing system for buildings
C214.4	Design a Sewage Treatment Plant for a town/city.

C215	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Outcomes (Cos)

C215.1	The Learner is equipped with the knowledge of estimating the Demand and demand elasticity for a product.
C215.2	The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs.
C215.3	The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units.
C215.4	The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis.
C215.5	The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making.

C216	EVIRONMENTAL ENGINEERING LAB

Course Outcomes (Cos)

C216.1	Estimate some important characteristics of water, wastewater and soil in the laboratory
C216.2	Draw some conclusion and decide whether the water is suitable for Drinking/Construction / Agriculture/ Industry.
C216.3	Estimate Chloride, EC and Salinity of Soil and suggest their suitability for Construction/Agriculture
C216.4	Estimation of the strength of the sewage in terms of BOD and COD and Decide whether the water body is polluted or not with reference to the stated parameters in the list of experiments
C216.5	Demonstration of various instruments used in testing of water and soil and study of Drinking water standards, WHO guidelines, Effluent standards and standards for Construction/ Agriculture/ Industry.

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C217	STRENGTH OF MATERIALS LAB

Course Outcomes (Cos)

C217.1	The student doing following experiments 1. Tension test on Mild steel bar 2. Bending test on (Steel / Wood) Cantilever beam.
C217.2	3. Bending test on simply supported beam. 4. Torsion test
C217.3	5. Hardness test 6. Spring test
C217.4	7. Compression test on wood or concrete 8. Impact test (Charpy and Izod impact test) 9. Sheartest (on UTM) 10. Verification of Maxwell's Reciprocal theorem on beams.

C218	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Course Outcomes (Cos)

C218.1	List of Experiments 1. Calibration of Venturi meter & Orifice meter 2. Determination of Coefficient of discharge for a small orifice and mouth piece by a constant head and variable head method. 3. Calibration of contracted Rectangular Notch and /or 9. Performance test on Francis turbine. 10. Efficiency test on centrifugal pump. 11. Efficiency test on reciprocating pump.
C218.2	Notch 4. Determination of Coefficient of loss of head in a sudden contraction and friction factor. 5. Verification of Bernoulli's equation. 6. Impact of jet on vanes
C218.3	Triangular 7. Study of Hydraulic jump. 8. Performance test on Peloton wheel turbine
C218.4	11. Use of Electrical resistance strain gauges 12. Continuous beam – deflection test.

SKILL ORIENTED COURSE*

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PROGRAMME:CIVIL ENGINEERING
JNTUK UNIVERSITY REGULATION R20
THIRD YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)
III-I&III-II

C301	Structural analysis

Course Outcomes (Cos)

C301.1	Distinguish between the determinate and indeterminate structures
C302.2	Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure.
C303.3	Estimate the bending moment and shear forces in beams for different fixity conditions.
C304.4	Analyze the continuous beams using various methods -, three moment method, slope deflection method, energy theorems.
C305.5	Draw the influence line diagrams for various types of moving loads on beams/bridges.
C306.6	Analyze the loads in Pratt and Warren trusses when loads of different types and spans are passing over the truss.

C302	Design&Drawing of reinforced concrete structures

Course Outcomes (Cos)

C302.1	Work on different types of design methods
C302.2	Carryout analysis and design of flexural members and detailing
C302.3	Design structures subjected to shear, bond and torsion
C302.4	Design different type of compression members and footings•

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C303	GEOTECHNICAL ENGINEERING - I

Course Outcomes (Cos)

C303.1	The student must know the definition of the various quantities related to soil mechanics and establish their inter-relationships.
C303.2	The student should be able to know the methods of determination of the various index properties of the soils and classify the soils.
C303.3	The student should be able to know the importance of the different engineering properties of the soil such as compaction, permeability, consolidation and shear strength and determine them in the laboratory
C303.4	The student should be able to apply the above concepts in day-to-day civil engineering practice.

C304	REMOTE SENSING AND GIS

Course Outcomes(Cos)

C304.1	Be familiar with ground, air and satellite-based sensor platforms.
C304.2	Interpret the aerial photographs and satellite imageries.
C304.3	. Create and input spatial data for GIS application.
C304.4	Apply RS and GIS concepts for application in Civil Engineering.

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C305	ROAD SAFETY ENGINEERING

Course Outcomes(Cos)

C305.1	To understand fundamental of Traffic Engineering
C305.2	To investigate & determine the collective factors & remedies of accident involved.
C305.3	To design & planning various road geometrics.
C305.4	To massage the traffic system from road safety point of view.

C306	GEOTECHNICAL ENGINEERING LAB

Course Outcomes(Cos)

C306.1	Determine index properties of soil and classify them.
C306.2	Determine permeability of soils.
C306.3	Determine Compaction, Consolidation and shear strength characteristics.

