LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

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R20 Course Articulation Matrices :: Dept of ECE

I-Semester

20EE01 Basic Electrical Engineering

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Illustrate** the behavior of active and passive components, series and parallel circuits, self and mutual inductance of magnetic circuits, network functions and two port networks using circuit and mathematical approaches.(Understand – L2)	2	1	-	-	-	-	-	-	-	1	-	-	-	-	2
CO2	**Interpret** the working principles of AC and DC machines along with grounding and earthing using electrical engineering fundamentals and mathematical approaches.(Understand – L2)	2	1	1	1	-	-	-	-	-	1	-	-	-	-	2
CO3	**Apply** mesh analysis, nodal analysis and network theorems to solve Thevenin's voltage, Norton's current and maximum power transfer of the linear circuits. (Apply – L3)	3	3	1	1	-	-	-	-	-	1	-	-	-	-	2
CO4	**Analyze** the concepts of bandwidth, quality factor of series and parallel resonant circuits using circuit and mathematical approaches.(Analyze – L4)	3	2	1	1	-	-	1	-	-	1	-	-	-	-	3

20EE51 Basic Electrical Engineering Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Interpret** the behavior of passive components of electrical circuits, inductance of magnetic circuits, two port networks and principle of DC machines using fundamental electrical laws and mathematical models.**(Understand – L2)**	3	2	1	1	-	-	-	-	-	2	-	-	-	-	2
CO2	**Apply** Kirchhoff's laws, Network theorems to verify the linear electrical circuits using fundamental electrical laws and mathematical equations.**(Apply – L3)** .	3	3	1	1	-	-	-	-	-	2	-	-	-	-	2
CO3	**Examine** the active & reactive powers of single phase electrical circuits and resonant frequency, bandwidth & quality factor of electrical circuits.(Apply – L3)	3	2	1	1	-	-	-	-	-	2	-	-	-	-	3
CO4	Adapt effective Communication, presentation and report writing skills.**(Apply – L3)**	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-

20EC01 Electronic Devices and Circuits

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Identify** the types of Diodes, Transistors, FETs, Biasing techniques and their comparisons to select the best approaches for designing the electronic circuits using Devices and components.(Apply – L3)	2	3	1	-	-	3	1	-	-	-	1	2	-	1	-
CO2	**Interpret** the mathematical models of Currents and Voltages of Diodes, Bipolar Junction Transistors and Field Effect Transistors and biasing of BJT and FET using fundamental circuits.(Understand – L2)	2	1	2	1	-	3	1	-	-	-	-	1	-	1	-
CO3	**Apply** the knowledge of diodes, transistors and filters for designing the rectifiers, Filters, Regulators and Amplifier circuits using Devices and components.(Apply – L3)	3	1	1	-	-	-	1	-	-	-	-	-	-	2	-
CO4	**Analyz**e the characteristics of Diodes, Bipolar Junction Transistors, Field Effect Transistors and their equivalent models using VI Characteristics and mathematical models.(Analyze – L4)	1	3	-	-	-	-	-	-	-	-	1	1	-	2	-

20EC51 Electronic Devices and Circuits Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the characteristics of Diodes, BJT, FET, Voltage regulators, Diode applications. (Understand – L2)	2	1	-	-	-	-	-	-	-	-	-	-	-	1	-
CO2	**Analyze** the device parameters of Diodes, Bipolar Junction Transistors, and Field Effect Transistors for its electrical parameters using VI characteristics. (Analyze – L4)	3	1	-	-	-	-	-	-	-	-	1	1	-	2	-
CO3	**Apply** the knowledge of diodes, Capacitors and transistors for the realization of rectifiers, regulators, Clippers and Clampers circuits. (Apply – L3)	3	1	1	-	-	-	-	-	-	-	-	-	-	2	-
CO4	**Adap**t effective Communication, presentation and report writing skills.(Apply – L3)	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-

20FE01Professional Communication-I

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Write sentences and paragraphs using proper grammatical structures and word forms (Remember : L1).	-	-	-	2	-	-	-	-	3	3		2	-	-	-
CO2	Comprehend the given text by employing suitable strategies for skimming and scanning and draw inferences (Understand : L2).	-	1	-	2	-	1	-	-	3	3		2	-	-	-
CO3	Write summaries of reading texts using correct tense forms & appropriate structures (Remember : L1)	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-
CO4	Write Formal Letters; Memos & E-Mails (Apply : L3).	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-
CO5	Edit the sentences/short texts by identifying basic errors of grammar/vocabulary/syntax (Understand : L2).	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-

20FE03 Differential Equations

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply first order and first-degree differential equations to find orthogonal trajectories (Apply : L3).	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-
CO2	Distinguish between the structure and methodology of solving higher order differential equations with constant coefficients (Understand : L2).	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-
CO3	Apply various Numerical methods to solve initial value problem (Apply : L3).	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-
CO4	Generate the infinite series for continuous functions and investigate the functional dependence (Understand : L2).	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-
CO5	Solve partial differential equations using Lagrange method (Apply : L3).	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-

20FE07 Applied Physics

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Define the nature of interference and diffraction (Remember : L1).	3	3	1	1	-	-	-	-	-	-	-	1	-	-	-
CO2	Apply the lasers and optical fibers in different fields (Apply : L3).	3	3	2	1	-	-	-	-	-	-	-	1	-	-	-
CO3	Estimate the electrical conductivity of metals (Understand : L2).	3	3	1	1	-	-	-	-	-	-	-	1	-	-	-
CO4	Analyze the properties of semiconducting materials (Understand : L2).	3	3	1	1	-	-	-	-	-	-	-	1	-	-	-
CO5	Classify the different types of magnetic and dielectric materials (Understand : L2).	3	3	1	1	-	-	-	-	-	-	-	1	-	-	-

20FE54 Applied Physics Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze the wave characteristics of light (Understand : L2).	3	3	1	1	-	1	-	-	1	-	-	1	-	-	-
CO2	Estimate the magnetic field using Stewart's and Gee's apparatus (Understand : L2).	3	2	1	1	-	1	-	-	1	-	-	1	-	-	-
CO3	Verify the characteristics of semiconductor diodes (Apply : L3).	3	2	1	1	-	-	-	-	1	-	-	1	-	-	-
CO4	Determine the acceptance angle and numerical aperture of optical fiber (Apply : L3).	3	2	1	1	-	-	-	-	1	-	-	1	-	-	-
CO5	Improve report writing skills and individual teamwork with ethical values. (Understand : L2)	3	2	1	1	-	-	-	2	2	2	-	1	-	-	---

