Department of Electronics and Communication Engineering

Course Outcomes (M21)

III-Semester

S.No	Course Name	CO No	Course Outcome
1	Electronic Devices	CO1	Demonstrate understanding of the characteristic behavior of various electronic devices such as Diodes, Transistors etc, and applying them for understanding various circuits.
		CO2	Evaluate the performance parameters of various diode circuits (rectifiers, clippers and clampers). Identify the merits and demerits of various filters, formulate and design rectifier circuits with filters. Calculate ripple factor, efficiency and percentage regulation of rectifier circuits.
		CO3	Discriminate the BJT configurations to recognize appropriate transistor configuration for any given application and design the biasing circuits with good stability.
		CO4	Analyze and design various circuits for different applications in Engineering Field.
2	Signals and Systems	CO1	Define and differentiate types of signals and systems in continuous and discrete time.
		CO2	Apply the properties of Fourier transform to continuous time signals.
		CO3	Relate Laplace transforms to solve differential equations and to determine the response of the Continuous Time Linear Time Invariant Systems to known inputs.
		CO4	Apply Z-transforms to discrete time signals to solve Difference equations.
		CO5	Obtain Linear Convolution and Correlation of discrete time signals with graphical representation.
3	Network Theory	CO1	Able to Express given Electrical Circuit in terms of A, B, C, D and Z, Y Parameter Model and Solve the circuits and how they are used in real time applications.
		CO2	Able to learn how to calculate properties of networks and design of attenuators.
		CO3	Able to design of equalizers.
		CO4	Able to design different types of filters using passive elements.
		CO5	Able to synthesize the RL & RC networks in Foster and Cauer Forms.
4	Switching Theory and Logic Design	CO1	To apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates namely NAND, NOR etc.
		CO2	Make use of the concepts to solve the problems related to the logic circuits.
		CO3	Design simple Combinational Circuits such as Adders, Subtractors, Code Convertors, Decoders, Multiplexers, and Magnitude Comparators etc.
		CO4	Identification of gates – application. Understand and design – concept of FSM, Mealy and Moore machines.
		CO5	Design Sequential Circuits such as different types of Counters, Shift

			Registers, Serial Adders, and Sequence Generators. Compare various Programmable logic devices.
5	Probability Theory and Stochastic Processes	CO1	To understand different types of Random variables their density and distribution functions.
		CO2	To learn one Random variable characteristic of different variables their density and distribution functions.
		CO3	To extend bi-variate distributions and the operations on.
		CO4	To understand elementary concepts of the stochastic process in to Temporal characteristics.
		CO5	To understand elementary concepts of the stochastic process in to spectral characteristics.
6	Managerial Economics & Financial Accounting	CO1	Determine the responsibilities & decision making in the Organization.
		CO2	Understand the various factors influencing demand & market structure.
		CO3	Understand the principles of Accounting & solve the problems.
		CO4	Analyze the Financial performance.
		CO5	Understand the capital structure & to take decision on selection of projects.
7	Indian Constitution	CO1	Have a general knowledge and back ground of the Constitution of India and its importance.
		CO2	Will distinguish and understand the working of the Central, state and provincial levels of administration.
		CO3	Will be conscious about the fundamental duties, responsibilities and rights as an ideal citizen of India
		CO4	Will be able to perceive and interpret the functioning and distribution of resources between centre and state.
		CO5	Have an awareness and relate to the existing hierarchy of the social structure, election process and grievance redressal in a democracy.
8	Python Programming	CO1	Explain basic principles of Python programming language.
		CO2	Create, run, and manipulate Python Programs using core data structures like Lists, Tuple, Set and Dictionaries.
		CO3	Understand and summarize different File handling operations.
		CO4	Handle exceptions in programming.
9	Electronic Devices and Logic Design Lab	CO1	To demonstrate the characteristic behavior of PN junction diode and Zener diode.
		CO2	To design various non-linear wave shaping circuits using diodes for given specifications.
		CO3	Analyze the behavior of non-linear wave shaping circuits using diodes.
		CO4	Evaluate and compare the significant parameters obtained from the characteristics of BJT and FET.
		CO5	Examine the characteristics of BJT and FET in various configurations.
10	Network Theory Lab	CO1	Use the basic electronic components and design circuits.
		CO2	Verify various parameters of the circuits by applying theorems.
		CO3	Understand the making of PCB.
		CO4	Design various filters.
11	Python Programming Laboratory	CO1	Develop solutions to simple computational problems using Python programs.
		CO2	Solve problems using Control statements.
		CO3	Develop Python programs by defining functions and parameters.
		CO4	Use Python data structures for problem solving.
		CO5	Apply file handling and report preparation to access data.
		CO6	Develop Python programs for exception handling.