C307	SURVEYING FIELD WORK – II

Course Outcomes(Cos)

C307.1	Theodolite Survey: Finding the distance between two inaccessible points.
C307.2	Tachometric Survey: Heights and distance problems using tachometric principles.
C307.3	One Exercise on Curve setting.

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C308	DESIGN AND DRAWING OF STEEL STRUCTURES

Course Outcomes(Cos)

C308.1	Work with relevant IS codes
C308.2	Carryout analysis and design of flexural members and detailing
C308.3	Design Plate Girder and Gantry Girder with connection detailing
C308.4	Produce the drawings pertaining to different components of steel structures

C309	WATER RESOURCES ENGINEERING

Course Outcomes(Cos)

C309.1	Have a thorough understanding of the theories and principles governing the hydrologic processes.
C309.2	Be able to quantify hydrologic components and apply concepts in hydrologic design of water resources projects.
C309.3	Develop Intensity-Duration-Frequency and Depth-Area Duration curves to design hydraulic structures.
C309.4	Develop design storms and carry out frequency analysis
C309.5	Develop flow mass curve and flow duration curve, apply hydrograph analysis in the design of water resources projects.

C310	GEOTECHNICAL ENGINEERING – II

Course Outcomes(Cos)

C310.1	The student must be able to understand the various types of shallow foundations and decide on their location based on soil characteristics.
C310.2	The student must be able to compute the magnitude of foundation settlement and decide on the size of the foundation accordingly.
C310.3	The student must be able to use the field test data and arrive at the bearing capacity.
C310.4	The student must be able to apply the principles of bearing capacity of piles and design them accordingly.

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C311	TRAFFIC ENGINEERING

Course Outcomes(Cos)

C311.1	Determine traffic speed, volume, travel time and density.
C311.2	Design traffic signals
C311.3	Determine highway capacity and LOS

C312	ELEMENTS OF CIVIL ENGINEERING

Course Outcomes(Cos)

C312.1	basics of Civil Engineering concepts
C312.2	the surveying the elevations and mapping
C312.3	the construction materials and elements
C312.4	water resource development and
C312.5	overall infrastructure development

C313	ESTIMATION, COSTING AND CONTRACTS LAB

Course Outcomes(Cos)

C313.1	The student should be able to determine the quantities of different components of buildings.
C313.2	The student should be in a position to find the cost of various building components.
C313.3	The student should be capable of finalizing the value of structures.

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C314	REMOTE SENSING & GIS LAB

Course Outcomes(Cos)

C314.1	Work comfortably on GIS software
C314.2	Digitize and create thematic map and extract important features
C314.3	Develop digital elevation model
C314.4	Interpretation and Estimation of features from satellite imagery.

C315	CIVIL ENGINEERING PRACTICE LAB

Course Outcomes(Cos)

C315.1	Introducing practical aspects of Civil Engineering profession to the students
C315.2	Equipping students with the professional knowledge in the design and construction procedures of various Civil Engineering projects
C315.3	Introducing the important codes and by-laws that will benefit young professionals

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PROGRAMME:CIVIL ENGINEERING
JNTUK UNIVERSITY REGULATION R20
FOURTH YEAR COURSES (I & II SEMISTER)
Course Outcome's (Co's)

C406	Universal Human Values: Understanding Harmony

Course Outcomes (Cos)

C406.1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
C406.2	They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
C406.3	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

C407	Urban transportation planning

Course Outcomes (Cos)

C407.1	Estimate travel demand for an urban area
C407.2	Plan the transportation network for a city
C407.3	Identify the corridor and plan for providing good transportation facilities.
C407.4	Evaluate various alternative transportation proposals

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C408	Ground improvement tec hniques

Course Outcomes (Cos)

C408.1	By the end of the course, the student should be able to possess the knowledge of various methods of ground improvement and their suitability to different field situations.
C408.2	The student should be in a position to design a reinforced earth embankment and check its stability.
C408.3	The student should know the various functions of Geo synthetics and their applications in Civil Engineering practice.
C408.4	The student should be able to understand the concepts and applications of grouting.

C409	Mechatronics

Course Outcomes (Cos)

C409.1	To apply the concepts of solid state electronic devices.
C409.2	To identify the components in the design of elector mechanical systems.
C409.3	To apply the concepts of digital electronics and applications of PLCs for control.
C409.4	To understand system interfacing, data acquisition and design of mechatronics systems.

C410	Safety engineering

Course Outcomes (Cos)

C410.1	To understand the concepts of industrial safety and management.
C410.2	To demonstrate the accident preventions and protective equipment.
C410.3	To understand and apply the knowledge of safety acts
C410.4	To have the knowledge about fire prevention and protection systems

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C411	Urban hydrology

Course Outcomes (Cos)

C411.1	develop intensity duration frequency curves for urban drainage systems
C411.2	Develop design storms to size the various components of drainage systems.
C411.3	Apply best management practices to manage urban flooding.
C411.4	Prepare master drainage plan for an urbanized area.

PROJECT

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