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Introduce oneself and others using appropriate language and details (Understand : L2).	-	-	-	-	3	-	-	-	-	3	3	-	-	-	-
CO2	Comprehend short talks and speak clearly on a specific topic using error free English(Understand : L2).	-	-	-	-	3	-	-	-	-	3	3	-	-	-	-
CO3	Report effectively after participating in informal discussions ethically (Remember : L1).	-	-	-	-	3	-	-	-	-	3	3	-	-	-	-
CO4	Interpret data aptly, ethically & make oral presentations (Apply : L3).	-	-	-	-	3	-	-	-	-	3	3	-	-	-	-

II-Semester

Digital Logic Circuits

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Summarize** the key differences between number systems and their usage in Digital electronics circuits. (Understand – L2)	2	3	1	-	-	-	-	-	-	-	-	1	-	1	-
CO2	**Identify** the minimization techniques of Boolean expressions to implement digital circuits using basic logic gates and logic circuits. (Apply – L3)	2	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO3	**Apply** the minimization and realization methods for design of Combinational and Sequential logic circuits. (Apply – L3)	2	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO4	**Analyze** the Combinational, Sequential, Finite state machines and Algorithmic State Machines for implementation of digital logic circuits. (Analyze – L4)	2	3	3	-	-	-	-	-	-	-	-	3	-	2	-

Digital Logic Circuits Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the functionality of Logic gates, Flip-flops, Shift registers and Counters. (Understand – L2)	2	2	1	2	2	-	-	-	-	-	-	2	2	-	-
CO2	**Apply** the Boolean minimization methods to implement Combinational and Sequential logic circuits using logic gates. (Apply – L3)	2	3	3	3	2	-	-	-	-	-	-	2	2	-	-
CO3	**Analyze** the behavior of Combinational and Sequential logic circuits. (Analyze – L4)	2	3	2	3	3	-	-	-	-	-	-	2	2	-	-
CO4	**Adapt** effective Communication, presentation and report writing skills. (Apply – L3)	-	-	-	-	-	-	-	2	2	3	-	1	-	-	-

20fe02 Professional Communication II

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Produce a coherent paragraph interpreting a figure / graph/ chart/ table (Understand:L2)	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-
CO2	Comprehend the given texts thorughly by guessing the meanings of the words contextually. (Understand:L2)	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-
CO3	Use language appropriately for describing / comparing / contrasting / giving directions and suggestions (Remember:L1)	-	-	-	2	-	-	-	-	3	3	-	2	-	-	-
CO4	Write formal /informal dialouges with an understanding of verabl / non verbal features of communication. guess measings of the words from the context.(Understand:L2)	-	1	-	2	-	1	-	-	3	3	-	2	-	-	-
CO5	Write well structured essays ; Reports and Re'sume' (Apply - L3).	-	1	-	2	-	1	-	-	3	3	-	2			

20FE04 Linear Algebra and Transformation Techniques

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply Nernst Equation for calculating electrode cell potentials and compare batteries for different applications (Apply - L3).	3	3	2	1	-	2	2	-	-	-	-	2	-	-	-
CO2	Apply principles of corrosion for design and effective maintenance of variousequipment (Apply - L3).	3	2	2	1	-	2	1	-	-	-	-	2	-	-	-
CO3	Analyse the suitability of advanced materials like nano materials in electronics and medicine (Understand - L2).	3	2	2	1	-	1	1	-	-	-	-	2	-	-	-
CO4	Identify the importance of liquid crystals, polymers in advanced technologies (Understand - L2).	3	2	2	1	-	1	1	-	-	-	-	2	-	-	-
CO5	Apply the principles of analytical techniques in chemical analysis (Apply - L3).	3	2	1	1	-	1	1	-	-	-	-	2			

20FE06 Engineering Chemistry

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply Nernst Equation for calculating electrode cell potentials and compare batteries for different applications (Apply - L3).	3	3	2	1	-	2	2	-	-	-	-	2	-	-	-
CO2	Apply principles of corrosion for design and effective maintenance of variousequipment (Apply - L3).	3	2	2	1	-	2	1	-	-	-	-	2	-	-	-
CO3	Analyse the suitability of advanced materials like nano materials in electronics and medicine (Understand - L2).	3	2	2	1	-	1	1	-	-	-	-	2	-	-	-
CO4	Identify the importance of liquid crystals, polymers in advanced technologies (Understand - L2).	3	2	2	1	-	1	1	-	-	-	-	2	-	-	-
CO5	Apply the principles of analytical techniques in chemical analysis (Apply - L3).	3	2	1	1	-	1	1	-	-	-	-	2			

20CS01 - Programming For Problem Solving Using C

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Familiar with syntax and semantics of the basic programming language constructs. (Understand : L2)	2	3	-	-	-	-	-	-	-	1	-	1	-	-	-
CO2	Construct derived data types like arrays in solving problem. (Apply : L3)	2	3	2	1	-	-	-	-	-	1	-	1	-	-	-
CO3	Decompose a problem into modules and reconstruct it using various ways of user-defined functions. (Apply : L3)	2	3	2	1	-	-	-	-	-	1	-	1	-	-	-
CO4	Define user-defined data types like structures and unions and its applications to solve problems. (Apply : L3)	2	3	2	-	-	-	-	-	-	1	-	1	-	-	-
CO5	Discuss various file I/O operations and its application. (Understand : L2)	2	3	2	-	-	-	-	-	-	1	-	1	-	-	-

20MC01 Constitution of India

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties. (Understand : L2)						3	3	3		2		3	-	-	-
CO2	Understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System(Understand : L2)						3	2	3		2		3	-	-	-
CO3	Understand the structure of the state government, Secretariat, Governor and Chief Minister and their functions(Understand : L2)						3	3	3		2		3	-	-	-
CO4	Learn local administration viz. Panchayat, Block, Municipality and Corporation. (Understand : L2)						3	2	3		2		3	-	-	-
CO5	learn about Election Commission and the process and about SC, ST, OBC and women(Understand : L2)						3	3	3		2		3			

20FE53 Engineering Chemistry Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Assess alkalinity of water based on the procedure given (Understand - L2).	3	3	-	1	-	2	2	-	-	-	-	-	-	-	-
CO2	Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus (Understand - L2).	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Acquire practical knowledge related to preparation of polymers (Understand - L2).	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Exhibit skills in performing experiments based on theoretical fundamentals (Understand - L2).	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-

20CS51 Programming For Problem Solving Using C Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply control structures of C in solving computational problems. (Apply – L3)	2	3	1						1	1		2	-	-	-

CO	Statement															
CO2	Implement derived data types & use modular programming in problem solving. (Apply – L3)	2	3	1						1	1		2	-	-	-
CO3	Implement user defined data types and perform file operations. (Apply – L3)	2	3	1						1	1		2	-	-	-
CO4	Improve individual / teamwork skills, communication & report writing skills with ethical values. (Apply – L3)	2	3	1						1	1		2	-	-	-

