

### Course Outcomes

Dept	Year & Semester	Course Code	Course Name	Course Outcomes
ECE	1	ECE 111	ENGLISH	Analyze the structure of the phrases, clauses and sentences
				Apply his enriched vocabulary to give better shape to his communication skills.
				Effectively use different formats of business correspondence.
				Use idiomatic expressions and foreign phrases in his communication.
				Use correct structures to write sentences
ECE	1	ECE 112	ENGINEERING MATHEMATICS-I	Familiarize with functions of several variables
				Apply Fourier series in solving boundary value problems
				Apply the concept of three dimensional analytical geometry
				Use mathematical tools needed in evaluating multiple integral and their usage.
				Use the concepts of improper integrals, Gamma, Beta and Error functions which are needed in Engineering applications
ECE	1	ECE 113	ENGINEERING CHEMISTRY	Adopt suitable technologies for domestic and industrial water
				Able to distinguish different material properties to be used in the semiconductor electronic devices.
				Design suitable batteries for different applications.
				Select and design of suitable material to prevent corrosion and protecting metals from corrosion.
				Develop green technologies for industrial processes.
				solve scientific problems related to various engineering works
ECE	1	ECE114	PROFESSIONAL ETHICS AND HUMAN VALUES	Understand the right code of conduct
				Assess his/her roles as a proactive member of the society
				Solve moral dilemmas and issues
				Implement Code of ethics of relevant Professional societies

ECE	1	<b>ECE115</b>	<b>ENGINEERING PHYSICS</b>	Design and conduct simple experiments as well as analyse and interpret data in engineering applications
				understand advanced topics in engineering
				Identify formulae and solve engineering problems
				Apply quantum physics to electrical phenomena
ECE	1	<b>ECE 116</b>	<b>ENGINEERING CHEMISTRY LAB</b>	Able to identify the suitable method for analyzing samples.
			(	Able to analyze different types of water samples to test quality parameters.
				Able to use different types of instruments in estimating the composition of materials in samples related to Soil, Water.
ECE	1	<b>ECE 117</b>	<b>PROGRAMMING WITH C LAB</b>	Gain a working knowledge on programming.
				Learn and use the fundamentals of a programming language (such as language-defined data types (int, float, char, double), control constructs (sequence, selection, repetition), program modules (including functions, modules, methods)).
				Exhibit the ability to formulate a program that correctly implements the algorithm.
				Demonstrate the effective use the programming environment used in the course.
ECE	2	<b>ECE121</b>	<b>ENGINEERING MATHEMATICS-II</b>	Solve linear system equations using of matrix algebra techniques
				Determine the Eigen values and vectors of a matrix
				Apply different techniques in solving differential equations that model engineering problem
				Use the application of Differential equations like simple electric circuits, Newtons law of cooling and to solve any higher order linear ordinary differential equation with constant coefficients
				Solve linear differential equations and Network analysis using Laplace transforms.
ECE	2	<b>ECE122</b>	<b>APPLIED PHYSICS</b>	Correlate the theoretical principles with experimental observations
				Identify engineering materials for specific engineering applications
				Apply the knowledge of advanced materials for engineering applications

ECE	2	<b>ECE123</b>	<b>ENVIRONMENTAL SCIENCES</b>	Understand the natural environment and its relationships with human activities.
				Characterize and analyze human impacts on the environment.
				Integrate facts, concepts, and methods from multiple disciplines and apply to environmental problems
				Design and evaluate strategies, technologies, and methods for sustainable management of environmental systems and for the remediation or restoration of degraded environments
ECE	2	<b>ECE124</b>	<b>ENGINEERING DRAWING</b>	Perform basic sketching techniques will improve.
				Draw orthographic projections and section
				Use architectural and engineering scales will increase.
				Produce engineering drawing will improve
				Convert sketches to engineered drawing will increase.
				Develop good communication skills and team work
				Become familiar with Auto CAD two dimensional drawings.
ECE	2	<b>ECE125</b>	<b>BASIC ELECTRONICS ENGINEERING</b>	Understand the behavior of passive electrical components
				Determine Acquire knowledge on measuring physical variables using meters/ instruments such as volt meters, ammeters power supplies, CRO etc according to the range selected.
				Determine the parameters of the semiconductor devices such PN junction diode, Zener diode, LED, etc., from the electrical behaviour of the devices.
				Understand how to operate transistor such as BJT, JFET and MOSFET in the desired operating region using any of the available biasing techniques.
				Analyze the characteristics of Integrated circuits and its use in several applications in electronics circuits particularly the IC Op- Amp and 555 timer, IC voltage regulators etc.
ECE	2	<b>ECE126</b>	<b>ENGINEERING PHYSICS LAB</b>	Design and conduct experiments as well as to analyze and interpret data.
				Identify, solve and apply fundamental physics principles to solve engineering problems

