Course Outcomes (COs)

Department of

Electronics and Communication Engineering

Programme Name: B.E.-Electronics & Communication Engineering

CONTENTS

2022 Scheme (UG)

Course Outcome for ECE Engineering

Course Outcomes of Second -Year Courses

Course Name	DIGITAL SYSTEM DESIGN USING VERILOG
Course Code	BEC302
Course outcomes (COs): At the end of the course the student will be able to:	
BEC302.1	Simplify Boolean functions using K-map and Quine-McCluskey minimization technique.
BEC302.2	Analyze and design for combinational logic circuits.
BEC302.3	Analyze the concepts of Flip Flops(SR, D,T and JK) and to design the synchronous sequential circuits using Flip Flops.
BEC302.4	Model Combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions.

Course Name	ELECTRONIC PRINCIPLES AND CIRCUITS
Course Code	BEC303
Course outcomes (COs): At the end of the course the student will be able to:	
BEC303.1	Understand the characteristics of BJTs and FETs for switching and amplifier circuits.
BEC303.2	Design and analyze amplifiers and oscillators with different circuit configurations and biasing conditions.
BEC303.3	Understand the feedback topologies and approximations in the design of amplifiers and oscillators.
BEC303.4	Design of circuits using linear ICs for wide range applications such as ADC, DAC, filters and timers And Understand the power electronic device components and its functions for basic power electronic circuits.

Course Name	NETWORK ANALYSIS
Course Code	BEC304
Course outcomes (COs): At the end of the course the student will be able to:	
BEC304.1	Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star- delta transformation
BEC304.2	Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
BEC304.3	Analyse the circuit parameters during switching transients and apply Laplace transform to solve the given network .
BEC304.4	Evaluate the frequency response for resonant circuits and the network parameters for two port networks.

Course Name	ANALOG AND DIGITAL SYSTEMS DESIGN LABORATORY
Course Code	BECL305
Course outcomes (COs): At the end of the course the student will be able to:	
BECL305.1	Design and analyze the BJT/FET amplifier and oscillator circuits.
BECL305.2	Design and test Op-amp circuits to realize the mathematical computations, DAC and precision rectifiers.
BECL305.3	Design and test the combinational logic circuits for the given specifications.
BECL305.4	Test the sequential logic circuits for the given functionality and Demonstrate the basic circuit experiments using 555 timer.

Course Name	ELECTRONIC DEVICES
Course Code	BEC306A
Course outcomes (COs): At the end of the course the student will be able to:	
BEC306A.1	Understand the principles of semiconductor Physics
BEC306A.2	Understand the principles and characteristics of different types of semiconductor devices
BEC306A.3	Understand the fabrication process of semiconductor devices
BEC306A.4	Utilize the mathematical models of semiconductor junctions for circuits and systems and identify the mathematical models of MOS transistors for circuits and systems.

2021 Scheme(UG)

Course Outcomes of Second-Year Courses

Course Name	Transform Calculus, Fourier Series and Numerical Techniques
Course Code	21MAT31
Course outcomes (COs): At the end of the course the student will be able to:	
21MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series , Numerical solutions of PDE & ODE and Calculus of variation .
21MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
21MAT31.3	Analyze the solutions of the real world problems using above techniques.
21MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	DIGITAL SYSTEM DESIGN USING VERILOG
Course Code	21EC32
Course outcomes (COs): At the end of the course the student will be able to:	
21EC32.1	Understand the basics of combinational and sequential circuits and basics of verilog HDL.
21EC32.2	Designing combinational circuits and sequential circuits along with verilog programs
21EC32.3	Implementation of digital circuits and verification using verilog programs
21EC32.4	Analyzing the applications of digital circuits and verification using verilog programs

Course Name	BASIC SIGNAL PROCESSING
Course Code	21EC33
Course outcomes (COs): At the end of the course the student will be able to:	
21EC33.1	Understanding mathematical background pertaining to signals and systems.
21EC33.2	Analysing different types of operations on signals and systems.
21EC33.3	Applying signals and its implications.
21EC33.4	Analysing system behaviour for different types of signals.