Engineering Workshop & 20ME51

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop different prototypes in the carpentry section.	1	2	1	2	-	2	-	-	3	1	-	3	-	-	-
CO2	Fabricate various basic prototypes in fitting trade	1	2	1	2	-	2	-	-	3	1	-	3	-	-	-
CO3	Demonstrate various operations related to plumbing, tin smithy and black smithy	1	2	1	1	-	2	-	-	3	1	-	3	-	-	-
CO4	Perform various basic house wiring techniques	1	2	1	2	-	2	-	-	3	1	-	3	-	-	-

III-Semester

20EC04 Signals and Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Summarize** the basic concepts of signals, systems and sampling (Understand – L2)	2	1	1	-	-	-	-	-	-	-	-	-	1	-	1
CO2	**Examine** the operations on signals and approximate using orthogonal functions.(Apply – L3)	2	1	1	-	-	-	-	-	-	-	-	-	-	-	2
CO3	**Apply** the concept of impulse response to analyze the linear time invariant systems (Apply – L3)	3	1	1	1	-	-	-	-	-	-	-	1	-	-	3
CO4	**Analyze** continuous time periodic and aperiodic signals using Fourier series, Fourier transform and Laplace transforms (Analyze – L4)	3	2	1	1	-	-	-	-	-	-	-	2	1	-	3

20EC05 Random Variables & Stochastic Processes

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Summarize** the concepts of random variables, random processes and noise.(Understand – L2)	3	2	1	-	-	-	-	-	-	-	-	1	1	-	1
CO2	**Use** the mathematical concepts of random variables and random processes for determining statistical parameters and spectral characteristics of random processes. (Apply – L3)	3	2	1	1	-	-	-	-	-	-	-	2	2	-	2
CO3	**Analyze** the behavior of random variables and random processes using distribution and density functions. (Analyze – L4).	3	2	1	1	-	-	-	-	-	-	-	2	2	-	
CO4	**Apply** the knowledge of random variables and processes for analyzing the system behavior (Apply – L3).	3	3	1	1	-	-	-	-	-	-	-	2	3	-	2

20EC03 Analog Circuit Design

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the concept of amplifier, Oscillator and linear wave shaping circuits. (Understand – L2)	2	3	1	-	-	3	1	-	-	-	1	2	-	1	-
CO2	**Apply** the suitable models of the transistor for estimating gain, input resistance, and output resistance and feedback concepts at amplifier and oscillator circuits. (Apply – L3)	3	1	-	-	-	-	-	-	-	-	-	1	-	2	-
CO3	**Analyze** feedback concepts in amplifier, oscillator circuits, and Multivibrators. (Analyze – L4)	3	1	1	-	-	-	-	-	-	-	-	2	-	2	-
CO4	**Apply** knowledge of transistor for the design of amplifiers, oscillator circuits, linear wave shaping Circuits and Multivibrators. (Apply – L3)	3	-	-	-	-	-	-	-	-	-	1	1	-	2	-

20EC53 Analog Circuit Design Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the characteristics of Amplifiers, Oscillators, feedback amplifiers, and Multivibrators. (Understand – L2)	2	1	-	-	-	-	-	-	-	-	-	-	-	1	0
CO2	**Apply** the knowledge of devices for the design of Timer circuits, Oscillators and Multivibrators. (Apply – L3)	3	1	1	-	-	-	-	-	-	-	-	-	-	2	0
CO3	**Analyze** feedback amplifiers and waveform generators using Electronic devices and components. (Analyze – L4)	1	1	1	2	-	-	-	-	-	-	-	1	-	2	0
CO4	**Adapt** effective Communication, presentation and report writing skills. (Apply – L3)	-	-	-	-	-	-	-	-	3	2	-	-	-	3	-

20EC54 Digital System Design Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the functionality of logic gates using Verilog HDL simulator.(Understand – L2)	2	2	1	2	2	-	-	-	-	-	-	2	2	-	-
CO2	**Analyze** the behaviour of combinational and sequential circuits using Verilog HDL simulator. (Analyze – L4)	2	3	2	3	3	-	-	-	-	-	-	2	2	-	-
CO3	**Understand** the functionality of memories using Verilog HDL simulator.(Understand – L2)	2	3	2	2	3	-	-	-	-	-	-	2	2	-	-
CO4	**Adapt** effective communication, presentation and report writing. (Apply – L3)	-	-	-	-	-	-	-	2	2	3	-	1	-	-	-

20ECS1-Signal Modeling And Analysis

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the programming concept of plotting trigonometric function, linear equations solutions in MATLAB. (Understand – L2)	1	1	-	1	2	-	-	-	-	-	-	2	-	-	-
CO2	Analyze the time frequency relations of signals. (Analyze – L4))	2	2	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	Adapt effective communication, presentation and report writing. (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20CS03-Data Structures

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Write the algorithms for various operations on list using arrays and linked list and analyze the time complexity of its operations. (Understand : L2)	3	2	-	-	-	-	-	-	-	-	-	-	3	-	3
CO2	Apply linear data structures like stack and queue in problem solving.(Apply : L3)	3	1	-	-	-	-	-	-	-	-	-	-	-	3	3
CO3	Demonstrate various searching and sorting techniques and compare their computational complexities in terms of space and time. (Understand : L2)	3	1	-	-	-	-	-	-	-	-	-	-	2	-	3
CO4	Write the algorithms for various operations on binary trees ,binary search trees and AVL trees.(Understand : L2)	3	1	-	-	-	-	-	-	-	-	-	-	-	-	3
CO5	Demonstrate graph traversal techniques and hashing techniques. (Understand : L2)	3	1	-	-	-	-	-	-	-	-	-	-	2	-	3

20CS53 – Data Structures Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Implement Linear Data Structures using array and Linked list. (Apply : L3)	-	2	1	-	1	-	-	-	-	-	-	-	-	3	-
CO2	Implement Various Sorting Techniques. (Apply : L3)	-	2	1	-	1	-	-	-	-	-	-	-	-	3	-
CO3	Implement Non-Linear Data Structure such as Trees &Graphs. (Apply : L3)	-	2	1	-	1	-	-	-	-	-	-	-	-	2	
CO4	Improve individual / teamwork skills, communication & report writing skills with ethical values.	-	-	-	-	-	-	-	2	2	2	-	-		-	-

20EC07 Analog Communications

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the fundamental concepts of various analog modulation schemes with relevant time and frequency domain representations.(Understand – L2)	2	2	1	-	-	-	-	-	-	-	-	2	1	-	-
CO2	**Interpret** the generation, detection of continuous wave and pulse analog modulation techniques. (Understand – L2)	2	2	1	-	-	-	-	-	-	-	-	2	2	-	-
CO3	**Apply** the concepts of analog modulation and demodulation techniques for calculating communication system related parameters.(Apply – L3)	2	2	1	1	-	-	-	-	-	-	-	2	3	-	-
CO4	**Analyze** the performance of continuous wave modulation schemes in the presence of channel noise.(Analyze – L4)	2	3	1	1	-	-	-	-	-	-	-	3	3	-	

