



**DEPARTMENT OF ELECTRONICS AND
COMMUNICATION ENGINEERING**

ACADEMIC YEAR 2022-2023

COURSE OUTCOMES

ACADEMIC YEAR 2022-2023
SEMESTER 1

Course Code: MAT 101

Course Name: LINEAR ALGEBRA AND CALCULUS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	It is introducing students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarises students with some basic techniques in matrix theory which are essential for analysing linear systems.	solve systems of linear equations, diagonalize matrices and characterise quadratic forms
2	The calculus of functions of one or more variables taught in this course are useful in modelling and analysing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.	compute the partial and total derivatives and maxima and minima of multivariable functions
3		compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas
4		perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
5		determine the Taylor and Fourier series expansion of functions and learn their applications

Course Code: CYT 100

Course Name: ENGINEERING CHEMISTRY

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application-oriented topics like spectroscopy, electrochemistry, instrumental methods etc.	Apply their knowledge for protection of different metals from corrosion. To prevent the monuments from getting corroded, recent trends in electrochemical energy storage devices.
2	Also familiarize the students with topics like mechanism of corrosion, corrosion prevention methods, SEM, stereochemistry, polymers, desalination etc., which enable them to develop abilities and skills that are relevant to the study and practice of chemistry.	Learn how to use different spectroscopy techniques for analysis purpose of simple molecules.
3		Design economically and new methods of synthesis nano materials.
4		Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
5		Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

Course Code: EST 110

Course Name: ENGINEERING GRAPHICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The student to effectively perform technical communication through graphical representation as per global standards.	Draw the projection of points and lines located in different quadrants
2		Prepare multi-view orthographic projections of objects by visualizing them in different positions
3		Draw sectional views and develop surfaces of a given object
4		Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
5		Convert 3D views to orthographic views, Obtain multiview projections and solid models of objects using CAD tools

Course Code: EST 120

Course Name: BASICS OF CIVIL & MECHANICAL ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course is to provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
2		Explain different types of buildings, building components, building materials and building construction
3		Describe the importance, objectives and principles of surveying.
4		Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
5		Discuss the Materials, energy systems, water management and environment for green buildings.
6		Analyse thermodynamic cycles and calculate its efficiency
7		Illustrate the working and features of IC Engines
8		Explain the basic principles of Refrigeration and Air Conditioning
9		Describe the working of hydraulic machines
10		Explain the working of power transmission elements
11		Describe the basic manufacturing, metal joining and machining processes

Course Code: HUN 101

Course Name: LIFE SKILLS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes.	Define and Identify different life skills required in personal and professional life
2	Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at.	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress..
3	This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underly personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers	Explain the basic mechanics of effective communication and demonstrate these through presentations.
4		Explain the basic mechanics of effective communication and demonstrate these through presentations.
5		Understand the basics of teamwork and leadership

Course Code: CYL 120

Course Name: ENGINEERING CHEMISTRY LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To impart scientific approach and to familiarize with the experiments in chemistry relevant for research projects in higher semesters	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
2		Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
3		Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds
4		Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
5		Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economic and environmental problems and why it is an integral part of curriculum

Course Code: ESL:120

Course Name: CIVIL & MECHANICAL WORKSHOP

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The course is designed to train the students to identify and manage the tools, materials and methods required to execute an engineering project.	Name different devices and tools used for civil engineering measurements
2	Students will be introduced to a team working environment where they develop the necessary skills for planning, preparing and executing an engineering project.	Explain the use of various tools and devices for various field measurements
3	To enable the student to familiarize various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
4		Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
5		Compare different techniques and devices used in civil engineering measurements
6		Identify Basic Mechanical workshop operations in accordance with the material and objects
7		Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
8		Apply appropriate safety measures with respect to the mechanical workshop trades

ACADEMIC YEAR 2022-2023
SEMESTER 2

Course Code: MAT 102

Course Name: VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	It is introducing the concepts and applications of differentiation and integration of vector valued functions, differential equations, Laplace and Fourier Transforms	Compute the derivatives and line integrals of vector functions and learn their applications
	The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box.	Evaluate surface and volume integrals and learn their inter-relations and applications
	The topics treated in this course have applications in all branches of engineering	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
		Compute Laplace transform and apply them to solve ODEs arising in engineering
		Determine the Fourier transforms of functions and apply them to solve problems arising in engineering

