Department of Electronics & Telecommunication Engineering
Academic Year 2021-22
Program Outcomes
PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

At the end of the program engineering graduate will be able to:

PSO1. Apply the knowledge of Electronics and Communication to analyse, design and implement application-specific problems with modern tools.

PSO2: Adapt emerging technologies with continuous learning in the field of Electronics and Telecommunication engineering with appropriate solutions to real life problems.

Course Outcomes

At the end of the semester, the student will able to

FEC101	**Engineering Mathematics-I**
FEC101.1	Apply the concepts of Complex Numbers to solve Engineering problems.
FEC101.2	Apply hyperbolic functions and logarithm of complex number to solve Engineering problems.
FEC101.3	Compute the partial differentiation of functions of two & three variables.
FEC101.4	Find the nth order derivative of a function using successive differentiation & Compute maxima-minima of a function.
FEC101.5	Apply the properties of matrices to find rank of a matrix & to solve system of linear simultaneous equations.
FEC101.6	Solve the system of linear algebraic and transcendental equation numerically and also by using Scilab.
FEC102	**Engineering Physics-I**
FEC102.1	Analyse the motion of free particle using time independent & time dependent Schrodinger wave equation
FEC102.2	Draw miller indices using concept of crystallography and Identify crystal structure using X-ray diffraction technique
FEC102.3	Explore the concepts of semiconductor physics and apply them for applications like LED, photoconductor and photovoltaic cell.
FEC102.4	Employ the concept of interference in thin films in measurements.
FEC102.5	Examine the properties of superconductors and super capacitors and apply them for the applications in-hand
FEC102.6	Explore the properties of engineering materials and their applications
FEC103	**Engineering Chemistry-I**
FEC103.1	Analyse the quality of water and suggest methods of its treatment.

FEC103.2	Differentiate thermosoftening & thermosetting plastic & select appropriate fabrication method.
FEC103.3	Understand the concept of microscopic chemistry in terms of atomic and molecular orbital theory & calculate bond order of molecule.
FEC103.4	Understand the concept of aromaticity & calculate aromaticity using Huckel's Rule.
FEC103.5	Understand Gibb's phase rule & calculate number of phases, component & degree of freedom of one & two component system.
FEC103.6	Differentiate ionic, dipolar & Vander waal's intermolecular forces of attraction.
FEC104	**Engineering Mechanics**
FEC104.1	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three-dimensional systems with the help of FBD.
FEC104.2	Demonstrate the understanding of Centroid and its significance and locate the same
FEC104.3	Estimate required force to overcome friction and correlate real life application to specific type of friction.
FEC104.4	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation
FEC104.5	Illustrate different types of motions and establish Kinematic relations for a rigid body
FEC104.6	Analyse body in motion using force and acceleration, work-energy, impulse- momentum principles
FEC105	**Basic Electrical Engineering**
FEC105.1	Analyse DC circuits and apply Superposition, Thevenin's, Nortons', Maximum Power Transfer theorems to determine their response
FEC105.2	Analyse single-phase AC circuit and determine their response
FEC105.3	Analyse three-phase circuits and determine voltage/current/power relationship in star and delta connections.
FEC105.4	Understand the construction and operation of single-phase transformer and evaluate its equivalent circuit and efficiency.
FEC105.5	Compare single phase & three phase machines on the basis of working principle, constructional details and operation
FEL101	**Engineering Physics-I Lab**
FEL101.1	Perform the experiments based on interference in thin films and analyse the results.
FEL101.2	Determine the crystal structure and study/draw miller indices
FEL101.3	Determine energy band gap of semiconductor.
FEL101.4	Study Hall Effect in semiconductor devices

FEL101.5	Design a solution for a real-world problem using knowledge gained in this course
FEL102	**Engineering Chemistry-I Lab**
FEL102.1	Analyse water for its hardness.
FEL102.2	Estimate viscosity of lubricant using Redwood viscometer.
FEL102.3	Estimate chloride content of water using Mohr's method.
FEL102.4	Identify nature of solution based on its pH value.
FEL102.5	Demonstrate phenol-formaldehyde synthesis.
FEL103	**Engineering Mechanics Lab**
FEL103.1	Verify the law of polygon, varignon's theorem and find the resultant of given force system
FEL103.2	Verify the conditions of equilibrium and find the beam reactions
FEL103.3	Analyse the friction between two different surfaces.
FEL103.4	Demonstrate the understanding of Centroid and its significance and locate the same
FEL103.5	Illustrate different types of motions and establish Kinematic relations for particles and rigid body.
FEL103.6	Verify the law of conservation of momentum and find the coefficient of restitution.
FEL104	**Basic Electrical Engineering Lab**
FEL104.1	Implement DC circuits and analyse their behavior using network theorems
FEL104.2	Analyse frequency behavior of RLC circuit and calculate resonance frequency, Bandwidth and Q- factor.
FEL104.3	Determine relationship between voltage/current/power in three phase star/delta circuits.
FEL104.4	Perform OC/SC test on transformer and determine its equivalent circuit and efficiency.
FEL104.5	Illustrate the working of Single & Three Phase Induction Motor
FEL105	**Basic Workshop practice-I**
FEL105.1	Use different fitting tools and perform the basic operations such as square, hexagonal and V male-female joint.
FEL105.2	Develop the skill required for hardware maintenance, and installation of operating system and system drivers.
FEL105.3	Identify the network components and perform basic networking and crimping.
FEL105.4	Develop the skill to use different plumbing tools and accessories for domestic water line.

