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

Course Title	Course Outcomes (COs)	
Algebra and Calculus	CO1	Apply the matrix algebra techniques for solving various linear equations.
	CO2	Analyze the linear transformations of quadratic forms and mean value theorems.
	CO3	Apply the fundamental concepts of partial derivatives for multi variable functions.
	CO4	Evaluate the multiple integrals in cartesian, polar, cylindrical, and spherical co-ordinate systems.
	CO5	Evaluate the improper integrals using special functions like Beta and Gamma
Applied physics	CO1	Understand the properties of light and electromagnetic waves.
	CO2	Analyze the fundamentals of Lasers and optical fibers.
	CO3	Analyze the properties of dielectric and magnetic materials.
	CO4	Analyze the charge carrier dynamics in semiconductors by implementing the equations of state.
	CO5	Apply the basic concepts of superconductors and nano materials for engineering problems.
Communicative English	CO1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (Listening and Writing)
	CO2	Apply grammatical structures to formulate sentences and correct word forms (Grammar)
	CO3	Analyze discourse markers to speak clearly on a specific topic in informal discussions (Speaking)
	CO4	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts. (Reading and Writing)
	CO5	Create a coherent paragraph interpreting a figure/graph/chart/table (Writing)
Engineering Workshop Practice	CO1	Understand workshop tools and operational capabilities.
	CO2	Apply wood working skills to prepare different joints.
	CO3	Apply sheet metal operations to prepare different components in real world applications.
	CO4	Apply fitting operations for various applications.
	CO5	Apply basic electrical engineering knowledge for house wiring practice.
Problem Solving and Programming	CO1	Understand the Programming and Algorithms concepts to Perform Basic operations.
	CO2	Apply the problem-solving approaches to generate different algorithms.

	CO3	Understand the various operators to perform mathematical operations.
	CO4	Apply the Pointers and Array Techniques to manipulate the data.
	CO5	Analyze the Sorting and Searching Techniques to arrange the data in sorted order
Communicative English Lab	CO1	Evaluate the awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
	CO2	Understand the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.
	CO3	Apply the knowledge of vocabulary and skills in various language learning activities.
	CO4	Analyze the speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
	CO5	Evaluate the acceptable etiquette essentials in social and professional presentations.
Applied Physics Lab	CO1	Analyze the properties of light for solving engineering problems.
	CO2	Understand the basic concepts of electromagnetic induction.
	CO3	Evaluate the crystallite size using X-ray diffraction.
	CO4	Analyze the basic properties of dielectric and magnetic behavior of the given material.
	CO5	Evaluate the basic parameters of a given semiconductor material.
Problem Solving and Programming Lab	CO1	Analyze the basics of computer and concepts of C for writing simple programs.
	CO2	Analyze the control statements for solving the problems using C
	CO3	Design the algorithm for implementing complex problems using C.
	CO4	Analyze the arrays to store and retrieve the elements.
	CO5	Apply the different sorting techniques for solving real world problems.
Differential Equations and Vector Calculus	CO1	Analyze the mathematical concepts of ordinary differential equations of higher order.
	CO2	Apply the methods of linear differential equations related to various engineering problems.
	CO3	Analyze the partial differential equations of first and higher order.
	CO4	Understand the vector differential operators such as gradient, curl, divergent.
	CO5	Evaluate the vector integral theorems by using line, surface, and volume integrals.
	CO1	Understand the interaction of energy levels between atoms and molecules
	CO2	Apply the electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors

Chemistry	CO3	Analyze the preparation and mechanism of polymers
	CO4	Analyze the separation of gaseous and liquid mixtures using instrumental methods
	CO5	Apply the purification technique to remove hardness of water and to check the quality of water
Network Theory	CO1	Understand the fundamental concepts and operational analysis of electrical circuits.
	CO2	Apply the different network theorems for electrical circuits to study its properties.
	CO3	Evaluate the transient response of R-L, R-C and R-L-C circuits.
	CO4	Analyze the Resonance and Coupled circuit properties in steady state domain.
	CO5	Evaluate two port network parameters and Pole-Zero location from transfer function
Data Structures	CO1	Understand the basic concepts of an Algorithm to measure its performance
	CO2	Apply the Linear Data Structure to arrange the data in memory
	CO3	Apply the Non-Linear Data Structure to organize the data in hierarchical structure
	CO4	Evaluate the real time problems using graphs and hashing techniques
	CO5	Apply the File handling and sorting methods to rearrange the data.
Engineering Graphics	CO1	Understand the quadrant system to locate the position of points and projection of lines
	CO2	Analyze the projection of planes as well as solids located in quadrant system
	CO3	Analyze the sectional views and development of surfaces of regular solids
	CO4	Apply orthographic and isometric projections concepts to construct the given object.
	CO5	Understand the quadrant system to locate the position of points and projection of lines
Network Theory Lab	CO1	Apply the KVL, KCL, Mesh and Nodal analysis for the electrical circuits.
	CO2	Apply the different Network theorems for the electrical circuits.
	CO3	Evaluate the parameters of RL, RC and RLC circuits under different damping conditions.
	CO4	Analyze the frequency response RL, RC and RLC circuits to find f_O, Bandwidth and Q-factor.
	CO5	Evaluate the Z, Y, Transmission and Hybrid parameters of two port network.
Chemistry Lab	CO1	Analyze the hardness of ground water sample.
	CO2	Apply the internal and external indicators in volumetric analysis.
	CO3	Analyze the preparation and applications of advanced polymer materials.

	CO4	Apply the electro analytical technique to measure the strength of acids.
	CO5	Analyze the mixture of components by chromatographic techniques.
Data Structures Lab	CO1	Apply the sorting and searching algorithms using suitable data structure
	CO2	Design the algorithms to solve real time problems using Linked lists
	CO3	Design the solutions for computational problems using stacks and queues
	CO4	Evaluate the operations of breadth first search using queues
	CO5	Design the algorithms to perform operations on trees and graphs
Constitution of India	CO1	Understand the historical background of the Constitution making and its importance for building a democratic India.
	CO2	Remember the basic features of Indian Constitution
	CO3	Understand the fundamental rights and duties for becoming a good citizen of India.
	CO4	Understand the Powers and functions of Governor, President, and Judiciary.
	CO5	Understand the functions of local administration bodies.
Transform Techniques and Complex Variables	CO1	Apply the Laplace transform techniques for solving differential equations.
	CO2	Evaluate the Fourier series of periodic signals and half range series.
	CO3	Apply the Fourier series and Fourier transforms for continuous functions.
	CO4	Apply the Z -transform techniques for solving discrete functions.
	CO5	Analyze the differentiation and integration of complex functions used in engineering fields.
Electronic Devices and Circuits	CO1	Understand the characteristics of PN junction diode and special electronic devices.
	CO2	Analyze the construction and operation of three rectifiers using without and with filters.
	CO3	Evaluate the transistor parameters from its characteristics in three configurations.
	CO4	Understand transistor biasing methods and thermal stabilization concepts.
	CO5	Analyze the transistor amplifier using h-parameter models for three configurations.
Switching Theory and Logic Design	CO1	Understand the fundamentals of number systems, Boolean algebra and Logic Gates
	CO2	Apply the minimization techniques to Boolean expressions using K-Map and Tabulation Methods

	CO3	Analyze the design procedure of combinational logic circuits by using Logic gates
	CO4	Analyze the design procedure of sequential logic circuits by using Flip-Flops
	CO5	Analyze the semiconductor memories and realization of Programmable Logic Devices.
Signals and Systems	CO1	Understand the representation of continuous time and discrete time signals
	CO2	Analyze the signals in frequency domain using Fourier series and Fourier Transforms
	CO3	Apply the Sampling theorem to convert continuous time signals into discrete time signals
	CO4	Analyze the properties of systems and characteristics of LTI systems
	CO5	Evaluate Continuous Time and Discrete Time LTI systems by using Laplace and Z-Transforms.
Managerial Economics and Financial Analysis	CO1	Understand the fundamentals of managerial economics and demand concept.
	CO2	Understand the production and cost concepts to optimize the output
	CO3	Analyze the price output relationship in different markets.
	CO4	Evaluate the capital budgeting techniques to invest in various projects.
	CO5	Analyze the accounting statements to evaluate the financial performance of business entity
Electronic Devices and Circuits Lab	CO1	Analyze V-I characteristics of PN Diode, Zener diodes, SCR and UJT.
	CO2	Evaluate the parameters of Rectifiers with and without filters.
	CO3	Evaluate the parameters from the characteristics of BJT and FET in different configurations.
	CO4	Analyze the operation of DC biasing circuits of Transistors.
	CO5	Analyze the frequency response of amplifiers using BJT and FET.
Signals and Systems Lab	CO1	Analyze the generation of various standard signals and basic operations between them.
	CO2	Analyze the spectrum of a periodic and aperiodic signals using FS and FT respectively.
	CO3	Apply the Linearity and Time Invariant properties to test a continuous/discrete time system.
	CO4	Analyze the process of sampling a Continuous Time signal to get a Discrete Time signal.
	CO5	Evaluate the filters response for speech signal, removal of noise, and waveform synthesis.
Switching Theory and Logic Design Lab	CO1	Understand the operation of different logic gates using relevant IC's.

