## Course Outcome Statements of 2018 Scheme

The below table represents the 2018 Scheme Course Outcome Statements of the courses offered from 3rd semester to 8th semester of Electronics & Communication Engineering.

### 3rd Semester

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|---|---|
| **Course Code** | **18MAT31** |
| **Course Name** | **Transform Calculus, Fourier Series and Numerical Techniques** |
| CO1 | Use Laplace transform and inverse Laplace transform in solving differential/ integral equations arising in network analysis, control systems and other fields of engineering. |
| CO2 | Demonstrate Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing and field theory. |
| CO3 | Make use of Fourier transform and Z-transform to illustrate discrete/continuous function arising in wave and heat propagation, signals and systems. |
| CO4 | Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods. |
| CO5 | Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis. |
| **Course Code** | **18EC32** |
| **Course Name** | **Network Theory** |
| CO1 | Determine currents and voltages by applying source transformation/source shifting/mesh/nodal analysis and reduce given network using star-delta transformation/source transformation/source shifting |
| CO2 | Solve network problems by applying Superposition/Thevenin's/ Norton's/Maximum Power Transfer/ Millman's Theorems and electrical laws to reduce circuit complexities and arrive at feasible solutions. |
| CO3 | Calculate current and voltages for the given circuit under transient conditions and apply Laplace Transform to solve the given network. |
| CO4 | Solve the given network using specified two port network parameters-Z, Y, H and T |
| CO5 | Understand the concept of resonance and determine the parameters that characterize series/parallel resonant circuits. |
| **Course Code** | **18EC33** |
| **Course Name** | **Electronic Devices** |
| CO1 | Understand the principles of semiconductor Physics |
| CO2 | Understand the mathematical models of semiconductor junctions and optoelectronic devices. |
| CO3 | Understand the principles and characteristics of BJT, and analyze the coupled diode model. |
| CO4 | Understand the principles and characteristics of MOSFET, and analyze the small signal model. |
| CO5 | Understand the fabrication process of semiconductor devices and Integrated circuits. |
| **Course Code** | **18EC34** |

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| Course Name | Digital System Design |
|---|---|
| CO1 | Illustrate the simplification of Boolean equations using Karnaugh Maps and Quine-McCluskey Techniques |
| CO2 | Design Decoders, Encoders, Multiplexers, Adders, Subtractors, Binary Comparators and other combinational logic circuits |
| CO3 | Describe the different types of Latches, Flip-flops and Registers, and design different Counters. |
| CO4 | Design and Analyze Mealy and Moore Models, and Develop state diagrams for Synchronous Sequential Circuits |
| **Course Code** | **18EC35** |
| **Course Name** | **Computer Organisation and Architecture** |
| CO1 | Explain the basic organization of a computer system and fundamentals of computers. |
| CO2 | Apply assembly language instructions for basic input, output operations and other related programs. |
| CO3 | Illustrate different ways of accessing an input / output device including interrupts |
| CO4 | Demonstrate the organization of different types of semiconductor and other secondary storage memories |
| CO5 | Illustrate simple processor organization based on hardwired control and micro programmed control. |
| **Course Code** | **18EC36** |
| **Course Name** | **Power Electronics and Instrumentation** |
| CO1 | Study the basics of power electronics and analysis of thyristor circuits with different triggering conditions. |
| CO2 | Analyze and design controlled rectifiers, DC to DC converters, DC to AC converters and SMPS. |
| CO3 | Study of electronic instrumental parameters and design of multi range Ammeters, Voltmeters. |
| CO4 | Study of digital voltmeters, frequency meters and the bridge circuits to measure passive component values and frequency |
| CO5 | Describe the principle of operation of different Transducers and Programmable Logic Controllers. |
| **Course Code** | **18ECL37** |
| **Course Name** | **Electronic Devices and Instrumentation Laboratory** |
| CO1 | Understand the characteristics of various electronic devices, and measure the parameters. |
| CO2 | Design and test simple electronic circuits. |
| CO3 | Use circuit simulation software for the implementation and characterization of electronic circuits and devices. |
| **Course Code** | **18ECL38** |
| **Course Name** | **Digital System Design Laboratory** |
| CO1 | Demonstrate the truth table of various expressions and combinational circuits using logic gates. |
| CO2 | Design various combinational circuits such as adders, Subtractor, comparators, multiplexers and demultiplexers. |
| CO3 | Construct flips-flops, counters and shift registers. |

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|---|---|
| CO4 | Simulate Serial adder and Binary Multiplier. |
| CO5 | Demonstrate the ability to conduct experiments individually/ in group and write clear lab reports. |