Course Code: PHT 100

Course Name: ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines.	Compute the quantitative aspects of waves and oscillations in engineering systems
2	The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments
3		Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
4		Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
5		Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system

Course Code: EST 100

Course Name: ENGINEERING MECHANICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	the students to the fundamental concepts of mechanics and enhance their problem-solving skills	Recall principles and theorems related to rigid body mechanics
2	It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion.	Identify and describe the components of system of forces acting on the rigid body
3	After this course students will be able to recognize similar problems in real-world situations and respond accordingly.	Apply the conditions of equilibrium to various practical problems involving different force system
4		Choose appropriate theorems, principles or formulae to solve problems of mechanics
5		Solve problems involving rigid bodies, applying the properties of distributed areas and masses

Course Code: HUN 102

Course Name: PROFESSIONAL COMMUNICATION

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Clear, precise, and effective communication has become a sine qua non in today's information-driven world given its interdependencies and seamless connectivity.	. Understand the role of communication in personal & professional success
2	Any aspiring professional cannot but master the key elements of such communication.	. Understand the role of communication in personal & professional success
3	The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators	Prepare and present messages with a specific intent.
4		Analyze a variety of communication acts.
5		Ethically use, document and integrate sources

Course Code: EST 102

Course Name: PROGRAMING IN C

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	C programs to solve computational problems that they may have to solve in their professional life.	Analyze a computational problem and develop an algorithm/flowchart to find its solution
2	The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.	Write readable C programs with arrays, structure or union for storing the the data to be processed
3	This course has got 2 Hours per week for practicing programming in C. A list showing 24 mandatory programming problems are given at the end.	Write readable C programs with arrays, structure or union for storing the the data to be processed
4	The instructor is supposed to give homework/assignments to write the listed programs in the rough record as and when the required theory part is covered in the class. The students are expected to come prepared with the required program written in the rough record for the lab classes.	Write readable C programs which use pointers for array processing and parameter passing
5		Develop readable C programs with files for reading input and storing output

Course Code: PHL :120

Course Name: ENGINEERING PHYSICS LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	the students gain practical knowledge to co-relate with the theoretical studies and to develop practical applications of engineering materials and use the principle in the right way to implement the modern technology.	Compute the quantitative aspects of waves and oscillations in engineering systems
2		Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments
3	.	Apply the concept of polarization to understand the wave nature of light and the method of analyzing the light whether it is polarized or not. Explain types of superconductivity and their applications
4		Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices
5		Compute the quantitative aspects of waves and oscillations in engineering systems

Course Code: ESL 130

Course Name: ELECTRICAL & ELECTRONICS WORKSHOP

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring.	Demonstrate safety measures against electric shocks
2	It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.	identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols
3		Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
4		Identify and test various electronic components. Assemble and test electronic circuits on boards
5		Draw circuit schematics with EDA tools a team with good interpersonal skills

ACADEMIC YEAR 2022-2023
SEMESTER 3

Course Code: MAT201

Course Name: PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

Sl. No.	Course Objectives	Learning Outcomes (Course Outcomes)
1.	To understand basic ideas of partial differential equations which are widely used in the modelling and analysis of a wide range of physical phenomena	Understand the concept and the solution of partial differential equation.
2.	To understand the practical importance of solving differential equations. understand the differences between initial value and boundary value problems (IVPs and BVPs)	Analyse and solve one dimensional wave equation and heat equation
3.	To understand the basic theory of functions of a complex variable, describe conformal mappings between various plane regions.	Understand complex functions, its continuity differentiability with the use of Cauchy Riemann equations.
4.	To study the techniques of complex variables and functions together with their derivatives and Contour integration .	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
5.	To study complex power series, classification of singularities, calculus of residues and its applications in the evaluation of integrals, and other concepts and properties.	Understand the series expansion of complex function about a singularity and apply residue theorem to compute several kinds of real integrals.

Course Code: ECT 201

Course Name: SOLID STATE DEVICES

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to understand the physics and working of solid-state devices	Graduates will be able to define and understand the concepts in semiconductor physics.
2	To provide a sound understanding of current semiconductor devices and technology to appreciate its applications to electronics circuits and system	Graduates will be able to describe and apply the generation and recombination processes in semiconductors.
3		Graduates will be able to explain the structure, creation of electric field and working of PN junction semiconductor diodes
4		Graduates will be able to illustrate the minority carrier distribution across PN junction semiconductor diodes.
5		Graduates will develop skills and can-do research in new concepts and devices.
6		Graduates can summarize concepts that studied relating different modes of operation and the various current components in BJTs and analyze energy band diagram of PN junction diodes, BJTs, metal semiconductor junctions and MOS capacitors.