ECE	2	<b>ECE127 LANGUAGE LAB</b>	Handle CBT (Computer Based Tests) of the qualifying examinations.
			Receive, interpret, remember and evaluate information by practicing effective listening skills.
			Speak English with neutralized accent.
			Narrate, describe and report incidents and situations using appropriate terminology.
ECE	2	<b>ECE 128 OBJECT ORIENTED PROGRAMMING WITH C++ LAB</b>	Understand how to use the programming constructs of CPP.
			Use Object Oriented Programming concepts to develop object oriented programs.
			Apply various object oriented features to solve real world computing problems using C++ language.
ECE	2	<b>ECE129 WORKSHOP</b>	Make simple carpentry and fitting works
			Understand and do different types of wiring for practical requirements
			Develop cross-sections of models for tin smithy and make them.
			It also helps in understanding of relevant skills required by the engineer working in engineering industries and
ECE	3	<b>ECE 211 ENGINEERING MATHEMATICS –III</b>	Understanding the concepts of Gradient, Divergence and Curl and finding scalar potential function of irrotational vector fields.
			Understanding the concepts of Green's Theorem, Stokes' Theorem and the Divergence Theorem and to evaluate line integrals, surface, integrals and flux integrals.
			Understand some basic techniques for solving linear partial differential equations and how to identify a partial differential equation in order to determine which technique(s) can best be applied to solve it.
			Understand the methods to solve the Laplace, heat, and wave equations.
			Gain good knowledge in the application of Fourier Transforms.
ECE	3	<b>ECE 212 ELECTRICAL MACHINES</b>	Find efficiency of DC Machine
			Find Regulation and Efficiency of Single phase Transformer
			Analyze the performance of Induction Motors
			Understand working of synchronous machine

				Understand basic concepts of Electric Power System
ECE	3	<b>ECE 213</b>	<b>DATA STRUCTURES</b>	Demonstrate the knowledge in problem solving techniques.
				Write programs for different data structures
				Implement different applications using tree structures.
				Implement various sorting techniques
				Apply and implement learned algorithm design techniques and data structures to solve problems using Graphs.
ECE	3	<b>ECE 214</b>	<b>SIGNALS AND SYSTEMS</b>	Apply transformations on the independent variable of the given CT and DT signals and analyze the properties of CT and DT signals and systems.
				Represent mathematically the CT and DT LTI systems and determine the response of an LTI system for the given input signal using either convolution integral or convolution sum.
				Represent CT and DT signals and systems in the Frequency domain using Fourier Analysis tools like CTFS, CTFT, DTFS and DTFT.
				Represent the CT signals in terms of its samples and reconstruct using interpolation.
				Represent DT signals in the Frequency domain and analyze DT systems using Z-Transforms and analyze CT signal and systems using Laplace transforms
ECE	3	<b>ECE 215</b>	<b>NETWORK ANALYSIS AND SYNTHESIS</b>	Apply basic network theorems and analyze both D.C and A.C. circuits.
				Determine various parameters of two port networks.
				Analyze circuits under resonant condition.
				Calculate natural and forced response of RL, RC & RLC circuits
				Measure real, reactive, apparent power in three phase circuits.
ECE	3	<b>ECE 216</b>	<b>ELECTRONIC CIRCUITS AND ANALYSIS-I</b>	Determine the performance parameters like current gain, voltage gain, input impedance, output impedance using the models such as h-parameter model, simplified CE h-parameter model and $\pi$ -model.