**4th Semester**

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|---|---|
| **Course Code** | **18MAT41** |
| **Course Name** | **Complex Analysis Probability and Statistical Methods** |
| CO1 | Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory. |
| CO2 | Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing. |
| CO3 | Apply discrete and continuous probability distributions in analyzing the probability models arising in the engineering field. |
| CO4 | Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data |
| CO5 | Construct joint probability distributions and demonstrate the validity of testing the hypothesis. |
| **Course Code** | **18EC42** |
| **Course Name** | **Analog Circuits** |
| CO1 | Design biasing circuits for BJT and MOSFET amplifiers, and perform DC and AC analysis. |
| CO2 | Analyze MOSFET amplifiers using small-signal model and high frequency model, and generate sine waves using different oscillator circuits. |
| CO3 | Understand the different types of feedback topologies in amplifiers, and design power amplifiers |
| CO4 | Design Op-Amp circuits for linear and nonlinear applications |
| CO5 | Design converters and filters using Op-Amp and multivibrators using 555 Timer |
| **Course Code** | **18EC43** |
| **Course Name** | **Control Systems** |
| CO1 | Develop the mathematical and State model of electrical and mechanical systems. |
| CO2 | Develop transfer function for a given control system using Block diagram reduction method and Signal Flow Graph Method. |
| CO3 | Determine the time domain specifications for first and second order systems. |
| CO4 | Determine the stability of the system in the time domain using Routh-Hurwitz Criterion and Root locus Technique. |
| CO5 | Determine the stability of the system in the frequency domain using Nyquist and Bode plots. |
| **Course Code** | **18EC44** |
| **Course Name** | **Engineering Statistics and Linear Algebra** |
| CO1 | Examine Single random variables, functions of single random variables and its applications. |
| CO2 | Compute the various statistical parameters for Multiple Random Variables. |
| CO3 | Analyze the quantitative parameters of Random Processes and its applications. |
| CO4 | Analyze a typical signal set in terms of the basis function set. |
| CO5 | Calculate the quantitative parameters for Matrices and Linear Transformations. |

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|---|---|
| **Course Code** | **18EC45** |
| **Course Name** | **Signals and Systems** |
| CO1 | Analyze the different types of signals and systems. |
| CO2 | Determine the linearity, causality, time-invariance and stability properties of continuous and discrete time systems. |
| CO3 | Evaluate the convolution sum and integral. |
| CO4 | Represent continuous and discrete signals & systems in frequency domain using Fourier representations. |
| CO5 | Analyze discrete time signals & systems using Z-transforms. |
| **Course Code** | **18EC46** |
| **Course Name** | **Microcontroller** |
| CO1 | Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 |
| CO2 | Write 8051 Assembly level programs using the 8051 instruction set. |
| CO3 | Write stack related assembly level programs using 8051 instruction set and I/O Port Interfacing and Programming. |
| CO4 | Write 8051 Assembly language program to handle timers/counters, serial port and interrupts. |
| CO5 | Interface various peripheral devices to 8051 using I/O ports and related programming. |
| **Course Code** | **18ECL47** |
| **Course Name** | **Microcontroller Laboratory** |
| CO1 | Write Assembly level programs using 8051 instruction set. |
| CO2 | Write 8051 Assembly language program to handle timers/counters, serial port and interrupts. |
| CO3 | Interface various peripheral devices to 8051 using I/O ports. |
| **Course Code** | **18ECL48** |
| **Course Name** | **Analog Circuits Laboratory** |
| CO1 | Design analog circuits using BJT/MOSFET/555 Timer and evaluate their performance characteristics. |
| CO2 | Design analog circuits using OPAMPs for different applications. |
| CO3 | Simulate and analyze analog circuits for different electronic applications. |
| CO4 | Demonstrate the ability to work in groups and write clear lab reports. |
| **Course Code** | **18CPC49** |
| **Course Name** | **Constitution of India, Professional Ethics and Cyber Law** |
| CO1 | Have knowledge of the Indian Constitution and legal aspects. |
| CO2 | Understand Engineering and Professional ethics and responsibilities of Engineers. |
| CO3 | Understand the cybercrimes and cyber laws for cyber safety measures. |

**5th Semester**

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|---|---|
| **Course Code** | **18ES51** |
| **Course Name** | **Technological Innovation Management and Entrepreneurship** |