Course Code: ECT203

Course Name: LOGIC CIRCUIT DESIGN

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to impart the basic knowledge of logic circuits and enable students to apply it to design a digital system.	Explain the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra
2		Create an implementation of a combinational logic function described by a truth table using and/or/inv gates/ muxes
3		Compare different types of logic families with respect to performance and efficiency
4		Design a sequential logic circuit using the basic building blocks like flip-flops
5		Design and analyze combinational and sequential logic circuits through gate level Verilog models.

Course Code: ECT205

Course Name: NETWORK THEORY

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to analyze the linear time invariant electronic circuits.	The students will be able to understand and list various methods like Mesh / Node analysis or Network Theorems to obtain steady state response of the linear time invariant networks.
2		Graduates will be able to examine and apply Laplace Transforms to determine the transient behaviour of RLC networks.
3		Apply Network functions and Network Parameters to analyse the single port and two port networks.

Course Code: EST 200

Course Name: DESIGN AND ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The objective of this course is to give an introduction to the basic principles of engineering design, inform them about the steps involved in the design process process and Familiarize them with the basic tools and design techniques to be used	Explain the different concepts and principles involved in design engineering.
2	Students are expected to learn and apply design thinking during engineering training, which is very important and relevant today.	Apply design thinking while learning and practicing engineering.
3	Case studies from different practical contexts can help students understand that design is not only about functionality, but also about various life cycle issues with multiple factors such as customer, economy and reliability.	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

Course Code: MCN 201

Course Name: SUSTAINABLE ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability.	Understand the relevance and the concept of sustainability and the global initiatives in this direction
2	To realize the potential of technology in bringing in sustainable practices.	Explain the different types of environmental pollution problems and their sustainable solutions
3		Discuss the environmental regulations and standards
4		Outline the concepts related to conventional and non-conventional energy
5		Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

Course Code: ECL 201

Course Name: SCIENTIFIC COMPUTING LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The following experiments are designed to translate the mathematical concepts into system design.	CO 1: Describe the needs and requirements of scientific computing and to familiarize one programming language for scientific computing and data visualization.
2	The students shall use Python for realization of experiments. Other softwares such as R/MATLAB/SCILAB/LabVIEW can also be used.	CO 2 :Approximate an array/matrix with matrix decomposition.
3	The experiments will lay the foundation for future labs such as DSP lab.	CO 3 :Implement numerical integration and differentiation.
4	The first two experiments are mandatory and any six of the rest should done	CO 4 :Solve ordinary differential equations for engineering applications
5		CO 5: Compute with exported data from instruments
6		CO 6 :Realize how periodic functions are constituted by sinusoids
7		CO 7: Simulate random processes and understand their statistics.

Course Code: ECL 203

Course Name: LOGIC DESIGN LAB

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Familiarize students with the Digital Logic Design through the implementation of Logic Circuits using ICs of basic logic gates	Design and demonstrate the functioning of various combinational and sequential circuits using ICs
2	Familiarize students with the HDL based Digital Design Flow.	Apply an industry compatible hardware description language to implement digital circuits
		Implement digital circuits on FPGA boards and connect external hardware to the boards
		Function effectively as an individual and in a team to accomplish the given task

ACADEMIC YEAR 2022-2023
SEMESTER 4

Course Code: MAT 204

Course Name: PROBABILITY RANDOM PROCESS AND NUMERICAL METHODS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the modern theory of probability and its applications to modelling and analysis and processing of random processes and signals	Understand the concept, properties and important models of discrete random variables and using them analyses suitable random phenomena.
2	To understand some basic numerical methods for interpolation and integration and also for finding roots of equations and solutions of ODEs.	Understand the concept, properties and important models of continuous random variables and using them analyses suitable random phenomena.
3	To learn most of the important models of discrete and continuous probability distributions and widely used models of random process such as Poisson process	Analyse random processes using autocorrelation, power spectrum and Poisson process model as appropriate.
4		Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques.
5		Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

Course Code: ECT202

Course Name: ANALOG CIRCUITS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to develop the skill of analyse and design of different types of analog circuits using discrete electronic components.	Students will be able to understand the working and design of first order RC circuits & diodes
2		Students will be able to analyze basic amplifier configuration using BJT.
3		Students will be able to analyze basic amplifier configuration using MOSFET.
4		Students can apply the principle of different feedback amplifiers & Oscillators.
5		Students can apply the principle of power amplifiers & regulated power supply circuits.