FEC201	**Engineering Mathematics-II**
FEC201.1	Solve differential equations of first order & first degree.
FEC201.2	Solve linear differential equations with constant coefficients, variable coefficients of higher order.
FEC201.3	Apply Beta, Gamma functions and D.U.I.S.to solve improper integrals.
FEC201.4	Apply concepts of Double integral of different coordinate systems to compute Area.
FEC201.5	Apply concepts of triple integral of different coordinate systems to find volume of a solids.
FEC201.6	Solve Differential equations & Definite integrals using Numerically and also by using Scilab.
FEC202	**Engineering Physics-II**
FEC202.1	Examine the diffraction through single slit and its applications.
FEC202.2	Apply the foundation of laser and fiber optics in development of modern communication technology.
FEC202.3	Explore the fundamentals of Electrodynamics and its application in the field of engineering.
FEC202.4	Explore the fundamentals of special theory of relativity
FEC202.5	Assimilate the scope of nanotechnology in modern developments and its role in emerging innovating applications.
FEC202.6	Select appropriate sensing technology for physical measurements in modern instrumentations.
FEC203	**Engineering Chemistry-II**
FEC203.1	Identify types of corrosion & select corrosion control measures.
FEC203.2	Analyse the quality of fuel & calculate the oxygen required for combustion of fuel.
FEC203.3	Discuss the range of EMS used for molecular transitions in spectroscopic techniques and determine possibility of molecular transitions.
FEC203.4	Discuss the phenomenon of fluorescence & Phosphorescence.
FEC203.5	Understand the concept of electrode potential & calculate EMF of cell.
FEC203.6	Illustrate the principles of green chemistry & examine its environmental impact.
FEC204	**Engineering Graphics**
FEC204.1	Apply the basic principles of projections in Projection of Lines and Planes
FEC204.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEC204.3	Apply the basic principles of projections in converting 3D view to 2D drawing.

FEC204.4	Visualize an object from the given two views.
FEC205	**C programming**
FEC205.1	Write an algorithm to support Structure Programming approach.
FEC205.2	Use variables, derived data types and control structures to write c program
FEC205.3	Decompose a problem into functions and synthesize a complete program
FEC205.4	Use Array and String for solving complex computational problem
FEC205.5	Use Structure-Union for solving complex computational problem
FEC205.6	Use Pointers for solving complex computational problem
FEC206	**Professional Communication and Ethics-I**
FEC206.1	Communicate effectively using verbal/non-verbal cues at social and workplace situation.
FEC206.2	Select/Use appropriate grammar and vocabulary in oral, written communication
FEC206.3	Summarize/Comprehend passages, run plagiarism check softwares and generate plagiarism report for paraphrased passages
FEC206.4	Write/ Draft academic, business and technical letter/email
FEC206.5	Frame Definition, write user instruction, description of technical object, description of a Technical / Scientific Process
FEC206.6	Demonstrate principles of ethics in professional environment
FEL201	**Engineering Physics -II Lab**
FEL201.1	Perform the experiments based on diffraction through slits using Laser source and analyse the results.
FEL201.2	Determine the number of lines on the grating surface using LASER Source.
FEL201.3	Perform the experiments using optical fibre and analyse its characteristics
FEL201.4	Perform the experiments on various sensors and analyse the result.
FEL201.5	Implement a solution for a real-world problem using knowledge gained in this course
FEL202	**Engineering Chemistry-II Lab**
FEL202.1	Analyse fuel for moisture content.
FEL202.2	Estimate Na, k & Ca in the given sample using flame photometer.
FEL202.3	Estimate flash point of diesel oil using Abel's apparatus.
FEL202.4	Determine saponification value of vegetable oil.
FEL202.5	Estimate acid value of vegetable oil.