Course Name	ANALOG ELECTRONIC CIRCUITS
Course Code	21EC34
Course outcomes (COs): At the end of the course the student will be able to:	
21EC34.1	Describe the characteristics of BJT, FET, OPAMP, SCR and Amplifier
21EC34.2	Design the amplifier with and without feedback circuits using BJT, FET and linear ICs
21EC34.3	Implementation of linear, nonlinear and power electronic circuits
21EC34.4	Analyze the circuits using small signal models, frequency response, power amplifiers, op-amp application circuits and SCR

Course Name	ANALOG AND DIGITAL ELECTRONICS LAB
Course Code	21ECL35
Course outcomes (COs): At the end of the course the student will be able to:	
21ECL35.1	Design and test the combinational and sequential logic circuits for their functionalities by using suitable ICs based on specifications and functions
21ECL35.2	Realize and test rectifiers, amplifier, oscillators, opamps for the given specifications
21ECL35.3	Design and demonstrate various types of counters and Registers using Flip-flops
21ECL35.4	Analyse the characteristics and behaviour of various circuits for various parameters

Course Name	LIC (LINEAR INTEGRATED CIRCUITS) LAB USING PSPICE / MULTISIM
Course Code	21EC383
Course outcomes (COs): At the end of the course the student will be able to:	
21EC383.1	Make the circuit schematics, construct circuits containing op-amps, resistors, diodes, capacitors and independent sources using LTspice.
21EC383.2	Analyze and troubleshoot circuits containing op-amps, BJTs, MOSFETs, Resistors, Capacitors etc. using LTspice.
21EC383.3	Realize and verify the operation of analog integrated circuits like Amplifiers, Precision Rectifiers, Comparators and Waveform generators using LTspice.
21EC383.4	Design and implement analog integrated circuits like Oscillators, Active filters, Timer circuits, Data converters and compare the experimental results with theoretical values using LTspice.

Course Name	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS
Course Code	21MAT41
Course outcomes (COs): At the end of the course the student will be able to:	
21MAT41.1	Illustrate the fundamental concepts of– Complex Analysis, Complex integration, Special functions, Probability distributions, Statistical methods and Sampling theory.
21MAT41.2	Apply the acquired knowledge of - Complex Analysis, Complex integration, Special functions, Probability distributions, Statistical methods and Sampling theory in Electrical & Electronics engineering.
21MAT41.3	Analyze the solutions of the problem using appropriate techniques of - Complex Analysis, Complex integration, Special functions, Probability distributions, Statistical methods and Sampling theory.
21MAT41.4	Interpret the overall knowledge of -- Complex Analysis, Complex integration, Special functions, Probability distributions, Statistical methods and Sampling theory.

Course Name	DIGITAL SIGNAL PROCESSING
Course Code	21EC42
Course outcomes (COs): At the end of the course the student will be able to:	
21EC42.1	Determine response of LTI systems using time domain and DFT techniques and compute real and complex discrete time signals.
21EC42.2	Compute DFT and FFT algorithms and linear filtering approach
21EC42.3	esign and realize FIR and IIR digital filters
21EC42.4	Understand the DSP processor architecture.

Course Name	CIRCUITS AND CONTROLS
Course Code	21EC43
Course outcomes (COs): At the end of the course the student will be able to:	
21EC43.1	Understand the theorems/methods to analyze the circuits of two port system and simulating the same.
21EC43.2	Evaluate the system using different methods and implementation.
21EC43.3	Analyze the time domain and frequency domain response of the two port system and perform analysis.
21EC43.4	Represent the state model of the system and implementation.

Course Name	COMMUNICATION THEORY
Course Code	21EC44
Course outcomes (COs): At the end of the course the student will be able to:	
21EC44.1	Understand the amplitude and frequency modulation techniques and perform time and frequency domain transformations
21EC44.2	Identify the schemes for amplitude and frequency modulation and demodulation of analog signals and compare the performance
21EC44.3	Characterize the influence of channel noise on analog modulated signals
21EC44.4	Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems

Course Name	Biology For Engineers
Course Code	21BE45
Course outcomes (COs): At the end of the course the student will be able to:	
21EC45.1	Understand the basic biological concepts and their engineering applications.
21EC45.2	Apply the concepts of bio design principles to create novel devices and structures.
21EC45.3	Analyse how biological systems can be re-designed as substitute products for natural systems.
21EC45.4	Develop and design the interdisciplinary vision of biological engineering.