Course Code: ECT204

Course Name: SIGNALS AND SYSTEMS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to lay the foundational aspects of signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, communication theory and control systems.	Apply properties of signals and systems to classify them
2		Represent signals with the help of series and transforms
3		Describe orthogonality of signals and convolution integral.
4		Apply transfer function to compute the LTI response to input signals.
5		Apply sampling theorem to discretize continuous time signals

Course Code: ECT206

Course Name: COMPUTER ARCHITECTURE AND MICROCONTROLLERS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the concepts of basic concepts of operation of microprocessor.	The students will be able to understand the functional units, basic microprocessor architecture and basic processor operation.
2	To understand the basic architecture and programming of 8051 microcontroller	The students will be able to learn the 8051 architectures, instruction set, ports, timers and interrupts.
3	To understand the basic architecture of ARM Processor.	The students will be able to understand the basics of assembly language programming, interfacing concepts using 8051 assembly and C.
4	To give an idea on the various memory related management techniques.	The students will be able to learn the architecture of ARM and various system software.
5		To understand the different types of memory, hierarchy and different memory management techniques and IO organization mechanisms.

Course Code: HUT 200

Course Name: PROFESSIONAL ETHICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To enable students to create awareness on ethics and human values.	CO 1	Understand the core values that shape the ethical behavior of a professional
2		CO 2	Adopt a good character and follow an ethical life.
3		CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
4		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments
5		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Course Code: MCN202

Course Name: CONSTITUTION OF INDIA

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To understand their own country's constitution and study the importance of environment as well as understand their own human rights and to help the students to concentrate on their day-to-day discipline.	MCN202.1	Explain the background of the present constitution of India and features.
2	It also gives the knowledge and strength to face the society and people.	MCN202.2	Utilize the fundamental rights and duties.
3		MCN202.3	Understand the working of the union executive, parliament and judiciary.
4		MCN202.4	Explain the background of the present constitution of India and features.
5		MCN202.5	Utilize the fundamental rights and duties.

Course Code: ECL 202

Course Name: ANALOG CIRCUITS AND SIMULATION LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To familiarize students with the Analog Circuits Design through the implementation of basic Analog Circuits using discrete components.	Students will be able to design and demonstrate the functioning of basic analog circuits using discrete components
2	To familiarize students with simulation of basic Analog Circuits.	Students will be able to design and simulate the functioning of basic analog circuits using simulation tools.
3		Students will be able to Function effectively as an individual and in a team to accomplish the given task.

Course Code: ECL 204

Course Name: MICROCONTROLLER LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Familiarize the students with Assembly Language Programming of modern microcontrollers.	CO1 Write an Assembly language program/Embedded C program for performing data manipulation.
2	Impart the skills for interfacing the microcontroller with the help of	CO2 Develop ALP/Embedded C Programs to interface microcontroller with peripherals
3		CO3 Perform programming/interfacing experiments with IDE for modern Microcontrollers.

ACADEMIC YEAR 2022-2023
SEMESTER 5

Course Code: ECT301

Course Name: LINEAR INTEGRATED CIRCUITS

Sl. No.	Course Objectives	Subject Learning Outcomes or Course Outcomes
1	To understand the basic principles of linear integrated circuits. To equip the students with a sound understanding of fundamental concepts of operational amplifiers.	Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques. Able to analyse differential amplifier configurations
2	To understand some applications of linear integrated circuits. To know the diversity of operations that the op amp can perform in a wide range of applications.	Elucidate and design the linear and non-linear applications of an opamp and special application ICs. Able to design opamp circuits for various applications.
3	To understand the basic principles of integrated circuit fabrication and design waveform generators, oscillators and filters	Able to design and analyze oscillators, multivibrators and filters
4	To study the different types of ICs and its applications. To introduce a few special functions integrated circuits.	Able to design multivibrators using special application IC 555, PLL and its application in communication
5	To impart basic concepts and types of data converters	Able to design, classify and comprehend the working principle of data converters. Able to design ADC and DAC converters and Voltage regulators