	CO2	Analyze the operation of different combinational logic circuits.
	CO3	Analyze the operation of various flip flops
	CO4	Design various shift registers using sequential logic circuits
	CO5	Design Synchronous and Asynchronous counters using Flip-Flops.
Electronic circuit design (SOC)	CO1	Understand the procedure for identifying different electronic components
	CO2	Analyze the design of clipping, clamping and rectifiers circuits using diodes.
	CO3	Analyze the power supply requirements and power losses in electronic products.
	CO4	Understand the fabrication process and design considerations of Printed Circuit Board.
	CO5	Evaluate an electronic circuit over Printed Circuit Board under mini project
Biology for Engineers	CO1	Understand the structure of cells and basics in living organisms
	CO2	Understand the importance of various biomolecules and enzymes in living organisms
	CO3	Analyze the functioning of physiology in respiratory system and digestive system.
	CO4	Understand the DNA technology and gen cloning in living organisms.
	CO5	Apply the biological principles in different technologies for the production of medicines and pharmaceuticals
Basics of Python Programming	CO1	Understand the Basic concepts of python programming to build scripts in IDLE.
	CO2	Apply the modularity techniques to invoke user defined functions.
	CO3	Apply the concept of Strings and Lists to perform iterative operations on data.
	CO4	Apply the Mutable and Immutable data types to perform python Programs.
	CO5	Understand the concepts of expected Value of a Function of Random Variables and Gaussian Random variables.
Probability Theory and Stochastic Process	CO1	Understand the Basics of Probability and Random Variables.
	CO2	Analyze the concepts of Multiple Random Variables and their operations.
	CO3	Analyze the Temporal Characteristics of Random Process
	CO4	Analyze the Spectral Characteristics of Random Process.
	CO5	Evaluate the Response of Linear System with Random Inputs
Electromagnetic Theory and Transmission Lines	CO1	Understand the vector algebra and electrostatic fields using coulomb's law and Gauss law.

	CO2	Understand the concept of magneto static fields using BIOT-Savart's law and Ampere's circuit law.
	CO3	Apply the maxwell's equations for time varying fields in different boundary conditions.
	CO4	Analyze the propagation of electromagnetic waves in conductors and dielectric media.
	CO5	Understand the concepts of transmission line parameters and its applications.
Analog Communication Systems	CO1	Understand the elements of communication systems and amplitude modulation.
	CO2	Analyze the angle modulation & demodulation methods in time and frequency domains.
	CO3	Evaluate the performance of analog communication systems in the presence of different types of noise.
	CO4	Analyze various pulse analog modulation schemes and parameters of radio receivers.
	CO5	Apply the fundamental concepts of information theory to communication channel.
Electronic Circuit Analysis	CO1	Understand the multi stage amplifiers and high input resistance amplifiers using BJT and FET.
	CO2	Apply the hybrid Π model for transistor amplifiers at high frequencies
	CO3	Evaluate the parameters of feedback amplifier and frequency of oscillators.
	CO4	Understand the large signal amplifiers and thermal stabilization concepts
	CO5	Analyze the tuned amplifiers and effect on bandwidth while cascading tuned amplifiers.
Basics of Python Programming Lab	CO1	Understand the multi stage amplifiers and high input resistance amplifiers using BJT and FET.
	CO2	Apply the hybrid Π model for transistor amplifiers at high frequencies
	CO3	Evaluate the parameters of feedback amplifier and frequency of oscillators.
	CO4	Understand the large signal amplifiers and thermal stabilization concepts.
	CO5	Analyze the tuned amplifiers and effect on bandwidth while cascading tuned amplifiers.
Analog Communication Systems Lab	CO1	Analyze the Analog modulation and demodulation methods in time domain.
	CO2	Evaluate the characteristics of mixer, pre-emphasis and de-emphasis.
	CO3	Evaluate the performance of various analog pulse modulation schemes.
	CO4	Analyze the selectivity, sensitivity and fidelity parameters of radio receiver

