



CVR COLLEGE OF ENGINEERING

(An UGC Autonomous Institution with NAAC 'A' Grade, Affiliated to JNTUH)
 Vastunagar, Mangalpalli (V), Ibrahimpatan (M), R.R. District, Telangana
 Ph. No:91-8414 – 661601, 661675

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OUTCOMES (COs)

OF

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

R22 REGULATIONS

I Year I Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22BS101	APPLIED PHYSICS	CO1	Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.
		CO2	Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
		CO3	Identify the role of semiconductor devices in science and engineering Applications.
		CO4	Explore the fundamental properties of dielectric, magnetic and energy materials, their applications.
		CO5	Appreciate the features and applications of Nanomaterials.
22BS104	MATRICES AND CALCULUS	CO1	Find the rank of a matrix and solve a linear system of equations.
		CO2	Evaluate eigenvalues, eigenvectors and diagonalize the given matrix.
		CO3	Apply Mean value theorems to solve engineering problems and to evaluate improper integrals using Beta and Gamma functions.
		CO4	Find the extremum of a multi-variate function with/without constraints.
		CO5	Evaluate multiple integrals and apply the concept to find the areas and volumes.
22HS101	ENGLISH FOR SKILL ENHANCEMENT	CO1	Choose appropriate vocabulary and sentence structures for oral and written communication suitable to the context and culture.
		CO2	Communicate effectively in various professional contexts through oral and written communication.
		CO3	Comprehend, emphasize, conceptualize and evaluate the given texts and other authentic texts such as magazines, newspaper articles etc.
		CO4	Understand explicit and implicit meaning and draw inference from the given text.

		CO5	Evaluate their language skills and soft skills to handle personal and professional challenges.
22CS101	PROBLEM SOLVING THROUGH 'C'	CO1	Understand programming concepts and analyze a problem, design a solution and develop an algorithm to solve it.
		CO2	Modularize a problem and implement the solution using basic programming concepts, control statements and functions.
		CO3	Evaluate the use of macros and implement solutions to complex problems using recursion and homogeneous data types.
		CO4	Implement solution using pointers for problems of relevance and use different dynamic memory allocation methods.
		CO5	Understand and analyze, differentiate and implement elementary algorithms of sorting, searching and will also be able to compare and contrast algorithms with respect to time and space complexity.
22EE102	FUNDAMENTALS OF ELECTRICAL ENGINEERING	CO1	Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits
		CO2	Understand the concept of resonance and solve the complex AC circuits.
		CO3	Able to solve the problems and simplify complex networks using various network theorems.
		CO4	Apply the concepts of two port network parameters and transient response of electrical circuits in the real time applications.
		CO5	Acquire sufficient knowledge about the basic principles of various Electrical Machines.
22HS102	ENVIRONMENTAL SCIENCE	CO1	Define the concepts of Ecosystem.
		CO2	Explain and enunciate the value of biodiversity and its conservation.
		CO3	Discuss various natural resources and their importance, understand the advantages and disadvantages of renewable energy sources and technologies.
		CO4	Develop awareness on pollution control technologies and global atmospheric changes.
		CO5	Relate the importance of Environmental Impact Assessment and Environmental legislation in the management of the environment.
22BS131	APPLIED PHYSICS LAB	CO1	Determine the wavelength of light by diffraction principle and learn methods to minimize the signal loss in optical fibers.
		CO2	Understand the applications of the Photoelectric effect, develop skills to identify the type of semiconductors and determine charge carrier concentration in it using Hall effect.

		CO3	Understand the applications of various semiconductor, and optoelectronic devices.
		CO4	Gain knowledge of applications of dielectric materials and hysteresis behavior of magnetic materials.
		CO5	Understands the concepts of resonance, charging and discharging of the capacitor, dispersion of light and carry out data analysis.
22CS131	C PROGRAMMING LAB	CO1	Familiarize with Linux programming environment and translate given algorithms to a working and correct program.
		CO2	Interpret syntax errors as reported by the compilers and to be able to identify and correct logical errors encountered at run time using debuggers like GDB.
		CO3	Write iterative as well as recursive programs.
		CO4	Represent data in arrays, pointers, strings and manipulate them through a program.
		CO5	Apply Algorithm for solving problems like sorting, searching.
22ME131	ENGINEERING WORKSHOP	CO1	Acquire skills of basic engineering trades like Carpentry, Tin smithy etc.
		CO2	Demonstrate an understanding of and comply with workshop safety regulations.
		CO3	Identify and use marking out tools, hand tools, and measuring equipment and to work to prescribed tolerances.
		CO4	Apply the knowledge of the above trades in their day-to-day activities.
		CO5	Select appropriate equipment and consumables for required applications.
22EE132	ELECTRICAL ENGINEERING LAB	CO1	Verify the network theorems practically and can apply wherever it is necessary in the circuit analysis.
		CO2	Verify the two port network parameters practically.
		CO3	Understand the phenomenon of resonance and measure active power and reactive power in single phase system.
		CO4	Analyze the performance characteristics of DC shunt generator, DC motor and single-phase transformer.
		CO5	Verification of voltage division, current division, power distribution and measure RMS and average values.

