



Annamacharya Institute of Technology and Sciences, Tirupati
Department of Civil Engineering Course Outcomes(COs)
AK-20 Regulations



Course Title	Course Outcomes(COs)	
Algebra and Calculus	CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications.
	CO2	Utilize mean value theorems to real life problems.
	CO3	Familiarize with functions of several variables which is useful in optimization.
	CO4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems.
	CO5	Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions
Engineering chemistry	CO1	Understand the disadvantages of using hard water and Select suitable treatments domestically and industrially
	CO2	Understand the electrochemical sources of energy
	CO3	Understand the corrosion prevention methods and factors affecting corrosion
	CO4	Understand the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers.
	CO5	Understand calorific values, octane number, refining of petroleum and cracking of oils
	CO6	Understand the manufacturing of portland cement and concrete formation
	CO7	Summarize the application of SEM, TEM and XRD in surface characterization
	CO1	Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
	CO2	Formulate sentences using proper grammatical structures and correct word forms.
	CO3	Speak clearly on a specific topic using suitable discourse markers in informal discussions.

Communicative English	CO4	Write summaries based on global comprehension of reading/listening texts
	CO5	Produce a coherent paragraph interpreting a figure/graph/chart/table
	CO6	Take notes while listening to a talk/lecture to answer questions
Engineering Workshop Practice	CO1	Apply wood working skills in real world applications.
	CO2	Build different parts with metal sheets in real world applications.
	CO3	Apply fitting operations in various applications.
	CO4	Apply different types of basic electric circuit connections.
	CO5	Demonstrate soldering and brazing.
Problem Solving and Programming	CO1	Introduce the internal parts of a computer, and peripherals.
	CO2	Introduce the Concept of Algorithm and use it to solve computational problems
	CO3	Identify the computational and non-computational problems
	CO4	Teach the syntax and semantics of a C Programming language
	CO5	Demonstrate the use of Control structures of C Programming language
	CO6	Illustrate the methodology for solving Computational problems
Communicative English Lab	CO1	Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
	CO2	Apply communication skills through various language learning activities
	CO3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
	CO4	Evaluate and exhibit acceptable etiquette essential in social and professional settings.
	CO5	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
Engineering Chemistry Lab	CO1	To familiarize the students with the basic concepts of chemistry of materials
	CO2	Prepare advanced polymer materials
	CO3	Measure the strength of an acid present in secondary batteries
	CO4	To familiarize with digital and instrumental methods of analysis
	CO1	Construct a Computer given its parts
	CO2	Select the right control structure for solving the problem

Problem Solving and Programming Lab	CO3	Analyze different sorting algorithms
	CO4	Design solutions for computational problems
	CO5	Develop C programs which utilize the memory efficiently using programming constructs like pointers.
Differential Equations and Vector Calculus	CO1	Apply the mathematical concepts of ordinary differential equations of higher order.
	CO2	Solve the differential equations related to various engineering fields.
	CO3	Identify solution methods for partial differential equations that model physical processes.
	CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.
	CO5	Estimate the work done against a field, circulation and flux using vector calculus.
Engineering Physics	CO1	Explain physics applied to solve engineering problems.
	CO2	Apply the principles of acoustics and ultrasonics in engineering applications.
	CO3	Explains the applications of ultrasonics in various engineering fields.
	CO4	Apply electromagnetic wave propagation in different Optical Fibers and the concepts of lasers in various applications.
	CO5	Explains the concepts of dielectric and magnetic materials and Identify the sensors for various engineering applications
Basics of Electrical & Electronics Engineering	CO1	Apply concepts of KVL/KCL in solving DC circuits
	CO2	Illustrate working principles of induction motor - DC Motor
	CO3	Identify type of electrical machine based on their operation
	CO4	Describe operation and characteristics of diodes and transistors.
	CO5	Make use of diodes and transistors in simple, typical circuit applications.
	CO6	Understand operation of basic op-amp circuits.
Basics of Python Programming	CO1	To learn the fundamentals of Python
	CO2	To elucidate problem-solving using a Python programming language
	CO3	To introduce a function-oriented programming paradigm through python
	CO4	To get training in the development of solutions using modular concepts