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|---|---|
| CO1 | Make use of the fundamental concepts of Management and functions of Management. |
| CO2 | Summarize the concepts related to Entrepreneurship and their social responsibilities. |
| CO3 | Choose a relevant business idea through market feasibility analysis study |
| CO4 | Develop a business plan and project report. |
| **Course Code** | **18EC52** |
| **Course Name** | **Digital Signal Processing** |
| CO1 | Analyze the DFT and IDFT of sequences to verify their properties. |
| CO2 | Validate the efficiency of DFT computation using FFT algorithms and linear filtering approach. |
| CO3 | Design and realize IIR and FIR filters |
| CO4 | Implement IIR and FIR filters in Digital Signal Processors. |
| **Course Code** | **18EC53** |
| **Course Name** | **Principles of Communication Systems** |
| CO1 | Apply the mathematical techniques to represent amplitude modulation schemes such as DSBFC, DSBSC, SSB and VSB in time and frequency domains with the generation and detection methods. |
| CO2 | Apply the mathematical techniques and represent frequency modulation in time and frequency domains with the generation and detection methods. |
| CO3 | Compute the performance of AM and FM modulation in the presence of noise at the receiver. |
| CO4 | Illustrate the characteristics of pulse amplitude modulation, pulse position modulation systems |
| CO5 | Illustrate the PCM and delta modulation methods and the use of digital formatting in Multiplexers, Vocoders Video transmission. |
| **Course Code** | **18EC54** |
| **Course Name** | **Information Theory and Coding** |
| CO1 | Explain the concept of dependent and independent source, measure of information, entropy, rate of information and order of a source |
| CO2 | Interpret the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithm. |
| CO3 | Interpret the continuous and discrete communication channels using input, output and joint probabilities |
| CO4 | Determine the codeword comprising of check bits computed using linear block codes, cyclic codes and convolutional codes |
| **Course Code** | **18EC55** |
| **Course Name** | **Electromagnetic Waves** |
| CO1 | Solve 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, divergence theorem in electrostatics to evaluate electric fields. |
| CO3 | Apply Biot-Savart's and Ampere's laws for evaluating Magnetic fields of different current configurations. |
| CO4 | Calculate magnetic force, potential energy and magnetization with respect to magnetic materials and voltage induced in electric circuits. |
| CO5 | Make use of Maxwell's equations to inspect electromagnetic waves in different media. |
| **Course Code** | **18EC56** |

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| Course Name | Verilog HDL |
|---|---|
| CO1 | Design abstract level programs on Verilog HDL. |
| CO2 | Comprehend the different lexical conventions, Verilog task, functions and directives. |
| CO3 | Design digital circuits using gate level, dataflow and behavioral modeling through engineering knowledge on different statements, looping, tasks and functions in Verilog HDL. |
| CO4 | Interpret the useful modeling techniques and the various constructs of logic synthesis. |
| CO5 | Program and verify the functionality of a given problem statement using EDA tools |
| **Course Code** | **18ECL57** |
| **Course Name** | **Digital Signal Processing Laboratory** |
| CO1 | Conduct the experiments on Sampling Theorem, DFT and interpret the data. |
| CO2 | Verify the properties of discrete time signals and systems. |
| CO3 | Verify the result of discrete computations and generate the standard test signals using DSP processor. |
| CO4 | Realize the digital filters using a simulation tool and analyze the response of the filter for an audio signal. |
| **Course Code** | **18ECL58** |
| **Course Name** | **HDL Laboratory** |
| CO1 | Apply the knowledge of Verilog HDL for modeling and functional verification of combinational circuits in Dataflow, Behavioral and Gate level Abstractions. |
| CO2 | Apply the knowledge of Verilog HDL for modeling and functional verification of sequential circuits. |
| CO3 | Design and synthesize combinational and sequential circuits on programmable ICs and test the hardware. |
| CO4 | Program and verify the functionality of a given problem statement using EDA tools |
| **Course Code** | **18CIV59** |
| **Course Name** | **Environmental Studies** |
| CO1 | Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale. |
| CO2 | Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment. |
| CO3 | Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components. |
| CO4 | Apply the ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues. |

**6th Semester**

| Course Code | 18EC61 |
|---|---|
| **Course Name** | **Digital Communication** |
| CO1 | Understand and apply the concepts of representing Bandpass signals in complex low pass equivalent. |
| CO2 | Analyze the geometric representation and detection of signals and also understand different types of receivers used to detect signals. |