I Year II Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22BS152	ENGINEERING CHEMISTRY	CO1	Relate the basic properties of water and its usage for domestic and industrial purposes.

		CO2	Summarize the basic knowledge of electrochemical procedures related to batteries and corrosion and its control.
		CO3	Apply the fundamentals and general properties of polymers and other engineering materials.
		CO4	Analyze real-time situations related fuel energy sources.
		CO5	Predict potential applications of chemistry and the practical utility of engineering materials in order to become good engineers and entrepreneurs.
22BS153	ADVANCED CALCULUS AND INTEGRAL TRANSFORMS	CO1	Solve the first-order Ordinary Differential Equations and extend the knowledge to the applications in engineering problems.
		CO2	Solve higher-order Ordinary Differential Equations and extend the knowledge to the applications in engineering problems.
		CO3	Make use of Laplace transform techniques to solve Ordinary Differential Equations.
		CO4	Formulate any periodic function in terms of Sine and Cosine functions.
		CO5	Evaluate the line, surface and volume integrals and translate them from one to another.
22CS151	DATA STRUCTURES THROUGH 'C'	CO1	Design and implement appropriate user-defined types to a given problem definition and apply various functions for processing files.
		CO2	Understand basic concepts, Design and implement linear list data structures.
		CO3	Implement stack and queue data structures and their application.
		CO4	Assimilate the terminology of trees and implement binary tree operations in C.
		CO5	Understand the representation of graph and traversal techniques.
22ME151	COMPUTER AIDED ENGINEERING DRAWING	CO1	Know the Standard conventions and Construction of various Engineering curves through Auto CAD.
		CO2	Know the Standard conventions and Construction of various Engineering curves through Auto CAD.
		CO3	Construct orthographic projections of simple planes and regular solids in any position through Auto CAD.
		CO4	Draw sectional views and developments of various basic 3D objects through Auto CAD.
		CO5	Construct isometric views and construct multi-view drawings of simple 3D objects through Auto CAD
22EC151	ELECTRONIC DEVICES AND CIRCUITS	CO1	Understand the operation of the PN junction diode and analyze different rectifier circuits
		CO2	Design clippers, clampers, and RC circuits
		CO3	Understand the working principles of BJT & FET
		CO4	Develop biasing circuits for BJT and FET amplifier

		CO5	Understand the working principles of special purpose devices & their applications.
22BS182	ENGINEERING CHEMISTRY LAB	CO1	Determine the parameters like the hardness of water, alkalinity, and rate of corrosion of mild steel
		CO2	Estimate the acid concentration by conductometry.
		CO3	Analyze instrumental techniques such as potentiometry and pH meter in order to find out the concentrations or equivalence points.
		CO4	Interpret molecular/system properties such as viscosity, and saponification value of coconut oil.
		CO5	Apply analytical skills about colorimeter/polymer/Sanitizer.
22HS131	ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB	CO1	Comprehend and respond appropriately in various scenarios
		CO2	Emerge as confident and competent communicators of the English Language
		CO3	Apply pronunciation skills to evolve as proficient speakers
		CO4	Analyze and compose effectively across various mediums
		CO5	Develop critical and analytical thinking
22CS181	DATA STRUCTURES THROUGH 'C' LAB	CO1	Implement file processing functions and be able to store, retrieve and process data in text and binary format
		CO2	Understand basic data structures such as arrays, and linked lists.
		CO3	Understand basic data structures such as stacks, queues, and circular Queues
		CO4	Implement operations on Binary Search Trees
		CO5	Solve problems involving graphs.
22IT182	PYTHON PROGRAMMING LAB	CO1	Design, code, and test Python modules.
		CO2	Understand and use standard library modules.
		CO3	Apply object-oriented concepts to solve problems.
		CO4	Write Python solutions to solve statistical problems.
		CO5	Use advanced Python programming concepts.