IV-Semester

S.No	Course Name	CO No	Course Outcome
1	Analog Electronic Circuits	CO1	Recall and relate the knowledge of BJT and FET behavior in the design of various biasing and amplifier circuits.
		CO2	Apply low and high frequency models of transistor in the analysis of single stage and multistage amplifiers.
		CO3	Design and analyze amplifier and oscillator circuits.
		CO4	Compare and Contrast different types of biasing, Multistage, Feedback and Power amplifiers.
		CO5	Interpret a given analog circuit and evaluate its performance parameters by applying acquired knowledge.
2	Automatic Control Systems	CO1	Convert a given control system into equivalent block diagram and transfer function.
		CO2	Analyze system stability using time domain techniques.
		CO3	Analyze system stability using frequency domain techniques.
		CO4	Design a digital control system in the discrete time domain.
		CO5	Analyze a control system in the state space representation.
3	Computer Organization and Architecture	CO1	Apply digital engineering fundamentals to acquire knowledge of arithmetic algorithms for different processors.
		CO2	Interpret the concept of Basic processor system and analyze the performance of Micro programmed Control unit organization.
		CO3	Implementing the techniques of pipelining and parallelism to analyze the performance of a Processor.
		CO4	Apply the conceptual knowledge of system development with appropriate I/ O Interface.
		CO5	Interpret various techniques for efficient memory utilization to develop a system application.
4	Electro Magnetic Theory and Transmission Lines	CO1	Understand the different coordinate systems, vector calculus, coulombs law and gauss law for finding electric fields due to different charges and to formulate the capacitance for different capacitors.
		CO2	Learn basic magneto-statics concepts and laws such as Biot –Savart's law and Amperes law, their application in finding magnetic field intensity, inductance, and magnetic boundary conditions.
		CO3	Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
		CO4	Determine the Transmission Line parameters for different lines, characterize the distortions and estimate the characteristics for different lines.
		CO5	Analyze the RF Line features and configure them as SC, OC Lines, □/2, □/4 and □/8 Lines and design the same for effective impedance transformation.
		CO6	Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems.
5	IC Applications	CO1	Understand the basic construction, characteristics and parameters of Op- Amp.
		CO2	Analyze the linear and non-linear applications of Op-Amp.
		CO3	Understand the concepts of IC555 timer, IC723 regulator and PLL.
		CO4	Classify and describe the characteristics of different logic families.
		CO5	Design and analyze ADC & DAC converters.
		CO6	Design the Combinational and Sequential circuits with ICs.
6	Essence of Indian	CO1	Understand the concepts of Indian culture and Traditions and their

	Traditional Knowledge		importance.
		CO2	Distinguish the Indian languages and literature
		CO3	Learn the philosophy of ancient, medieval and modern India.
		CO4	Acquire the information about the fine arts in India
		CO5	Know the contribution of scientists of different eras, interpret the concepts and the importance to protect Intellectual property of the nation.
7	Human Values and Professional Ethics	CO1	Understand the significance of value inputs in a classroom and start applying them in their life and profession
		CO2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.
		CO3	Understand the role of a human being in ensuring harmony in society and nature.
		CO4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
8	AEC Laboratory	CO1	Apply the concepts of amplifiers in the design of Public Addressing System.
		CO2	To be able to Generate Sinusoidal wave forms of given specifications.
		CO3	Design stable system using feedback concepts.
		CO4	Design of Tuned amplifier.
		CO5	Design Series and Shunt Voltage Regulators.
9	IC Applications Laboratory	CO1	Analyze the configurations, parameters of Op-Amp (IC741).
		CO2	Demonstrate the circuits of Op-Amp for various applications.
		CO3	Implement Active filters using Op-amps.
		CO4	Analyze and design the circuits using IC555 timer, IC723 and data converters.
		CO5	Analyze the characteristics of TTL and CMOS gates.
		CO6	Analyze and design various combinational & sequential circuits using digital ICs.