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| CO3 | Analyze different digital modulation and demodulation techniques. |
| CO4 | Analyze communication through Band Limited Channels and understand the channel equalization techniques. |
| CO5 | Understand the principle of spread spectrum used in digital communication system |
| **Course Code** | **18EC62** |
| **Course Name** | **Embedded Systems** |
| CO1 | Explain the architecture of ARM Cortex M3 with block diagram. |
| CO2 | Write programs to solve desired task using ISA or embedded C language |
| CO3 | Infer firmware and system components with respect to embedded applications. |
| CO4 | Determine embedded firmware design and development using hardware software co-design and program modeling. |
| CO5 | Explain different types of OS and discuss embedded system (IDE) development environments. |
| **Course Code** | **18EC63** |
| **Course Name** | **Microwave and Antenna** |
| CO1 | Compute various parameters related to microwave transmission lines and waveguides. |
| CO2 | Study microwave network theory and network parameters. |
| CO3 | Identify microwave devices for various applications and explain the antenna basics. |
| CO4 | Analyze various parameters necessary for building an RF system. |
| CO5 | Understand various antenna configurations according to the applications. |
| **Course Code** | **18EC646** |
| **Course Name** | **Python Application Programming** |
| CO1 | Make use of the Syntax and Semantics to develop Functions in Python |
| CO2 | Experiment with Strings and Files in Python |
| CO3 | Apply Lists, Tuples, Dictionaries and Regular expressions in Python programming. |
| CO4 | Experiment with Object Oriented Programming concepts in Python |
| CO5 | Construct networked programs using Web Services, Database and SQL |
| **Course Code** | **18CS653** |
| **Course Name** | **JAVA Programming** |
| CO1 | Understanding the basic programming constructs of Java and application of Object Oriented Principles |
| CO2 | Understand the usage of operators and control statements and applying them in programming |
| CO3 | Develop programs using the concepts of Java classes and Inheritance |
| CO4 | Make use of the concepts of exception, packages and interfaces in problem solving |
| CO5 | Make use of Console IO and string handling operations in Java programs |
| **Course Code** | **18CS654** |
| **Course Name** | **Operating Systems** |
| CO1 | Understand the basic concept of Operating system and apply the same in Operating system design and implementation. |

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| CO2 | Understand the concepts of process and threads and analyze the concept of inter-process communication |
| CO3 | Understand the concepts of scheduling and synchronization and apply them in designing scheduling algorithms along with finding solutions for critical section problems. |
| CO4 | Discuss the concept of deadlock and the different memory management strategies like paging, segmentation. |
| CO5 | Apply the concepts of virtual memory and perform page replacement and file handling in managing free space. |
| **Course Code** | **18ECL66** |
| **Course Name** | **Embedded Systems Laboratory** |
| CO1 | Understand the instruction set of 32 bit microcontroller ARM Cortex M3, and the software tool required for programming in Assembly and C language. |
| CO2 | Develop assembly language programs using ARM Cortex M3 for different applications. |
| CO3 | Interface external devices and I/O with ARM Cortex M3. |
| CO4 | Develop C language programs and library functions for embedded system applications. |
| **Course Code** | **18ECL67** |
| **Course Name** | **Communication Laboratory** |
| CO1 | Design and test the digital and analog modulation circuits and display the Waveforms. |
| CO2 | Determine the characteristics and response of microwave Waveguide. |
| CO3 | Determine the characteristics of micro strip antennas and devices and compute the parameters associated with it. |
| CO4 | Simulate the digital modulation systems and compare the error performance of basic digital modulation schemes. |
| **Course Code** | **18ECMP68** |
| **Course Name** | **Mini Project** |
| CO1 | Identify the requirements for the real-world problems. |
| CO2 | Conduct an investigation of several literature available in the chosen sector. |
| CO3 | Studying and improving the abilities of software and hardware. |
| CO4 | Successfully demonstrate and build the prototype through hardware needs, coding, emulation and testing. |
| CO5 | To record and present the results of the analysis carried out in the chosen region. Demonstrate a skill in working in teams to handle the analysis. |

**7th Semester**

| | |
|---|---|
| **Course Code** | **18EC71** |
| **Course Name** | **Computer Networks** |
| CO1 | Identify the functions in the layered architecture of OSI reference model & TCP/IP protocol suite. |
| CO2 | Apply the working of data link layers in networking. |
| CO3 | Make use of the routing operations of the network layer in packet forwarding. |
| CO4 | Apply the responsibilities of transport layer in networking. |
| CO5 | Utilize the activities of the application layer in networking. |