				Analyze the frequency response characteristics of single stage and multistage amplifier circuits (i.e. given a lower cut off, upper cut-off frequencies of an amplifier determining the coupling and bypass capacitor values) and different circuit configurations for improving the transistor amplifier characteristics such as input impedance, voltage gain etc.
				Analyze the response of linear wave shaping circuits such as high pass and low pass filter circuits for different types of inputs such as step input, pulse input, square input ramp input.
				Analyze the response of Non-linear wave shaping circuits such as clipping and clamping circuits when the sinusoidal input is applied and to design two level clipping circuits in order to select the desired portion of the input signal.
				Determine the stable state voltages and currents and design the various multivibrators to meet the given specifications.
ECE	3	ECE 217	<b>ELECTRONIC CIRCUITS AND ANALYSIS-I LABORATORY</b>	Measure the important parameters of a PN diode and to implement for various Applications.
				Design and construct different rectifier and voltage regulation circuits used in regulated Power supplies.
				Design amplifier circuits for specific applications, based on their input and output Characteristics of BJT and FET.
				Design and verify the output of linear wave shaping circuits for different inputs.
				Design and analyze different multivibrator circuits.
ECE	3	ECE 218	<b>NETWORK &amp; EM LABORATORY</b>	Conduct the experiments based on basic network theorems.
				Predict the characteristics of D.C machines and single phase transformers
				Predict the regulation of an alternator.
ECE	4	ECE 221	<b>ENGINEERING MATHEMATICS –IV</b>	Understand, interpret and use the basic concepts: Analytic function, harmonic function, Taylor and Laurent Series, Singularity, Residues and evaluation of improper integrals.
				Familiarize the concepts of Finite Differences and Interpolation techniques.
				Familiarize the concept of Differentiation and Integration by numerical methods.

				Understand the characteristics and properties of Z-transforms and its applications.
				Analyze the Statistical data by using statistical tests and to draw valid inferences about the population parameters.
ECE	4	<b>ECE 222</b>	<b>ELECTRONIC CIRCUITS AND ANALYSIS-II</b>	Analyze negative feedback amplifiers and sinusoidal oscillators for different performance metrics such as input impedance, output impedance, voltage gain, condition for oscillations, frequency of oscillations etc.
				Determine the resonant frequency for the tuned voltage amplifiers and analyze class-A, class-B, class-AB , class-C amplifiers for efficiency.
				Analyze current mirror differential amplifier circuits using BJTs.
				Design and analyze analog circuits like integrator, differentiator, comparator, instrumentation amplifier and logarithmic amplifier using op-amps.
				Analyze the response of common source, common drain and common gate amplifiers with enhancement and depletion loads.
ECE	4	<b>ECE 223</b>	<b>DIGITAL ELECTRONICS</b>	Perform number conversions between different number systems and codes and apply Boolean algebra to minimize logic expressions up to three variables.
				Analyze the characteristics of logic families and compare their performance in terms of performance metrics.
				Apply tabulation method to minimize logic expressions up to Five variables and design a combination logic circuit like decoders, encoders, multiplexers, and demultiplexers etc. for a given specification and verify the correctness of the design.
				Analyze the operation of sequential circuits built with various flip-flops by finding the Boolean function or truth table and design various sequential circuits like flip flops, registers, counters etc.
				Design of sequential detector by constructing a state/output tables or diagrams from a word description or flow chart specification of sequential behavior using either mealy and/or Moore machines.,,
ECE	4	<b>ECE 224</b>	<b>PROBABILITY THEORY AND RANDOM PROCESSES</b>	Calculate probabilities and conditional probabilities of events defined on a sample space.

				Compute statistical averages of one random variables using probability density and distribution functions and also transform random variables from one density to another
				Compute statistical averages of two or more random variables using probability density and distribution functions and also perform multiple transformations of multiple random variables.
				Determine stationarity and ergodicity and compute correlation and covariance of a random process.
				Compute and sketch the power spectrum of the response of a linear time-invariant system excited by a band pass/band-limited random process.
ECE	4	ECE 225	<b>ELECTROMAGNETIC FIELD THEORY &amp; TRANSMISSION LINES</b>	Apply vector calculus to static electric fields in different engineering situations
				Solve the problems related to magnetostatic fields by applying magnetostatic laws.
				Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.
				Analyze the phenomena of wave propagation in different media.
				Apply the concepts of transmission line and use smith chart to find various parameters useful to design a matching circuits at radio frequency
ECE	4	ECE 226	<b>CONTROL SYSTEMS</b>	Apply block reduction techniques and signal flow graphs
				Apply mathematical modelling of mechanical and electrical systems
				Analyze the given systems in time domain
				Determine the relative and steady state stability of the systems
				Analyze the systems in frequency domain
ECE	4	ECE 227	<b>ELECTRONIC CIRCUITS AND ANALYSIS-II LABORATORY</b>	Design and identify the applications of feedback amplifiers and sinusoidal oscillators in different electronic circuits.
				Design and implement different power amplifiers and tuned voltage amplifiers.
				Calculate the parameters of BJT differential amplifier.
				Apply op-amps fundamentals in design and analysis of op-amps applications.
				Apply the MOSFET inverter in different electronic circuits.