	CO5	Analyze the parameters of Half wave dipole and loop antenna using radiation pattern.
Electronic Circuit Analysis Lab	CO1	Analyze the frequency response of multistage amplifier and high input resistance amplifier.
	CO2	Evaluate the Parameters of feedback amplifiers with and without feedback
	CO3	Analyze the steps in the design of LC &RC oscillators.
	CO4	Evaluate the conversion efficiency of class A and class B power amplifiers.
	CO5	Evaluate the performance of single and double tuned amplifiers.
Internet of things (SOC)	CO1	Understand the characteristics and functionality of IoT.
	CO2	Analyze the characteristics and applications of various sensors
	CO3	Apply different enabling technologies for Arduino IDE.
	CO4	Analyze the different electronic components in Development Boards.
	CO5	Create an IOT application as a mini project.
Universal Human values	CO1	Understand the essentials of human values, self-exploration, happiness and prosperity for value added education.
	CO2	Analyze the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.
	CO3	Apply the nine universal human values in relationships for harmony in the family and orderliness in the society.
	CO4	Evaluate the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.
	CO5	Apply the holistic understanding of harmony on professional ethics through augmenting universal human order.
Antennas and Wave Propagation	CO1	Understand the fundamentals of Antenna Parameters.
	CO2	Analyze the working principles of Loop, Yagiuda, Helical and Horn antenna
	CO3	Analyze the working principles of Micro-strip antenna, Reflector, Lens antennas and its parameters.
	CO4	Analyze the Principles of Antenna Arrays and Measurements using pattern multiplication.
	CO5	Understand Different Modes of Wave propagation in Atmospheric Layers.
Digital Communication Systems	CO1	Understand the concepts of various digital pulse modulation methods.
	CO2	Analyze the performance of base band pulse transmission using signaling schemes.
	CO3	Apply the signal representation and error probabilities in receivers.
	CO4	Apply the digital modulation techniques for pass band data transmission.

	CO5	Evaluate the error detection and error correction using Block code and Convolutional code.
	CO1	Understand the basic building blocks of operational amplifiers and its characteristics
	CO2	Analyze the frequency response of different feedback amplifiers using Operational amplifiers.
Integrated Circuit Analysis	CO3	Analyze the linear and nonlinear applications and filter design using operational amplifiers
	CO4	Understand the oscillators and specialized applications using op amps and 555 IC Timer respectively
	CO5	Analyze the Analog to Digital Converters and Digital to Analog Converters using Op amp.
	CO1	Understand the basic concepts of Operating Systems and its services.
	CO2	Apply the concepts of process synchronization and CPU scheduling by drawing Gantt chart
Operating Systems	CO3	Analyze the methods to handle deadlock and memory management
	CO4	Evaluate the various disk scheduling algorithms and file system interfaces
	CO5	Understand the issues and goals of protection various security
	CO1	Understand the purpose, functions, and operations of a PLC and identify the basic
	CO2	Components of the PLC and how they function.
Programmable Logic Controllers	CO3	Analyze the directory of processor files using PLC software.
	CO4	Understand the different types of devices to which PLC input and output modules are connected and various types of PLC registers.
	CO5	Create the ladder diagrams from process control descriptions.
	CO1	Understand the mathematical modelling and transfer function of physical systems.
	CO2	Apply time response analysis to first order systems &controllers and their stability.
Control Systems	CO3	Analyze the stability of a system using Routh-Hurwitz criteria and root locus.
	CO4	Evaluate the stability of a system using Bode and Nyquist plot methods.
	CO5	Apply state space analysis to study response of continuous system.
	CO1	Understand the IC fabrication Process and electrical properties of MOS Circuits.
VLSI Design	CO2	Analyze the scaling parameters of Metal Oxide Semiconductor (MOS) circuits.
	CO3	Analyze a Gate-level VLSI circuits using stick diagrams and layouts with design rules.