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| Course Code | 18EC72 |
|---|---|
| Course Name | VLSI Design |
| CO1 | Explain the operation of MOS transistors, and design logic gates and circuits using MOS transistors |
| CO2 | Explain the CMOS fabrication processes, scaling methods, capacitances in MOSFETs, and design gate layouts using lambda based rules |
| CO3 | Analyze the performances of single-stage and multi-stage combinational logic circuits, and optimize the circuit for lowest delay |
| CO4 | Design dynamic and static sequential circuits using various techniques and understand their merits and demerits |
| CO5 | Explain the structures of semiconductor memories, and understand the testing and verification principles |
| Course Code | 18EC733 |
| Course Name | Digital Image Processing |
| CO1 | Understand the fundamentals of image processing and role of the human visual system in perception of gray and color image data. |
| CO2 | Apply image processing techniques in both the spatial and frequency domains |
| CO3 | Study and analyze the image reconstruction model with various forms of degradations and additive noises |
| CO4 | Apply the fundamental transforms used in color image processing and morphological operations |
| Course Code | 18EC744 |
| Course Name | Cryptography |
| CO1 | Apply the basic cryptographic algorithms to encrypt and decrypt the data and to determine the GCD of two numbers using the Euclidean algorithm. |
| CO2 | Use symmetric cryptography algorithms to encrypt and decrypt the data. |
| CO3 | Use the concepts of abstract algebra and the mathematics associated with cryptography. |
| CO4 | Apply the public key cryptosystems to ensure confidentiality through key distribution and digital signatures for verifying user identities. |
| CO5 | Apply pseudo random sequence in stream cipher algorithms. |
| Course Code | 18ME751 |
| Course Name | Energy and Environment |
| CO1 | Understand energy scenarios, energy sources and their utilization. |
| CO2 | Understand various methods of energy storage, energy management and economic analysis. |
| CO3 | Analyze the awareness about the environment and ecosystem. |
| Course Code | 18CV753 |
| Course Name | Environmental Protection and Management |
| CO1 | Appreciate the elements of Corporate Environmental Management systems complying to international environmental management system standards. |
| CO2 | Lead pollution prevention assessment team and implement waste minimization options. |

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| CO3 | Develop, Implement, maintain and Audit Environmental Management systems for Organizations |
| **Course Code** | **18ECL76** |
| **Course Name** | **Computer Networks Laboratory** |
| CO1 | Choose suitable tools to model a network. |
| CO2 | Use the network simulator for learning and practice of networking algorithms. |
| CO3 | Illustrate the operations of network protocols and algorithms using C programming. |
| CO4 | Simulate the network with different configurations to measure the performance parameters. |
| **Course Code** | **18ECL77** |
| **Course Name** | **VLSI Laboratory** |
| CO1 | Implement the data link and routing protocols using C programming. |
| CO2 | Design and simulate basic CMOS circuits. |
| CO3 | Design and simulate analog amplifiers. |
| CO4 | Design and simulate combinational and sequential digital circuits using Verilog HDL |
| CO5 | Perform ASIC design flow and understand the process of synthesis, synthesis constraints and evaluating the synthesis reports to obtain optimum gate level net list |

**8th Semester**

| | |
|---|---|
| **Course Code** | **18EC81** |
| **Course Name** | **Wireless and Cellular Communication** |
| CO1 | Understand the communication theory both Physical and networking associated with GSM, CDMA & LTE 4G systems and concepts of propagation mechanisms like Reflection, Diffraction, Scattering in Wireless channels. |
| CO2 | Develop a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network. |
| CO3 | Develop a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network. |
| CO4 | Understand the Basic operations of Air interface in a LTE 4G system. |
| **Course Code** | **18EC823** |
| **Course Name** | **Radar Engineering** |
| CO1 | Understand the basics of the radar system and apply the radar range equation to find the maximum range. |
| CO2 | Examine the range parameters of Radar system which affect the system performance and also understand Radar Cross Section of Targets |
| CO3 | Explain the working and applications of different types of Radar. |
| CO4 | Describe the working of various radar antennas and receivers. |
| **Course Code** | **18EC824** |
| **Course Name** | **Optical Communication Network** |
| CO1 | Explain the working principle of optical fiber with different modes of signal propagation and fiber materials and apply the concepts of ray theory. |

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| CO2 | Apply the concepts of losses and describe the transmission characteristics in optical fiber communication and the construction and working principle of optical connectors. |
| CO3 | Describe the constructional features and the characteristics of optical sources, Receivers, Photodetectors and use the idea to solve for rate equation & quantum efficiency. |
| CO4 | Understand the applications and types of optical amplifiers and describe the WDM concepts and Components. |
| CO5 | Discuss the networking aspects of optical fiber and describe various standards associated with it. |
| **Course Code** | **18ECP78/83** |
| **Course Name** | **Project Work** |
| CO1 | Recognise and define problems by understanding its background, set the objectives (time, cost and technical requirements) and deliverables of a project. |
| CO2 | Develop the strategies and methodologies by thorough literature review to achieve the project objectives within a given set of constraints. |
| CO3 | Select the most suitable method to achieve the objectives among the developed strategies and Conduct scientific and logical analysis using information or data generated to draw the conclusions |
| CO4 | Communicate effectively with stakeholders of the project and work independently to achieve the project objectives and produce the deliverables as well as prepare, present, and defend a clear, coherent and succinct project report in a technical platform |
| **Course Code** | **18ECS84** |
| **Course Name** | **Seminar** |
| CO1 | Identify and study the technological development in the respective domain through literature survey |
| CO2 | Perform thorough analysis of the work done by the experts in the field and draw conclusions |
| CO3 | Prepare , present a clear, coherent and succinct seminar report |
| **Course Code** | **18ECI85** |
| **Course Name** | **Internship** |
| CO1 | Identify and study the technological development in the respective domain and develop a technical artifact. |
| CO2 | Develop work habits and attitudes necessary for job success and build a record of work experience |
| CO3 | Communicate effectively and to present ideas clearly and coherently in both the written and oral forms. |