II Year I Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC201	Analog Circuits	CO1	Analyze the design aspect of various filters and attenuators
		CO2	Design and analyze single stage BJT amplifiers
		CO3	Utilize the concepts of feedback to improve the stability of amplifiers
		CO4	Design and analyze LC and RC oscillators

		CO5	Design and analyze JFET & MOSFET amplifiers
22EC202	Digital Logic Design	CO1	Perform number system conversions, binary arithmetic, and realization of logic circuits.
		CO2	Simplify Boolean functions and understand various digital logic families.
		CO3	Analyze and design various combinational logic circuits.
		CO4	Analyze and design various synchronous sequential logic circuits.
		CO5	Understand FSMs and ASM Charts and their implementation.
22EC203	Probability Theory and Stochastic Processes	CO1	Perceive the various probability concepts, and theorems.
		CO2	Apply the concepts of various random variables to model random experiments
		CO3	Evaluate the statistical operations performed on Random variables.
		CO4	Evaluate the temporal and spectral characteristics of Random process.
		CO5	Analyze the performance of communication systems with Random inputs.
22EC204	Signals and Systems	CO1	Characterize and analyze the properties of continuous and discrete-time signals and systems. To apply the knowledge of linear algebra topics like vector space, basis,
		CO2	Represent continuous signals and systems in the Frequency domain using Fourier Series and Fourier transform.
		CO3	Understand the concepts of LTI and LTV systems, filter characteristics of LTI systems.
		CO4	Apply the Laplace transforms to analyze continuous-time and Z- transforms to analyze discrete-time signals and systems.
		CO5	Apply correlation and its properties for various applications and use sampling theorem for Band limited signals and reconstruction.
22HS205	Complex Variables and Numerical Methods	CO1	Understand the concept of analyticity and the construction of analytic functions if a part of it is known.
		CO2	Evaluate integrals using Cauchy's Integral formulae around a simple closed contour to find Taylor's and Laurent's series expansion of complex functions and to evaluate contour integrals using the Residue theorem.
		CO3	Find the real roots of Algebraic and Transcendental equations and solve the system of linear equations iteratively
		CO4	Understand interpolation and obtain approximate solutions for evenly and unevenly spaced data and

			evaluate definite integrals using numerical techniques.
		CO5	Develop the skill of finding approximate solutions to problems arising in first-order initial value problems in differential equations.
22EC231	Analog Circuits Laboratory	CO1	Analyze the working of rectifiers with and without filters
		CO2	Design Nonlinear and Linear wave-shaping circuits
		CO3	Design BJT and FET amplifiers
		CO4	Investigate the effect of feedback in amplifiers
		CO5	Design RC and LC oscillators
22EC232	Digital Logic Design Laboratory	CO1	Design and implement various combinational circuits using logic gates
		CO2	Design and implement various sequential circuits.
22EC233	Basic Simulation Laboratory	CO1	Simulate the generation and operation of different types of signals and systems.
		CO2	Apply transform techniques for the analysis of signals
		CO3	Simulate convolution, correlation and spectral densities of deterministic signals.
		CO4	Simulate response of LTI system for various input signals.
		CO5	Simulate the statistical problems using python.
22HS201/251	Constitution of India	CO1	Understand and explain the significance of Indian Constitution as the fundamental law of the land.
		CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
		CO3	Analyze the organs of governance and District's Administration head.
		CO4	Analyze the Local Administration: District's and Village Administration
		CO5	Understand Election Commission Process and Institutional Bodies for the welfare of SC/ST/OBC and women.

II Year II Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC251	Analog and Digital Communications	CO1	Understand and analyze various amplitude modulation and demodulation techniques.
		CO2	Compare and contrast different types of angle modulation and demodulation techniques and measure FM's power and bandwidth requirements.

