Annamacharya Institute of Technology and Sciences, Tirupati
Department of Electronics and Communication Engineering
Course Outcomes(COs)
AK-19 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.
	CO5	Students will become familiar with 2-dimensional coordinate systems
Applied physics	CO1	Analyze the wave properties of light and the interaction of energy with the matter.
	CO2	Apply electromagnetic wave propagation in different guided media.
	CO3	Asses the electromagnetic wave propagation and its power in different media
	CO4	Analyze the conductivity of semiconductors.
	CO5	Interpret the difference between normal conductor and superconductor and apply the nano materials for engineering
Problem solving and Programming	CO1	Ability to construct his own computer using parts
	CO2	Recognizes the importance of programming language independent constructs
	CO3	Able to solve computational problems
	CO4	Understand the features of C language appropriate for solving a problem
	CO5	Analyze computer programs for real world problems
	CO6	Identifies data which is more appropriate for solving a problem
Communicative English -1	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
	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
Electronics and Communication Engineering Workshop	CO1	Identify discrete components and ICs and Assemble simple electronic circuits over a PCB
	CO2	Disassembling and assembling a Personal Computer and make the computer ready to use CO5:
	CO3	Identify discrete components and ICs and Assemble simple electronic circuits over a PCB
	CO4	Disassembling and assembling a Personal Computer and make the computer ready to use
	CO5	Make use of Office tools for preparing documents
Applied physics Lab	CO1	Analyze the wave properties of light and the interaction of energy with the matter.
	CO2	Apply electromagnetic wave propagation in different guided media.
	CO3	Asses the electromagnetic wave propagation and its power in different media
	CO4	Analyze the conductivity of semiconductors.
	CO5	Interpret the difference between normal conductor and superconductor and apply the nanomaterials for engineering applications.
Problem solving and Programming Lab	CO1	Construct a Computer given its parts (L6)
	CO2	Select the right control structure for solving the problem (L6)
	CO3	Analyze different sorting algorithms (L4)
	CO4	Design solutions for computational problems (L6)
	CO5	Develop C programs which utilize the memory efficiently using programming constructs like pointers.
Communicative English -1 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
Network Theory	CO1	Solve network problems using mesh and nodal analysis techniques
	CO2	Analyze networks using Thevenin, Norton, Maximum power transfer, Superposition, Miller and Millman theorems
	CO3	Compute responses of first order and second order networks using time & frequency domain analysis

	CO4	Design resonant circuits for given bandwidth
	CO5	Utilize z, y, ABCD and h parameters for analyzing two port circuit behavior
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 .
	CO4	Estimate the work done against a field, circulation and flux using vector calculus .
Chemistry	CO1	Understand the behaviour of, and interactions between mater and energy at both the atomic and molecular levels
	CO2	Compare the materials of construction for battery and electrochemical sensors
	CO3	Understand the preparation, properties, and applications of thermoplastics & thermo settings, elastomers & conducting polymers.
	CO4	HPLC and GC methods used for separation of gaseous and liquid mixtures.
	CO5	Understand the disadvantages of using hard water and select suitable treatments domestically and industrially.
Data Structures	CO1	Understand appropriate Data Structure for solving a real world problem
	CO2	Analyze appropriate file organization technique depending on the processing to be done
	CO3	Construct Indexes for Databases
	CO4	Analyze the Algorithms
	CO5	Developing Algorithm for Sorting large files
Engineering Workshop	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.
Engineering Graphics lab	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 drawings using CAD packages.
Network Theory lab	CO1	Verify Kirchhoff's laws and network
	CO2	Measure time constants of RL & RC circuits
	CO3	Analyze behavior of RLC circuit for different cases
	CO4	. Design resonant circuit for given specifications
	CO5	Characterize and model the network in terms of all network parameters
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
Data Structures Lab	CO1	To introduce to the different data structures
	CO2	To elucidate how the data structure selection influences the algorithm complexity
	CO3	To explain the different operations that can be performed on different data structures
	CO4	To introduce to the different search and sorting algorithms.
Transform Techniques and Complex variables	CO1	Compute differentiation and integration of complex functions used in engineering problems
	CO2	Apply the Laplace transform for solving differential equations (continuous systems)
	CO3	Identifying the Fourier series of periodic signals
	CO4	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
	CO5	Develop Z transform techniques for discrete time systems
Basics of Python Programming	CO1	Apply the features of Python language in various real time applications.