FEL203	**Engineering Graphics Lab**
FEL203.1	Apply the basic principles of projections in Projection of Lines and Planes and Curves
FEL203.2	Apply the basic principles of projections in Projection of Solids & Section of solids
FEL203.3	Apply basic AutoCAD skills to draw different views of a 3D object
FEL203.4	Apply basic AutoCAD skills to draw the isometric view from the given two views
FEL204	**C programming Lab**
FEL204.1	Translate given algorithms to a program
FEL204.2	Use variables, derived data types and control structures to write c program
FEL204.3	Write iterative as well as recursive programs
FEL204.4	Represent data in Array and String and manipulate them through a program
FEL204.5	Use Structure-Union for solving complex computational problem
FEL204.6	Declare pointers and demonstrate call by reference concept
FEL205	**Professional Communication and Ethics-I Lab**
FEL205.1	Listen and comprehend all types of spoken discourse successfully
FEL205.2	Speak fluently and make effective professional presentations.
FEL205.3	Read large quantities of text in a short time to comprehend, summarise and evaluate content
FEL205.4	Draft precise business letters, academic essays and technical guidelines.
FEL205.5	Dress finely and conduct themselves with confidence in social, academic and professional situation.
FEL205.6	Respond to moral dilemmas successfully.
FEL206	**Basic Workshop practice-II**
FEL206.1	Use different carpentry tools and perform the basic operations like joints and wood turning practise.
FEL206.2	Understand the safe practices to adopt in electrical workshop.
FEL206.3	Demonstrate the wiring practices for the connection of simple electrical load.
FEL206.4	Demonstrate the use of furnace and produce the simple forging job.
ECC301	**Engineering Mathematics III**
ECC301.1	Understand the concept of Laplace transform and its application to solve the real integrals in engineering problems.
ECC301.2	Understand the concept of inverse Laplace transform of various functions and its applications in engineering problems.

ECC301.3	Expand the periodic function by using Fourier series for real life problems and complex engineering problems.
ECC301.4	Understand complex variable theory, application of harmonic conjugate to get orthogonal trajectories and analytic function.
ECC301.5	Use matrix algebra to solve the engineering problems.
ECC301.6	Apply the concepts of vector calculus in real life problems.
ECC302	**Electronic Devices & Circuits**
ECC302.1	Students will be able to understand knowledge of diode, Zener diode, apply in Zener voltage regulator and illustrate voltage current characteristics of semiconductor devices (BJT, JFET, EMOSFET).
ECC302.2	Students will be able to analyse dc analysis of semiconductor devices (BJT, JFET and MOSFET).
ECC302.3	Students will be able to perform ac analysis of BJT (CE) Amplifier, EMOSFET (CS) Amplifier and analyse amplifier based on parameters (Voltage gain, Input resistance and Output resistance).
ECC302.4	Students will be able to understand and analyse frequency response of BJT and MOSFET amplifier.
ECC302.5	Students will be able to analyse the power Amplifier based on efficiency ,power consumption .
ECC302.6	Students will be able to understand and analyse differential amplifier.
ECC303	**Digital System Design**
ECC303.1	Students will be able to understand different number systems and codes.
ECC303.2	Students will be able understand types of digital logic, digital circuits and logic families.
ECC303.3	Students will be able analyse , design and implement combinational logic circuits.
ECC303.4	Students will be able analyse , design and implement sequential logic circuits.
ECC303.5	Students will be able to classify different types of memories and PLDs.
ECC303.6	Students will be able to simulate basic combinational and sequential circuits using VHDL/Verilog.
ECC304	**Network Theory**
ECC304.1	Apply their knowledge in analyzing Circuits by using network theorems
ECC304.2	Apply the time and frequency method of analysis.
ECC304.3	Evaluate circuit using graph theory
ECC304.4	Find the various parameters of two port network.
ECC304.5	Students will be able to characterize a circuit in terms of its network functions and analyse it behaviour in terms of poles and zeros.
ECC304.6	Synthesize the network using passive elements.

ECC305	**Electronic Instrumentation & Control Systems**
ECC305.1	Understand the fundamentals of basic instruments and apply the concept of measurement methods to compute the component values.
ECC305.2	Understand and analyse construction and operational aspects of different electro-mechanical measuring instruments along with their application domains.
ECC305.3	Compute and compare Transfer Function of a system with various techniques.
ECC305.4	Understand and analyse time response of first and second order control systems for different standard test signals.
ECC305.5	Examine system stability in time domain.
ECC305.6	Examine system stability in frequency domain.
ECL301	**Electronic Devices & Circuits Lab**
ECL301.1	Students will be able to sketch and analyse characteristics of Semiconductor devices (diode, BJT, JFET).
ECL301.2	Students will be able to analyse Zener voltage regulator.
ECL301.3	Students will be able to determine and analyse Q point of biasing circuits and its use in BJT amplifier.
ECL301.4	Students will be able to plot and analyse frequency response CE, CS amplifier.
ECL301.5	Students will be able to demonstrate and analyse performance power amplifier.
ECL301.6	Students will be able to analyse differential amplifier.
ECL302	**Digital System Design Lab**
ECL302.1	Identify various Digital ICs and basic building blocks of digital system design
ECL302.2	Design and implement combinational circuits like adder, subtractor, multiplexer, code converters etc.
ECL302.3	Identify and understand working of various types of flip flops and their inter conversions
ECL302.4	Design and implement basic sequential circuits such as counters, registers etc.
ECL302.5	Describe different types of memories and programmable logic devices.
ECL302.6	Acquire basic knowledge of VHDL/Verilog basic programming
ECL303	**Electronic Instrumentation & Control Systems Lab**
ECL303.1	To understand and analyse the performance characteristics of transducers.
ECL303.2	To designing bridge for Resistance Measurement.