V – Semester

S.No	Course Name	CO No	Course Outcome
1	Microcontrollers	CO1	Explain the architecture of 8051
		CO2	Write Assembly programming using 8051microcontroller.
		CO3	Interface different peripherals to 8051microcontroller.
		CO4	Explain the architecture of ARM controller.
		CO5	Interface different peripherals to ARM controller.
2	Digital Signal Processing	CO1	Apply the knowledge of FFT Algorithms for computation of DFT.
		CO2	Design of FIR filters using various methods.
		CO3	Design of IIR filters using various methods.
		CO4	Apply decimation and interpolation concepts for the design of sampling rate converters.
		CO5	Understand TMS320C67XX DSP processors for the design of digital filters.
3	Analog Communication	CO1	Understand analog communication system.
		CO2	Compare and analyze analog modulation techniques.
		CO3	Calculate noise performance of analog modulation techniques.
		CO4	Design AM and FM receivers.
		CO5	Differentiate between pulse modulation & continuous modulation techniques
4	Electronic Measurements and Instrumentation (PE-I)	CO1	Understand the performance characteristics and various errors of an instrument.
		CO2	Apply the complete knowledge of transducers to measure the physical quantities in the field of science, engineering and technology.
		CO3	Understand construction and working principle of transducers, display devices, printers, Oscilloscopes, signal generators and digital instruments.
		CO4	Illustrate different types of signal generators.
		CO5	Understand the operation of different digital instruments.
5	Scripting Languages (PE-I)	CO1	Able to use UNIX and Linux based systems to perform various tasks.
		CO2	Able to use shell scripting to run programs of any scripting language.
		CO3	Able to compile large programming sets in the Perl and Python environment.
		CO4	Able to effectively apply knowledge of Perl and Python to new situations and learn from the experience.
		CO5	Able to Use Python scripting language for Web application development.
6	Real Time Operating Systems (PE-I)	CO1	Classify various types of kernels and operating systems
		CO2	Analyse various scheduling algorithms related to RTOS
		CO3	Summarize the Inter process communication tools.
		CO4	Understand the elementary concepts of VxWorks.
		CO5	Enumerate the fundamental concepts of UNIX operating system.
7	Neural Networks (PE-I)	CO1	Understand the fundamental concepts and classification of neural networks, and apply this knowledge to solve real-world problems related to pattern recognition and memory systems.
		CO2	Analyze and interpret the mathematical models of artificial neural networks, including the McCulloch-Pitts and perception neuron models, and apply them to various learning scenarios.
		CO3	Evaluate and compare different activation models in neural networks, such as additive, shunting, and stochastic models, and select the appropriate model for specific applications.
		CO4	Apply the basic learning laws of neural networks, such as Hebbian and

			delta rules, to train and adapt neural networks for pattern recognition and recall tasks.
		CO5	Design and implement neural network memory systems, including auto, hetero, and bidirectional associative memory, for storing and retrieving patterns.
		CO6	Develop an understanding of feed-forward and feedback neural networks, including back propagation and Hopfield networks, and apply them to solve complex problems in classification, approximation, and optimization.
8	Disaster Mitigation (OE-I)	CO1	Demonstrate the concepts of disaster management
		CO2	Identify different types of disasters
		CO3	Explain the disaster management cycle
		CO4	Illustrate the role of NDMA in disaster management
		CO5	Explain the development of disaster mitigation plan
9	OOPS USING JAVA (OE-I)	CO1	Understand the concept of OOP and analyze relationships among classes, objects.
		CO2	Develop programs using concepts like inheritance, packages, interfaces, Java I/O streams and strings
		CO3	Utilize exception handling and Multi-threading concepts to develop Java programs
		CO4	Interpret the Java Collection API, Java utility classes, concept of files and serialization
		CO5	Design GUI applications using concepts like AWT controls and Swings and client server programs using networking concepts
10	ARTIFICIAL INTELLIGENCE (OE-I)	CO1	Understand fundamental AI concepts and identify arrange of symbolic and non symbolic AI techniques.
		CO2	Demonstrate an understanding of various searching algorithms such as adversarial search and game-playing commonly used in artificial intelligence software.
		CO3	Use different knowledge representation techniques used in AI Applications.
		CO4	Demonstrate an understanding of agent based AI architectures, Planning and logic based agents.
		CO5	Exploring Expert systems options.
11	RENEWABLE ENERGY SYSTEMS (OE-I)	CO1	Understand the advantages, disadvantages and applications of different non-conventional sources.
		CO2	Analyze principle of operation and applications of different Fuel cells
		CO3	Analyze the principles of Solar and Wind Energy sources and its applications
		CO4	Understand the principles of OTEC and GTE
		CO5	Analyze the biomass conversion technologies, Biogas generation and Biogas plants
12	Basics of Electronic Communication (OE-I)	CO1	Understand the working of analog and digital communication systems.
		CO2	Explain the OSI network model and the working of data transmission.
		CO3	describe the evolution of communication technologies from traditional telephony systems to modern wireless communication systems.
		CO4	Differentiate between analog and digital modulation techniques
		CO5	Understand the optical fibre communication link, structure, propagation and transmission properties.
13	START- UP AND ENTREPRENEURSHIP (OE-I)	CO1	Understand Entrepreneurship and Economic growth, Small and Large Scale Industries, Types and forms of enterprises.
		CO2	Identify the characteristics of entrepreneurs, Emergence of first generation entrepreneurs, Conception and evaluation of ideas and their