Course Code: ECT 303

Course Name: DIGITAL SIGNAL PROCESSING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	State and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods.	The students will be able to state and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods
2	Compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms.	The students will be able to compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms.
3	Design linear phase FIR filters and IIR filters for a given specification.	The students will be able to design linear phase FIR filters and IIR filters for a given specification.
4	Illustrate the various FIR and IIR filter structures for the realization of the given system function	The students will be able to illustrate the various FIR and IIR filter structures for the realization of the given system function.
5	Explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations. Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects.	The students will be able to explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations. The students will be able to explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects

Course Code: ECT305

Course Name: ANALOG AND DIGITAL COMMUNICATION

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to develop analog and digital communication systems.	Explain the existent analog communication systems.
2		Apply the concepts of random processes to LTI systems
3		Apply waveform coding techniques in digital transmission
4		Apply GS procedure to develop digital receivers
5		Apply equalizer design to counteract ISI
6		Apply digital modulation techniques in signal transmission.

Course Code: ECT307

Course Name: CONTROL SYSTEMS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to develop the skills for mathematical modelling of various control systems and stability analysis using time domain and frequency domain approaches.	CO1 Analyse electromechanical systems by mathematical modelling and derive their transfer functions
2		CO2 Determine Transient and Steady State behaviour of systems using standard test signals
3		CO3 Determine absolute stability and relative stability of a system
4		CO4 Apply frequency domain techniques to assess the system performance and to design a control system with suitable compensation techniques
5		CO5 Analyse system Controllability and Observability using state space representation

Course Code: HUT300

Course Name: INDUSTRIAL ECONOMICS AND FOREIGN TRADE

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To equip the students to take industrial decisions and to create awareness of economic environment.	To equip the students to take industrial decisions and to create awareness of economic environment.
2		To equip the students to take industrial decisions and to create awareness of economic environment.
3		To equip the students to take industrial decisions and to create awareness of economic environment.
4		To equip the students to take industrial decisions and to create awareness of economic environment.
5		To equip the students to take industrial decisions and to create awareness of economic environment.

Course Code: MCN 301

Course Name: DISASTER MANAGEMENT

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the fundamental concepts of hazards and disaster management.	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
2		Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
3		Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
4		Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)
5		Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
6		Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).

Course Code: ECL331

Course Name: ANALOG INTEGRATED CIRCUITS AND SIMULATION LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Familiarize students with the Analog Integrated Circuits and Design and implementation of application circuits using basic Analog Integrated Circuits	Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs.
2	Familiarize students with simulation of basic Analog Integrated Circuits.	Design and simulate the application circuits with Analog Integrated Circuits using simulation tools.
3		Function effectively as an individual and in a team to accomplish the given task.

Course Code: ECL 333

Course Name: DIGITAL SIGNAL PROCESSING LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Simulate digital signals.	Students become capable of designing and developing solutions related to different signals.
2	Verify the properties of DFT computationally.	Students become able to design and develop solutions for problems that would require verification of the properties of DFT.
3	Familiarize the DSP hardware and interface with computer.	Students become capable of designing and developing. Students can use the DSP hardware interfaced.
4	Implement LTI systems with linear convolution.	The graduates will be able to implement programs for simulating different types of signals
5	Implement FFT and IFFT and use it on real time signals.	Students gain the capability to investigate complex problems by the application of FFT.
6	Implement FIR low pass filter.	With the implementation of FIR filters students demonstrate and test systems for signal processing.
7	Implement real time LTI systems with block convolution and FFT.	Students can investigate complex engineering problems by the implementation of LTI systems with block convolution and FFT.