ECL303.3	To analyse the steady-state and frequency response of the Type 0, 1, and 2 systems
ECL303.4	To analyse steady-state and frequency response of first and second order electrical systems.
ECL303.5	To analyse the stability in time domain.
ECL303.6	To analyse the stability in frequency domain.
ECL304	**Skill Lab: C++ and Java Programming**
ECL304.1	To examine the principals of Object-Oriented Programming (OOP) and Object-Oriented Concepts.
ECL304.2	To design and apply OOP principles for effective programming.
ECL304.3	To develop programming applications using OOP Language.
ECL304.4	To implement programming applications using packaging.
ECL304.5	To analyse the strength of OOP.
ECL304.6	To percept the Utility and applicability of OOP.
ECM301	**Mini Project 1A**
ECM301.1	Identify problems based on societal /research needs.
ECM301.2	Apply Knowledge and skill to solve societal problems in a group.
ECM301.3	Implement and trouble-shoot the circuit.
ECM301.4	Design PCB layout and fabricate the same.
ECM301.5	Analyse the impact of solutions in societal and environmental context for sustainable development.
ECM301.6	Write and present their work effectively with ethical values.
ECC401	**Engineering Mathematics IV**
ECC401.1	Use the concepts of Complex Integration for evaluating integrals, computing residues & evaluate various contour integrals.
ECC401.2	Apply the concept of Correlation and Regression to the engineering problems in data science, machine learning and AI.
ECC401.3	Apply the concepts of probability and expectation for getting the spread of the data and distributionn of probabilities.
ECC401.4	Apply the concept of vector spaces and orthogonalization process in Engineering Problems.
ECC401.5	Use the concept of Quadratic forms and Singular value decomposition which are very useful tools in various Engineering applications.
ECC401.6	Find the extremals of the functional using the concept of Calculus of variation.
ECC402	**Microcontrollers**

ECC402.1	Students will able to understand and examine the elements of microprocessor based system.
ECC402.2	students will be able to understand memory of microprocessor-based system and examine its concepts.
ECC402.3	Students will be able to analyse Architecture of 8051 microcontroller.
ECC402.4	Students will be able to develop assembly language program for 8051 microcontroller for arithmetic, logical, delay input, output, serial communication and interrupts.
ECC402.5	Students will be able to examine concept of advance microcontroller ARM7.
ECC402.6	Students will able to analyse microcontroller-based applications.
ECC403	Linear Integrated Circuits
ECC403.1	Understand & explain working of OP-AMP along with it's applications.
ECC403.2	Analyse and demonstrate linear applications of OP-AMP.
ECC403.3	Analyse and demonstrate nonlinear applications of OP-AMP.
ECC403.4	Explain working of IC 555 & able to design multivirators.
ECC403.5	Explain the working of voltage regulator ICs (IC 78XX, 79XX, 723, LM317) & able to design three terminal voltage regulators.
ECC403.6	Able to analyse working of different ICs (IC 566, IC 565).
ECC404	**Signals & Systems**
ECC404.1	Classify and analyse different types of signals and systems.
ECC404.2	Analyse continuous time LTI signals and systems in transform domain
ECC404.3	Analyse discrete time LTI signals and systems in transform domain
ECC404.4	Represent signals using Fourier Series and Analyse the systems using the Fourier Transform.
ECC404.5	Classify and realize basic structures of DT systems
ECC404.6	Demonstrate the concepts learnt in Signals and systems Course using the modern engineering tools.
ECC405	**Principles of Communication Engineering**
ECC405.1	Understand the basic components and types of noises in communication system, apply this knowledge to evaluate the effects of noise
ECC405.2	Analyse the concepts of amplitude modulation and demodulation along with their applications
ECC405.3	Analyse the concepts of angle modulation and demodulation along with their applications
ECC405.4	Compare the performance of AM and FM receivers
ECC405.5	Describe analog and digital pulse modulation techniques.