ECE	4	<b>ECE 228</b>	<b>SIMULATION LABORATORY</b>	Calculate the convolution and correlation between signals
				Plot magnitude and phase spectrum of a given signal using various transformation tools.
				Generate random sequences for a given distribution.
				Understand the basics of VHDL and describe the logic circuit using different types of models in the architecture of the body.
				Design and simulate combinational and sequential circuits using VHDL
ECE	5	<b>ECE 311(a)</b>	<b>INTRODUCTION TO EMBEDDED SYSTEMS</b>	learn about the general principles of computer architecture
				learn about the working of a simple embedded system and embedded system applications
				learn the hardware aspects of embedded systems
				understand the sensors, ADCs and actuators used in embedded systems
				understand the real world examples of embedded systems
ECE	5	<b>ECE 311(b)</b>	<b>ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY</b>	Gain enough knowledge to understand the concept of EMI / EMC related to product design & development.
				Analyze the different EM coupling principles and its impact on performance of electronic system.
				Know how to bring down the electromagnetic interference highlighting the concepts of both susceptibility and immunity
				Acquire broad knowledge of various EM radiation measurement techniques
				Gain enough knowledge to understand the present leading edge industry standards in different countries
ECE	5	<b>ECE 312</b>	<b>COMMUNICATION SYSTEMS ENGINEERING</b>	Analyze about various blocks in a Communication System.
				Analyze and design the analog modulator and demodulator circuits.
				Apply the concepts to explain about various blocks in Transmitters and Receivers.

				Analyze and design the pulse analog modulation techniques and evaluate the performance of analogue communication systems in the presence of noise.
				Gain knowledge of satellite orbits, its launching methods, Link design, earth segment and space segment components.
ECE	5	ECE 313	<b>MICROPROCESSORS AND APPLICATIONS</b>	Able to program 8085 microprocessor to meet the specific requirements of the client
				Able to organize the hardware involved in BIU & EU of 8086 microprocessor & analyze the minimum and maximum mode 8086 systems using timing diagrams
				Able to program 8086 microprocessor to meet the specific requirements of the client
				Able to interface 8086 microprocessor to semiconductor memories (SRAM & EPROM), stepper motor to meet the specific requirements of the Client, Also able to generate a specific waveform by designing an interface between a CRO and 8086 microprocessor & able to convert a given analog sample value into its equivalent digital value by designing an interface between 8086 microprocessor and analog input using A/D converter to meet the meet the specific requirements of the Client
				Able to design interface between peripheral devices and 8086 microprocessor using 8259 (Programmable Interrupt Controller) to get services from 8086 microprocessor on Interrupt basis & able to interface USART to 8086 to perform serial communication.
ECE	5	ECE314	<b>COMPUTER ARCHITECTURE AND ORGANIZATION</b>	Work with the typical assembly language instructions of a computer
				Organize the hardware involved in the CPU of a computer
				Design CPU & control unit of a basic computer
				Use computing resources such as memory and I/O in an effective manner to improve the performance of a computer
				Illustrate the concept of pipelining and multiprocessors

ECE	5	<b>ECE315</b>	<b>INTEGRATED CIRCUITS AND APPLICATIONS</b>	Analyze the static and dynamic electrical behavior of CMOS circuits.
				Design and analyze active filters of an op-amp & IC Voltage regulators
				Design circuits for several applications using IC 555 Timer, PLL, analog multiplier ICs etc.
				Design several circuits using D/A and A/D convertor.
				Design the combinational and Sequential circuits using digital ICs.
ECE	5	<b>ECE 316</b>	<b>ANTENNAS AND WAVE PROPAGATION</b>	1. Analyze the basic antenna parameters by applying the concepts & properties of electromagnetism
				2. Determine the fundamental parameters of practical antennas operating at various frequencies from LF to Microwave applications.
				3. Analyze & design the linear antenna arrays.
				4. Assess antenna performance by using suitable measurement technique.
				5. Identify & Analyze the characteristics of radio wave propagation.
ECE	5	<b>ECE 317</b>	<b>MICROPROCESS ORS &amp; APPLICATIONS LABORATORY</b>	Program 8085 & 8086 microprocessor to meet the requirements of the user.
				Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.,
				Handle interrupts
				Design a microcomputer to meet the requirement of the user
ECE	5	<b>ECE318</b>	<b>INTEGRATED CIRCUITS LABORATORY</b>	Design the circuits using op-amps for various applications like adder, subtractor, integrator, differentiator and Schmitt trigger
				Design active filters for the given specifications and obtain their frequency response characteristics.
				Design and analyze multivibrator circuits using op-amp and 555 Timer
				Design and analyze various combinational circuits like multiplexers, and de-multiplexers, binary adder, subtractor, etc
ECE	5	<b>ECE 319</b>	<b>QUANTITATIVE APTITUDE - I</b>	Solve problems related to numerical computations in company specific and other competitive tests
				Recall and use the concepts to solve problems numerical estimation with respect to company specific and competitive tests.