	CO2	Analyze appropriate data structure of Python for solving a problem.
	CO3	Design object-oriented programs using Python for solving real-world problems.
	CO4	Apply Modularity to programs
	CO5	Able to understand the programming constructs in python programming
Internet of Things	CO1	Interpret the vision of IOT from a global context.
	CO2	Determine the Market perspective of IOT.
	CO3	Compare and Contrast the use of Devices, Gateways and Data Management in IoT.
	CO4	Implement state of the art architecture in IOT.
	CO5	Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints
Electronic Devices and Circuits	CO1	Understand the operation of diodes and special electronic devices.
	CO2	Know operation of different rectifiers without and filters..
	CO3	Understand construction, operation of BJT, FET in different configurations
	CO4	Know the need of biasing and design of DC biasing circuits..
	CO5	Design of amplifiers with BJTs and FETs by using small signal model
Electromagnetic Theory and Transmission Lines	CO1	Understand basic laws of electric fields and Solve problems related to electric fields
	CO2	Apply laws of magnetic fields and Solve problems related to magnetic fields.
	CO3	Analyze electric and magnetic fields at the interface of different media and derive Maxwell's equations for static and time varying fields
	CO4	Proficient with analytical skills for understanding propagation of electromagnetic waves in different media..
	CO5	Understand the concept of transmission lines & their applications
Signals and Systems	CO1	Understand mathematical description and representation of continuous time and discrete time signals.
	CO2	Resolve signals in frequency domain using Fourier series and Fourier Transforms.
	CO3	Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back

	CO4	Understand the properties of systems, response of LTI systems and filters..
	CO5	Able to analyze LTI systems using Laplace and Z-Transforms
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
Basics of Python Programming Lab	CO1	To train the students in solving computational problems
	CO2	To elucidate solving mathematical problems using Python programming language
	CO3	To understand the fundamentals of Python programming concepts and its applications To understand the object-oriented concepts using Python in problem solving.
	CO4	To train the students in solving computational problems
Electronic Devices and Circuits Lab	CO1	Test and operate diodes and special electronic devices.
	CO2	Construct and operate rectifiers without and with filters
	CO3	Construct and operate BJT, FET in different configurations Test and operate diodes and special electronic deviecs.
	CO4	Design DC biasing circuits for Transistors
	CO5	Design amplifiers using BJTs and FETs.
Internet of Things Lab	CO1	Choose the sensors and actuators for an IoT application.
	CO2	Select protocols for a specific IoT application
	CO3	Utilize the cloud platform and APIs for IoT application.
	CO4	Choose the sensors and actuators for an IoT application.