ECC405.6	Illustrate the principles of multiplexing and demultiplexing techniques along with their application
ECL401	**Microcontrollers Lab**
ECL401.1	Students will be able understand use of assembler , compiler and apply in practicals.
ECL401.2	Students will be able to write a program for arithmatic operations with different addressing mode and compare it.
ECL401.3	Students will be able to write a program using data transfer instruction to examine concept of internal and external memory .
ECL401.4	Students will be able to develop assembly langauge program for arrays .
ECL401.5	Students will be able to analyse serial communication , timer section by developing assembly language program for the same.
ECL401.6	Students will be able to interface LEDs, Keys etc with 8051 microcontroller.
ECL402	**Linear Integrated Circuits Lab**
ECL402.1	Students should be able to analyse chractersic of OPAMP & basic application circuits using OP-AMP.
ECL402.2	Students should be able to construct and analyse linear application circuits using OP-AMP.
ECL402.3	Students should be able to construct and analyse nonlinear application circuits using OP-AMP.
ECL402.4	Students should be able to design and analyse applications using IC 555.
ECL402.5	Students should be able to design and analyse applications using regulator ICs (IC 78XX,79XX,723,LM317).
ECL402.6	Students should be able to construct and analyse application using IC 566,565
ECL403	**Principles of Communication Engineering Lab**
ECL403.1	Analyse analog modulation techniques
ECL403.2	Analyse the waveforms of Radio receivers
ECL403.3	Design and analyse Pre-emphasis and De-emphasis circuit for given cut-off frequency.
ECL403.4	Implement analog pulse modulation and demodulation circuits
ECL403.5	Demonstrate digital pulse modulation and demodulation techniques.
ECL403.6	Demonstrate digital pulse modulation and demodulation techniques.
ECL404	**Skill Lab: Python Programming**
ECL404.1	Apply syntax and semantics in Python
ECL404.2	Illustrate different file handling operations

ECL404.3	Interpret object oriented programming in Python
ECL404.4	Design GUI Applications in Python
ECL404.5	Build proficiency in the handling Python libraries for data science
ECL404.6	Develop machine learning applications using Python
ECM401	**Mini Project 1B**
ECM401.1	Identify problems based on societal /research needs.
ECM401.2	Apply Knowledge and skill to solve societal problems in a group.
ECM401.3	Apply the knowledge of interfacing different devices to the Arduino board and design Arduino based projects for a given problem.
ECM401.4	Apply the knowledge of interfacing different devices to raspberry pi board and design Arduino based projects for a given problem.
ECM401.5	Analyse the impact of solutions in societal and environmental context for sustainable development.
ECM401.6	Write and present their work effectively with ethical values.
ECC501	**Digital Communication**
ECC501 .1	Apply the concepts of information theory in source coding.
ECC501 .2	Compare different error control systems and apply various error detection codes.
ECC501 .3	Analyse different error correction codes
ECC501 .4	Compare various baseband transmission methods for digital signals
ECC501 .5	Evaluate the performance of optimum baseband detection in the presence of white noise
ECC501 .6	Compare the performances of different digital modulation techniques.
ECC502	**Discrete Time Signal Processing**
ECC502 .1	Understand the concepts of discrete-time Fourier transform, fast Fourier transform and apply in system analysis.
ECC502 .2	Design digital IIR filters to satisfy the given specifications and evaluate the frequency response and pole zero representations to choose a particular filter for the given application.
ECC502 .3	Design digital FIR filters to satisfy the given specifications and evaluate the frequency response and pole zero representations to choose a particular filter for the given application.
ECC502 .4	Interpret the different realization structures of Digital IIR and FIR filters.
ECC502 .5	Analyse the impact of Finite Word Length Effects on the performance of digital filters.
ECC502 .6	Apply signal processing concepts, algorithms in applications related to the field of biomedical and audio signal processing.
ECC503	**Digital VLSI**

ECC503.1	Student will be able to explain MOS fabrication process, Lambda based rule and analyse MOSFET capacitance, technology scaling and its issues.
ECC503.2	Student will be able to understand, and Analyse CMOS inverter based on Noise margin, Power dissipation and propagation delay.
ECC503.3	Student will be able to realize combinational and sequential circuits using different design style and compare their performance parameter.
ECC503.4	Students will be able to understand of operation of memory and apply in various applications.
ECC503.5	Students will be able to understand and analyse data path elements and system level design issues.
ECC503.6	Students will be able to examine RTL Design Process with Case Studies.
ECC504	**Random Signal Analysis**
ECC504.1	Apply theory of probability in identifying and solving relevant problems.
ECC504.2	Differentiate continuous and discrete random variables and their distributions.
ECC504.3	Apply the concepts of expectations and functions of one random variable to solve relevant problems.
ECC504.4	Apply the concepts of expectations and functions of multiple Random variables to solve relevant problems.
ECC504.5	Apply fundamentals of Random processes and analyse types of Random processes.
ECC504.6	Explain linear regression algorithms and apply for predictive applications.
ECCDLO5013	**IT Infra and Security**
ECCDLO5013.1	Explain fundamentals of IT Infrastructure and its Management.
ECCDLO5013.2	Explain and analyse Access Control Policies and Models, Authentication and Access Control Services.
ECCDLO5013.3	Understand and explain software vulnerabilities and attacks.
ECCDLO5013.4	Explain and compare the protection mechanisms for operating systems and database security.
ECCDLO5013.5	Explain the security aspects of wireless network infrastructure and protocols.
ECCDLO5013.6	Examine the different attacks on Web Applications and Web services.
ECCDLO5014	**Data Structures and Algorithm**
ECCDLO5014.1	Compare functions using asymptotic analysis and describe the relative merits of worst case, average case, and best-case analysis.
ECCDLO5014.2	Apply various operations on Stack and Queue.