	CO5	To introduce the programming constructs of python
Engineering Graphics	CO1	Draw various curves applied in engineering.
	CO2	Show projections of solids and sections graphically.
	CO3	Draw the development of surfaces of solids.
	CO4	Use computers as a drafting tool.
	CO5	Draw isometric and orthographic.
Basics of Electrical & Electronics Engineering Lab	CO1	Verify Kirchoff's Laws & Superposition theorem for dc supply
	CO2	Analyze the performance of AC and DC Machines by testing.
	CO3	Study I – V Characteristics of PV Cell & Perform speed control of dc shunt motor
	CO4	Ability to operate diodes for finding V-I Characteristics.
	CO5	Ability to construct and operate rectifiers without & with filters
	CO6	Ability to construct and operate BJT & FET Characteristics.
Engineering Physics Lab	CO1	Operate various optical instruments and Estimate wavelength of laser and particles size using laser.
	CO2	Estimate the susceptibility and related magnetic parameters of magnetic materials and plot the intensity of the magnetic field of circular coil carrying current with distance
	CO3	Evaluate the acceptance angle of an optical fiber and numerical aperture and determine magnetic susceptibility of the material and its losses by B-H curve
	CO4	Identify the type of semiconductor i.e., n-type or p-type using Hall effect
	CO5	Apply the concepts of sensors for various applications
Basics of Python Programming Lab	CO1	Design solutions to mathematical problems.
	CO2	Organize the data for solving the problem.
	CO3	Develop Python programs for numerical and text based problems.
	CO4	Select appropriate programming construct for solving the problem.
	CO5	Illustrate object oriented concepts.

Constitution of India	CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
	CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
	CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
	CO4	Discuss the Powers and functions of Governor, President, and Judiciary.
	CO5	Discuss the functions of local administration bodies.
Probability & Statistics, Partial differential equations	CO1	Understand the concepts of Central Tendency, Correlation, Regression concepts.
	CO2	Apply discrete and continuous probability distributions
	CO3	Design the components of a classical hypothesis test for large samples.
	CO4	Infer the statistical inferential methods based on small sampling tests.
	CO5	Find the general solution of the PDEs bearing applications
Mechanics of Materials	CO1	Understand the system of forces on bodies.
	CO2	Determine the centroid and moment of inertia for different cross-sections.
	CO3	Understand the concepts of stress, strain, generalized Hooke's law, elastic moduli
	CO4	Develop shear force and bending moment diagrams for different load cases.
	CO5	Compute the slope and deflection of simple beams
Surveying	CO1	Understand basic principles of surveying, Prismatic compass
	CO2	Understand basic concepts of leveling and contouring and Theodolite survey
	CO3	Understand Computation of Areas and Volumes
	CO4	Understand and able to set the curves on field.

	CO5	Understand modern techniques in the survey systems.
Fluid Mechanics	CO1	Understand basic characteristics and behavior of fluids
	CO2	Understand concepts of fluid statics, different equipment and their applications stability of floating bodies
	CO3	Understand fundamentals of fluid kinematics and Differentiate types of fluid flows
	CO4	Understand and apply experiments with different equipments under fluid flow
	CO5	Estimate Energy losses in pipelines and Determine flow characteristics Through closed conduits
Managerial Economics and Financial Analysis	CO1	Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
	CO2	Apply the Concept of Production cost and revenues for effective Business decision
	CO3	Analyze how to invest their capital and maximize returns.
	CO4	Evaluate the capital budgeting techniques.
	CO5	Define the concepts related to financial accounting and management and able to develop the accounting Statements and evaluate the financial performance of business entity.
Strength of Materials Lab	CO1	Determine the properties of material
	CO2	Determine the compressive strength of wood or concrete
	CO3	Examine the Polygon law of Co-planar forces and principle of moments
	CO4	Solve the Reactions at the supports.
	CO5	Determine the bending and deflection of beam
Surveying Lab	CO1	Understand basic principles of plane table surveying and fly leveling.
	CO2	Understand basic concepts of theodolite survey and trigonometric leveling
	CO3	Understand basic concepts of total station
	CO4	Understand the components of simple curve and able to set the curve on field.