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## Course Outcome Statements of 2021 Scheme

The below table represents the 2021 Scheme Course Outcome Statements of the courses offered from 3rd semester to 5th semester of Electronics & Communication Engineering.

### 3rd Semester

| **Course Name** | Transform Calculus, Fourier Series & Numerical Techniques |
|---|---|
| **Course Code** | 21MAT31 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| **CO1** | To solve ordinary differential equations using Laplace transform. |
| **CO2** | Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory. |
| **CO3** | To use Fourier transforms to analyze problems involving continuous-time signals and to apply Z-Transform techniques to solve difference equations |
| **CO4** | To solve mathematical models represented by initial or boundary value problems involving partial differential equations |
| **CO5** | Determine the externals of functionals using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis. |

| **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 :** | |
| **CO1** | Simplify Boolean functions using K-map and Quine-McCluskey minimization techniques. |
| **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 sequential circuits using Flip Flops. |
| **CO4** | Model combinational circuits (adders, subtractors, multiplexers) and sequential circuits using Verilog descriptions. |

| **Course Name** | Basic Signal Processing |
|---|---|
| **Course Code** | 21EC33 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| **CO1** | Understand basics of Linear Algebra |
| **CO2** | Understand various quantitative parameters for matrix operations |
| **CO3** | Analyze the different types of signals and systems, operations on signals and properties of systems |
| **CO4** | Analyze the discrete time signals in time domain using convolution sum, interconnection of systems and properties. |
| **CO5** | Determine the Z-transforms and inverse Z-Transforms of discrete time signals. |

| **Course Name** | Analog Electronic Circuits |
|---|---|
| **Course Code** | 21EC34 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| **CO1** | Understand the biasing and small signal model of BJTs and FETs and design for switching and amplifier circuits. |

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| 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 Name** | Analog and Digital Electronics Lab |
|---|---|
| **Course Code** | 21ECL35 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| 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 Name** | Ability Enhancement Course – III LD (Logic Design) Lab using MultiSIM |
|---|---|
| **Course Code** | 21EC381 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| CO1 | Demonstrate the truth table of various expressions and combinational circuits using logic gates. |
| CO2 | Design various combinational circuits such as adders, subtractors, comparators, multiplexers and code converters and decoders. |
| CO3 | Construct flip-flops, counters and shift registers. |
| CO4 | Design and implement a random sequence generator, serial adders and mod-N counters. |
| CO5 | Design a circuit to solve a given open ended problem individually or in a team using either simulation software or hardware. |

| **Course Name** | Balake Kannada |
|---|---|
| **Course Code** | 21KBK37 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |
| CO1 | To understand the necessity of learning of local language for comfortable life. |
| CO2 | To Listen and understand the Kannada language properly. |
| CO3 | To speak, read and write Kannada language as per requirement. |
| CO4 | To communicate (converse) in Kannada language in their daily life with kannada speakers. |
| CO5 | To speak in polite conservation. |

**4th Semester**

| **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 :** | |
| CO1 | Use the concepts of an analytic function and complex potentials to solve the problems arising in electromagnetic field theory Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing. |
| CO2 | Obtain Services Solutions of Ordinary Differential Equation. |
| CO3 | Make use of correlation and regression analysis to fit a suitable mathematical model for the statistical data. |

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| CO4 | Apply discrete and continuous probability distributions in analyzing the probability models arising in the engineering field. |
| CO5 | Construct joint probability distributions and demonstrate the validity of testing the hypothesis. |

| Course Name | | Digital Signal Processing |
|---|---|---|
| Course Code | | 21EC42 |
| Course Outcomes(Cos): At the end of the course the student will be able to : | | |
| CO1 | Analyze the DFT and IDFT of sequences to verify their properties. | |
| CO2 | Validate the efficiency of DFT computation using FFT algorithms and linear filtering approach. | |
| CO3 | Design and realize FIR filters | |
| CO4 | Design and realize IIR filters | |
| CO5 | Design of digital filters in Digital Signal Processors. | |