ECCDLO5014.3	Ability to demonstrate the operations of Linked list.
ECCDLO5014.4	Demonstrate and apply non-linear data structures such as Trees & Graphs
ECCDLO5014.5	Apply various Sorting and Searching Algorithms and compare their performance characteristics.
ECCDLO5014.6	Compare different hash function and apply suitable collision resolution techniques.
ECCDLO5015	**Sensor Technology**
ECCDLO5015.1	Understand the transduction principle of various sensors
ECCDLO5015.2	Select sensors suitable for required applications
ECCDLO5015.3	Analyse wireless sensing techniques
ECCDLO5015.4	Design the data acquisition system
ECCDLO5015.5	Identify signal conditioning method for a particular application
ECCDLO5015.6	Create an application using various sensor technologies
ECL501	**Digital Communication Lab**
ECL501.1	Students will be able to compare various source coding schemes
ECL501.2	Students will be able to design & implement different error detection codes
ECL501.3	Students will be able to design & Implement error correction techniques.
ECL501.4	Students will be able to compare various line coding techniques.
ECL501.5	Students will be able to illustrate the impulse response of a matched filter for optimum detection
ECL501.6	Students will be able to demonstrate various digital modulation techniques.
ECL502	**Discrete-Time Signal Processing Lab**
ECL502.1	Students will be able to apply different operations on discrete signals and implement it in OCTAVE/ MATLAB
ECL502.2	Students will be able to determine the response of the digital filter by convolution, implemented using different methods using OCTAVE/ MATLAB.
ECL502.3	Write an OCTAVE/ MATLAB code to design and implement a low-pass Butterworth IIR digital filter.
ECL502.4	Students will be able to design and verify the response of FIR filters using OCTAVE/ MATLAB.
ECL502.5	Students will be able analyse realization methods of filters by implementing in OCTAVE/ MATLAB.
ECL502.6	Students will be able to analyse frequency response and pole zero plot of frequency selective filters in OCTAVE/ MATLAB

ECL503	**Digital VLSI Lab**
ECL503.1	Students will be able to Plot and analyse MOSFET Characteristics based on performance parameters (Threshold voltage process transconductance, channel length modulation factor etc) and an effect of different types of scaling on the current.
ECL503.2	Students will be able to Plot and analyse transfer characteristics of CMOS inverter.
ECL503.3	Students will be able to Sketch layout for combinational and sequential circuits using different logic style and analyse it.
ECL503.4	Students will be able to Sketch layout for memory and examine it.
ECL503.5	Students will be able to explain and realize the datapath components.
ECL503.6	Students will be able to explain RTL design process.
ECL504	**Business Communication and Ethics Lab/Professional Communication & Ethics - II**
ECL504.1	Write technical paper solicited and unsolicited proposals effectively.
ECL504.2	Write a cover letter and prepare a resume, statement of purpose, participate in GD and apply for personal interviews.
ECL504.3	Understand the roles and responsibilities of the members of the meeting, prepare meeting documentation and also participate as a member in a meeting.
ECL504.4	Deliver technical business presentations individually and contribute as a team member for building content and visuals in GD
ECL504.5	Demonstrate skills like leadership, motivation, negotiation etc during their projects.
ECL504.6	Understand Intellectual property rights and demonstrate ethical conduct while analyzing technical paper.
ECM501	**Mini Project 2AEmbedded System Project**
ECM501.1	Understand the embedded systems and apply it for applications.
ECM501.2	Analyse different microcontroller and develop programs in Embedded C
ECM501.3	Interface peripherals and different sensors for Embedded systems applications.
ECM501.4	Implementation of Embedded systems with different communication protocols as IoT.
ECM501.5	Analyse concepts of Real time operating systems.
ECM501.6	Design embedded system applications using sensors, peripherals and RTOS
ECC601	**Electromagnetics and Antenna**
ECC601.1	DescribeElectromagnetics field includin static and dynamic in terms of Maxwell's equations.