				Apply basic principles related to geometry and mensuration & solve questions in company specific and competitive tests.
				Detect grammatical errors in the text/sentences and rectify them while answering their competitive company specific tests and frame grammatically correct sentences while writing.
				Answer questions on synonyms, antonyms, hyponyms, hypernyms and other vocabulary based exercises while attempting company specific and other competitive tests.
				Use their logical thinking ability and solve questions related to reasoning based exercises.
				Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent
				Analyze the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences.
ECE	6	<b>ECE 321</b>	<b>MICROWAVE &amp; RADAR ENGINEERING</b>	Apply the EM fundamentals in solving problems related to guided wave theory.
				Analyze the working of microwave components using S-matrix.
				Choose suitable microwave tube or a solid state device for generating / amplifying microwave signals for a specific application.
				Determine the parameters of a microwave device such as wavelength VSWR, impedance.
				Analyze different types of radars to be used for specific application.
ECE	6	<b>ECE 322</b>	<b>DIGITAL SIGNAL PROCESSING</b>	Mathematically classify different types of signals and perform basic operations on time and amplitude and Represent DT signals in the Frequency domain using Fourier Analysis and Z-Transforms.
				Transform a DTS into frequency domain using DFT and FFT and compare these two methods with respect to their computation complexity.
				Design and realize IIR and FIR digital filters for arbitrary frequencies and attenuation values .
				Implement sampling rate conversion using decimation and interpolation applied in digital filter banks.
				Explain the DSP processors which can be used for practical applications and also acquired knowledge on various applications of Digital Signal Processors in speech processing.

ECE	6	<b>ECE 323</b>	<b>MICROCONTROLLERS &amp; EMBEDDED SYSTEMS</b>	<b>Acquire</b> knowledge of the architecture and operation of Intel 8051 microcontroller and <b>Analyze</b> the hardware features like timers, memory, interrupts and serial communication available in 8051 Microcontroller Family of devices
				<b>Develop</b> assembly language programs for data transfer, arithmetic, logical, and branching operations using instruction set of 8051 and <b>apply</b> them in control applications
				<b>Develop</b> applications that will provide solution to real world problems by Interfacing 8051 Microcontroller with various peripherals such as ADC, DAC, keyboard, display, Interrupt and Serial communication modules.
				<b>Evaluate</b> the Embedded system design flow from the requirements to the deployment level and <b>analyze</b> the hardware/software tradeoffs involved in the design of embedded systems.
				<b>Express</b> the implementation of ARM and SHARC Processors in terms of architecture, and memory organization. Also <b>evaluate</b> the performance metrics of simple and networked Embedded systems
ECE	6	<b>ECE 324(a)</b>	<b>ANALOG IC DESIGN</b>	Understand the basic MOS device physics and models
				Analyze and design single stage amplifiers
				Analyze and design differential amplifiers
				Analyze and design current sources/sinks/mirrors
				Analyze and design basic operational amplifiers circuits
ECE	6	<b>ECE 324(b)</b>	<b>ELECTROMAGNETIC INTERFERENCE / COMPATABILITY</b>	Understand the concept of EMI / EMC, related to product design & development.
				Analyze the different EM coupling principles and its impact on performance of electronic system.
				Ensure that a designed system conforms itself to certain standard through a thorough understanding of various standards in different countries.
				Have broad knowledge of various EM radiation measurement techniques.
				Model a given electromagnetic environment/system so as to comply with the standards.