	CO4	Analyze a VLSI circuits at Physical-level through various VLSI design styles and methods.
	CO5	Evaluate the VLSI circuits using VHDL synthesis and Design Tools.
Computer Organization	CO1	Understand the operational concepts and instruction set related to modern processors.
	CO2	Evaluate the Arithmetic operations for understanding execution process.
	CO3	Understand the hardware requirements of primary and secondary memories to store the data.
	CO4	Analyze the Input / Output interfaces to connect multiple devices.
	CO5	Apply the pipeline concepts to execute parallel tasks
Digital System Design	CO1	Understand the different Logic families and its interfacing
	CO2	Analyze different applications by understanding VHDL Programming
	CO3	Analyze different combinational circuits and its logic
	CO4	Analyze different sequential circuits by using logical concepts.
	CO5	Apply Various VHDL programming models on digital circuit designs
Digital Communication Systems Lab	CO1	Analyze the process of transmission and receiving of signals using Time division multiplexing.
	CO2	Evaluate the performance of pulse code modulation and demodulation schemes.
	CO3	Analyze performance of Delta modulation and demodulation systems.
	CO4	Apply Frequency shift keying method for modulation and demodulation of digital signals.
	CO5	Apply Phase shift keying method for modulation and demodulation of digital signals.
Integrated Circuit Analysis Lab	CO1	Analyze the characteristics of negative feedback, regenerative feedback and ICs.
	CO2	Evaluate the performance of summing, subtracting and instrumentation amplifiers using op-amps.
	CO3	Evaluate the steps in the design of Analog filters for the given specifications.
	CO4	Analyze the performance of DC-DC Converter and Function Generator.
	CO5	Analyze the performance of Voltage Controlled Oscillator, Phase Locked Loop and Regulator.
Principles of Effective Public Speaking	CO1	Apply the knowledge of principles, concepts and skills learned in speech preparation.
	CO2	Analyze the techniques of knowing audiences and in refining the speech
	CO3	Understand the listening skills and styles in effective listening.
	CO4	Analyze the diverse methods of speech in speech composition
	CO5	Apply the supporting materials and presentation aids in speech

		preparation.
Professional Ethics and Human Values	CO1	Understand the sustained happiness through identifying the essentials of human values and skills.
	CO2	understand the importance of Values and Ethics in their personal lives and professional careers.
	CO3	Understand the rights and responsibilities as an employee, team member and a global citizen.
	CO4	Understand the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
	CO5	Understand appropriate technologies and management patterns to create harmony in professional and personal life.
Microprocessors and Microcontrollers	CO1	Understand the basic concepts of 8085 architecture and Instruction set
	CO2	Understand the architecture details of 8086 processor.
	CO3	Apply various Instructions in assembly language programs by using 8086 Instruction set.
	CO4	Analyze the architectural features of different MSP 430 family processors.
	CO5	Evaluate the operational behavior of peripheral devices by using low power modes
Digital Signal Processing	CO1	Analyze the discrete time signals and systems in time and frequency domains.
	CO2	Apply the Fast Fourier Transform algorithms for efficient computation of DFT.
	CO3	Analyze the steps in the design of analog and digital filters for the given specifications
	CO4	Evaluate the realizations of digital IIR and FIR filters by using various structures.
	CO5	Analyze the interpolation and decimation in multirate digital signal processing and applications
Microwave and Optical Communications	CO1	Understand the different fields in rectangular waveguides and principles of Gunn diode.
	CO2	Evaluate S parameters of different waveguide components.
	CO3	Analyze the operation of O type tubes and measure different parameters of microwave test bench setup.
	CO4	Understand the fundamental concepts of Optical fibre modes in various configurations
	CO5	Analyze the types of Optical sources, detectors, Fiber joining techniques and fibre components.
Low Power VLSI Circuits and Systems	CO1	Understand the concepts of low power for VLSI circuits and their Design methodologies.
	CO2	Understand the characteristics of MOS Inverters and MOS combinational circuits.
	CO3	Evaluate the sources of power dissipation and supply voltage scaling using different scaling approaches.
	CO4	Analyze various switched capacitance minimization techniques of VLSI Circuits using system level Approaches
	CO5	Analyze various Leakage power minimization techniques in VLSI circuits using CAD Tools
MEMS and Micro Systems	CO1	Understand the Micro sensors and different material properties