ACADEMIC YEAR 2022-2023
SEMESTER 6

Course Code: ECT302

Course Name: ELECTROMAGNETICS

Sl. No.	Course Objectives	Subject Learning Outcomes or Course Outcomes
1	<p>To study Electromagnetic theory and various laws.</p> <p>Solving problems using vector calculus</p> <p>Develop an idea about solving problems of vector calculus in different coordinate system.</p>	<p>To summarize the basic mathematical concepts related to electromagnetic vector fields.</p>
2	<p>To study Maxwell's equations and apply this knowledge to solve problems.</p> <p>To develop the Maxwell's equations for static and time varying fields.</p> <p>Analysis and interpretation of Maxwell's equation.</p>	<p>Analyse Maxwell's equation in different forms and apply them to diverse engineering problems.</p>
3	<p>To conduct investigation on electromagnetic wave propagation in different media.</p> <p>To study reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence</p>	<p>To analyse electromagnetic wave propagation and wave polarization</p>
4	<p>Students will use the knowledge of electromagnetics and apply this to understand electromagnetic wave propagation in transmission lines and solve problems.</p>	<p>To analyse polarization of electromagnetic wave ability to use the concept of transmission lines for design and projects.</p>
5	<p>To understand electromagnetic wave propagation in waveguides and to solve problems</p> <p>To develop Smith Chart</p>	<p>Conduct investigation of problems involving transmission of electromagnetic waves through transmission lines.</p> <p>To analyse and evaluate the propagation of EM waves in Wave guides.</p> <p>Able to analyse using Smith Chart</p>

Course Code: ECT304

Course Name: VLSI CIRCUIT DESIGN

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To impart the knowledge of VLSI design methodologies and Digital VLSI circuit design.	Explain the various methodologies in ASIC and FPGA design.
2	Describe the various MOSFET logic families.	Design VLSI Logic circuits with various MOSFET logic families.
3	Identify commonly used memory elements.	Compare different types of memory elements
4	Analyse various adders and multipliers.	Design and analyse data path elements such as Adders and multipliers.
5	Describe MOSFET fabrication techniques.	Explain MOSFET fabrication techniques and layout design rules.

Course Code: ECT306

Course Name: INFORMATION THEORY AND CODING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to lay down the foundation of information theory introducing both source coding and channel coding. It also aims to expose students to algebraic and probabilistic error-control codes that are used for reliable transmission.	Explain measures of information – entropy, conditional entropy, mutual information
2		Apply Shannon’s source coding theorem for data compression
3		Apply the concept of channel capacity for characterize limits of error-free transmission.
4		Apply linear block codes for error detection and correction
5		Apply algebraic codes with reduced structural complexity for error correction
6		Understand encoding and decoding of convolutional and LDPC codes

Course Code: ECT 362

Course Name: INTRODUCTION TO MEMS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Describe the working principles of micro sensors and actuators	The students will be able to describe the working principles of micro sensors and actuators.
2	Identify commonly used mechanical structures in MEMS	The students will be able to identify commonly used mechanical structures in MEMS.
3	Explain the application of scaling laws in the design of micro systems	The students will be able to explain the application of scaling laws in the design of micro systems.
4	Identify the typical materials used for fabrication of micro systems	The students will be able to identify the typical materials used for fabrication of micro systems.
5	Explain the principles of standard micro fabrication techniques	The students will be able to explain the principles and challenges in the design and fabrication of micro systems.

Course Code: HUT310

Course Name: Management for Engineers

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course is intended to help the students to learn the basic concepts and functions of management and its role in the performance of an organization and to understand various decision-making approaches available for managers to achieve excellence. Learners shall have a broad view of different functional areas of management like operations, human resource, finance and marketing.	CO1 Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).
2		CO2 Describe the functions of management (Cognitive Knowledge level: Understand).
3		CO3 Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).
4		CO4 Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).
5		CO5 Summarize the functional areas of management (Cognitive Knowledge level: Understand).
6		CO6: Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).

Course Code: ECT308

Course Name: COMPREHENSIVE COURSE WORK

Sl. No.	Course Objectives	Subject Learning Outcomes or Course Outcomes
1	To ensure the comprehensive knowledge of each student in Analog Circuits.	Able to apply the knowledge of circuit theorems and solid state physics to solve the problems in electronic Circuits
2	Impart the basic knowledge of logic circuits and enable students to apply it to design a digital system.	Able to design a logic circuit for a specific application
3	To develop the skill to design circuits using operational amplifiers and other linear ICs for various applications.	Able to design linear IC circuits for linear and non-linear circuit applications.
4	To provide an understanding of the principles, algorithms and applications of DSP.	Students should get the knowledge about basic signal processing operations and Filter designs
5	To expose students to apply waveform coding techniques in digital transmission, digital modulation techniques, GS procedure.	Able to apply the knowledge in analog and digital communication systems