			sources.
		CO3	Practice the principles of project formulation, Analysis of market demand, Financial and profitability analysis and Technical analysis.
		CO4	Understand the concept of Intellectual Property Rights and Patents
		CO5	Comprehend the aspects of Start-Ups.
14	Effective Technical Communication	CO1	Handle Technical Communication effectively by over coming barriers of communication.
		CO2	Use different types of Professional correspondence to communicate effectively.
		CO3	Use different types of Business and Inter Office Correspondence.
		CO4	Acquire adequate skills to draft reports efficiently.
		CO5	Enhance their skills of information transfer.
15	Microcontrollers Lab	CO1	To write assembly language programs using 8051 controller.
		CO2	To develop interfacing applications using 8051 controller.
		CO3	To develop embedded C programming concepts of ARM.
		CO4	To develop ARM based programs for various interface modules.
16	Signals and Systems Lab	CO1	Develop MATLAB files for the verification of system response.
		CO2	Design and analyze the digital filters using MATLAB.
		CO3	Verify the functionality of FFT algorithms.
		CO4	Experiment with multirate techniques using MATLAB & CCS.
		CO5	Design and implement the digital filters on DSP processor.
17	Mini Project	CO1	Get practical experience of software design and development, and coding practices within Industrial/R&D Environments.
		CO2	gain working practices within Industrial/R&D Environments
		CO3	Prepare reports and deliver effective presentation.
		CO4	Demonstrate effective written and oral communication skills.
		CO5	Innovate in various engineering disciplines and nurture their entrepreneurial ideas.

VI-Semester

S.No	Course Name	CO No	Course Outcome
1	Digital Communication	CO1	Classify the different types of digital modulation techniques PCM, DPCM, DM and ADM and compare their performance by SNR.
		CO2	Illustrate the classification of channels and Source coding methods.
		CO3	Distinguish different types of Error control codes along with their encoding/ decoding algorithms.
		CO4	Examine the Performance of different Digital Carrier Modulation schemes of Coherent and Non-coherent type based on Probability of error.
		CO5	Generation of PN sequence using Spread Spectrum and characterize the Acquisition Schemes for Receivers to track the signals.
2	VLSI Design	CO1	Familiarize with the constructs and conventions of the verilog HDL programming in gate level and data flow modeling.
		CO2	Generalize combinational and sequential logic circuits in behavioural modeling and concepts of switch level modelling.
		CO3	Analyze modes of operation of MOS transistor and its basic electrical properties.
		CO4	Draw stick diagrams and layouts for any MOS transistors.
		CO5	Analyse the operation of various arithmetic and sequential logic circuits using CMOS transistors.
3	Antenna and Wave Propagation	CO1	To illustrate the basic principles of antennas and learn the antenna terminology.
		CO2	To design different types of wire antennas and make proficient in analytical skills for understanding practical antennas.
		CO3	To design different types of antennas for various frequency ranges and get updated with latest developments in the practical antennas.
		CO4	To apply the principles of antennas, to design antenna arrays and measure various parameters of antennas.
		CO5	To Identify and understand the suitable modes of Radio Wave propagation used in current practice.
4	Embedded System Design (PE-II)	CO1	Understand the fundamentals of the embedded system design.
		CO2	Enumerate the instruction set of ARM Processor by studying the architecture of ARM core.
		CO3	Acquire knowledge on the serial, parallel and network communication protocols.
		CO4	Learn the embedded system design life cycle and co-design issues.
		CO5	List the various embedded software development tools used in the design of embedded system for various applications.
5	Data Analytics using R-Programming (PE-II)	CO1	Use various data structures and packages in R for data visualization and summarization.
		CO2	Use linear, non-linear regression models, and classification techniques for data analysis.
		CO3	Use clustering methods including K-means and CURE algorithm.
6	Digital Image Processing (PE-II)	CO1	Develop a foundation that can be used as the basis for higher study and research in the Image processing area.
		CO2	Design various filters for processing and deblurring of images without destroying fine details like edges and lines.
		CO3	Apply image processing techniques for processing and analysis of remotely sensed, Microscope, Radar and Medical images.
		CO4	Understand the need for Digital Image processing techniques for Machine vision.