ECC601.2	Apply Maxwell's various electromagnetic phenomenon such as electromagnetic wave propagation in different medium, Power in EM wave.
ECC601.3	Analyse fundamental parameters of Antennas and mechanism of EM wave radiation.
ECC601.4	Analyse linear wire antenna elements & Antenna arrays.
ECC601.5	Analyse & differentiate special types of Antennas and their properties.
ECC601.6	Describe radio wave propagation.
ECC602	**Computer Communication Networks**
ECC602.1	Illustrate network topologies, hardware devices, addressing schemes and the protocol stacks.
ECC602.2	Compare various transmission media and broadband technologies
ECC602.3	Analyse the flow control, error control and the medium access control technique
ECC602.4	Classify the routing protocols and design the network using IP addressing and subnetting schemes.
ECC602.5	Describe and analyse transport layer protocols and its services Describe and analyse transport layer protocols and its services
ECC602.6	Illustrate application layer protocols.
ECC603	**Image Processing and Machine Vision**
ECC603.1	Students will be able to understand basic fundamentals of image processing and apply them for image processing applications.
ECC603.2	Students will be able to select among various spatial domain and frequency domain filtering techniques, apply them for image enhancement and analyse images for various techniques.
ECC603.3	Students will be able to implement morphological operations and image restoration for various image processing applications..
ECC603.4	Students will be able to implement image segmentation algorithms based on principle of discontinuity and similarity
ECC603.5	Students will be able to implement algorithms for various representation techniques to find boundaries and shapes.
ECC603.6	Students will be able to understand basic fundamentals of Machine Vision and use them to classify and recognize the objects using different classification methods
ECC604	**Artificial Neural Network and Fuzzy Logic**
ECC604.1	student will be able to understand the concepts of biological neurons and artificial neurons.
ECC604.2	student will be able to analyse the feed-forward and feedback neural networks and their learning algorithms.
ECC604.3	student will be able to understand the neural network training and design concepts.

ECC604.4	Students will be able to explain the Algorithms of Neural Networks
ECC604.5	Students will be able to understand and explain the architecture of CNN and its application in image classification.
ECC604.6	Students will be able to analyse and apply neural networks and fuzzy logic to real-world problems.
ECCDLO6014	**Database Management System**
ECCDLO6014.1	Describe the fundamentals of database systems, different data models and design issues in database.
ECCDLO6014.2	Design ER diagram & relational schema for the problem definition
ECCDLO6014.3	Differentiate between Relational Algebra & Calculus for computational capabilities and apply concepts of normalization.
ECCDLO6014.4	Implement views, constraints and querying the database using SQL to retrieve the data from database
ECCDLO6015	**IoT and Industry**
ECCDLO6015.1	Explain Basics of IoT & M2M communication using Case Studies.
ECCDLO6015.2	Illustrate various protocols of web connectivity.
ECCDLO6015.3	Understand and use tools for data management and analytics in IoT.
ECCDLO6015.4	Explain various frameworks for industry 4.0 standards.
ECCDLO6015.5	Illustrate case studies on applications of IIOT.
ECCDLO6015.6	Understand advanced concepts and applications of industry 4.0
ECL601	**Electromagnetics and Antenna Lab**
ECL601.1	Explain different types of antennas and fundamental parameters of antenna.
ECL601.2	To design and analyse the behaviour of different wire antennas using antenna simulation software 4NEC2.
ECL601.3	To design and analyse radiation patterns of antenna arrays using MATLAB 4NEC2.
ECL601.4	To study different types of Aperture antennas.
ECL601.5	To design and analyse radiation patterns of Regular shaped Microstrip antenna using MATLAB
ECL601.6	To Describe different types of wave propagation.
ECL602	**Computer Communication Networks Lab**
ECL602.1	Design a small or medium sized computer network including media types, end devices, and interconnecting devices that meets a customer's specific needs.

ECL602.2	Demonstrate/illustrate the use of network layer protocol, addressing and subnettin
ECL602.3	Compare routing algorithms and protocols
ECL602.4	Demonstrate an understanding of the significance and purpose of protocols and their use in computer networks using simulator
ECL602.5	Troubleshoot problems in a host occurring at multiple layers of the OSI model.
ECL602.6	Compare connectionless and connection-oriented services and protocol
ECL603	**Image Processing and Machine Vision Lab**
ECL603.1	Students will be able to understand basic fundamentals of image processing and modify spatial and gray scale resolution using Python
ECL603.2	Students will be able to implement histogram equalisation for image enhancement using Python
ECL603.3	Students will be able to analyse various spatial domain and frequency domain filtering techniques to perform enhancement using python.
ECL603.4	Students will be able to apply morphological operations and image restoration for various image processing applications python.
ECL603.5	Students will be able to analyse various representation techniques to find boundaries and shapes using python
ECL603.6	Students will be able to understand basic fundamentals of Neural Tetworks and apply it for image processing algorithms.
ECL604	**Skill Lab:Linux and Networking and Server Configuration**
ECL604.1	Demonstrate installation Linux using Debian, Ubuntu or kali Linux platform and execute standard Linux commands.
ECL604.2	Implement Process management, scheduling, Inter-process communication in Linux.
ECL604.3	Implement shell script programs for common administrative tasks and managing user accounts.
ECL604.4	Implement shell script programs for conditional and looping statements in bash.
ECL604.5	Configure DHCP server, DNS server, NFS file server.
ECL604.6	Configure and Deploy Mail server, Telnet server, FTP server, Web server.
ECM601	**Mini Project 2B- FPGA based Projects**
ECM601.1	Understand various FPGA families and methods of FPGA synthesis and implementation
ECM601.2	Learn the working of basic EDA tools like Xilinx, Modelsim cadence, etc.
ECM601.3	Able to program, simulate and synthesize circuits in Verilog HDL.
ECM601.4	Learn the technique of interfacing of LED, switches and seven segment with FPGA