	CO5	Design a solution for a given IoT application.
Signals and Systems Lab	CO1	Understand basics of MATLAB syntax, functions and programming.
	CO2	Generate and characterize various signals and perform the basic operations.
	CO3	Design and analyze linear time-invariant (LTI) systems and compute its response.
	CO4	Analyze the spectral characteristics of signals using Fourier analysis.
	CO5	Analyze the systems using Laplace transform and Z-transform
Probability and Random Variables	CO1	Able to know the fundamental concepts of Probability theory
	CO2	Analyze continuous and discrete-time random processes
	CO3	Analyze the concepts of a Random Variable and operations that may be performed on a single Random variable
	CO4	Analyze the characterize probability models and function of random variables based on multiple Random variable
	CO5	Understand the concepts of expected Value of a Function of Random Variables and Gaussian Random variables.
Communicative English - 2	CO1	Prioritize information from reading texts after selecting relevant and useful points
	CO2	Paraphrase short academic texts using suitable strategies and conventions
	CO3	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
	CO4	Participate in group discussions using appropriate conventions and language strategies
	CO5	Prepare a CV with a cover letter to seek internship/ job
	CO6	Collaborate with a partner to make presentations and Project Reports
Design Thinking and Product Innovation	CO1	Generate and develop different design ideas.
	CO2	Appreciate the innovation and benefits of design thinking.
	CO3	Develop innovative products or services for a customer base using ideation techniques.
	CO4	Build prototypes for complex problems using gathered user requirements.
	CO5	Improve prototype by testing it with a specific set of users for making it sustainable by following ethics

Control Systems	CO1	Develop the transfer function of Mechanical systems, Electrical systems and Electro mechanical systems.
	CO2	Develop the transfer function using Block Diagram reduction and Signal flow graph technique of LTI systems.
	CO3	Obtain the time domain specifications and error constants of a First order and second order systems.
	CO4	Determine the stability of a linear time invariant systems using Routh criterion, Root locus, Bode plots, polar plots and Nyquist plot.
	CO5	Derive state space model of a given physical system and solve the state equation.
Analog Electronic Circuits	CO1	Understand multi stage amplifiers using BJT and FET.
	CO2	Understand high frequency model and analyze its frequency responses.
	CO3	Understand feedback amplifiers and oscillators along with design.
	CO4	Understand power amplifiers.
	CO5	Understand tuned amplifiers and their effect on bandwidth and stability.
Basics of Civil and Mechanical Engineering	CO1	understand principles of Stress and Strain and able to draw SFD & BMD for simply supported beams and cantilever beams.
	CO2	understand basic principles of Strain Measurement and apply the concepts of Strain Rosettes for strain measurement.
	CO3	understand common building materials used in construction and analyze characteristics of common building materials.
	CO4	Apply velocity ratio concepts in power transmission.
	CO5	Understand the principles of CAD, CAM & CIM. (L.2)
Biology for Engineers	CO1	Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms
	CO2	Explain about bimolecules, their structure, function and their role in the living organisms. How bimolecules are useful in Industry.
	CO3	Brief about human physiology.
	CO4	Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
	CO5	Know about application of biological principles in different technologies for the production of Medicines and pharmaceutical molecules through transgenic microbes, plants and animals.
Digital Electronics and Logic design	CO1	Understand various number systems, Boolean Functions and Logic gates.
	CO2	Apply k-map and Q-M methods to minimize and realize switching functions.

	CO3	Analyze and Design combinational logic circuits	
	CO4	Analyze and Design sequential logic circuits	
	CO5	Analyze and Compare different types of Programmable logic devices.	
Antennas and Wave Propogation	CO1	Apply parametric equations for the calculation of antenna parameters in the far field region.	
	CO2	Identify Loop antenna, helical antenna, horn antenna and its parameters.	
	CO3	Compute Micro-strip antenna, Reflector and Lens antennas and its parameters.	
	CO4	Analyze principle of pattern multiplication for antenna arrays	
	CO5	Explain different modes of Wave propagation in atmospheric layers.	
Analog and Digital Communications	CO1	Describe of various amplitude modulation and demodulation techniques.	
	CO2	Understand various angle modulation and demodulation techniques.	
	CO3	Explain AM, FM Transmitters and Receivers.	
	CO4	Analyze and design the various pulse modulation techniques.	
	CO5	Design various digital carrier modulation techniques and baseband transmission.	
Integrated Circuits and Applications	CO1	Understand the basic building blocks of linear integrated circuits and its characteristics.	
	CO2	Ability to understand feedback amplifiers and analyze its frequency response.	
	CO3	Analyze the linear and non-linear applications of operational amplifiers.	
	CO4	Realize the importance of specialized applications of Operational Amplifier.	
	CO5	Understand the different types of Analog to Digital Converters and Digital to Analog Converters.	
Information Theory and Coding	CO1	Understand the principles behind modeling data and develop data compression algorithms	
	CO2	Analyze and design data compression algorithms for text, speech and image and multimedia	
	CO3	Understand the need for channel coding and design efficient channel coders	
	CO4	Understand multimedia coding techniques.	