		CO5	Applications and concept of image compression.
7	CPLD/FPGA Architectures (PE-II)	CO1	Design of ASICs using implementation tools for simulation and synthesis.
		CO2	Describe the architecture of FPGAs.
		CO3	Discuss physical design using FPGAs and CAD tools.
		CO4	Describe placement & routing algorithms.
		CO5	Analyze verification and testing of Digital circuits.
8	INTERNET OF THINGS (PE-III)	CO1	Understand the relevance of cloud computing and data analytics to IoT.
		CO2	Comprehend the business model of IoT from developing a prototype to launching a product.
		CO3	Design simple IoT systems with requisite hardware and Python programming software.
		CO4	Understand the relevance of cloud computing and data analytics to IoT.
		CO5	Comprehend the business model of IoT from developing a prototype to launching a product.
9	Cyber Security (PE-III)	CO1	Analyze and evaluate the cyber security needs of an organization.
		CO2	Understand Cyber Security Regulations and Roles of International Law.
		CO3	Design and develop security architecture for an organization.
		CO4	Understand fundamental concepts of data privacy attacks.
10	MULTIRATE SIGNAL PROCESSING (PE-III)	CO1	Solve problems in sampling rate conversion and filter banks.
		CO2	Build digital filter bank systems.
		CO3	Implement quadrature-mirror filter banks for multirate signal processing.
		CO4	Analyze the various adaptive processing algorithms.
		CO5	Implement wavelets in signal processing applications.
11	Fundamentals of Electronics Packaging (PE-III)	CO1	Discuss the various packaging types.
		CO2	Design of packages which can withstand higher temperature, vibrations and shock.
		CO3	Design of PCBs which minimize the EMI and operate at higher frequency.
		CO4	Analyze the concepts of testing methods.
		CO5	Discuss the various packaging types.
12	Green Building Technologies (OE-II)	CO1	Define a green building, along with its features,benefits and rating systems
		CO2	Describe the criteria used for site selection andwater efficiency methods
		CO3	Explain
		CO4	Select materials for sustainable built environment & adopt waste management methods
		CO5	Describe the methods used to maintain indoor environmental quality.
13	SOFTWARE ENGINEERING (OE-II)	CO1	Acquired working knowledge of alternative approaches and techniques for each phase of SDLC.
		CO2	Judge an appropriate process model(s) for software project attributes and analyze requirements for project development.
		CO3	Acquire skills necessary as an independent or as part of a team for architecting a complete software project by identifying solutions for recurring problems exerting
		CO4	Concede product quality through testing techniques employing appropriate metrics by understanding the practical challenges

			associatedwith the development of a significant software system
		CO5	Apply the software engineering principles in realtime project development.
14	DEEP LEARNING (OE-II)	CO1	Feature Extraction from Image and Video Data
		CO2	Implement Image Segmentation andInstance Segmentation in Images
		CO3	Implement image recognition and image classification using a pretrained network (Transfer Learning)
		CO4	Traffic Information analysis using Twitter Data
		CO5	Auto encoder for Classification & FeatureExtraction
15	ELECTRIC VEHICLE TECHNOLOGY (OE-II)	CO1	To identify and describe the history and evolvement of electric & hybrid electric vehicles to emphasize on the need andimportance of EV/HEV for sustainable future.
		CO2	To identify and describe the principles of various EV/HEVs drive train topologies along with their power flow control andfuel efficiency estimation.
		CO3	To design and select electric propulsion system components for EV/HEV drives suitability for the desirable performanceand control.
		CO4	To compare and evaluate various energy sources and energy storage components for EV and HEV applications.
		CO5	To compare and evaluate various energy sources and energy storage components for EV and HEV applications.
16	Fundamentals of IOT (OE-II)	CO1	Understand the various applications of IoT and other enabling technologies.
		CO2	Comprehend various protocols and communication technologies used in IoT.
		CO3	Construct simple IoT systems with requisite hardware and p ython programming.
		CO4	Understand the relevance of cloud computing and data analytics to IoT.
		CO5	Apply the business model of IoT from developing a prototype to launching a product.
17	3D PRINTING TECHNOLOGIES (OE-II)	CO1	Describe the fundamentals of 3D printing, classify and explain advantages anddisadvantages of 3D Printing technologies.
		CO2	Select thesuitable CAD data formats and software used in 3D Printing technology.
		CO3	Describe the operating principles, capabilities and limitations of liquid, solid &powder-based 3D Printing Technologies.
		CO4	Compare different 3D printing technologies based on their process capabilities andapplications.
		CO5	Apply the capabilities and knowledge of 3D printing in different industrial sectors.
18	ANALOG/DIGITAL COMMUNICATION LAB	CO1	Understand and simulate modulation and demodulation of AM and FM.
		CO2	Construct pre-emphasis and de-emphasis at the transmitter and receiver respectively
		CO3	Understand and simulate the PAM,PWM&PPM circuits
		CO4	Understand baseband transmission (i.e., PCM, DPCM, DM, and ADM) generation and detection.
		CO5	Understand error detection and correction.
19	VLSI DESIGN LAB	CO1	Write the Verilog HDL programs in Gate level and Data flow Modelling.