ECM601.5	Learn the project documentation, designing and handling techniques
ECM601.6	Faculty supervisor may give inputs to students during mini project activity; however, focus shall be on self-learning.
ECL601	**Electromagnetics and Antenna Lab**
ECL601.1	Explain different types of antennas and the fundamental parameters of antenna.
ECL601.2	To design and analyse the behavior of different wire antennas using antenna simulation software 4NEC2.
ECL601.3	To design and analyse radiation patterns of antenna arrays using MATLAB 4NEC2.
ECL601.4	To study different types of Aperture antennas.
ECL601.5	To design and analyse radiation patterns of Regular shaped Microstrip antenna using MATLAB
ECL601.6	To Describe different types of wave propagation.
ECC701	**Microwave Engineering**
ECC701.1	To analyse transmission line parameters and design distributed Impedance matching networks.
ECC701.2	To explain the working of the rectangular waveguides and analyse its rent modes.
ECC701.3	Explain the coupling mechanisms in waveguides and analyse the waveguide multiport junctions.
ECC701.4	To explain the working principle and analyse the microwave linear and cross-field tubes.
ECC701.5	To explain the operation of microwave solid state devices and avalanche transit time devices.
ECC702	**Mobile Communication System**
ECC702.1	Explain the cellular fundamentals and estimate the coverage and capacity of cellular systems.
ECC702.2	Classify different types of propagation models and analyse the link budget.
ECC702.3	Compare and contrast GSM, GPRS, HSCSD, EDGE, and IS-95 Technologies.
ECC702.4	Apply the concepts of 3G technologies for UMTS and CDMA 2000.
ECC702.5	Describe the features and working principles of 3GPP LTE.
ECC702.6	Discuss the emerging technologies for upcoming mobile communication systems.
ECCDLO 7012	**Deep Learning**
ECCDLO 7012.1	Explain the fundamentals of Deep Learning.
ECCDLO 7012.2	Apply knowledge of deep learning in TensorFlow.

ECCDLO 7012.3	Analyse techniques Regularization and Optimization for deep learning models.
ECCDLO 7012.4	Compare various Convolution Neural Network architectures and use them as per the application.
ECCDLO 7012.5	Understand and analyse Sequence Neural Network systems and its applications to real-world problems.
ECCDLO 7012.6	Illustrate the working of Autoencoders and use them for real-life applications.
ECCDLO 7013	**Cloud Computing**
ECCDLO 7013.1	Explain the fundamentals of cloud computing.
ECCDLO 7013.2	Interpret the significance of virtualization in the context of cloud computing.
ECCDLO 7013.3	Describe cloud computing services working on AWS, Azure, and Google cloud platforms.
ECCDLO 7013.4	Explain application design aspects of cloud computing
ECCDLO 7013.5	Interpret security aspects to cloud computing.
ECCDLO 7013.6	Explain advances in cloud computing for real applications of the cloud.
ECCDLO 7023	**Internet Communication Engineering**
ECCDLO 7023.1	Explain internet standards and architecture model
ECCDLO 7023.2	Illustrate application layer protocols for different applications.
ECCDLO 7023.3	Illustrate how security mechanisms are employed at various layers of TCP/IP architecture.
ECCDLO 7023.4	Describe different multimedia standards and relevant protocols used for their transmission over the internet.
ECCDLO 7023.5	Describe Quality of Service and compare integrated & differentiated services for quality of service.
ECCDLO 7023.6	Develop an understanding of new networking trends in industry and automation.
ECL701	**Microwave Engineering Lab**
ECL701.1	To analyse S- parameters and design distributed and Lumped Elements type of impedance matching networks using APLAC.
ECL701.2	To explain microwave measurements and test the characteristics of microwave components.
ECL701.3	To explain Wave guide and transmission line measurements.
ECL701.4	To explain to measure wave parameters like impedance, frequency, and wavelength using microwave bench and VSWR meter.
ECL701.5	To determine the characteristics of various microwave components.
ECL701.6	To study the characteristics and behavior of various microwave semiconductor devices.

ECL702	**Mobile Communication System Laboratory**
ECL702.1	Demonstrate the effect of cellular system design parameters on system capacity and quality of service.
ECL702.2	Examine the effect of small-scale fading parameters on the performance of radio channel characteristics.
ECL702.3	Analyse link budget for various propagation path-loss models.
ECL702.4	Analyse the effect of multipath diversity on Bit Error Rate in CDMA system.
ECL702.5	Construct orthogonal codes of length n for 2G and 3G mobile systems and check orthogonality.
ECL702.6	Evaluate the performance of different MIMO systems.