20EC56-Analog Communications Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the practical aspects of continuous wave modulation schemes.(Understand – L2)	3	3	1	-	1	-	-	-	-	-	-	-	2	-	-
CO2	**Construct** the circuits for studying pulse modulation techniques. (Apply – L3)	2	3	1	-	1	-	-	-	-	-	-	2	2	-	-
CO3	**Apply** the programming aspects of MATLAB in simulation of continuous wave and pulse modulation techniques(Apply – L3)	3	2	2	-	2	-	-	-	-	-	-	2	3	-	-
CO4	**Adapt** effective communication, presentation and report writing skills.(Apply – L3)	-	-	-	-	-	-	-	1	2	3	-	1	-	-	-

20EC06-Digital Signal Processing

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Interpret** the basics of discrete time signal processing techniques.(Understand – L2)	2	2	1	-	-	-	-	-	-	-	-	2	-	-	1
CO2	**Examine** Discrete Time Signals in time and frequency domain using DTFT, DFT, FFT and Z-transforms (Apply – L3)	2	1	1	-	-	-	-	-	-	-	-	2	-	-	2
CO3	**Apply** DFT, FFT and Z-Transform techniques to solve and realize discrete Systems (Apply – L3)	3	3	1	1	-	-	-	-	-	-	-	2	-	-	2
CO4	**Construct** the IIR Filters using Butterworth, Chebyshev Approximation techniques and FIR Filters using Fourier series method and windowing Techniques (Apply – L3)	3	3	2	1	-	-	-	-	-	-	-	3	-	-	2

20EC55-Digital Signal Processing Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the generation and operations of signals using MATLAB. (Understand – L2)	1	1	-	-	1	-	-	-	-	-	-	-	-	-	1
CO2	**Analyze** the signals in time and frequency domains using MATLAB and Code Composer Studio. (Analyze – L4)	2	3	-	-	1	-	-	-	-	-	-	2	-	-	2
CO3	**Design** IIR and FIR Filters and obtain their frequency response using MATLAB. (Apply – L3)	2	2	3	1	2	-	-	-	-	-	-	2	-	-	2
CO4	**Adapt** effective communication, presentation skills and report writing. (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20EE09-Control Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Develop** mathematical models of systems in terms of transfer function and state-space. (Apply-L3)	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	**Analyze** control systems in time domain (Apply-L3)	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-
CO3	**Analyze** control systems in frequency domain (Apply-L3)	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	**Understand** the concepts of controllers and compensators. (Understand-L2)	3	3	1	1	-	-	-	-	-	-	-	-	-	-	-

20EC08-Electro Magnetic Waves and Transmission Lines

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Define** the basic laws that govern Electrostatic and Magnetostatic Fields. (Understand – L2)	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
CO2	**Understand** the basic concepts of Electro Magnetic fields in static and time varying conditions. (Understand – L2)	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
CO3	**Apply** the Electromagnetic concepts to different mediums (air, Dielectric media) (Apply – L3)	2	3	2	1	1	1	-	-	-	-	-	2	2	-	-
CO4	**Analyze** the characteristics of EM wave propagation in different unbounded and bounded mediums. (Analyze – L4)	2	3	2	1	1	-	-	-	-	-	-	2	2	-	-

20HS01 -Universal Human Values 2: Understanding Harmony

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO2	Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence	-	-	-	-	-	3	-	-	-	-	-	3	-	-	-
CO3	Strengthening of self-reflection.	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-
CO4	Development of commitment and courage to act.	-	-	-	-	-	-	-	-	-	3	-	3	-	-	-

20MC02 – Environmental science

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions.(Understand- L2)	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-
CO2	Evaluate local, regional and global environmental issues related to resources and their sustainable management.(Understand- L2)	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-
CO3	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.(Understand- L2)	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-
CO4	Acknowledge and prevent the problems related to pollution of air, water and soil.(Understand- L2)	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-
CO5	Identify the significance of implementing environmental laws and abatement devices for environmental management.(Understand -L2)	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-

20AD543-Programming Using Python Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Identify various programming constructs available in Python and apply them in solving computational problems	3	2	-	-	2	-	-	-	-	-	-	-	-	-	2
CO2	Demonstrate data structures available in Python and apply them in solving computational problems	3	2	2	-	3	-	-	-	-	-	-	-	-	-	2
CO3	Implement modular programming, string manipulations and Python Libraries	3	2	2	-	3	-	--	-	-	-	-	-	-	-	2
CO4	Improve individual / teamwork skills, communication & report writing skills with ethical values	-	-	-	-	-	-	-	-	3	2	-	-	-	-	2

20ECS2 -Modeling, Design And Prototyping

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the programming concept of virtual instruments. (**Understand – L2**)	3	2	-	-	2	-	-	-	-	-	-	1	1	2	1
CO2	Develop real time applications using loops, formula nodes, array, clusters and DAQ. (**Apply – L3**)	3	2	2	-	2	-	-	-	2	-	-	1	1	2	1
CO3	Adopt Communication, Presentation and Report writing skills. (**Apply – L3**)	-	-	-	-	-	-	-	-	2	2	-	-	1	2	1

Honours CPLD and FPGA Architectures

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand different types of Complex Programmable Logic Devices (CPLD) and FieldProgrammable Gate Arrays (FPGA) chips.	1	1	2	2	2	-	-	-	-	-	-	-	-	-	2
CO2	Analyze the device Architecture of Anti-Fuse Programmed FPGAs.	2	3	3	3	3	-	-	-	-	-	-	-	-	-	2
CO3	Apply Programming Technology for SRAM and FPGAs.	2	3	3	2	3	-	--	-	-	-	-	-	-	-	2
CO4	Design the Combinational and Sequential Circuits using CPLD & FPGAs for real time applications	2	3	3	3	3	-	-	-	3	2	-	-	-	-	2

V-Semester

20EC09 – Digital Communications

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the concepts of digital communication system (Understand – L2).	2	1	1	-	-	-	-	-	-	-	-	2	1	-	-
CO2	**Analyze** the Baseband and Passband digital modulation techniques (Analyze – L4)	3	2	1	-	-	-	-	-	-	-	-	2	3	-	-
CO3	**Examine** the optimum reception and probability of error of digital modulation (Apply – L3).	3	3	2	2	-	-	-	-	-	-	-	2	3	-	-
CO4	**Apply** source coding and error control coding techniques in digital communication process (Apply – L3).	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-