		CO2	Implement combinational and sequential circuits using Verilog.
		CO3	Analyse digital circuits using VLSI CAD tools like DSCH, Microwind.
		CO4	Design CMOS circuits like basic gates, adders at the transistor level.
		CO5	Implement the layout of simple CMOS circuits like inverter and basic gates.
20	SOFT SKILLS LAB	CO1	Listen to a variety of speakers and texts and will be able to comprehend and perform the required tasks.
		CO2	Interact in a group professionally and communicate confidently in terms of both the spoken and written communication.
		CO3	Develop the skills and strategies of reading and writing.
		CO4	Face any Interview confidently by managing time, making decisions by speaking appropriately according to the context.
		CO5	Demonstrate right attitude and right skills to cope with team and communicate professionally.
21	TECHNICAL SEMINAR	CO1	Identify and explain emerging and advanced topics in Electronics and Communication Engineering through systematic literature review and technical resources.
		CO2	Analyse research papers, technical reports, and case studies to extract key concepts, methodologies, and applications relevant to the selected seminar topic.
		CO3	Organise and prepare a structured technical seminar report and presentation using appropriate engineering terminology, figures, and references.
		CO4	Deliver an effective oral presentation demonstrating professional communication skills, logical flow, time management, and appropriate use of audio-visual aids.
		CO5	Respond confidently to questions and critiques, demonstrating critical thinking, subject understanding, and ethical use of technical information.
22	SUMMER INTERNSHIP	CO1	Acquire practical experience of software design and development, and coding practices within Industrial/R&D Environments.
		CO2	understand working practices within Industrial/R&D Environments
		CO3	Prepare reports and deliver effective presentation.
		CO4	demonstrate effective written and oral communication skills
		CO5	Innovate in various engineering disciplines and nurture their entrepreneurial ideas.

VII-Semester

S.No	Course Name	CO No	Course Outcome
1	Data Communication and Computer Networks	CO1	Classify and compare different types of computer networks, network topologies, switching principles and OSI, TCP/IP models.
		CO2	Analyze the need and design issues of Data Link layer and distinguish between various multiple access protocols.
		CO3	Compare different routing algorithms of Network layer and discuss the role of network layer in internetworking and the IP addresses.
		CO4	Interpret the elements of the transport layer and evaluate the TCP, UDP and ATM protocols.
		CO5	Illustrate the features of Application layer and various issues of network security and authentication protocols.
2	Microwave Theory and Techniques	CO1	Analyze the propagation of Guided waves in different modes between parallel planes.
		CO2	Evaluate different parameters like impedance, attenuation and quality factor for Rectangular & Circular Waveguides and Cavity Resonators.
		CO3	Determine Scattering parameters of different microwave components and analyze their properties.
		CO4	Integrate the concept of bunching and velocity modulation to summarize the operation of microwave tubes and the high frequency limitations of conventional tubes.
		CO5	Analyze the principle, operation and characteristics of different microwave solid state devices.
3	Digital Design Verification using System Verilog (PE-IV)	CO1	Understand the evolution and importance of System Verilog
		CO2	Familiarize with the System Verilog tools
		CO3	Apply the concepts of OOP in verification
		CO4	Write Programs using the concepts of OOP.
		CO5	Apply verification techniques for digital circuits design.
4	Mobile and Cellular Communication (PE-IV)	CO1	Understand the method of selection and reuse of a set of frequency channels, Base station requirements.
		CO2	Appreciate and understand the methods of electromagnetic wave propagation in cellular communication.
		CO3	Identify different methods of mobile access technologies suitable for mobile cellular solutions.
		CO4	Explain features, authentication, and operational details of GSM and CDMA mobile cellular systems.
		CO5	Understand the development and limitation of the preliminary and advanced generation mobile systems.
5	Biomedical Signal Processing (PE-IV)	CO1	Apply the probability theory and random processes techniques in analyzing biological signals.
		CO2	Determine the best class of compression techniques to use for a particular biomedical signal to compress.
		CO3	Possess the basic mathematical, scientific and computational skills necessary to analyze and process cardiological signals as per the requirement.
		CO4	Ability to formulate and solve basic problems in biomedical signal analysis.
		CO5	Possess the basic mathematical, scientific and computational skills necessary to analyze and process neurological signals as per the requirement