	CO2	Apply different techniques in Micro machine processes.
	CO3	Analyze various characteristics in different types of Microsensors
	CO4	Analyze MEMS accelerometers functionality and its applications.
	CO5	Apply MEMS devices in various applications.
Industrial Electronics	CO1	Review of semi-conductors and the operation of Diodes
	CO2	Understand the operation of Semiconductor Devices.
	CO3	Analyze the characteristics of various Rectifiers and Voltage regulator circuits
	CO4	Analyze the techniques of Heating and Welding methods.
	CO5	Apply Ultrasonic waves in various Industrial applications
Microprocessors and Microcontrollers Lab	CO1	Understand the execution of assembly language program using MASM software
	CO2	Evaluate Arithmetic and Logical operations using 8086 processor.
	CO3	Evaluate sorting and string operations using 8086 processor.
	CO4	Analyze interfacing of various I/O devices using MSP 430.
	CO5	Analyze MSP 430 operations in various Low power modes.
Digital Signal Processing Lab	CO1	Analyze the power or energy of a discrete time sequence.
	CO2	Evaluate the convolution and correlation of discrete time sequences.
	CO3	Apply the Fourier Transform to discrete time sequences for finding its spectrum.
	CO4	Analyze the steps in the design of analog filters for the given specifications.
	CO5	Analyze the steps in the design of digital filters for the given specifications
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

MWOC lab	CO1	Analyze the Characteristics of Reflex Klystron

	CO2	Evaluate the V-I Characteristics of Gunn Diode
	CO3	Analyze the performance of Reflex Klystron using Directional Coupler, Fixed and Variable Attenuator.
	CO4	Evaluate the parameters of LED and LASER from its V-I characteristics.
	CO5	Evaluate the parameters of Analog and Digital Optical Fiber Communication link.
Basics of Cloud Computing	CO1	Understand the various basic concepts related to cloud computing technologies.
	CO2	Understand the cloud architecture and service delivery models
	CO3	Analyze the need for cloud service providers in a cloud environment.
	CO4	Design the various virtualization tools such as Virtual Box, VMware workstation.
	CO5	Analyze the security issues in cloud services and disaster management
Environmental Science	CO1	Understand the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.
	CO2	Understand the ecosystem and biodiversity to solve complex environmental problems
	CO3	Apply the various types of pollution, solid waste management, and related preventive measures
	CO4	Apply the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.
	CO5	Analyze the population explosion and impact of environmental health issues on human being.
Pattern Recognition and Applications	CO1	Understand the concepts of pattern recognition system for Differential approaches
	CO2	Analyze the statistical pattern recognition using supervised and unsupervised learning.
	CO3	Understand the grammars and graphical approaches for syntactic pattern recognition.
	CO4	Analyze the pattern preprocessing clustering techniques using feature selection.
	CO5	Evaluate the different real time applications through pattern recognition techniques
Digital Image Processing	CO1	Understand the fundamental concepts of digital image processing
	CO2	Analyze the images in frequency domain using image transforms
	CO3	Apply the techniques for image enhancement in spatial and frequency domains
	CO4	Analyze various image restoration and image segmentation techniques
	CO5	Evaluate different coding methods for image compression to save memory & bandwidth.

Adaptive Signal Processing	CO1	Understand device filtering solutions for optimizing the cost function indicating error in estimation of parameters and appreciate the need for adaptation in design.
	CO2	Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters of stationary random process clearly considering practical application specifications.
	CO3	Analyze convergence and stability issues associated with adaptive filter design and come up with optimum solutions for real life applications taking care of requirements in terms of complexity and accuracy.
	CO4	Analyze Multipath communication channel and synthesis of FIR digital filter.
	CO5	Design filtering solutions for applications such as channel equalization, interference cancelling and prediction considering present day challenges.
Television Engineering	CO1	Understand different modules present in the TV transmitter and receiver with their design considerations.
	CO2	Analyze essentials of Television cameras and Color picture tube
	CO3	Understand different modules present in the Monochrome TV receiver and IF subsystem.
	CO4	Understand the concepts of Color signal decoding.
	CO5	Analyze the functioning of modern televisions system such as direct to home satellite TV, digital TV receiver, digital terrestrial TV.
Electronic Measurement and Instrumentation	CO1	Understand the basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on
	CO2	Understand the working of CRO for measuring voltage, current, resistance, frequency and so on
	CO3	Analyze the working of advanced instruments such as wave analyzer and spectrum analyzers.
	CO4	Apply the Principles of measurements associated with different bridges
	CO5	Analyze Electrical Parameters using advanced Electrical and Mechanical Transducer
Sensors and IoT	CO1	Understand the concepts of data converters and sensor data acquisition systems
	CO2	Understand the concepts of various sensing technologies.
	CO3	Analyze the basics of IoT and enabling technologies.
	CO4	Design basic IoT applications using Arduino
	CO5	Design IoT applications using Raspberry Pi
RF Integrated Circuits	CO1	Analyze the working of RLC networks and Transmission lines at Radio frequencies.
	CO2	Evaluate the parameters of various high frequency amplifiers.
	CO3	Analyze the different types of Noises and operations of various Mixer circuits.