20EC57 – Digital Communications Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Interpret** baseband and passband modulation and demodulation techniques (Understand – L2)	3	2	-	2	-	-	-	-	-	-	-	2	3	-	-
CO2	**Apply** coding techniques for error detection and correction in digital data transmission (Apply – L3).	3	2	1	2	-	-	-	-	-	-	-	-	3	-	-
CO3	**Implement** frequency and phase shift keying techniques using Software Defined Radio (Apply – L3).	3	2	-	2	3	-	-	-	-	-	-	-	3	-	-
CO4	**Adopt** effective communication, presentation and report writing skills (Apply – L3).	-	-	-	2	-	-	1	2	3	-	1	-	-	-	-

20EC11 – Linear IC Applications

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Identify** the building blocks of linear integrated circuits, characteristics and application of Op-Amps (Understand – L2)	3	2	1	1	-	-	-	2	-	-	-	1	-	1	-
CO2	**Apply** the concept of feedback to op-amps for linear and non-linear applications. (Apply – L3).	3	2	2	-	-	-	-	2	-	-	-	1	-	2	-
CO3	**Analyze** Op-Amp, 555 timer applications, phase locked loops to perform addition and multiplication of signals and voltage regulators using Linear ICs (Analyze – L4)	3	3	1	-	-	-	-	2	-	-	-	1	-	2	-
CO4	**Design** active filters, waveform generators and data converters using Op Amps (Apply – L3)	3	2	3	1	-	-	-	2	-	-	1	1	-	3	-

20EC58 – Linear IC Applications Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the characteristics and applications of Op-Amps (Understand – L2)	2	3	1	2	-	-	-	2	1	2	-	1	-	2	-
CO2	**Apply** the 555 Timer circuit concepts for the realization of waveform generators (Apply – L3).	2	3	1	1	-	-	-	2	1	2	-	1	-	2	-
CO3	**Design** Active filters, arithmetic circuits, waveform generators and data converters using Op-Amp (Apply – L3)	2	3	1	2	-	-	-	2	1	2	-	1	-	3	-
CO4	**Adap**t effective Communication, presentation and report writing skills (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20EC12 – Electronic Measurements and Instrumentation PE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the concepts of measurements and working principle of different voltmeters, ammeters, signal generators, Wave analyzers, Oscilloscopes and Transducers. (Understand-L2)	2	2	1	-	-	-	-	-	-	-	-	2	-	2	-
CO2	**Analyz**e the working of different measuring instruments and bridges using mathematical models.(Analyze-L4)	3	3	3	-	-	-	-	-	-	-	-	2	-	2	-
CO3	**Apply** appropriate passive or active transducers for measurement of physical parameters.(Apply-L3)	3	3	3	-	-	-	-	-	-	-	-	3	-	2	-
CO4	**Design** ammeter, voltmeter, ohmmeters and bridges for the given specifications. (Apply-L3)	3	3	3	-	-	-	-	-	-	-	-	3	-	2	-

20EC13 – Digital IC Design -PE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	.**Understand** the parameters of MOS transistors. (Understand – L2)	3	2	1	1	1	-	-	-	-	-	-	1	-	3	-
CO2	**Design** of Combinational and Sequential Circuits using MOS transistors. (Apply – L3)	3	3	3	1	1	-	-	-	-	-	-	2	-	3	-
CO3	**Examine** the Dynamic logic circuits and their characteristics. (Apply – L3).	3	2	1	1	1	-	-	-	-	-	-	-	-	3	-
CO4	**Summarize** Semiconductor memories and their organization. (Understand – L2)	1	3	1	1	-	-	-	-	-	-	-	2	-	3	-

20EC14 – Data Communication and Computer Networks

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the functions of the OSI, TCP/IP reference models (Understand – L2)	2	3	1	-	-	-	-	-	-	-	-	3	3	-	-
CO2	**Summarize** design issues for layer protocols (Understand – L2).	2	1	1	-	-	-	-	-	-	-	-	2	3	-	-
CO3	**Examine** the routing algorithms to find shortest paths for packet delivery (Apply– L3)	3	3	-	2	2	-	-	-	-	-	-	2	3	-	-
CO4	**Interpre**t the operations of application layer protocols (Understand – L2)	2	2	-	-	-	-	-	-	-	-	-	3	3	-	-

20ECS3 – Design and Simulation of Antennas – SoC

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the basic concepts of transmission lines and antennas according to Requirement and applications. (Understand – L2)	3	2	1	2	-	-	-	-	-	-	-	-	1	-	-
CO2	**Apply** software tools for different transmission lines and antennas. (Apply – L3)	3	2	1	1	-	-	-	-	-	-	-	-	1	-	-
CO3	**Analyze** the different parameters of transmission lines and antennas. (Analyze – L4)	2	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO4	**Design** the different parameters of transmission lines and antennas. (Design – L4)	3	1	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	**Adapt** effective Communication, presentation and report writing skills (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20EC10 – Antennas and Wave Propagation

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understan**d basic antenna parameters, radiation mechanism, characteristics of radio wave propagations (Understand – L2)	3	2	1	1	-		-	-	-		-	1	3	-	-
CO2	**Analyze** wire antenna, ground, space, and sky wave propagation mechanism for communication purpose and various Antenna Arrays (Analyze – L4)	3	2	1	1	-	-	-	-	-	-	-	1	3	-	-
CO3	**Design** HF, VHF and UHF Antennas (Apply – L3)	2	3	2	1	-	-	-	-	-	-	-	2	3	-	-
CO4	**Apply** antenna measurement methods to assess antenna's performance (Apply – L3)	1	2	3	2	-	-		-	-	-	-	2	3	-	-

20PI01 – Summer Internship

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Identify** engineering processes relevant to the industry (Understand – L2)	3	3	-	-	-	2	3	-	-	-	-	3	3	3	3
CO2	**Understand** the usage of modern technologies & tools in the field of Electronics & Communication Engineering (Understand – L2)	3	3	3	3	3	3	3	3	3	-	3	3	3	3	3
CO3	**Adapt** communication & Presentation skills (Apply – L3)	-	-	-	-	-	-	-	-	3	3	1	3	-	-	-
CO4	**Improve** the report writing skills (Apply – L3)	-	-	-	-	-	-	-	3	1	3	1	3	-	-	2

Honours R20 - Real Time Operating Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the commands and utilities in Linux/UNIX and RTO systems..	1	-	-	-	-	-	-	-	--	-	-	1	-	1	-
CO2	Analyze real-time operating systems objects, services and I/O concepts.	2	1	2	1	2	-	-	-	-	-	-	1	-	2	-
CO3	Evaluate various Interrupts and Timers.	2	2	2	2	2	-	--	-	-	-	-	2	-	3	-
CO4	Design real time embedded systems using the concepts of RTOS.	3	3	3	3	3	-	-	-	-	-	-	2	-	3	-