ECE	6	<b>ECE 324(c)</b>	<b>ELECTRONIC MEASUREMENTS AND INSTRUMENTATION</b>	Measure various parameters with accuracy, precision and resolution and understand the operation of PMMC and EMMC with their applications
				Understand the principle of operation, working of different electronic instruments
				Apply the knowledge of cathode ray oscilloscopes and understand the functioning, specification, applications of signal analyzing instruments
				Understand principles of measurement associated with different bridges
				Select appropriate passive or active transducers for measurement of physical phenomenon
ECE	6	<b>ECE 324(d)</b>	<b>TELECOMMUNICATION SWITCHING AND NETWORKS</b>	Understand and describe the concepts of multiplexing and switching.
				Apply probability related concepts to resolve traffic and network related issues
				Analyze and solve problems in traffic engineering
				Recognize the significance of ISDN and outline its architecture
				Obtain an overview of end to end transmission in data networks
ECE	6	<b>ECE 325</b>	<b>DIGITAL COMMUNICATIONS</b>	Compare and analyze various baseband and bandpass digital modulation techniques
				Calculate probability of error for various digital modulation techniques to analyze the performance of DCS in the presence of noise.
				Analyze the performance of spread spectrum code acquisition and tracking circuits.
				Evaluate the channel capacity and Calculate efficiency of various source encoding techniques.
				Implement channel coding techniques and comprehend error correction and detection.
ECE	6	<b>ECE 326</b>	<b>COMMUNICATION SYSTEMS ENGINEERING LABORATORY</b>	Design and Simulate different Modulation schemes
				Design high pass and Low-pass filters used in communication system.
				Perform multiplexing on analog signals and Retrieve useful information by observing AM and FM in frequency domain.

				Design and Simulate a Practical Pre-emphasis and De-emphasis circuit.
				Measure the characteristics of practical AM Super Heterodyne Radio Receiver using Spectrum Analyzer, Cathode Ray Oscilloscope & Digital Multi Meter.
ECE	6	ECE327	<b>MICROCONTROLLER &amp; EMBEDDED SYSTEMS LABORATORY</b>	Program 8051 microcontroller to meet the requirements of the user.
				Interface peripherals like switches, LEDs, stepper motor, Traffic lights controller, etc.,
				Handle interrupts
				Design a microcontroller development board to meet the requirements of the user
ECE	6	ECE328	<b>SOFT SKILLS LAB</b>	Comprehend the core engineering subjects using effective verbal and nonverbal communication skills.
				Present accurate and relevant information efficiently, using suitable material aids.
				Work effectively as an individual as well in teams and emerge as responsible leaders with appropriate professional ethics.
				Participate in group discussions and interviews using analytical and problem solving abilities, which enhance their employability skills.
				Set time bound goals and realize them through strategic plans for successful career.
ECE	7	ECE 411	<b>ENGINEERING ECONOMICS AND MANAGEMENT</b>	Understand the concepts of Economics
				Gain basic understanding of management and manage organizations effectively and to relate the concepts of management with industrial organizations and manage organizations efficiently
				Have the basic knowledge of production management and make decisions proficiently
				Understand the basic concepts of accounting, finance and marketing management
ECE	7	ECE 412	<b>COMPUTER NETWORK ENGINEERING</b>	<b>Apply</b> the concepts of Computer Networks and Networks Models for Data Communication.
				<b>Analyze</b> networking architecture and infrastructure for wired and wireless link

				<b>Design</b> , calculate, and apply subnet masks and routing addresses to fulfill networking requirements
				<b>Analyze</b> issues of routing and congestion mechanism for independent and internetworking networks for wired and wireless link.
				<b>Analyze</b> internal workings of the Internet and of a number of common Internet applications and protocols (DNS, SMTP, FTP, HTTP, WWW, Security and Cryptography).
ECE	7	<b>ECE 414(a)</b>	<b>ADVANCED DIGITAL SIGNAL PROCESSING</b>	Understand decimation and interpolation of discrete-time signals.
				Design a digital system with different sampling rates.
				Describe the properties of various linear filters.
				Apply various adaptive algorithms for different applications.
				Analyze the parametric and non parametric methods of power spectrum estimation.
ECE	7	<b>ECE 414(b)</b>	<b>RADAR SIGNAL PROCESSING</b>	Describe the principles of CW and FM radar
				Understand moving target indication radar, and analyse the time, frequency and signal processing aspects of pulse Doppler radar
				Represent the design aspects of radar waveforms including matched filtering
				Understand and analyze pulse burst waveform and frequency modulated pulse compression waveforms
				Understand the basic principles of synthetic aperture radar
ECE	7	<b>ECE 414(c)</b>	<b>DIGITAL IC DESIGN USING HDL</b>	Interpret the importance of EDA tools and its flow for VLSI designs
				Model logic gates ,half adder, full adder ,various digital blocks by using modern tools with HDL
				Construct verilog HDL models for combinational and sequential circuits using gate level, behavioral level and dataflow level
				Build CMOS circuits using Verilog switch level programming
				Apply design rule checks and timing parameters to digital circuits and model the state machines
ECE	7	<b>ECE 414(d)</b>	<b>DIGITAL IMAGE PROCESSING</b>	Describe the basic components of digital image processing system and transform techniques (FFT, DCT and Hadamard transform).