	CO5	Understand modern techniques in the survey systems.
Fluid Mechanics Lab	CO1	Verify Bernoulli's theorem
	CO2	Calibrate flow measuring devices such as Venturimeter, orifice meter and notch
	CO3	Determine friction factor in pipes
	CO4	Determine minor losses in the pipes
	CO5	Determination of Coefficient of discharge for orifice and mouth piece
Environmental Studies	CO1	Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
	CO2	Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
	CO3	Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
	CO4	. Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
	CO5	To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting
Mathematical Modeling & Optimization Techniques	CO1	Know about the classifications and stages of mathematical modelling.
	CO2	Understand building of mathematical models.
	CO3	Study the behaviour of mathematical models.
	CO4	Formulate a linear programming problem and solve it by various methods.
	CO5	Give an optimal solution in assignment jobs, give transportation of items from sources to destinations
	CO1	Identify critical planes in two dimensional stress systems

Strength of Materials	CO2	Compute slopes and deflections of beams with different boundary conditions
	CO3	Determine shear stresses for different shapes.
	CO4	Analyze members under torsion, combined torsion and bending moment for determination of energy absorption
	CO5	Determine the Load carrying capacity of column by using different approaches
Hydraulic Engineering	CO1	Understand Laminar Flow and Turbulent flow through plates
	CO2	Understand different formulae on open channel flow and design open-channel flow systems.
	CO3	Understand the concepts of varying flow in pipes and Measure discharge and velocity
	CO4	Understand hydrodynamic force of jets different vanes and design Pelton wheel, Francis and Kaplan turbine
	CO5	Understand principles of centrifugal pumps and Calculate losses and efficiencies of centrifugal pumps
Structural Analysis-I	CO1	Apply energy theorems for analysis of indeterminate structures
	CO2	Analyze indeterminate structures with yielding of supports
	CO3	Analyze beams using slope deflection distribution method
	CO4	Analyze beams using moment distribution methods
	CO5	Analyze the Determinate and Indeterminate trusses
Concrete Technology	CO1	Understand various ingredients of concrete and their role.
	CO2	Examine knowledge on the fresh and hardened properties of concrete
	CO3	Know the engineering properties and non-destructive testing methods of normal concrete.
	CO4	Understand the durability problems and remedial measure in the concrete.

	CO5	Design of concrete mixes using BIS methods.
Universal Human Values	CO1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence
	CO2	. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
	CO3	Strengthening of self-reflection
	CO4	Development of commitment and courage to act
Hydraulic Machinery Lab	CO1	Able to determine minor losses in pipes
	CO2	Understand the concept of formation of hydraulic jump
	CO3	Determine the performance of hydraulic turbine and pumps under different working conditions
Concrete Technology Lab	CO1	Determine the properties of cement as per IS specifications.
	CO2	Determine the properties of aggregates as per IS specifications.
	CO3	Determine the properties of fresh concrete as per IS specifications.
	CO4	Determine the properties of hardened concrete as per IS specifications.
	CO5	Determine the strength of concrete using Rebound hammer method
Computer-aided Civil Engineering Drawing Lab	CO1	Understand the concepts and basics of CAD
	CO2	Understand the building plan elevation and section drawings
	CO3	Understand the building components drawings
Soil Mechanics	CO1	Understand soil formation and determine the index properties of soil
	CO2	Determine the coefficient of permeability and effective stress

	CO3	Estimate stresses under various loading conditions and compaction characteristics.
	CO4	Analyze the compressibility of the soils
	CO5	Understand the strength of soils under various drainage conditions
BUILDING TECHNOLOGY	CO1	Classify and understand the applications of basic building materials.
	CO2	Understand the applications of advanced building materials
	CO3	Explain the principles and methods of construction of building components
	CO4	Understand the building services and principles of building planning.
	CO5	Apply the principles and bye-laws in planning Residential buildings
Engineering Geology	CO1	Understand principles of engineering geology.
	CO2	Understand properties of various rocks and minerals
	CO3	Understand the suitability of sites for various civil engineering structures.
	CO4	Understand geological strata in the analysis and design the civil engineering structures.
	CO5	Understand the concept of remote sensing and GIS.
Sensor Networks	CO1	Understand the concepts of Converters and Sensor data acquisition systems
	CO2	Understand the concepts of Sensor Measurements in Structural Monitoring
	CO3	Understand the concepts of commonly used sensing technologies and algorithms
	CO4	Understand the concepts of Piezoelectric transducers for assessing and monitoring infrastructures