20EC15 – Microprocessors & Micro controllers

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the architecture of 8086, 8051 and ARM Controller (Understand – L2)	1	-	2	-	-	-	-	-	-	-	-	1	-	2	-
CO2	**Apply** Assembly Language instructions for Processor and Controller based applications (Apply – L3)	2	2	3	3	3	-	-	-	-	-	-	3	-	2	-
CO3	**Analyze** the operating modes and interrupt structures of processors and controllers (Analyze – L4)	2	3	3	2	2	-	-	-	-	-	-	3	-	3	-
CO4	**Develop** the ARM based interfacing systems for Real time applications (Apply – L3)	2	3	3	3	3	-	-	-	-	-	-	3	-	3	-

20EC59 – Microprocessors & Micro controllers Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the MASM/TASM tool for developing Assembly Language Programs. (Understand – L2)	2	2	3	2	2	-	1	1	-	-	-	2	-	2	-
CO2	**Apply** the Assembly Language instructions of Processor and Controller for logical operations. (Apply – L3)	3	3	3	2	2	-	1	1	-	-	-	3	-	3	-
CO3	**Develop** the ARM based interfacing systems for Real time applications. (Apply – L3)	3	3	3	3	3	-	1	1	-	-	-	3	-	3	-
CO4	**Adapt** effective communication, presentation and report writing skills. (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20EC16 – VLSI Design

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** semiconductor technology and MOS fabrication process (Understand- L2)	2	1	1	-	-	-	-	-	-	-	-	3	-	-	-
CO2	**Apply** layout design rules for NMOS, CMOS logic circuit designs. (Apply – L3)	2	1	1	-	-	-	-	-	-	-	-	3	-	2	-
CO3	**Analyze** the IC building blocks. (Analyze L4)	2	3	2	-	-	-	-	-	-	-	-	3	-	4	-
CO4	**Apply** CMOS testing techniques to test different digital designs. (Apply-L3)	2	2	1	-	-	-	-	-	-	-	-	3	-	-	-

20EC60 – VLSI Design Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Implement** combinational and sequential circuits on FPGA/CPLD boards. (Apply – L3)	2	1	2	2	3	-	-	-	-	-	-	-	-	3	-
CO2	**Design** the Combinational and Sequential logic using NMOS and CMOS Technology. (Apply – L3)	2	1	2	2	3	-	-	-	-	-	-	-	-	3	-
CO3	**Analyze** combinational and sequential circuits using Static CMOS logic from schematic to layout. (Analyze – L4)	2	1	2	2	3	-	-	-	-	-	-	-	-	3	-
CO4	**Adapt** effective communication, presentation and report writing skills. (Apply – L3)	-	-	-	2	-	-	-	1	2	3		1	-	-	-

20EC17 – Microwave Engineering

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the microwave sources, components and measurements of microwave parameters (Understand – L2)	3	2	2	1	-	-	-	-	-	-	-	2	3	-	-
CO2	**Develop** the TE, TM fields in waveguides and microwave signals using microwave tubes and solid state devices (Apply – L3)	3	2	2	1	-	-	-	-	-	-	-	2	3	-	-
CO3	**Apply** the properties of S-parameters to model the S-matrix of waveguide components (Apply – L3)	3	2	1	1	1	-	-	-	-	-	-	1	3	-	-
CO4	**Analyze** the flow of microwave fields in waveguides, components and efficiency of microwave tubes (Analyze – L4)	3	3	2	1	1	-		-	-	-	-	2	3	-	-

20EC61 – Microwave Engineering Lab

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Demonstrate** the functions of microwave bench setup (Understand – L2)	1	-	-	1	1	-	-	-	-	-	-	-	1	-	-
CO2	**Examine** the properties of microwave passive devices using HFSS (Apply – L3)	1	1	1	1	3	-	-	-	-	-	-	1	3	-	-
CO3	**Estimate** the frequency, wave length, VSWR, impedance and scattering parameters of microwave devices (Apply – L3)	2	2	-	3	2	-	-	-	-	-	-	-	3	-	-
CO4	**Adapt** effective communication, presentation and report writing skills. (Apply – L3)	-	-	-	2	-	-	-	1	2	3		1	-	-	-

20EC18 – Image Processing

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Interpret** the fundamental concepts of digital Image Processing. (Understand- L2)	1	1	1									1			3
CO2	**Apply** the concepts of masking and filtering for image enhancement. (Apply-L3)	2	3	2	1								1			3
CO3	**Summarize** the image segmentation methodologies. (Understand-L2)	3	3	3	2								1			3
CO4	**Understand** the underlying concepts of image restoration and compression techniques. (Understand-L2)	3	3	2	2								1	2		3

20EC19 – Satellite Communications

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the orbital mechanics, concepts of satellite communication and its applications (Understand – L2)	1	-	-	-	-	3	3	-	-	-	-	1	1	-	-
CO2	**Summarize** the concepts of satellite space segment, earth segment and satellite services (Understand – L2)	1	1	1	-	-	3	1	-	-	-	-	1	2	-	-
CO3	**Examine** the satellite link budget calculations and orbital dynamics (Apply – L3)	1	-	1	2	-	-	-	-	-	-	-	-	2	-	-
CO4	**Apply** the multiple-access techniques and mobile services for satellite Communications (Apply – L3)	1	1	1	-	-	3	1	-	-	-	-	-	2	-	-

20EC20 – Principles of Robotic Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the Robotic components and modules. (Understand – L2)	3	2	-	-	2	-	-	-	-	-	-	1	-	2	-
CO2	**Analyse** the working of Modules and Control techniques. (Analyse – L4)	3	2	2	-	2	-	-	-	-	-	-	1	-	2	1
CO3	Summarize the concepts of Robotic sensors for vision related applications (Understand – L2)	2	2	1	-	2	-	2	-	-	-	-	2	-	2	-
CO4	**Apply** the concepts and algorithms to develop Robot designs (Apply – L3)	2	2	1	-	-	-	-	-	-	-	-	3	-	-	-

Honours R20 - VLSI Design Automation

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand need for VLSI physical design automation.	1	1	1	-	-	-	-	-	--	-	-	1	-	2	-
CO2	Analyze VLSI automation algorithms for partitioning..	1	2	2	1	2	-	-	-	-	-	-	1	-	2	-
CO3	Formulate placement, floor planning and pin assignment problems and simulate.	1	2	3	1	2	-	-	-	-	-	-	2	-	3	-
CO4	Resolve routing issues using various algorithms.	1	2	3	2	3	-	-	-	-	-	-	2	-	3	-
CO5	Illustrate physical design cycle for FPGAs.	3	2	3	2	3	-	-	-	-	-	-	2	-	3	-