	CO5	Recognize error control coding and decoding procedures.
MATLAB Programming	CO1	Understand the MATLAB Desktop, Command and Graph Windows
	CO2	Calculate simple and complex problems using MATLAB
	CO3	Compute Elementary and User defined mathematical functions
	CO4	Perform arithmetic & logical operations and create Plotting
	CO5	Find solutions for various Linear Algebraic equations
Computer System Architecture	CO1	Students should be able to understand instructions and addressing modes of a computer system.
	CO2	Students should be able to Design arithmetic and logic unit.
	CO3	Students should be able to Design and analysis pipelined control units.
	CO4	Students should be able to Understand parallel processing architectures.
	CO5	Students should be able to Evaluate performance of memory systems
Database Management systems	CO1	Design a database for a real-world information system
	CO2	Define transactions that preserve the integrity of the database
	CO3	Generate tables for a database
	CO4	Organize the data to prevent redundancy
	CO5	Pose queries to retrieve the information from the database.
Operating Systems	CO1	Able to use operating systems effectively.
	CO2	Write System and application programs to exploit operating system functionality.
	CO3	Add functionality to the exiting operating systems
	CO4	Design new operating systems
Programmable Logic Controllers	CO1	Understand the purpose, functions, and operations of a PLC and Identify the basic components of the PLC and how they function
	CO2	View a directory of processor files using PLC software and Ability to gain knowledge on Programmable logic controllers

	CO3	Will understand different types of Devices to which PLC input and output modules are Connected and To
	CO4	Able to create ladder diagrams from process control descriptions
	CO5	Ability to apply PLC timers and counters for the control of industrial processes. Able to use different types
Constitution of India	CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of
	CO2	Gandhi in Indian politics.
	CO3	2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of
	CO4	social reforms leading to revolution in India.
	CO5	3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the
Digital Electronics and Logic Design Lab	CO1	Verify the Basic Logic Gates
	CO2	Verify the Universal gates
	CO3	Design combinational logic circuits
	CO4	Design sequential logic circuits
	CO5	Design Sequential Circuits
Analog and Digital Communications Lab	CO1	Generate the characteristics of different analog modulation schemes.
	CO2	Analyze different pulse modulation schemes.
	CO3	Study the characteristics of Multiplexing.
	CO4	Ability to design different digital modulation schemes.
	CO5	Ability to analyze and design digital carrier modulation schemes.
Integrated Circuits and Applications lab	CO1	Understand the basic building blocks of linear integrated circuits and its characteristics.
	CO2	Ability to understand feedback amplifiers and analyze its frequency response.
	CO3	Analyze the linear and non-linear applications of operational amplifiers.
	CO4	Realize the importance of specialized applications of Operational Amplifier.
	CO5	Understand the different types of Analog to Digital Converters and Digital to Analog Converters.