6	Soft Computing Techniques (PE-IV)	CO1	Comprehend the categorization of machine learning algorithms and concepts of python programming
		CO2	Acquaint with artificial neural network terminologies.
		CO3	Understand advanced algorithms for artificial neural networks.
		CO4	Acquaint with the working mechanisms of evolutionary algorithms
		CO5	Apply genetic algorithms to solve soft computing problems
7	ESSENTIALS OF ROAD SAFETY ENGINEERING (OE-III)	CO1	Understand fundamental principles of road safety.
		CO2	Analyze traffic safety data using statistical methods and engineering techniques.
		CO3	Apply geometric design principles and integrate safety features into road infrastructure.
		CO4	Master traffic management systems to enhance road safety.
		CO5	Conduct road safety audits and develop comprehensive safety management systems.
8	HUMAN COMPUTER INTERACTION (OE-III)	CO1	Explain the capabilities of both humans and computers from the viewpoint of human information processing.
		CO2	Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
		CO3	Apply an interactive design process and universal design principles to designing HCI systems.
		CO4	Describe and use HCI design principles, standards and guidelines.
		CO5	Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.
9	MACHINE LEARNING (OE-III)	CO1	Describes types of data and their preprocessing methods
		CO2	Describes supervised, unsupervised learning methods and their appropriate evaluation procedures and metrics
		CO3	Applies different supervised and unsupervised machine learning algorithms to different datasets
		CO4	Evaluates different machine learning approaches and infers the best learning model for a given scenario
		CO5	Evaluates different machine learning approaches and infers the best learning model for a given scenario.
10	PROGRAMMABLE LOGIC CONTROLLERS (OE-III)	CO1	Describe typical components of a Programmable Logic Controller.
		CO2	State basic PLC terminology and their meanings.
		CO3	Use latch, timer, counter, and other intermediate programming functions.
		CO4	Explain and apply the concept of electrical ladder logic, its history, and its relationship to programmed PLC instruction.
		CO5	Design and program a small, automated industrial production line.
11	Medical Electronics (OE-III)	CO1	Demonstrate an understanding of the principles underlying bioelectric signals and their relevance in medical diagnostics.
		CO2	Apply appropriate techniques for the acquisition and preprocessing of biosignals using specialized instrumentation.
		CO3	Analyze and interpret biosignals such as ECG, EEG, EOG, and EMG to identify normal and abnormal patterns.
		CO4	Implement signal processing algorithms to remove artifacts and enhance the quality of biosignals for accurate diagnosis.
		CO5	Evaluate the clinical significance of biosignal analysis in the context of specific medical conditions and treatment strategies.
12	INTRODUCTION TO ROBOTICS (OE-III)	CO1	Understand the principles and functions of robotic components.
		CO2	Analyze the role of sensors, actuators, and controllers in robotic systems.
		CO3	Apply kinematic principles to model and control robot movement.

		CO4	Develop basic programming skills for robot control and simulation.
		CO5	Understand socio economic aspects of robotics.
13	GIS and Remote Sensing (OE-IV)	CO1	Explain the basics of Remote Sensing, different types of satellite and sensors
		CO2	Define the principles of satellite remote sensing, able to comprehend the energy interactions with earth surface features, spectral properties of water bodies
		CO3	Demonstrate the basic concept of GIS and its applications, know different types of data representation in GIS
		CO4	Create the spatial data using various techniques
		CO5	Develop models using spatial & Terrain Analysis
14	DATA SCIENCE (OE-IV)	CO1	Recognize the different levels of Data Science concepts for visualization of data.
		CO2	Demonstrate the data visualization and statistical techniques, for describing data structure property.
		CO3	Analyze the basics of probability and statistics models for data exploration
		CO4	Make use of Hypothesis testing for statistical analytics for destroying target based on the mission requirements.
		CO5	Demonstrate numerous open-source data science tools to solve real-world problems through industrial case studies
15	BIG DATA ANALYTICS (OE-IV)	CO1	Explain the foundations, definitions, and challenges of Big Data.
		CO2	Use Hadoop file system interfaces.
		CO3	Program using HADOOP and Map reduce.
		CO4	Understand various Hadoop Eco Systems like Pig, Hive.
		CO5	Outline Hadoop Eco System using HBase, Zookeeper.
16	SENSORS AND TANSDUCERS (OE-IV)	CO1	Explain the basic principle of operation of Transducers and Sensors. Distinguish different sensors and transducers.
		CO2	Identify suitable transducer by comparing different industrial standards and procedures for measurement of physical parameters
		CO3	Estimate the performance of different transducers.
		CO4	Design real life electronics and instrumentation measurement systems.
		CO5	Apply smart sensors, bio-sensors, PLC and Internet of Things to different applications.
17	Industrial Electronics (OE-IV)	CO1	Understand Industrial Semiconductor devices SCR , DIAC, TRAIC, and MOSFET respectively.
		CO2	Comprehend DC amplifiers, Operational amplifier and Instrumentation amplifier.
		CO3	Design and analysis of DC to DC converters and DC to AC converters and different types of Choppers.
		CO4	Develop skills to build and troubleshoot power electronic circuits.
		CO5	Synthesis of PWM Inverters, UPS and Switched mode regulators
18	INDUSTRIAL ENGINEERING AND MANAGEMENT (OE-IV)	CO1	Understand the concept of scientific management.
		CO2	Apply different types of inventory models in material management.
		CO3	Apply the concepts of PERT and CPM techniques in project management.
		CO4	Analyse the elements of costing and determine the selling price.
		CO5	Apply job evaluation and merit rating techniques to evaluate the performance of employees.
19	Microwave Engineering	CO1	Understand the characteristics of Microwave Sources.
		CO2	Evaluate the mode characteristics of Reflex klystron and V-I