Course Name	COMMUNICATION LABORATORY I
Course Code	21ECL46
Course outcomes (COs): At the end of the course the student will be able to:	
21ECL46.1	Demonstrate the AM and FM modulation and demodulation by representing the signals in time and frequency domain.
21ECL46.2	Design and test the sampling, Multiplexing and PAM with relevant circuits.
21ECL46.3	Demonstrate the basic circuitry and operations used in AM and FM receivers
21ECL46.4	Illustrate the operation of PCM and delta modulations for different input conditions

Course Name	EMBEDDED C BASICS
Course Code	21EC481
Course outcomes (COs): At the end of the course the student will be able to:	
21EC481.1	Build Embedded C Programs to elaborate on arithmetic operation.
21EC481.2	Analyze the higher order bits operation using 8-bit microcontroller.
21EC481.3	Realize the method of sorting the given numbers using the Embedded C Basics.
21EC481.4	Design and write the embedded C code for interfacing project.

Course Outcomes of Third -Year Courses

Course Name	DIGITAL COMMUNICATION
Course Code	21EC51
Course outcomes (COs): At the end of the course the student will be able to:	
21EC51.1	Analyze different digital modulation techniques and choose the appropriate modulation technique for the given specifications.
21EC51.2	Test and validate symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels.
21EC51.3	Differentiate various spread spectrum schemes and compute the performance parameters of communication system.
21EC51.4	Apply the fundamentals of information theory and perform source coding for given message and Apply different encoding and decoding techniques with error Detection and Correction.

Course Name	COMPUTER ORGANIZATION & ARM MICROCONTROLLERS
Course Code	21EC52
Course outcomes (COs): At the end of the course the student will be able to:	
21EC52.1	Explain the basic organization of a computer system.
21EC52.2	Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
21EC52.3	Describe the architectural features and instructions of 32-bit microcontroller ARM Cortex M3.
21EC52.4	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.

Course Name	COMPUTER COMMUNICATION NETWORKS
Course Code	21EC53
Course outcomes (COs): At the end of the course the student will be able to:	
21EC53.1	Understand the concepts of networking thoroughly.
21EC53.2	Identify the protocols and services of different layers.
21EC53.3	Distinguish the basic network configurations and standards associated with each network.
21EC53.4	Discuss and analyse the various applications that can be implemented on networks.

Course Name	ELECTROMAGNETIC WAVES
Course Code	21EC54
Course outcomes (COs): At the end of the course the student will be able to:	
21EC54.1	Evaluate problems on electrostatic force, electric field due to point, linear, volume charges by applying conventional methods and charge in a volume.
21EC54.2	Apply Gauss law to evaluate Electric fields due to different charge distributions and Volume Charge distribution by using Divergence Theorem.
21EC54.3	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
21EC54.4	Calculate magnetic force, potential energy and Magnetization with respect to magnetic materials and voltage induced in electric circuits and 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 Name	COMMUNICATION LAB II
Course Code	21ECL55
Course outcomes (COs): At the end of the course the student will be able to:	
21ECL55.1	Design and test the digital modulation circuits and display the waveforms.
21ECL55.2	To Implement the source coding algorithm using C/C++/ MATLAB code.
21ECL55.3	To Implement the Error Control coding algorithms using C/C++/ MATLAB code.
21ECL55.4	Illustrate the operations of networking concepts and protocols using C programming and network simulators.

Course Name	IOT (INTERNET OF THINGS) LAB
Course Code	21EC581
Course outcomes (COs): At the end of the course the student will be able to:	
21EC581.1	Understand internet of Things and its hardware and software components.
21EC581.2	Interface I/O devices, sensors & communication modules.
21EC581.3	Remotely monitor data and control devices.
21EC581.4	Develop real life IoT based projects.

Course Name	MICROWAVE THEORY AND ANTENNAS
Course Code	21EC62
Course outcomes (COs): At the end of the course the student will be able to:	
21EC62.1	Describe the use and advantages of microwave transmission.
21EC62.2	Analyze various parameters related to transmission lines.
21EC62.3	Identify microwave devices for several applications.
21EC62.4	Analyze various antenna parameters and their significance in building the RF system and identify various antenna configurations for suitable applications.

Course Name	VLSI DESIGN AND TESTING
Course Code	21EC63
Course outcomes (COs): At the end of the course the student will be able to:	
21EC63.1	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology scaling.
21EC63.2	Draw the basic gates using the stick and layout diagram with the knowledge of physical design aspects.
21EC63.3	Interpret memory elements along with timing considerations.
21EC63.4	Interpret testing and testability issues in combinational logic design and Interpret testing and testability issues in combinational logic design.