	CO5	Understand the concepts of Fiber optic sensors for assessing and monitoring infrastructures
Operations Research	CO1	Able to create mathematical models of the real-life situations and capable of obtaining best solution using Graphical Method and Simplex Method
	CO2	To implement the theory of duality for simplifying the solution procedure for certain LPPs, and solve the special cases of LPP and Assignment problems
	CO3	Knowledge of choosing the best strategy out of the available strategies which is an essential skill for any business manager to successfully face the competition
	CO4	Able to represent any project in the form of a network and estimate the parameters like Project Completion Time
	CO5	Applying Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems
Management Science	CO1	Understand the concepts & principles of management and designs of organization in a practical world.
	CO2	Apply the knowledge of Work-study principles & Quality Control techniques in industry.
	CO3	Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
	CO4	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
	CO5	Create Modern technology in management science
Structural Analysis - II	CO1	Analyse the behaviour of arches through different methods of analysis
	CO2	Analyze the frames using slope deflection and moment distribution method
	CO3	Analyze the beams and frames using Kani's method
	CO4	Analyze the beams using Matrix method
	CO5	Analyze the beams using plastic analysis

Water Harvesting and Conservation	CO1	Appreciate the importance of movement of ground water
	CO2	Understand the methods of Water Harvesting
	CO3	Understand water recovery and reuse
	CO4	Understand the principles of Watershed Management and its importance in sustainability
	CO5	Understand soil and water conservation
Cost Effective Housing Techniques	CO1	Apply the concept of housing techniques.
	CO2	Understand housing programmes and projects.
	CO3	Understand development and adoption of low cost housing technology
	CO4	Understand low cost housing in rural areas
	CO5	Understand housing in disaster prone areas
Soil Mechanics Lab	CO1	Classify the soil based on IS Code.
	CO2	Determine the index properties of soil.
	CO3	Determine the engineering properties of soil.
Engineering Geology Lab	CO1	Study of physical properties and identification of minerals referred under theory.
	CO2	Megascopic description and identification of rocks referred under theory.
	CO3	Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.
		Simple Structural Geology problems

	CO4	
Professional Ethics And Human Values	CO1	It ensures students sustained happiness through identifying the essentials of human values and skills.
	CO2	The students will understand the importance of Values and Ethics in their personal lives and professional careers.
	CO3	The students will learn the rights and responsibilities as an employee, team member and a global citizen.
	CO4	Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
	CO5	Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life.
ENVIRONMENTAL ENGINEERING	CO1	Identify the water demand and water characteristics.
	CO2	Apply the water treatment concept, methods, water distribution processes and operation.
	CO3	Carry out municipal water and wastewater treatment system operations and determine the sewage characteristics
	CO4	Prepare basic processes of designs of wastewater treatment plants.
	CO5	Design various sewage treatment plants and usage of solid wastes.
Highway Engineering	CO1	Understand the highway development and planning.
	CO2	Understand the geometric design of highway.
	CO3	Understand traffic studies and regulations.
	CO4	Understanding the concept of intersections, interchanges.
	CO5	Understanding the various pavement types and design.
Foundation Engineering	CO1	Understand the principles and methods of Soil Exploration
		Decide the suitability of soils and check the stability of slopes

	CO2	
	CO3	Calculate lateral earth pressures and check the stability of retaining walls
	CO4	Determine the bearing capacity of soil
	CO5	Analyze and design the shallow and deep foundations
Design of Reinforced Concrete Structures	CO1	Understand the basic concepts of reinforced concrete analysis and design.
	CO2	Understand the behaviour of beams.
	CO3	Analyze and design of slabs and staircase
	CO4	Analyze and design of columns
	CO5	Analyze and design of footings
INTELLIGENT TRANSPORTATION SYSTEMS	CO1	Understand the sensor technologies
	CO2	Understand the communication techniques
	CO3	Apply the various ITS methodologies
	CO4	Understand the user needs
	CO5	Define the significance of ITS under Indian conditions
Remote Sensing and GIS	CO1	Understand principles of aerial photography
	CO2	Understand the concept of remote sensing
	CO3	Understand the concept of GIS

	CO4	Analyze the GIS spatial data
	CO5	Apply the concepts of GIS in water resources
STAAD LAB	CO1	Understand basic commands used in STAAD Pro and their applications
	CO2	Analyse the structure for various loading conditions
	CO3	Analyse and design of structural elements for various loading conditions
ENVIRONMENTAL ENGINEERING LAB	CO1	Determine physical, chemical and biological characteristics of water and wastewater
	CO2	Determine optimum dosage of coagulant
	CO3	Assess the quality of water and wastewater
Highway Engineering lab	CO1	Asses properties of highway construction materials