	Laboratory		Characteristics of Gunn Diode.
		CO3	Analyze frequency, Wave length, SWR and Impedance for Reflex Klystron Oscillator by using its equation.
		CO4	Analyze the characteristics of Circulator, Isolator, Directional Coupler, Tees like (Magic Tee, E & H plane Tees) using the Scattering parameters.
		CO5	Generate the Radiation pattern of different antennas like Yagi-Uda and Horn Antenna and measure the gain of the antennas.
20	Embedded Systems and IOT Applications Laboratory	CO1	Understand the usage of IDE tools.
		CO2	Develop interfacing applications like display devices and input devices using ARM Processor.
		CO3	Develop program using ARM processor to read the sensor values and display them.
		CO4	Develop the IoT applications using Arduino/Raspberry Pi.
		CO5	Utilize the THINGSPEAK cloud to display the sensor values.
21	Project Work - Phase I	CO1	Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
		CO2	Evaluate different solutions based on economic and technical feasibility.
		CO3	Effectively plan a project and confidently perform all aspects of project management
		CO4	Demonstrate effective written and oral communication skills.
		CO5	Find relevant sources (e.g., library, Internet, experts) and gathers information for preparing reports and other relevant documentation.

VIII-Semester

S.No	Course Name	CO No	Course Outcome
1	Radar Systems and Navigational Aids	CO1	Demonstrate the basic principle of Radar system and develop Radar range equation. Illustrate the importance of various parameters to enhance range estimation for accurate prediction.
		CO2	Describe CW Radar and MTI radar.
		CO3	Illustrate on radar tracking methods and differences among them.
		CO4	Explain principles of navigation, in addition to approach and landing aids as related to navigation.
		CO5	Describe about the navigation systems using the satellite.
2	Optical Fiber Communication (PE-V)	CO1	Analyze the losses inserted in an optical fiber
		CO2	Study of material used and underlying principles of optical signal generation
		CO3	Design of optical detection systems
		CO4	Design an optical link in view of loss and dispersion.
		CO5	Study of modes of optical communication through optical waveguides
3	Wireless Sensor Networks (PE-V)	CO1	To understand network architecture, node discovery and localization, deployment strategies, fault tolerant and network security.
		CO2	To understand foundation for WSN by presenting challenges of wireless networking at various protocol layers.
		CO3	Study suitable protocols and radio hardware.
		CO4	To understand the performance of sensor networks and identify bottlenecks.
		CO5	To understand concepts of security in sensor networks.
4	Adaptive Signal Processing (PE-V)	CO1	Derive the response of the LTI system to stochastic processes.
		CO2	Comprehend and derive the Wiener filter for signals with known properties.
		CO3	Familiar with the Lattice filter implementation of the prediction filter.
		CO4	Apply the LMS algorithm to the lattice structure to improve convergence times.
		CO5	Use Recursive Least Squares algorithms in signal processing.
5	Automotive Electronics (PE-V)	CO1	Comprehend the concepts of ECU design for automotive applications.
		CO2	Analyze response of Transducers and sensors for automotive applications
		CO3	Understand the operation of automotive sensors and fuel injection systems.
		CO4	Comprehend various Microcontrollers for power train and body electronics.
		CO5	Understand the effects of cable and harnessing in EMI and EMC.
6	Cognitive Radio Systems (PE-VI)	CO1	Gain knowledge on software defined radio and cognitive radio.
		CO2	Describe about signal processing devices and architectures
		CO3	Discuss on software and hardware architecture of Software Defined and Cognitive Radio.
		CO4	Analyze spectrum sensing methods
		CO5	Implement CR and SDR applications on to FPGA and ASICS
7	5G Communications (PE-VI)	CO1	Describe the evolution of 5G Technology advances and their benefits
		CO2	Distinguish the different 5G channel access methods

		CO3	Illustrate the 5G Network Architecture and Network Protocols
		CO4	Describe 5G wireless Propagation Channels
		CO5	Demonstrate Device to device communication and millimetre wave communication
8	Global Navigation Satellite Systems (PE-VI)	CO1	Understand the fundamentals of GPS.
		CO2	Describe the different types of GNSS Signals and GNSS Datum.
		CO3	Analyze the GPS errors and their modeling techniques.
		CO4	Explain various GPS data processing and GPS integration techniques.
		CO5	Discuss the augmentation systems and regional navigation satellite systems
9	Pattern Recognition Systems (PE-VI)	CO1	Outline basic concepts of pattern recognition.
		CO2	Classify decision-making algorithms in pattern recognition.
		CO3	Apply about various decision-making techniques.
		CO4	Apply Hierarchical and Partition clustering techniques in pattern recognition applications.
		CO5	Analyze feature selection algorithms in pattern recognition.
10	Project Work – Phase II	CO1	Demonstrate the ability to synthesize and apply the knowledge and skills acquired in the academic program to the real-world problems.
		CO2	Evaluate different solutions based on economic and technical feasibility.
		CO3	Effectively plan a project and confidently perform all aspects of project management
		CO4	Demonstrate effective written and oral communication skills.
		CO5	Find relevant sources (e.g., library, Internet, experts) and gathers information for preparing reports and other relevant documentation.