Course Name	ARTIFICIAL NEURAL NETWORKS
Course Code	21EC641
Course outcomes (COs): At the end of the course the student will be able to:	
21EC641.1	Compare and contrast the biological neural network and ANN.
21EC641.2	Discuss the ANN for pattern classification.
21EC641.3	Develop and configure ANN's with different types of functions and learning algorithms.
21EC641.4	Apply ANN for real world problems.
Course Name	VLSI LABORATORY
Course Code	21ECL66
Course outcomes (COs): At the end of the course the student will be able to:	
21ECL66.1	Design and simulate combinational and sequential digital circuits using Verilog HDL.
21ECL66.2	Understand the synthesis process of digital circuits using EDA tool.
21ECL66.3	Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level netlist.
21ECL66.4	Design and simulate basic CMOS circuits like inverter, common source amplifier, differential amplifier, SRAM and Perform RTL_GDSII flow and understand the stages in ASIC design.

Course Outcomes of Fourth -Year Courses

Course Name	ADVANCED VLSI
Course Code	21EC71
Course outcomes (COs): At the end of the course the student will be able to:	
21EC71.1	Understand VLSI design flow
21EC71.2	Describe the concepts of ASIC design methodology
21EC71.3	Create floor plan including partition and routing with the use of CAD algorithms
21EC71.4	Will have better insights into VLSI back-end design flow and Learn verification basics and System Verilog.

Course Name	OPTICAL & WIRELESS COMMUNICATION
Course Code	21EC72
Course outcomes (COs): At the end of the course the student will be able to:	
21EC72.1	Classification and characterization of optical fibers with different modes of signal propagation.
21EC72.2	Describe the constructional features and the characteristics of optical fiber and optical devices used for signal transmission and reception.
21EC72.3	Understand the essential concepts and principles of mobile radio channel and cellular communication.
21EC72.4	Describe various multiple access techniques used in wireless communication systems and Describe the GSM architecture and procedures to establish call set up, call progress handling and call tear down in a GSM cellular network.

Course Name	DIGITAL IMAGE PROCESSING
Course Code	21EC722
Course outcomes (COs): At the end of the course the student will be able to:	
21EC722.1	Understand image formation and the role of human visual system plays in perception of gray and color image data.
21EC722.2	Compute various transforms on digital images.
21EC722.3	Conduct independent study and analysis of Image Enhancement techniques.
21EC722.4	Apply image processing techniques in frequency (Fourier) domain and Design image restoration techniques.

Course Name	MACHINE LEARNING WITH PYTHON
Course Code	21EC734
Course outcomes (COs): At the end of the course the student will be able to:	
21EC734.1	Appreciate the importance of visualization in the data analytics solution.
21EC734.2	Apply structured thinking to unstructured problems .
21EC734.3	Understand a very broad collection of machine learning algorithms and problems.
21EC734.4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory and Develop an appreciation for what is involved in learning from data.

Course Name	NATIONAL SERVICE SCHEME (NSS)
Course Code	21NS83
Course outcomes (COs): At the end of the course the student will be able to:	
21NS83.1	Under stand the importance of his / her responsibilities towards society.
21NS83.2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.
21NS83.3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.
21NS83.4	Implement government or self-driven projects effectively in the field.

2018 Scheme (UG)

Course Outcomes of Second-Year Courses

Course Name	**Transform Calculus, Fourier Series & Numerical Techniques**
Course Code	**18MAT31**
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT31.1	Illustrate the concepts of– Laplace, Fourier & Z transformation, Fourier series, Numerical solutions of ODE and Calculus of variation.
18MAT31.2	Apply the above acquired knowledge to solve the problems in engineering.
18MAT31.3	Analyze the solutions of the real world problems using above techniques.
18MAT31.4	Interpret the overall knowledge gained to demonstrate the problems arising in practical situations.

Course Name	**NETWORK THEORY**
Course Code	**18EC32**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC32.1	Determine currents/voltages and reduce network using various network transformation theorems
18EC32.2	Solve network problems by applying Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions.
18EC32.3	Understand transient conditions and apply Laplace transforms to networks
18EC32.4	Solve and simplify the given network using two port network parameters and understand the concept of resonance in circuits

Course Name	**ELECTRONIC DEVICES**
Course Code	**18EC33**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC33.1	Learn fundamental mechanisms of electrical conduction in semiconductors
18EC33.2	Understand the operating principles of basic electronic devices including pn junction, metal-semiconductor contact, bipolar junction transistors and field effect transistors
18EC33.3	Applying the mathematical equations to build the models for pn junction, BJTs and FETs

18EC33.4	Analyze the working of the semiconductor devices, optoelectronic devices and understanding the fabrication process of semiconductor devices

Course Name	**DIGITAL SYSTEM DESIGN**
Course Code	**18EC34**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC34.1	Understand the concepts of combinational and sequential logic circuits.
18EC34.2	Design of various types of combinational logic circuits.
18EC34.3	Design of sequential logic circuits using flip-flops.
18EC34.4	Apply combinational and sequential circuits.