	CO4	Evaluate the efficiency of RF power amplifiers and frequency of Oscillators.
	CO5	Understand the concepts of frequency synthesis and radio architectures
Radar Systems	CO1	Understand the factors affecting the Radar performance using Radar range equation.
	CO2	Analyze the Analyze the principles of continuous Wave Radar and FM-CW Radar.
	CO3	Analyze the performance of Moving Target Indicator and Pulse Doppler Radars.
	CO4	Evaluate the Principles of Tracking methods with Radars for range, acquisition and patterns.
	CO5	Apply the matched filter concepts for detection of Radar signals in the presence of RADAR
Satellite Communications	CO1	Understand the principles of satellite communication and its architecture.
	CO2	Analyze various aspects related to satellite systems
	CO3	Analyze the effects on satellite communication.
	CO4	Design of Satellite link for specified parameters.
	CO5	Apply Various modulation and multiple access schemes in satellite communication
Wireless Communications	CO1	Understand the effective bandwidth utilization to accommodate large number of mobile users by using various accessing techniques.
	CO2	Analyze networking considerations, practical networking approaches with mobile data services.
	CO3	Understand WAP architecture and services, WML scripts.
	CO4	Analyze the protocols used in wireless LAN technologies.
	CO5	Apply Various services in mobile data networks and HIPER LAN.
Computer Networks	CO1	Understand the basics of data communications and networking by using OSI model.
	CO2	Apply the Data link Layer functionalities to solve real world problems.
	CO3	Analyze the various routing algorithms and protocols.
	CO4	Analyze the Transport Layer services by using TCP and UDP protocols.
	CO5	Understand the various services protocols offered by application layer.
Neural Networks and Fuzzy logic	CO1	Understand the evolution and basic architecture of artificial neural networks.
	CO2	Analyze various learning process of Artificial Neural Networks.
	CO3	Analyze various learning rules used to train neural networks to produce desired results.

	CO4	Understand basic fuzzy logic operations and properties.
	CO5	Apply fuzzy logic control operations to real world applications.
Bio Medical Instrumentation	CO1	Understand the Cell structure of the heart, lungs, blood circulation and Respiratory systems.
	CO2	Apply various sensing and measurement devices of electrical origin.
	CO3	Analyze various electrical parameters and electrical safety in medical environment.
	CO4	Analyze the modern methods of Imaging techniques and Biometric systems.
	CO5	Understand various Medical Assistance/techniques, Robotic and Therapeutic equipment.
Database Management systems	CO1	Understand the fundamentals of databases to design relational models.
	CO2	Apply the SQL and PL/SQL concepts to formulate queries.
	CO3	Apply the E-R model for data base design of real-world applications.
	CO4	Analyze the query processing and optimization for data manipulation.
	CO5	Analyze the concurrent transactions and recover systems to prevent data loss in system crash.
Computer System Architecture	CO1	Understand the basic structure of computers and data representations.
	CO2	Understand the register transfer language concepts and micro-operations.
	CO3	Analyze the central processing unit and various computer Arithmetic operations.
	CO4	Analyze various memory systems and input and output organizations.
	CO5	Understand the basics of pipelining, vector and array processing of multiprocessors
Robotics	CO1	Understand the concepts and functioning of industrial robots
	CO2	Analyze the motion analysis of manipulators of in different movements for industries
	CO3	Apply the polynomial equations for path planning in industries
	CO4	Understand the actuators and feedback components
	CO5	Understand the applications of robots in manufacturing sector.
Embedded systems and UAV Lab (SOC)	CO1	Understand the fundamental concepts of embedded systems.
	CO2	Understand the architectural features of TM4C Embedded Processor
	CO3	Analyze the different configurations of TM4C by programming
	CO4	Understand the fundamental concepts of Unmanned Aerial Vehicle
	CO5	Design Various applications using Unmanned Aerial Vehicle.