20EC21 – ASIC Design

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** ASIC Design Styles, Design Issues, Design Techniques and Construction. (Understand – L2)	1	-	2	1	2	-	-	-	-	-	-	2	-	2	-
CO2	**Apply** design techniques, resources and tools to develop ASIC modules. (Apply – L3)	2	2	2	2	2	-	-	-	-	-	-	2	-	2	-
CO3	**Analyze** the characteristics and Performance of ASICs and judge independently the best suited device for fabrication of smart devices. (Analyze – L4)	2	3	2	2	2	-	-	-	-	-	-	3	-	3	-
CO4	**Evaluat**e Design issues, simulation and Testing of ASICs. (Apply – L3)	3	3	3	3	3	-	-	-	-	-	-	3	-	3	-

20EC22 – Advanced Digital Signal Processing

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand random signals, correlation functions and power spectrum.(Understand – L2)	3	1										2			1
CO2	Interpret forward and backward linear prediction models. (Understand – L2)	2	2										2			3
CO3	Apply concept of normal equation solution for analyzing Wiener Filter. (Apply-L3)	3	3	1	1								2			3
CO4	Examine the Power Spectrum by making use of parametric methods and non-parametric methods.(Apply-L3)	3	2	1	1								3			3

20EC23 – Optical Communications

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Describe** the fundamental concepts of optical fiber communication systems, WDM systems and optical networks **(Understand –L2)**.	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO2	**Apply** knowledge of signal transmission characteristics of fibers, sources, and detectors in the optical communication system parameters calculations. (Apply –L3)	3	2	2	2	-	-	-	-	-	-	-	2	3	-	-
CO3	**Interpret** the operation of optical sources, detectors in the presence of channel degradation mechanisms in analog and digital optical systems (Understand –L2).	2	1	1	1	-	-	-	-	-	-	-	2	2	-	-
CO4	**Examine** the parameters of source to fiber launching, Power-Coupling Calculations, attenuation, and dispersion measurement. (Apply –L3)	3	3	2	2	-	-	-	-	-	-	-	1	3	-	-

20EC24 – Micro-Electro-Mechanical Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the micro systems, microelectronics & miniaturization technique. **(Understand –L2)**	3	3	2	-	-	-	-	-	-	-	-	2	-	3	-
CO2	**Illustrate** the scaling laws necessary for micro systems including Bulk and Surface micromachining techniques used for MEMS fabrication. **(Understand –L2)**	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-
CO3	**Classify** and discuss the properties of materials suitable for Microsystems. **(Understand –L2)**	3	3	2	-	-	-	-	-	-	-	-	2	-	2	-

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO4	**Examine** the design aspects, sensing mechanisms and limitations of MEMS based devices. **(Apply –L3)**	3	3	3	-	-	-	-	-	-	-	-	3	-	3	-

20EC25 – Radar Systems

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the basic concepts of Radar systems. **(Understand – L2)**	3	3	2	-	-	-	-	-	-	-	-	3	3	3	-
CO2	**Analyz**e the CW Radar and FMCW Radar system for the measurement of speed and distance. **(Analyze – L4)**	3	2	2	-	-	-	-	-	-	-	-	3	3	2	1
CO3	**Apply** the techniques to remove the clutter using MTI Radar and Pulse Doppler Radar. **(Apply – L3)**	3	3	2	-	1	3	-	-	-	-	-	3	3	2	1
CO4	**Design** the matched filter for radar echoes. **(Apply – L3)**	3	3	2	-	1	3	-	-	-	-	-	3	3	2	1

20EC26 – Wireless Sensor Networks

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Interpret** the operation of wireless sensor network elements. (Understand-L2).	3	2	1	-	-	-	-	-	-	-	-	3	3	-	-
CO2	**Examine** different communication protocols of wireless sensor networks and its applications (Apply-L3).	-	3	2	-	3	-	-	-	-	-	-	3	3	-	-
CO3	**Outline** sensor tasking and techniques used to establish infrastructure of wireless sensor networks (Understand-L2).	-	3	3	3	3	-	-	-	-	-	-	3	3	-	-
CO4	**Apply** the knowledge of sensor network platforms and tools for sensor network application development (Apply-L3).	3	2	3	3	3	-	-	-	-	-	-	3	3	-	-

20EC27 – Low Power VLSI Design

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Summarize** the Fundamental concepts of Low Power VLSI Design. **(Understand – L2)**	1	1	-	-	-	-	-	-	-	-	-	1	-	1	-
CO2	**Apply** Low Power Design Approaches for IC designs. **(Apply – L3)**	3	2	1	1	-	-	-	-	-	-	-	1	-	2	-
CO3	**Analyze** low voltage low power memories using mathematical models. **(Analyze – L4)**	2	3	2	2	-	-	-	-	-	-	-	2	-	3	-
CO4	**Design** low voltage low power adders and multipliers. **(Apply – L3)**	3	3	3	2	-	-	-	-	-	-	-	2	-	3	-

20EC29 – Cellular & Mobile Communication

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Outline** the concepts and operational principles of cellular systems (Understand-L2)	2	1	-	-	-	2	2	-	-	-	-	1	2	-	-
CO2	**Summarize** the multiple access techniques and evolution of cellular technologies. (Understand-L2)	1	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO3	**Examine** interferences, performance parameters, cell site & mobile antennas and methodologies to improve the cellular capacity. (Apply-L3)	3	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO4	**Analyze** the effects of radio propagation models, Frequency Management, Channel Assignment, handoff, and call drops in cellular communications **(Analyze-L4).**	2	1	1	-	-	2	1	-	-	-	-	1	1	-	-

20EC30 – Internet of Things

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the programming concepts of IOT .(Understand – L2)	3	2	-	-	2	-	-	-	-	-	1	1	-	2	1
CO2	**Develop** real time applications using Internet of Things. (Apply – L3)	3	2	2	-	2	-	-	-	2	-	-	1	1	-	2	1
CO3	**Demonstrate** the integration of sensors with IOT. (Understand – L2)	3	2	-	-	2	-	-	-	-	-	1	1	-	2	1
CO4	**Adopt** effective Communication, Presentation and Report writing skills. (Apply – L3)	-	-	-	2	-	-	-	1	2	3	-	1	-	-	-

20EC28 – Bio Medical Signal Processing

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Illustrate** the characteristics of EEG and ECG signals. (Understand – L2)	1	1	1	1	-	-	-	-	-	-	-	1	-	-	-
CO2	**Describe** the behavior of EEG signals with Linear prediction and Autoregressive methods and ECG signals with detection and estimation Techniques (Understand-L2)	3	2	1	1	-	-	-	-	-	-	-	2	-	-	3
CO3	**Apply** adaptive filtering and data compression techniques on ECG data. (Apply-L3)	3	2	1	1	-	-	-	-	-	-	-	1	-	-	3
CO4	**Summarize** the concepts of Prony's methods of clinical applications (Understand-L2)	3	2	1	1	-	-	-	-	-	-	-	2	-	-	3