Course Name	**COMPUTER ORGANIZATION AND ARCHITECTURE**
Course Code	**18EC35**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC35.1	Understand the basic organization of computer system along with instructions and programs.
18EC35.2	Explain different ways of accessing input /output devices including interrupts.
18EC35.3	Illustrate the organization of different types of semiconductor Primary memory and secondary storage memories.
18EC35.4	Outline simple processor organization based on Hardwired control and Micro programmed control.

Course Name	**POWER ELECTRONICS AND INSTRUMENTATION**
Course Code	**18EC36**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC36.1	Understand the principle of working of Power semiconductor devices, Controlled rectifiers, DC to DC converters, Inverters and SMPS.
18EC36.2	Explain the principle of operation of Multi Range Ammeters, Voltmeters ,Digital Instruments and PLCs
18EC36.3	Design and analyze the all-power converters and measuring instruments.
18EC36.4	Use instruments for measuring physical parameters and also use Power converters for the given loads.

Course Name	ELECTRONIC DEVICES AND INSTRUMENTATION LABORATORY
Course Code	18ECL37
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL37.1	Recognize and demonstrate the functioning of semiconductor power devices.
18ECL37.2	Design and test simple electronic circuits for measurement of temperature
18ECL37.3	Analyze the response and plot the characteristics of transducers
18ECL37.4	Use circuit simulation software for the implementation and characteristics of semiconductor devices

Course Name	DIGITAL SYSTEM DESIGN LABORATORY
Course Code	18ECL38
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL38.1	Simplify and realize the given Boolean expression using logic gates and verify the same using truth table.
18ECL38.2	Design and test adders, sub tractors, comparators using multiplexers and decoders.
18ECL38.3	Construct flips-flops and Design synchronous and asynchronous counters, shift registers.
18ECL38.4	Simulate serial adder and binary multiplier using any open source/licensed tool.

Course Name	COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS
Course Code	18MAT41
Course outcomes (COs): At the end of the course the student will be able to:	
18MAT41.1	Explain the fundamental concepts of– Calculus of complex functions, conformal transformation, complex integration, Probability distributions, Statistical methods and Sampling theory.
18MAT41.2	Apply the acquired knowledge of - Calculus of complex functions, conformal transformation, complex integration, Probability distributions, Statistical methods and Sampling theory in engineering.
18MAT41.3	Analyze the solutions of the problem using appropriate techniques of - Calculus of complex functions, conformal transformation, complex integration, Probability distributions, Statistical methods and Sampling theory.
18MAT41.4	Interpret the overall knowledge of -- Calculus of complex functions, conformal transformation, complex integration, Probability distributions, Statistical methods and Sampling theory.

Course Name	ANALOG CIRCUITS
Course Code	18EC42
Course outcomes (COs): At the end of the course the student will be able to:	
18EC42.1	Describe the biasing of the circuits and basics of op-amp based circuits.
18EC42.2	Design the bias circuits and op-amp based circuits.
18EC42.3	Implement the amplifier circuits and op-amp based circuits.
18EC42.4	Analyze the circuits with small signal model of amplifier circuits and op-amp based circuits.

Course Name	CONTROL SYSTEMS
Course Code	18EC43
Course outcomes (COs): At the end of the course the student will be able to:	
18EC43.1	To provide a basic understanding of the concept and techniques for developing the mathematical model involved in designing control scheme for dynamic systems.
18EC43.2	Developing transfer function for a given system and analysing the stability of the system.
18EC43.3	Analyzing the system in different domain.
18EC43.4	Applying different analysis techniques to determine the stability of the system.

Course Name	ENGINEERING STATISTICS and LINEAR ALGEBRA
Course Code	18EC44
Course outcomes (COs): At the end of the course the student will be able to:	
18EC44.1	Understanding the basics of mathematics.
18EC44.2	Applying mathematical equations to solve engineering problems.
18EC44.3	Analyzing the various effects on the signals using mathematical equations.
18EC44.4	Identifying the solutions to the signal related problems.