		CO3	Understand the concept of radio transmitters and receivers and analyze the requirement of different IFs in AM and FM receivers.
		CO4	Learn various pulse analog and digital modulation techniques and calculate the SNR for PCM and DM. Also, compare TDM and FDM schemes.
		CO5	Understand various digital modulation techniques and calculate their probability of error.
22EC252	Computer System Architecture	CO1	Demonstrate an understanding of the design of the functional units of a digital computer system and understand the basics of instruction sets and their impact on processor design.
		CO2	Understanding the working principle of a control unit and familiar with addressing modes and instruction set of a computer.
		CO3	Perform computer arithmetic operations of a digital computer.
		CO4	Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory and I/O devices
		CO5	Design a pipeline for consistent execution of instructions with minimum hazards and understanding the interconnection networks of multiprocessor systems.
22EC253	Electronic Circuit Analysis	CO1	Design multistage amplifiers and understand the operation of BJT at high frequencies
		CO2	Design the various classes of power amplifiers
		CO3	Design the tuned amplifiers and analyze the frequency response
		CO4	Design Multivibrators and Sweep circuits for various applications
		CO5	Utilize the concepts of synchronization, frequency division and sampling gates
22EC254	Electromagnetic Theory and Transmission Lines	CO1	Acquire the knowledge of Basic Laws, Concepts of Electrostatic Fields and apply to solve Electrostatic Problems
		CO2	Acquire the knowledge of Basic Laws, Concepts of Magnetostatic Fields and apply to solve Magnetostatic Problems
		CO3	Differentiate the static and time-varying fields also understand the significance of Maxwell's Equations and Boundary Conditions
		CO4	Classify conductors, dielectrics and analyze the Wave Equations, evaluate the uniform plane wave Characteristics in several practical media of interest
		CO5	Analyze the Design aspects of transmission line parameters under different load conditions

22EC255	Linear IC Applications	CO1	Understand the basics of Op-Amp 741 IC and analyze op-amp circuits
		CO2	Infer the DC and AC characteristics of operational amplifiers & their effect on the output.
		CO3	Design active filters and oscillators using the Op-Amp
		CO4	Analyze and design comparator circuits and classify and comprehend the working principle of data converters.
		CO5	Design multivibrator circuits using 555 Timer, understand the PLL applications, and Op-Amp based regulators.
22EC281	Analog and Digital Communications Laboratory	CO1	Simulate various analog and digital modulations and design AM, FM and FSK schemes
		CO2	Implement and analyze the performance of different analog modulations and demonstrate the time and frequency division multiplexing schemes.
		CO3	Evaluate the performance of digital modulations using BER and apply pulse-analog modulations to real-time applications
22EC282	Electronic Circuit Analysis Laboratory	CO1	Design multistage amplifiers for desired gain
		CO2	Design power amplifiers and find their efficiency
		CO3	Design tuned amplifiers and find their Q-factor
		CO4	Design various multivibrators and sweep circuits
		CO5	Design sampling gates and understanding the concepts of frequency division
22EC283	Linear IC Applications Laboratory	CO1	Analyze and design different circuits using Op-Amp 741 IC
		CO2	Analyze and design multivibrators using 555 Timer IC
		CO3	Analyze and design PLL applications, converters and regulators
		CO4	Analyze and understand the sample & hold circuit and function generator
		CO5	
22HS281/231	Gender Sensitization Lab	CO1	Students will have developed a better understanding of important issues related to gender in contemporary India
		CO2	Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender
		CO3	Students will attain a finer grasp of the biological spheres of gender in our society and how to counter it.
		CO4	Students will acquire insight into the gendered division of labor and its relation to politics and Economics.

		CO5	Students will develop a sense of appreciation for women in all walks of life and contribute to establish an egalitarian society.
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III Year I Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC301	Microcontrollers	CO1	Understand the Architecture and Organization of the 8086 Processor
		CO2	Investigate the Internal Architecture of the 8051 Microcontroller and Develop Operational Programs using 8051 Assemblers
		CO3	Acquire Proficiency in Basic Embedded C Programming and the Functionality of Timers/Counters and Serial Communication in the 8051 Microcontroller
		CO4	Analyze Programs for 8051 Interrupt Handlers and Interface Real-World Devices, Including LCDs, Keyboards, ADCs, and DACs, with the 8051 Microcontroller
		CO5	Gain Insight into the Internal Architecture of ARM Processors and Fundamental Concepts Pertaining to Advanced ARM Processors
22EC302	Digital Modelling using HDL	CO1	Understand the capabilities of HDLs and learn Verilog constructs
		CO2	Differentiate and write circuit descriptions in gate level and data flow modelling styles
		CO3	Describe circuits using behavioural modelling and write test benches for simulation
		CO4	Describe circuits at transistor level using switch-level modelling and learn to use UDPs
		CO5	Understand delay models in Verilog and learn synthesis aspects
22EC303	Wireless Communications	CO1	Understand the fundamentals of mobile and cellular communications, system design and cell capacity.
		CO2	Understand about different propagation models and fading
		CO3	Model the fading effects using different modulation schemes
		CO4	Understand different types of equalizers and diversity techniques
		CO5	Acquire knowledge on multiple access techniques