20PI02 – Industrial/Research Internship

Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Identify engineering processes relevant to the industry (Understand – L2)	3	3	-	-	-	2	3	-	-	-	-	3	3	3	3
Understand the usage of modern technologies & tools in the field of Electronics & Communication Engineering (Understand – L2)	3	3	3	3	3	3	3	3	3	-	3	3	3	3	3
Adapt communication & Presentation skills (Apply – L3)	-	-	-	-	-	-	-	-	3	3	1	3	-	-	-
Improve the report writing skills (Apply – L3)	-	-	-	-	-	-	-	3	1	3	1	3	-	-	2

20EC84 – Analog And Digital Communications-OE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Describe** the concepts of analog and digital modulation (Understand-L2)	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	**Understand** the waveform coding techniques, modulation techniques used in communication systems (Understand-L2)	1	3	2	1	-	-	-	-	-	-	-	1	3	-	-
CO3	**Examine** the performance of analog and digital modulation techniques. (Apply-L3).	2	3	1	1	-	-	-	-	-	-	-	3	3	-	-
CO4	**Apply** the transmission and detection techniques for communication system applications (Apply-L3)	2	2	1	-	-	-	-	-	-	-	-	2	2	-	-

20EC85 – Systems and Signal Processing-OE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Discuss** the classification of signals and systems along with their properties and the concepts of sampling. (L2)	2	1	1	-	-	-	-	-	-	-	-	1	-	-	1
CO2	**Apply** the concepts of Fourier series, Continuous time and Discrete Fourier Transform and Z Transform on signals. (L3)	2	2	1	1	-	-	-	-	-	-	-	2	-	-	2
CO3	**Describe** the systems and observe the response of Linear Systems. (Understand – L2)	3	1	1	1	-	-	-	-	-	-	-	1	-	-	3
CO4	**Design** IIR Digital Filters by applying Approximation Procedures and FIR Digital Filters through Window Techniques**. (Apply – L3)**	3	2	1	1	-	-	-	-	-	-	-	2	-	-	3

20EC83 – Microprocessors And Interfacing-OE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Outline** the architecture of 8086 and peripheral devices. (Understand – L2)	1	-	2	1	1	-	-	-	-	-	-	1	-	1	-
CO2	**Apply** 8086 instructions for microprocessor based applications. (Apply – L3)	2	3	2	2	2	-	-	-	-	-	-	3	-	3	-
CO3	**Analyze** the operation and programming of peripheral devices. (Analyze – L4)	2	3	2	2	2	-	-	-	-	-	-	3	-	3	-
CO4	**Design** of 8086 based system by interfacing memory, peripherals and I/O devices. (Apply – L3)	2	3	3	3	3	-	-	-	-	-	-	3	-	3	-

20EC86 – Cellular Technology-OE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Understand** the concepts of cellular system and wireless standards (Understand- L2).	1	-	1	-	-	3	-	-	-	-	-	1	-	-	-
CO2	**Summarize** the evolution of cellular technologies from 1G to 5G systems and interference in cellular systems (Understand-L2).	1	-	1	-	-	2	1	-	-	-	-	1	1	-	-
CO3	**Examine** the multiple access techniques and architectures of 2G/3G/4G/5G systems (Apply-L3).	2	1	1	-	-	2	1	-	-	-	-	1	1	-	-
CO4	**Characterize** the advanced cellular technologies LTE, OFDMA, mm Wave, MIMO, NOMA. (Understand-L2	1	1	1	-	-	2	1	-	-	-	-	1	1	-	-

20EC82 – Elements Of Communication Systems-OE

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**Summarize** the properties of systems and concepts of noise in communication systems. (Understand-L2)**.**	3	-	1	-	-	-	-	-	-	-	-	2	3	-	-
CO2	**Outline** the concepts of communication system, transmission lines, antennas, and response of linear systems (Understand-L2).	2	1	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	**Apply** the knowledge of systems, transmission and reception concepts for communication systems in the presence of noise. (Apply-L3).	3	2	2	-	-	--	-	-	-	-	-	2	3	-	-
CO4	**Interpret** the response of linear systems and performance of RF transmitters, receivers, transmission lines and antennas (Understand L2).	3	1	-	2	-	-	-	-	-	-	-	2	3	-	-

20EC81 – Satellite Technology

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**List** out the operational bands, Space craft control mechanisms**,** sensors and navigational aids for satellite applications **(Remember-L1)**	1	-	-	-	-	3	2	-	-	-	-	1	1	-	-
CO2	**Summarize** the functions of satellite space segment, earth segment, Multiple access techniques and satellite services. **(Understand-L2)**	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO3	**Illustrate** the operational principles of satellite power system and space craft Control mechanism. **(Understand-L2)**	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-
CO4	**Outline** the concepts of orbital mechanics & satellite communication and its application**(Understand-L2)**	1	1	1	-	-	2	1	-	-	-	-	1	2	-	-

Honours R20 - VLSI Testing &Verification

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the importance of Design verification and significance of testable design	1	2	2	1	2	-	-	-	-	-	-	1	-	2	-
CO2	Apply the testable design verification tools.	1	2	3	1	2	-	-	-	-	-	-	2	-	3	-
CO3	Analyze the static timing verification and physical design verification	1	2	3	2	3	-	-	-	-	-	-	2	-	3	-
CO4	Create combinational and sequential circuit test generation algorithms	3	3	3	3	3	-	-	-	-	-	-	2	-	3	-

Honours R20 - Fundamentals of VLSI Design

CO	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand IC fabrication process and properties of MOSFET. (Understand – L2).	2	1	1	-	-	-	-	-	-	-	-	3	-	-	-
CO2	Apply the layout design rules for NMOS and CMOS circuits. (Apply – L3).	2	1	1	-	-	-	-	-	-	-	-	3	-	2	-
CO3	Apply the concepts of logic gates for combinational and Sequential circuits used in ICs. (Apply – L3)	2	2	1	-	-	-	-	-	-	-	-	3	-	-	-
CO4	Design the sub system using combinational and sequential circuits. (Apply – L3).	2	3	2	-	-	-	-	-	-	-	-	3	-	4	-

20PI03 – Project Work

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Identify the complex engineering problems relevant to the society and industry. (Understand – L2)	3	3	-	-	-	2	3	-	-	-	-	3	3	3	3
Apply modern technologies, tools and systems in the field of Electronics & Communication Engineering to analyze the identified problem. (Apply – L3)	3	3	3	3	3	3	3	3	3	-	3	3	3	3	3
Design and implement a viable solution to the problem. (Apply – L3)	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Apply communication & Presentation skills (Apply – L3)	-								3	3	1	3			
Develop the team work and leadership skills with	-							3	3	1	2	3			

professional and ethical values. **(Apply – L3)**															
Develop the report writing skills. **(Apply – L3)**	-	-	-	-	-	-	-	3	1	3	1	3	-	-	2