Course Name	SIGNALS AND SYSTEMS
Course Code	18EC45
Course outcomes (COs): At the end of the course the student will be able to:	
18EC45.1	Understanding the different signals and its operations with mathematical descriptions.
18EC45.2	Analyzing the properties of different types of signals under time and frequency domains.
18EC45.3	Applying the signals and realizing its implications under frequency and time domains.
18EC45.4	Analyzing the LTI system behavior for different signals.

Course Name	MICROCONTROLLER
Course Code	18EC46
Course outcomes (COs): At the end of the course the student will be able to:	
18EC46.1	Understand the difference between microprocessor and microcontroller and familiarize basic architecture of 8051.
18EC46.2	Program 8051 microprocessor using Assembly Level Language and C.
18EC46.3	Understand the interrupt system, timers, counters and their interfacing to 8051
18EC46.4	Interface 8051 to external memory and I/O devices using its I/O ports.

Course Name	MICROCONTROLLER LABORATORY
Course Code	18ECL47
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL47.1	Understand microcontroller instruction set and gain knowledge on assembly language programs
18ECL47.2	Develop and implement the program written in assembly language instructions.
18ECL47.3	Analyze the functioning of hardware devices and interface them into 8051 microcontrollers.
18EC4L7.4	Conduct and test on microcontroller board using KeilUvision tool/ compiler.

Course Name	ANALOG CIRCUITS LABORATORY
Course Code	18ECL48
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL48.1	Design and implement analog circuits using BJT and analyze their performance characteristics
18ECL48.2	Design and construct oscillators using FETs and analyze their performances.
18ECL48.3	Analyze and develop analog circuits using OP-AMP for different applications.
18ECL48.4	Simulate and analyze analog circuits that use ICs for different electronic applications.

Course Outcomes of Third-Year Courses

Course Name	TECHNOLOGICAL INNOVATION MANAGEMENT AND ENTREPRENEURSHIP
Course Code	18ES51
Course outcomes (COs): At the end of the course the student will be able to:	
18ES51.1	Understand the fundamental concepts of Management and Entrepreneurship and opportunities in order to setup a business.
18ES51.2	Describe the functions of Managers, Entrepreneurs and their social responsibilities.
18ES51.3	Analyze the components in developing a business plan.
18ES51.4	Illustrate various sources of funding and institutions supporting entrepreneurs.

Course Name	DIGITAL SIGNAL PROCESSING
Course Code	18EC52
Course outcomes (COs): At the end of the course the student will be able to:	
18EC52.1	Determine response of LTI systems using time domain and DFT techniques and compute real and complex discrete time signals.
18EC52.2	Compute DFT and FFT algorithms and linear filtering approach
18EC52.3	Design and realize FIR and IIR digital filters
18EC52.4	Understand the DSP processor architecture.

Course Name	PRINCIPLES OF COMMUNICATION SYSTEMS
Course Code	18EC53
Course outcomes (COs): At the end of the course the student will be able to:	
18EC53.1	Define AM, FM in Analog communication and sampling, quantizing and encoding in digital communication.
18EC53.2	Compare Analog communication and Digital communication and understand various modulation and demodulation techniques in AC & DC
18EC53.3	Develop a receiver model to study the behavior of noise.
18EC53.4	Analyze the performance of AM and FM in the presence of noise

Course Name	INFORMATION THEORY AND CODING
Course Code	18EC54
Course outcomes (COs): At the end of the course the student will be able to:	
18EC54.1	Understanding the channel information content and modelling the information content.
18EC54.2	Demonstrating the source coding by using different algorithms.
18EC54.3	Analyze the various types of information channel.
18EC54.4	Analyzing different error control coding technique and convolution codes

Course Name	ELECTROMAGNETIC WAVES
Course Code	18EC55
Course outcomes (COs): At the end of the course the student will be able to:	
18EC55.1	Define basic laws of electrostatics and magnetostatics.
18EC55.2	Derive various theorems related to electromagnetics.
18EC55.3	Calculate Force, Electric field intensity, Potential due to point charges and magnetic flux, Magnetic field intensity vector magnetic potential due to a current carrying conductor.
18EC55.4	Apply various laws to evaluate Electric and Magnetic field intensities and analyze boundary conditions.