| Course Name | | Circuits & Controls |
|---|---|---|
| Course Code | | 21EC43 |
| Course Outcomes(Cos): At the end of the course the student will be able to : | | |
| CO1 | Analyze 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 electric networks. | |
| 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 analyze the stability of the system | |
| CO5 | Draw and analyze the effect of gain on system behavior using root loci, perform frequency response analysis and find the stability of the system. Represent State model of the system and find the time response of the system. | |

| Course Name | | Communication Theory |
|---|---|---|
| Course Code | | 21EC44 |
| Course Outcomes(Cos): At the end of the course the student will be able to : | | |
| CO1 | Apply the mathematical techniques to represent amplitude modulation schemes such as DSBFC, DSBSC, SSB and VSB in time and frequency domains with the generation and detection methods. | |
| CO2 | Apply the mathematical techniques and represent frequency modulation in time and frequency domains with the generation and detection methods. | |
| CO3 | Compute the performance of AM and FM modulation in the presence of noise at the receiver. | |
| CO4 | Illustrate the characteristics of pulse amplitude modulation, pulse position modulation systems. | |
| CO5 | Illustrate the PCM and delta modulation methods and the use of digital formatting in Multiplexers, Vocoders and Video transmission. | |

| Course Name | | Biology For Engineers |
|---|---|---|
| Course Code | | 21BE45 |
| Course Outcomes(Cos): At the end of the course the student will be able to : | | |
| CO1 | Elucidate the basic biological concepts via relevant industrial applications and case studies. | |
| CO2 | Evaluate the principles of design and development, for exploring novel bioengineering projects. | |
| CO3 | Corroborate the concepts of biomimetics for specific requirements. | |
| CO4 | Think critically towards exploring innovative biobased solutions for socially relevant problems. | |

| Course Name | Communication Laboratory I |
|---|---|

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| Course Code | | 21ECL46 |
|---|---|---|
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Design and test analog modulation circuits and display the Waveforms. | |
| CO2 | Design analog circuits using BJT/NE565 and evaluate their performance characteristics. | |
| CO3 | Design and test analog modulation circuits and display the Waveforms. | |
| CO4 | Design and test analog modulation circuits and display the Waveforms. | |

| Course Name | | Constitution of India & Professional Ethics |
|---|---|---|
| Course Code | | 21CIP47 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Analyse the basic structure of Indian Constitution | |
| CO2 | Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution | |
| CO3 | Know about our Union Government, political structure & codes, procedures | |
| CO4 | Understand our State Executive & Elections system of India. | |
| CO5 | Remember the Amendments and Emergency Provisions, other important provisions given by the constitution. | |

| Course Name | | Ability Enhancement Course- IV Embedded C Basics |
|---|---|---|
| Course Code | | 21EC481 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Write C programs in 8051 for solving simple problems that manipulate input data using different instructions of 8051 C | |
| CO2 | Develop testing and experimental procedures on 8051 Microcontroller, analyze their operation under different cases. | |
| CO3 | Develop programs for 8051 Microcontroller to implement real world problems. | |
| CO4 | Design and Develop Mini projects | |

| Course Name | | Universal Human Values |
|---|---|---|
| Course Code | | 21UH49 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Understand the importance of value based education, right understanding, meaning of continuous happiness and differentiation between wealth and prosperity. | |
| CO2 | Understand the concepts like Co-existence of the Self and the Body, Difference between the Needs of the Self and the Body, Harmony in the Self and Harmony of the Self with the Body. | |
| CO3 | Understand the meaning of Harmony in the Family, Justice in Human-to-Human Relationship, Understanding Harmony in the Society and Vision for the Universal Human Order. | |
| CO4 | Understand the concepts like Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the four orders of Nature, Realizing Existence as Co-existence at all Levels, The holistic perception of harmony in Existence. | |
| CO5 | Understand the Natural Acceptance of Human Values, Definitiveness of Human Conduct, Humanistic Education, Humanistic Constitution and Universal Human Order. | |

| Course Name | | Inter/Intra Institutional Internship |
|---|---|---|
| Course Code | | 21INT49 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Develop Critical thinking, problem-solving, communication and reasoning skills required in interview process. | |

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|---|---|
| **CO2** | Investigate carrier opportunities prior to graduation. |
| **CO3** | Develop attitude and work culture and be industry ready. |
| **CO4** | Apply the theory concepts and integrate it practically. |

**5th Semester**

| **Course Name** | | Digital Communication |
|---|---|---|
| **Course Code** | | 21EC51 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **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 Name** | | Computer Organization & ARM Microcontroller |
|---|---|---|
| **Course Code** | | 21EC52 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **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 Name** | | Computer Communication Networks |
|---|---|---|
| **Course Code** | | 21EC53 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **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 Name** | | Electromagnetic Waves |
|---|---|---|
| **Course Code** | | 21EC54 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **CO1** | Solve 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 and Compute Energy and work done in moving charges | |
| **CO3** | Compute 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** | Compute 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 | |