22EC304	Antennas and Wave Propagation	CO1	Understand the antenna parameters and design linear wire antenna
		CO2	Design antenna arrays for desired antenna characteristics
		CO3	Design helical, reflector and horn antennas
		CO4	Design microstrip antenna and perform antenna measurement techniques
		CO5	Understand different modes of wave propagation
22EC305	Control Systems	CO1	Understand concept of control systems and different methods to find transfer function of a system
		CO2	Understand system transient and steady state response and their specifications
		CO3	Analyze the system stability in time domain and understand the frequency domain specification
		CO4	Analyze systems stability in frequency domain and design controller units
		CO5	Analyze the state variable analysis of control systems
22EC331	Advanced Communications Laboratory	CO1	Implement and analyze different modulations and demodulations for wireless communication
		CO2	Understand the different multiple access techniques for communication
		CO3	Implement and analyze multipath fading channel system
		CO4	Understand channel characteristics and equalization techniques
		CO5	Implement OFDM technique and analyze its BER
22EC332	Microcontrollers Laboratory	CO1	Implement the Assembly Language Programs to perform various operations in 8051 Micro-Controller
		CO2	Implement time delay between the events by programming the timers/interrupts in 8051 Micro-Controller
		CO3	Transmit the message serially at different baud rates using UART operation in 8051 Micro-Controller
		CO4	Interface various I/O Devices like DC Motor, LCD & LED to 8051 Micro-Controller
		CO5	Interface various I/O Devices like Keyboard, LCD, 7-Segment Display and DC Motor, Stepper Motor and Servo Motor to development boards
22HS331/381	Advanced English Communication and Soft Skills Laboratory	CO1	Gain proficiency in communication skills.
		CO2	Emerge as rational speakers.
		CO3	Efficiently Manage their professional career.
		CO4	Acclimatize to diverse cultures.
		CO5	Be empowered with skills required for self-management.

22HS302/352/ 253	Intellectual Property Rights	CO1	Understand concepts of intellectual property rights.
		CO2	Evaluate trademark.
		CO3	File for a patent.
		CO4	Analyze the fairness in a competition.
		CO5	Understand laws related to intellectual property rights

III Year II Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC351	Digital Signal Processing	CO1	Describe the amplitude modulation and demodulation techniques
		CO2	Apply DFT and FFT on discrete-time signals
		CO3	Realize the various Structures for digital filters
		CO4	Analyze and design an IIR digital filter
		CO5	Analyze and design an FIR digital filter
22EC352	IoT Architectures and Protocols	CO1	Understand the fundamental concepts of IoT, its characteristics, levels and applications
		CO2	Discuss various steps of design methodology involved in designing an IoT application
		CO3	Learn various wireless communication protocols used for IoT
		CO4	Understanding IoT Devices, Raspberry-Pi for smart applications and control
		CO5	Understand the concept of cloud, underlying infrastructure, servers and storage needed for IoT
22EC353	VLSI Design	CO1	Familiarize with the basics of MOSFET and different IC fabrication technologies
		CO2	Understand the Inverter analysis and CMOS logic structures
		CO3	Develop layouts for NMOS, CMOS logic circuits and learn the design flows
		CO4	Analyze and design various CMOS combinational and sequential circuits
		CO5	Understand the concept of memory implementation and the need for testing
22EC354	Machine Learning Algorithms	CO1	Understand the basics of Machine Learning and provide the knowledge on statistical learning
		CO2	Design & develop model-based techniques to solve Regression problems
		CO3	Efficient implementation of different Classifiers
		CO4	Analyze and build tree-based algorithms for classification
		CO5	Understand the concept of Bayesian Networks and Markov Networks Models
22EC355	Information Theory and Coding	CO1	Analyze the effect of noise in different analog communication systems. Also, able to calculate