Course Name	Verilog HDL
Course Code	18EC56
Course outcomes (COs): At the end of the course the student will be able to:	
18EC56.1	Understand the basic concepts of verilog HDL, Simulation and Test bench creation.
18EC56.2	Design of various combinational circuits in Verilog HDL at different levels of abstraction.
18EC56.3	Analyze sequential circuits in Verilog HDL at different levels of abstraction with task and function.
18EC56.4	Demonstrate the process of synthesis and post-synthesis

Course Name	DIGITAL SIGNAL PROCESSING LABORATORY
Course Code	18ECL57
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL57.1	Understand the concepts of analog and digital conversion of signals and frequency domain sampling of signals.
18ECL57.2	Modelling of discrete time signals and verification of its properties and results.
18ECL57.3	Implementation of discrete computations using digital signal processor and verify the results.
18ECL57.4	Realize the digital filter using simulation tool and analyze the response of the filter for audio signal

Course Name	HDL LABORATORY
Course Code	18ECL58
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL58.1	Simulate and demonstrate the working of Combinational circuits in Dataflow, Behavioral and Gate level Abstractions
18ECL58.2	Synthesize synchronous and Asynchronous sequential circuits using Xilinx Tools
18ECL58.3	Interface the hardware to the FPGA chips and obtain the desired output.
18ECL58.4	Apply EDA tools for simulation, verification and synthesis of digital design.

Course Name	DIGITAL COMMUNICATION
Course Code	18EC61
Course outcomes (COs): At the end of the course the student will be able to:	
18EC61.1	Associate and apply the mathematical concepts of bandpass and lowpass signals, line codes and Hilbert transform in a communication process
18EC61.2	Understand the signal processing in AWGN channel and analyze the performance parameters
18EC61.3	Compare the performance of various modulation and demodulation systems
18EC61.4	Analyze the performance parameters for low pass /bandpass signals under ideal and corrupted bandlimited channels and the spread spectrum communication

Course Name	EMBEDDED SYSTEMS
Course Code	18EC62
Course outcomes (COs): At the end of the course the student will be able to:	
18EC62.1	Understand the concept of 32-bit microcontroller and embedded system and their interactions
18EC62.2	Get familiarized with programming environment to develop embedded solutions and ARM microcontroller to perform various tasks.
18EC62.3	Apply contemporary techniques for hardware-software co-design of embedded systems for Real time applications using RTOs.
18EC62.4	Understand the interdisciplinary nature of various application field of embedded systems.

Course Name	MICROWAVE AND ANTENNAS
Course Code	18EC63
Course outcomes (COs): At the end of the course the student will be able to:	
18EC63.1	Describe the properties, characteristics of microwave system and Antennas.
18EC63.2	Illustrate the operation of microwave passive devices and components and Antennas.
18EC63.3	Design and construction of various antennas and microwave devices.
18EC63.4	Discuss the various applications of antennas and microwave devices.

Course Name	PYTHON APPLICATION PROGRAMMING
Course Code	18EC646
Course outcomes (COs): At the end of the course the student will be able to:	
18EC646.1	Describe the basics of the Python programming language.
18EC646.2	Create simple Python programs using basic syntax. .
18EC646.3	Implement application programs, sorting, looping, storing data as key/value pairs, extracting data etc.
18EC646.4	Analyze the programs, protocols that the web browsers retrieve data from websites, managing databases and the basics of object-oriented programming concepts

Course Name	SENSORS & SIGNAL CONDITIONING
Course Code	18EC652
Course outcomes (COs): At the end of the course the student will be able to:	
18EC652.1	Identify the importance of sensor-based measurement systems
18EC652.2	Utilize the working principles of reactance in sensor-based systems.
18EC652.3	Understand the working principles of self-generating sensors like thermoelectric, piezoelectric, photovoltaic and electrochemical sensors.
18EC652.4	Utilize the operations of digital sensors and evaluate the various electronic phenomenon and utilize them in manufacturing of semiconductor-based sensors

Course Name	EMBEDDED SYSTEM LABORATORY
Course Code	18ECL66
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL66.1	Understand the instruction set of 32-bit microcontroller ARM Cortex M3 and the software tool required for programming in Assembly and C language
18ECL66.2	Develop assembly level language program using ARM Cortex M3 for different applications
18ECL66.3	Interface external devices and I/O with ARM Cortex M3.
18ECL66.4	Apply assembly level language program and C language programs using ARM Cortex M3 for real time applications