	CO1	Describe the concepts of Intel 8085 series of processors.
	CO2	Discuss various Concepts of 8086.
Microprocessors and Microcontrollers	CO3	Demonstrate the concepts of 8086 instruction set.
	CO4	Program Discriminate the concepts of MSP430x2x Microcontroller series.
	CO5	Summarize different peripherals of MSP430.
	CO1	Interpret, represent and process discrete/digital signals and systems
	CO2	Understand frequency domain analysis of discrete time signals
Digital Signal Processing	CO3	Design & analyze various Analog Filters and Digital Filters
	CO4	Implement and realize various structures IIR and FIR systems
	CO5	Acquire the basics of multi rate digital signal processing
	CO1	Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, Active devices
	CO2	Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and Circuits are characterized in terms of their - ―S‖- Parameters.
Microwave Engineering and Optical communications	CO3	Ability to analyze the operation of Microwave tubes like klystron, magnetron, travelling wave tube and to measure the different parameters of microwave test bench setup.
	CO4	Ability to understand the Optical sources, detectors and their working principle.
	CO5	Ability to analyze the channel impairments like losses and dispersion.
	CO1	Introduce real-time embedded systems
	CO2	Describe the different types of policies.
Real Time operating systems	CO3	Demonstrate the Multi-resource Services techniques.
	CO4	Explain the Embedded System Components.
	CO5	Explain the embedded system design based on availability and reliability.
	CO1	Identify the various IC fabrication methods and Electrical Properties of MOS circuits
VLSI Design	CO2	Design VLSI circuits using design rules
	CO3	Design VLSI circuits at Gate level and Physical level.
	CO4	Can implement circuit through various design styles and verification using VHDL synthesis.

	CO5	Understand testing VLSI circuits and need of LPVLSI
MEMS	CO1	Able to understand the Micro sensors and different material properties
	CO2	Able to understand the micro machine process for different techniques
	CO3	Able to understand the types of Micro sensors
	CO4	Able to understand the MEMS accelerometers functionality and know its applications.
	CO5	Able to know where to use MEMS devices and understand CNT
Principles of Effective Public Speaking	CO1	Apply knowledge of principles, concepts and skills learned in speech preparation.
	CO2	Develop skills in effective listening.
	CO3	Evaluate the delivery of speeches.
	CO4	Develop skills in speech composition.
	CO5	Use supporting materials and presentation aids in speech preparation.
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.
Scripting Languages	CO1	Demonstrate knowledge on web page design elements, dynamic content and database Interaction,
	CO2	Use HTML, JavaScript and PHP technologies for web application development
	CO3	Design client-server applications using Scripting languages.
	CO4	Able to do server side programming with Java Servlets, JSP and PHP.
Neural Networks and Fuzzy logic	CO1	Understand the basic architecture of artificial neural network terminologies and techniques.
	CO2	Understand approaches and architectures of Artificial Intelligence.
	CO3	Perform the training of neural networks using various learning rules.
	CO4	Create different neural networks of various architectures both feed forward and feed backward.
	CO5	Application of ANN to System Identification and Pattern recognition.
Advanced Optics	CO1	Analyze the wave properties of light.
	CO2	Interpret the interaction of energy with matter.
	CO3	Analyze the semiconductor photo devices.
	CO4	Interpret structural spectroscopic techniques.
	CO5	Analyze NMR and ESR spectra.
Materials Chemistry	CO1	Student should be able to understand the grain boundaries, properties, grain size measurement and types of solid solutions.
	CO2	Student should be able to understand in detail about one component and binary component system
	CO3	Ability to know about composite materials, preparation of metal powders.
	CO4	Ability to understand Chemical analysis and different types of spectroscopic techniques.

	CO5	Student should be able to understand in detail about material structure, crystal defects
Microprocessors and Micro controllers lab	CO1	To apply the assembly language instructions of 8086 microprocessor to describe the concept of programming and its applications to real world.
	CO2	To demonstrate the steps in executing an assembly language program using an assembler.
	CO3	Understand concepts of MSP 430 Controllers
	CO4	Program MSP 430 for designing any basic Embedded System
	CO5	Design and implement some specific real time applications Using MSP 430 low power microcontroller.
Digital signal processing lab	CO1	Generate various standard discrete time signals /sequences.
	CO2	Perform basic operations on discrete time signals
	CO3	Compute Fourier Transform of discrete time/digital signal
	CO4	Design & analyze various Butterworth & Chebyshev Analog Filters
	CO5	Design & analyze various IIR & FIR Digital Filters