ELECTRONICS AND COMMUNICATION ENGINEERING 2021-Scheme	
Course Code	**21ELN14/24 - BASIC ELECTRONICS & COMMUNICATION ENGINEERING**
CO1	Describe the concepts of electronic circuits encompassing power supplies, amplifiers and oscillators
CO2	Present the basics of digital logic engineering including data representation, circuits and the microcontroller system with associated sensors and actuators.
CO3	Discuss the characteristics and technological advances of embedded systems.
CO4	Relate to the fundamentals of communication engineering spanning from the frequency spectrum to the various circuits involved including antennas.
CO5	Explain the different modes of communications from wired to wireless and the computing involved
Course Code	**21MAT 31 - TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICALTECHNIQUES**
CO1	To solve ordinary differential equations using Laplace transform
CO2	Demonstrate the Fourier series to study the behaviour of periodic functions and their applicationsin system communications, digital signal processing and field theory
CO3	To use Fourier transforms to analyze problems involving continuous-time signals and to apply ZTransform techniques to solve difference equations
CO4	To solve mathematical models represented by initial or boundary value problems involving partial differential equations
CO5	Determine the extremals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.
Course Code	**21EC32 - Digital System Design Using Verilog**
CO1	Simplify Boolean functions using K-map and Quine-McCluskey minimization technique
CO2	Analyze and design for combinational logic circuits
CO3	Analyze the concepts of Flip Flops (SR, D, T and JK) and to design the synchronous sequentialcircuits using Flip Flops.
CO4	Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.
Course Code	**21EC33 - Basic Signal Processing**
CO1	Understand the basics of Linear Algebra
CO2	Analyse different types of signals and systems
CO3	Analyse the properties of discrete time signals & systems
CO4	Analyse discrete time signals & systems using Z transforms
Course Code	**21EC34 - Analog Electronic Circuits**
CO1	Understand the characteristics of BJTs and FETs for switching and amplifier circuits.
CO2	Design and analyze FET amplifiers and oscillators with different circuit configurations and biasing conditions.
CO3	Understand the feedback topologies and approximations in the design of amplifiers and oscillators
CO4	Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers
CO5	Understand the power electronic device components and its functions for basic power electronic circuits.
Course Code	**21ECL35 - Analog and Digital Electronics Lab**
CO1	Design and analyze the BJT/FET amplifier and oscillator circuits

CO2	Design and test Opamp circuits to realize the mathematical computations, DAC and precision rectifiers.
CO3	Design and test the combinational logic circuits for the given specifications
CO4	Test the sequential logic circuits for the given functionality
CO5	Demonstrate the basic electronic circuit experiments using SCR and 555 timer.
Course Code	**21EC382 - AEC (Analog Electronic Circuits) Lab**
CO1	Understand the circuit schematic and its working
CO2	Study the characteristics of different electronic devices
CO3	Design and test simple electronic circuits as per the specifications using discrete electronic components.
CO4	Compute the parameters from the characteristics of active devices.
CO5	Familiarize with EDA software which can be used for electronic circuit simulation.
Course Code	**21EC41 - Maths for Communication Engineers**
CO1	Recall the basic laws and definitions (with mathematical representations) in Electric and Magnetic fields.
CO2	Apply the basic laws of Electric and Magnetic fields to arrive at Divergence Theorem, Current continuity Equation, Curl, Stokes' theorem
CO3	Apply Electric and Magnetic field concepts to arrive at Maxwell's equations, Electromagnetic wave equations and Poynting's theorem (Important concepts related to Communication link).
CO4	Recall the definitions related to Random variables and Random Processes
CO5	Model the Random events in the Communication set-up and determine useful statistical parameters.
Course Code	**21EC42 - Digital Signal Processing**
CO1	Determine response of LTI systems using time domain and DFT techniques
CO2	Compute DFT of real and complex discrete time signals
CO3	Compute DFT using FFT algorithms
CO4	Design FIR and IIR Digital Filters
CO5	Design of Digital Filters using DSP processor
Course Code	**21EC43- Circuits & Controls**
CO1	Analyse and solve Electric circuit, by applying, loop analysis, Nodal analysis and by applying network Theorems.
CO2	Evaluate two port parameters of a network and Apply Laplace transforms to solve electricnetworks
CO3	Deduce transfer function of a given physical system, from differential equation representation or Block Diagram representation and SFG representation
CO4	Calculate time response specifications and analyse the stability of the system
CO5	Draw and analyse the effect of gain on system behaviour using root loci.
CO6	Perform frequency response Analysis and find the stability of the system
CO7	Represent State model of the system and find the time response of the system.
Course Code	**21EC44 - Communication Theory**
CO1	Understand the amplitude and frequency modulation techniques and perform time and frequency domain transformations
CO2	Identify the schemes for amplitude and frequency modulation and demodulation of analog signals and compare the performance
CO3	Characterize the influence of channel noise on analog modulated signals
CO4	Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems

CO5	Illustration of digital formatting representations used for Multiplexers, Vocoders and Videotransmission.
Course Code	**21ECL46 - Communication Laboratory I**
CO1	Demonstrate the AM and FM modulation and demodulation by representing the signals in time and frequency domain.
CO2	Design and test the sampling, Multiplexing and PAM with relevant circuits
CO3	Demonstrate the basic circuitry and operations used in AM and FM receivers
CO4	Illustrate the operation of PCM and delta modulations for different input conditions
Course Code	**21EC482- C++ Basics**
CO1	Write C++ program to solve simple and complex problems
CO2	Apply and implement major object-oriented concepts like message passing, function overloading, operator overloading and inheritance to solve real-world problems
CO3	Use major C++ features such as Templates for data type independent designs and File I/O to deal with large data set
CO4	Analyze, design and develop solutions to real-world problems applying OOP concepts of C++
Course Code	**21EC51 - Digital Communication**
CO1	Analyze different digital modulation techniques and choose the appropriate modulation technique for the given specifications
CO2	Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels
CO3	Differentiate various spread spectrum schemes and compute the performance parameters of communication system.
CO4	Apply the fundamentals of information theory and perform source coding for given message
CO5	Apply different encoding and decoding techniques with error Detection and Correction
Course Code	**21EC52 - Computer Organization & ARM Microcontrollers**
CO1	Explain the basic organization of a computer system
CO2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory
CO3	Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3
CO4	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
Course Code	**21EC53 - Computer Communication Networks**
CO1	Understand the concepts of networking thoroughly
CO2	Identify the protocols and services of different layers
CO3	Distinguish the basic network configurations and standards associated with each network.
CO4	Discuss and analyse the various applications that can be implemented on networks
Course Code	**21EC54 - ELECTROMAGNETIC WAVES**
CO1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume
CO2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem
CO3	Determine potential and energy with respect to point charge and capacitance using Laplace equation and Apply Biot-Savart's and Ampere's laws for evaluating Magnetic field for different current configurations
CO4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials

	and voltage induced in electric circuits.
CO5	Apply Maxwell's equations for time varying fields, EM waves in free space and conductors and Evaluate power associated with EM waves using Poynting theorem
Course Code	**21ECL55 - Communication Lab II**
CO1	Design and test the digital modulation circuits and display the waveforms
CO2	To Implement the source coding algorithm using C/C++/ MATLAB code
CO3	To Implement the Error Control coding algorithms using C/C++/ MATLAB code.
CO4	Illustrate the operations of networking concepts and protocols using C programming and network simulators.
Course Code	**21EC581 - IoT (Internet of Things) Lab**
CO1	Understand internet of Things and its hardware and software components
CO2	Interface I/O devices, sensors & communication modules
CO3	Remotely monitor data and control devices
CO4	Develop real life IoT based projects
Course Code	**21EC62 - Microwave Theory and Antennas**
CO1	Describe the use and advantages of microwave transmission
CO2	Analyze various parameters related to transmission lines.
CO3	Identify microwave devices for several applications
CO4	Analyze various antenna parameters and their significance in building the RF system
CO5	Identify various antenna configurations for suitable applications
Course Code	**21EC63- VLSI Design and Testing**
CO1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling
CO2	Draw the basic gates using the stick and layout diagram with the knowledge of physical design aspects
CO3	Interpret memory elements along with timing considerations
CO4	Interpret testing and testability issues in combinational logic design
CO5	Interpret testing and testability issues in combinational logic design
Course Code	**21EC643 - Python Programming**
CO1	To acquire programming skills in Python
CO2	To demonstrate data structure representation using Python
CO3	To develop the skill of pattern matching and files in Python
CO4	To acquire Object Oriented Skills in Python
CO5	To develop the ability to write database applications in Python
Course Code	**21EC653 - Basic VLSI Design**
CO1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling
CO2	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects
CO3	Interpret Memory elements along with timing considerations
CO4	Demonstrate knowledge of FPGA based system design
CO5	Interpret testing and testability issues in VLSI Design
CO6	Analyze CMOS subsystems and architectural issues with the design constraints
Course Code	**21ECL66 - VLSI Laboratory**
CO1	Design and simulate combinational and sequential digital circuits using Verilog HDL.
CO2	Understand the synthesis process of digital circuits using EDA tool
CO3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist.

CO4	Design and simulate basic CMOS circuits like inverter, common source amplifier, differential amplifier, SRAM
CO5	Perform RTL_GDSII flow and understand the stages in ASIC design
Course Code	**21EC71 - Advanced VLSI**
CO1	Understand VLSI design flow
CO2	Describe the concepts of ASIC design methodology
CO3	Create floor plan including partition and routing with the use of CAD algorithms
CO4	Will have better insights into VLSI back-end design flow
CO5	Learn verification basics and System Verilog
Course Code	**21EC72 - Optical & Wireless Communication**
CO1	Classification and characterization of optical fibers with different modes of signal propagation
CO2	Describe the constructional features and the characteristics of optical fiber and optical devices used for signal transmission and reception
CO3	Understand the essential concepts and principles of mobile radio channel and cellular communication.
CO4	Describe various multiple access techniques used in wireless communication systems
CO5	Describe the GSM architecture and procedures to establish call set up, call progress handling and call tear down in a GSM cellular network.
Course Code	**21EC722 – Digital Image Processing**
CO1	Understand image formation and the role of human visual system plays in perception of gray and color image data
CO2	Compute various transforms on digital images
CO3	Conduct independent study and analysis of Image Enhancement techniques
CO4	Apply image processing techniques in frequency (Fourier) domain
CO5	Design image restoration techniques
Course Code	**21EC732 – Network Security**
CO1	Explain network security services and mechanisms and explain security concepts
CO2	Understand the concept of Transport Level Security and Secure Socket Layer
CO3	Explain Security concerns in Internet Protocol security
CO4	Explain Intruders, Intrusion detection and Malicious Software
CO5	Describe Firewalls, Firewall Characteristics, Biasing and Configuration
Course Code	**21CS744 - ROBOTIC PROCESS AUTOMATION DESIGN AND DEVELOPMENT**
CO1	To Understand the basic concepts of RPA
CO2	To Describe various components and platforms of RPA
CO3	To Describe the different types of variables, control flow and data manipulation techniques
CO4	To Understand various control techniques and OCR in RPA
CO5	To Describe various types and strategies to handle exceptions