Course Name	COMMUNICATION LAB
Course Code	18ECL67
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL67.1	Determine the characteristics and response of ASK, FSK and PSK modulation schemes
18ECL67.2	Measure the directivity and gain of microstrip, dipole and Yagi antennas
18ECL67.3	Simulate the Digital modulation schemes with display of waveforms and computation of performance parameters
18ECL67.4	Measure the propagation loss, bending loss and Numerical aperture of optical fiber

Course Outcomes of Fourth-Year Courses

Course Name	COMPUTER NETWORKS
Course Code	18EC71
Course outcomes (COs): At the end of the course the student will be able to:	
18EC71.1	Describe the layering architecture of computer networks and explain the functionalities of TCP/IP protocol suite
18EC71.2	Define different network types, topologies and understand the concepts of networking.
18EC71.3	Identify the protocols and services of different layers
18EC71.4	Construct a network model and determine the routing of packets using different routing algorithms

Course Name	VLSI DESIGN
Course Code	18EC72
Course outcomes (COs): At the end of the course the student will be able to:	
18EC72.1	Understand the working of basic CMOS circuits and the fabrication of MOS transistor.
18EC72.2	Implementation of the different types CMOS circuits
18EC72.3	Designing of combinational and sequential MOS circuits.
18EC72.4	Analyze the different types of basic VLSI circuits and the verification of the circuits

Course Name	DIGITAL IMAGEPROCESSING
Course Code	18EC733
Course outcomes (COs): At the end of the course the student will be able to:	
18EC733.1	Describe the fundamentals and Understand Image formation and the role Human visual system plays in perception of Gray and color images
18EC733.2	Understand Image processing transforms in both spatial and frequency domain

18EC733.3	Apply the Image transformation technique in spatial and frequency domain
18EC733.4	Analysis of Image enhancement, restoration techniques and morphological operations

Course Name	**IoT& WIRELESS SENSOR NETWORKS**
Course Code	**18EC741**
Course outcomes (COs): At the end of the course the student will be able to:	
18EC741.1	Understand the architecture and design principles of IoT.
18EC741.2	Describe the OSI Model for the IoT/M2M Systems.
18EC741.3	Develop the programming for IoT Applications.
18EC741.4	Analyze the basic protocols and architecture in wireless sensor network.

Course Name	**COMPUTER COMMUNICATION LAB**
Course Code	**18ECL76**
Course outcomes (COs): At the end of the course the student will be able to:	
18ECL76.1	Use the network simulator for learning and practice of networking algorithms.
18ECL76.2	Simulate the network with different transport layer protocols to understand the data transmission between two end devices.
18ECL76.3	Simulate the network with different configurations to measure the performance parameters.
18ECL76.4	Illustrate the operations of network protocols, routing protocols and algorithms using C programming.

Course Name	VLSI LAB
Course Code	18ECL77
Course outcomes (COs): At the end of the course the student will be able to:	
18EC77.1	Write test bench to simulate various digital circuits.
18EC77.2	Interpret concepts of DC Analysis, AC Analysis and Transient Analysis in analog circuits.
18EC77.3	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.
18EC77.4	Use basic amplifiers and further design higher level circuits like operational amplifier and analog/digital converters to meet desired parameters

Course Name	WIRELESS AND CELLULAR COMMUNICATION
Course Code	18EC81
Course outcomes (COs): At the end of the course the student will be able to:	
18EC81.1	Understand the process of Wireless Communication- both physical and networking associated with GSM, CDMA & LTE -4G Systems
18EC81.2	Explain concepts of propogation mechanism like Reflection, Diffraction, Scattering in wireless channels
18EC81.3	Develop a scheme for idle mode, call setup, call progress handling and call tear down in a GSM cellular network and CDMA networks
18EC81.4	Understand and Differentiate between the basic operation of Air Interface in LTE 4G systems and GSM

Course Name	NETWORK SECURITY
Course Code	18EC821
Course outcomes (COs): At the end of the course the student will be able to:	
18EC821.1	Describe network security services and mechanisms and explain security concepts.
18EC821.2	Elaborate the achieved goals of network security by understanding the concept and design of TLS and SSL.
18EC821.3	Explain Intruders, Malicious Software, Intrusion detection and elaborate security concerns in Internet Protocol.
18EC821.4	Describe Firewalls, Firewall Characteristics, Biasing and Configuration to understand the security of the network from outside attack and other security issues