Course Code: ECL332

Course Name: COMMUNICATION LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The experiments in Part A involve design and setting up of prototype circuits on breadboard or trainer kits.	Setup simple prototype circuits for waveform coding and digital modulation techniques working in a team.
2	The experiments in Part B are software simulations and can be done using GNU Octave or Python. Other softwares such as MATLAB/ SCILAB/ LabVIEW can also be used.	Simulate the error performance of a digital communication system using standard binary and M -ary modulation schemes.
3	The experiments in Part C are emulations using SDR (software-designed radio) dongle connected to laptops. A control software has to be installed on the laptops. A combination of open-source GNU Radio software, RTLSDR (for reception) and HackRF / LimeSDR (for transmission) can be used to conduct these experiments. Other platforms such as LabView with NI-USRP or Simulink with RTL-SDR can also be used.	Develop hands-on skills to emulate a communication system with software-designed-radio working in a team.

Course Code: ECD334

Course Name: MINIPROJECT

Sl. No.	Course Objectives	Subject Learning Outcomes or Course Outcomes
1	To estimate the ability of the students in transforming the theoretical knowledge studied in to a working model of an electronic system.	Be able to practice acquired knowledge within the selected area of technology for project development.
2	For enabling the students to gain experience in organisation and implementation of small projects.	Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.
3	Design and development of Small electronic project based on hardware or a combination of hardware and software for electronics systems.	Reproduce, improve and refine technical aspects for engineering projects.
4	Enables the students to boost their skills, widen the horizon of thinking and their ability to resolve real life problems.	Work as a team in development of technical projects.
5	Apply engineering and management principles to achieve the goal of the project.	Communicate and report effectively project related activities and findings.

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Course Code:ECT401

Course Name: MICROWAVES AND ANTENNAS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to impart knowledge on the basic parameters of antenna, design and working of various broad band antennas, arrays and its radiation patterns.	Understand the basic concept of antennas and its parameters.
2	It introduces various microwave sources and their principle of operation .	Analyze the far filed pattern of Short dipole and Half wave dipole antenna.
3	Describe the various broad band antennas, arrays and its radiation patterns.	Design of various broad band antennas, arrays and its radiation patterns
4	Analyse the principle of operation of cavity resonators and various microwave sources.	Illustrate the principle of operation of cavity resonators and various microwave sources.
5	Describe the study of various microwave hybrid circuits and microwave semiconductor devices.	Explain various microwave hybrid circuits and microwave semiconductor devices.

Course Code: ECT413

Course Name: OPTICAL FIBER COMMUNICATION

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the concepts of light transmission through optical fibers, structure of optical fibers.	The students will be able to understand the basics of optical fiber communication, its structure, working and classification in terms of propagation modes
2	To understand the losses, associated with the propagation of light.	The students will be able to understand the different types of transmission characteristics and losses associated in an optical fiber.
3	To impart the working of optical components and the principle of operation of optical amplifiers.	The students will be able to illustrate the working and characteristics of components like optical sources, optical detectors, connectors used in fiber optic link.
4	To give idea on WDM technique and its components.	The students will be able to illustrate the working and characteristics of different types of optical amplifiers used, noises associated with different components in fiber optic link.
5		The students will be able to understand the concept of WDM and its components, fiber materials used, LiFi, fault detection methods.

Course Code: CET415

Course Name: ENVIRONMENTAL IMPACT ASSESSMENT

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course introduces the methodologies for identifying, predicting, evaluating and mitigating the impacts on environment due to any developmental project or activities.	Explain the need for minimizing the environmental impacts of developmental activities
2	Students will learn how to prepare an impact assessment report and devise an environment management plan.	Outline environmental legislation & clearance procedure in the country
3	Sufficient background will be provided on the environmental clearance procedures in India.	Apply various methodologies for assessing the environmental impacts of any developmental activity
4		Prepare an environmental impact assessment report
5		Conduct an environmental audit

Course Code: MCN 401

Course Name: INDUSTRIAL SAFETY ENGINEERING

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context.	"Describe the theories of accident causation and preventive measures of industrial accidents"
2	To compare different hazard identification tools and choose the most appropriate based on the nature of the industry.	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
3	It aims to equip students in working with projects and to take up research work in connected areas	Explain different issues in construction industries.
4		Describe various hazards associated with different machines and mechanical material handling.
5		Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

Course Code: ECL411

Course Name: ELECTROMAGNETICS LAB

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Provide practical experience in design and analysis of few electronic devices and circuits used for Microwave and Optical communication engineering.	Familiarize the basic Microwave components and to analyse few microwave measurements and its parameters.
2	Familiarize students with simulation of basic Antenna experiments with simulation tools.	Understand the principles of fiber-optic communications and the different kind of losses, signal distortion and other signal degradation factors.
3		Design and simulate basic antenna experiments with simulation tools.