			the signal to noise ratios for various analog modulation techniques
		CO2	Understand the information theory and able to do source coding for the given input data
		CO3	Design and analyze linear block codes and cyclic codes
		CO4	Understand the concept of convolutional and BCH codes
		CO5	Understand the concept of Turbo and LDPC codes. Also skillful in carrying out the error detection and correction techniques in channel coding
22EC356	Electronic Measurements and Instrumentation	CO1	Know the usage of various measuring instruments, minimize errors associated and evaluate their performance characteristics
		CO2	Design bridge circuits and evaluate resistance, inductance, capacitance, voltage, current, power factor and energy
		CO3	Generate various types of signals and measure physical quantities of signal
		CO4	Measure amplitude, frequency and phase of waveform with an oscilloscope
		CO5	Select appropriate passive or active transducers for measurement of strain, displacement, velocity, angular velocity, temperature and pressure
22HS351/301/401	Business Economics and Financial Analysis	CO1	Understand the concepts of micro and macro economics.
		CO2	Analyze demand and forecast demand
		CO3	Evaluate markets and formulate competitive strategies.
		CO4	Prepare financial statements.
		CO5	Evaluate the financial strengths and weaknesses of a business by using ratio analysis.
22EC381	Digital Signal Processing Laboratory	CO1	Carry out a simulation of DSP systems
		CO2	Implement the FFT for various DSP applications
		CO3	Implement multi-rate signal processing systems and probability concepts
		CO4	Design IIR and FIR digital filters
		CO5	Implement DSP systems using DSP processor
22EC382	VLSI Design Laboratory	CO1	Gain knowledge of different EDA Tools
		CO2	Understand the simulation and synthesis procedure of combinational circuits
		CO3	Develop sequential circuit applications using Flip-Flops
		CO4	Draw layouts using various steps of the layout design process
		CO5	Design and implement digital circuits under a full-custom design environment

22EC383	IoT Architectures and Protocols Laboratory	CO1	Choose the sensors and actuators for an IoT application
		CO2	Experiment with embedded boards for creating IoT prototypes
		CO3	Select protocols for a specific IoT application
		CO4	Utilize the cloud platform and APIs for IoT application
		CO5	Know the use of cloud platforms and frameworks of IoT

VI Year I Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC401	Microwave Engineering	CO1	Analyze the characteristics of rectangular waveguides and its coupling mechanisms
		CO2	Design waveguide components and analyze using S matrix
		CO3	Analyze different types of microwave tubes
		CO4	Analyze different types of microwave solid state devices
		CO5	Measure various waveguide parameters using microwave bench set up
22EC402	Communication Networks	CO1	Understand the working of various network topologies and circuit and packet switching
		CO2	Comprehend the role of data link layers and significance of MAC protocols
		CO3	Understand the networking protocols and Internet protocols
		CO4	Understand the transport layer working with TCP, UDP and ATM protocols
		CO5	Comprehend the functionality of application layer and importance of network security
22HS402	Professional Practice, Law & Ethics	CO1	Identify the importance of Professional Ethics.
		CO2	Understand contract management and various legal aspects related to engineering.
		CO3	Create awareness of Arbitration, Conciliation and Alternative Dispute Resolution system.
		CO4	Highlight relevance of engagement of Labour and Labour & other construction related Laws.
		CO5	Get elementary knowledge of IPR laws that would be of utility in profession.
22EC403	FPGA Architectures	CO1	Understand the FPGA architectures
		CO2	Understand types of FPGA interconnecting technologies
		CO3	Know different FPGA vendors architecture and their applications
		CO4	Develop the capability of logic expression using anti-fuse FPGA such as ACTEL FPGAs