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| Course Name | | Research Methodology & Intellectual Property Rights |
|---|---|---|
| **Course Code** | | 21RMI56 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **CO1** | To know the meaning of engineering research. | |
| **CO2** | To know the procedure of Literature Review and Technical Reading. | |
| **CO3** | To know the fundamentals of patent laws and drafting procedure. | |
| **CO4** | Understanding the copyright laws and subject matters of copyrights and designs CO5. | |
| **CO5** | Understanding the basic principles of design rights. | |

| Course Name | | Environmental Studies |
|---|---|---|
| **Course Code** | | 21CIV57 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **CO1** | Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale. | |
| **CO2** | Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment | |
| **CO3** | Demonstrate ecology knowledge of a complex relationship between biotic and a biotic components. | |
| **CO4** | Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues. | |

| 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 :** | | |
| **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 Name | | Communication Lab II |
|---|---|---|
| **Course Code** | | 21ECL55 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **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. | |

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## Course Outcome Statements of 2022 Scheme

The below table represents the 2022 Scheme Course Outcome Statements of the courses offered from 3rd semester to 8th semester of Electronics & Communication Engineering.

| **Course Name** | | AV Mathematics-III for EC Engineering |
|---|---|---|
| **Course Code** | | BMATEC301 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| **CO1** | Demonstrate the Fourier series to study the behavior of periodic functions and their applications in system communications, digital signal processing, and field theory. | |
| **CO2** | To use Fourier transforms to analyze problems involving continuous-time signals | |
| **CO3** | To apply Z-Transform techniques to solve difference equations | |
| **CO4** | Understand that physical systems can be described by differential equations and solve such equations | |
| **CO5** | Make use of correlation and regression analysis to fit a suitable mathematical model for statistical data | |

| **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 :** | | |
| **CO1** | Understand the basics of combinational logic, canonical forms and simplify Boolean functions using truth table, 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 sequential circuits using Flip Flops. | |
| **CO4** | Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog. | |
| **CO5** | Analyze various Verilog descriptions for logical circuits. | |
| **CO6** | 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 :** | | |
| **CO1** | Design and analysis of different bias circuits for BJT amplifiers. | |
| **CO2** | Design MOSFET amplifiers and analyze them using small-signal frequency models. | |
| **CO3** | Design of converters and oscillators using op-amps and multivibrators using 555 timers. | |
| **CO4** | Understand the different types of feedback topologies in amplifiers, and design of filters. | |
| **CO5** | 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 :** | | |

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| CO1 | Determine currents and voltages using source transformation/ source shifting/ mesh/ nodal analysis and reduce given network using star- delta transformation. |
| CO2 | Solve problems by applying Network Theorems and electrical laws to reduce circuit complexities and to arrive at feasible solutions. |
| CO3 | Analyse the circuit parameters during switching transients and apply Laplace transform to solve the given network |
| CO4 | 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 :** | | |
| 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 circuit experiments using 555 timer. | |

| **Course Name** | | Computer Organization and Architecture |
|---|---|---|
| **Course Code** | | BEC306C |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Explain the basic organization of a computer system and fundamentals of computers. | |
| CO2 | Describe the addressing modes, instruction formats and program control statement. | |
| CO3 | Illustrate different ways of accessing an input / output device including interrupts | |
| CO4 | Demonstrate the organization of different types of semiconductor and other secondary storage memories | |
| CO5 | Illustrate simple processor organization based on hardwired control and micro programmed control. | |

| **Course Name** | | Social Connect & Responsibility |
|---|---|---|
| **Course Code** | | BSCK307 |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | | |
| CO1 | Communicate and connect to the surrounding. | |
| CO2 | Create a responsible connection with the society. | |
| CO3 | Involve in the community in general in which they work. | |
| CO4 | Notice the needs and problems of the community and involve them in problem –solving. | |
| CO5 | Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems. | |
| CO6 | Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes. | |

| **Course Name** | MATLAB Programming |
|---|---|
| **Course Code** | BEC358B |
| **Course Outcomes(Cos): At the end of the course the student will be able to :** | |

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|---|---|
| **CO1** | Understand the syntax of MATLAB for arithmetic computations, arrays, matrices. |
| **CO2** | Understand the built in function, saving and loading data, and create plots |
| **CO3** | Create program using symbolic computations, Importing and exporting data and files |
| **CO4** | Create program using character strings, Command line functions and Built-in functions. |

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