Course Code: ECQ413

Course Name: SEMINAR

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To do literature survey in a selected area of study.	Identify academic documents from the literature which are related to her/his areas of interest (Cognitive knowledge level: Apply)
2	To understand an academic document from the literature and to give a presentation about it.	Read and apprehend an academic document from the literature which is related to her/ his areas of interest (Cognitive knowledge level: Analyze).
3	To prepare a technical report.	Apply Prepare a presentation about an academic document (Cognitive knowledge level: Create).
4		Give a presentation about an academic document (Cognitive knowledge level: Apply).
5		Prepare a technical report (Cognitive knowledge level: Create).

Course Code: ECD415

Course Name: PROJECT PHASE I

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To apply engineering knowledge in practical problem solving.	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
2	To foster innovation in design of products, processes or systems.	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
3	To develop creative thinking in finding viable solutions to engineering problems.	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
4		Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
5		Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
6		Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).

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Course Code: ECT402

Course Name: WIRELESS COMMUNICATION

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to introduce students to basic theory and principles of wireless communication systems in general, and cellular systems in particular. It also introduces basics of radio wave propagation.	Summarize the basics of cellular system and cellular design fundamentals.
2		Describe the wireless channel models and discuss capacity of wireless channels.
3		Analyse the performance of the modulation techniques for flat-fading channels and multicarrier modulation.
4		Illustrate how receiver performance can be enhanced by various diversity techniques.
5		Identify advantages of various equalization techniques and multiple-access techniques in wireless communication.
6		Calculate system parameters such antenna height, range, maximum usable frequency in different modes of radio wave propagation.

Course Code: ECT474

Course Name: ENTREPRENEURSHIP

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The objective of this course is to understand the knowledge of entrepreneurship and apply in the organization.	Discuss the fundamental concepts of entrepreneurship
2		Understand entrepreneurial motivation and motivation theories
3		Analyze types of enterprises and ownership structure
4		Apply project evaluation methods
5		Evaluate enterprise financial strength

Course Code:ECT426

Course Name: Real Time Operating Systems

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Identify the basics of general operating systems.	Summarize the functions and structure of general-purpose operating systems.
2	Understand the structure and the scheduling operations performed by the operating systems.	Use different scheduling algorithms on processes and threads
3	Introduce Real Time Operating Systems, its basic structure, building blocks and various operations.	Interpret a real time operating system along with its synchronization, communication and interrupt handling tools.
4	Summarize the different scheduling algorithms used in RTOS.	Illustrate task constraints and analyze the different scheduling algorithms on tasks.
5	Identify the different applications of real time operating systems	Illustrate the applications of real time operating systems.

Course Code:ECT448

Course Name: LOW POWER VLSI

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course aims to impart the basic knowledge in designing of Low power VLSI Circuits.	Identify various short channel effects and various sources of power.
2	Identify and analyse various power reduction techniques to circuits.	Apply various power reduction techniques to circuits.
3	Describe the various clocked and non clocked design styles for logic implementation.	Apply various clocked and non clocked design styles for logic implementation.
4	Describe the adiabatic and reversible logic for circuit implementation.	Apply Adiabatic and reversible logic for circuit implementation.
5	Describe various sources of power dissipation in CMOS.	Explain sources of power dissipation in CMOS.

Course Code: ECD416

Course Name: PROJECT PHASE II

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To apply engineering knowledge in practical problem solving.	Model and solve real world problems by applying knowledge across domains (Cognitive knowledge level: Apply).
2	To foster innovation in design of products, processes or systems.	Develop products, processes or technologies for sustainable and socially relevant applications (Cognitive knowledge level: Apply).
3	To develop creative thinking in finding viable solutions to engineering problems.	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks (Cognitive knowledge level: Apply).
4		Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms (Cognitive knowledge level: Apply).
5		Identify technology/research gaps and propose innovative/creative solutions (Cognitive knowledge level: Analyze).
6		Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).