		CO5	Understand the design applications using FPGA
22EC404	Fundamentals of Deep Learning	CO1	Understand the basics of Deep Learning and provide the knowledge to provide useful insights
		CO2	Deep understanding of Neural network architectures with optimization
		CO3	Develop different methodologies to create applications using deep nets
		CO4	Analyze and build tree-based algorithms for classification
		CO5	Implement RNN architectures
22EC405	Satellite Communications	CO1	Analyze the basic concepts of satellite communication, orbital mechanics and launching
		CO2	Analyze the satellite subsystems and satellite antennas
		CO3	Analyze different multiple access schemes and satellite link design
		CO4	Understand NGSO satellite systems, satellite TV and radio broadcasting
		CO5	Understand the principle of GPS and its modernization
22EC406	ASIC Design	CO1	Gain understanding of different type of ASICs
		CO2	Learn about library cell design, library architecture
		CO3	Understand different types of simulation models and verification methods
		CO4	Learn about physical design, different CAD tools and power performance of ASIC
		CO5	Understand Floor Planning, Placement and Routing algorithms
22EC407	Embedded Real-Time Operating Systems	CO1	Distinguish the importance of RTOS from GPOS & appreciate the importance of basic building blocks of RTOS
		CO2	Know the available services of kernel & use them to meet the requirements appropriately
		CO3	Applying the learning of RTOS to provide solutions for real world requirements using exceptions, interrupts & timers
		CO4	Learn existing & popular RTOS & to learn in detail how they have been implemented & put in to use
		CO5	Apply the knowledge earned & to implement the learning from requirement to realization of the Embedded System's Product
22EC408	Digital Image Processing	CO1	Understand the basic concepts of a 2-D Image Processing system, Sampling and Quantization and gain the concepts regarding the use of different 2D Image transforms
		CO2	Understand the spatial domain and frequency domain filtering techniques, including point operations, masking, histogram modification, smoothing and sharpening filters

		CO3	Acquire the knowledge of the image degradation in the presence of noise, different noise models and different approaches to restore the image
		CO4	Understand the need for image segmentation using local and global processing methods
		CO5	Understand the need for compression and evaluate the basic compression algorithms
22EC431	Microwave Engineering Laboratory	CO1	Measure attenuation, frequency and waveguide parameters in waveguides
		CO2	Perform antenna measurements
		CO3	Understand the characteristics of the Reflex Klystron and Gunn diode
		CO4	Measure VSWR and Scattering parameters of microwave components
		CO5	Measure the input impedance of a microwave component

VI Year II Semester			
Course Code	Course Title	CO Number	Course Outcome Statement
22EC451	System on Chip Architecture	CO1	Understand the basic level of a system on chip processor and architectures
		CO2	Design various processors by using parallel techniques
		CO3	Explore different types of memory architectures and their internal structures
		CO4	Design bus architectures by using peripheral specifications
		CO5	Design various encryption algorithms for DSP processors
22EC452	Radar Systems	CO1	Understand the basic principles of how a Radar system works
		CO2	Identify the various Radar systems in existence, specify their applications and limitations and explain the principles of how they work
		CO3	Describe the most commonly used techniques in processing Radar signals
		CO4	Analyze the concepts of different Radar receivers
		CO5	Examine the different filter characteristics used in Radar
22EC453	5G Communications	CO1	Analyze the evolution of 5G, system concepts and spectrum challenges
		CO2	Illustrate the architecture of 5G
		CO3	Apply the 5G concepts to D2D communications

		CO4	Compare various Radio-Access technologies
		CO5	Analyze effectiveness of multi-antenna techniques and channel models in realizing 5G NR
22EC454	Artificial Intelligence	CO1	Identify the scope for agent-based engineering solutions using AI based tools
		CO2	Demonstrate advanced search strategies
		CO3	Perform search space reduction techniques using minmax algorithm
		CO4	Apply knowledge representation, reasoning to AI-based solutions
		CO5	Deal with uncertainty through formal procedures and Bayesian's probabilistic reasoning
22EC455	Embedded System Design	CO1	Understand the concept of embedded systems, it's history and applications
		CO2	Acquire the basic knowledge about embedded processors, memories, and various communication interfaces
		CO3	Understand the key concepts of timers and counters
		CO4	To learn various programming models to develop embedded system
		CO5	Get familiarized with different embedded system case studies
22EC456	Optical Fiber Communications	CO1	Define basic optical laws and fundamentals. Also, understand the fiber structures, associated design parameters, fiber materials, and Fiber manufacturing techniques
		CO2	Describe channel impairment like fiber losses and dispersion. Also, remember the fiber standards to utilize in-network design
		CO3	Classify the optical sources, explain their principles, properties and analyses power launching and coupling techniques for optical fibers
		CO4	Differentiate and explain the working of photodetectors. Also, able to calculate the system bandwidth, noise, probability of error and bitrate of a digital fiber system
		CO5	Explain the concept and component of wavelength division multiplexing. Also, skilful in the design of Passive Optical Networks (PON) along with SONET