				Analyze image enhancement in spatial domain using smoothing and sharpening operators.
				Analyze image enhancement in frequency domain using High pass and low pass filters.
				Describe image restoration using Weiner filtering and image segmentation using thresholding and region growing techniques.
				Compare and contrast image compression techniques (Variable length coding, LZW coding, Bit plane coding, Lossless predictive coding, Lossy prediction, transform coding).
ECE	7	<b>ECE 415 VLSI DESIGN</b>		Delineate IC Production process, fabrication processes for NMOS, PMOS, BiCMOS Technologies.
				Analyze CMOS electrical properties with circuit concepts.
				Draw stick diagrams, layouts for CMOS circuits and compute delays of CMOS circuits using modern tools.
				Design and test the CMOS digital Circuits at different levels of abstraction using modern tools.
				Apply testing methods on the digital designs for DFT.
ECE	7	<b>ECE 416(a) VLSI LAB</b>		Work with XILINX VLSI design tools.
				Develop the systems for various signal processing and computing applications
				Test and verify the prototypes at system level using XILINX Vivado simulators.
				Analyze and Develop the prototypes of Digital systems on Artix 7 FPGA.
ECE	7	<b>ECE 416(b) SIGNAL AND IMAGE PROCESSING LAB</b>		Compute and analyze signal spectrum of discrete system using DFT/FFT algorithms in MATLAB
				Design & implement the digital filter in MATLAB programming environments
				Program a DSP chip with a variety of real-time signal processing algorithms
				Perform some basic operations on an image and improve the appearance and quality of images using Spatial and frequency domain filtering.
				Know how morphological functions change images by applying erosion and dilation operations.
				Understand the concept of edge detectors and their operation in noisy images.

ECE	7	<b>ECE 416(c)</b>	<b>VIRTUAL INSTRUMENTATION LAB</b>	Develop software programs called virtual instruments that apply user interface, program control, data structures, file input output, hardware interfacing, data analysis and signal processing
				Experiment with, analyze and document prototype measurement systems using a computer, plug in DAQ interfaces and bench level instruments.
				Build an engineering application in lab view, install and configure data acquisition hardware.
				Design DAQ using LABVIEW modules.
ECE	7	<b>ECE 416(d)</b>	<b>ANTENNA DESIGN LAB</b>	Get familiarized with the simulation software
				Design the antenna with given specification using the simulation tools.
				Extract the various parameters that indicate the performance of the antenna
				Interpret the extracted results and analyse them and prepare a formal laboratory report.
ECE	7	<b>ECE 417</b>	<b>DIGITAL COMMUNICATIONS LABORATORY</b>	Implement modulation /demodulation of PCM, DPCM and Delta modulation schemes.
				Implement different digital modulation schemes like FSK, PSK, and DPSK.
				Design and Construct a source Encoder.
				Design and implement Channel Encoding techniques.
				Simulate various digital communication techniques like PCM, ASK, Companding techniques etc.
ECE	8	<b>ECE 421</b>	<b>CELLULAR AND MOBILE COMMUNICATIONS</b>	Principle of operation of cellular mobile systems and their interferences.
				Mobile radio propagation & mobile multipath channels.
				Handoff, dropped calls and Frequency management and channel assignment strategies.
				<b>Analyze and design</b>
				forward and reverse channels of various Multiple access techniques in wireless communications
				The changes in implementation of receiver circuitry with the integration of mobile satellites.
ECE	8	<b>ECE 422(a)</b>	<b>PHASED ARRAY SYSTEMS</b>	Apply the knowledge the engineering and science in understanding and differentiating various system requirements with phased arrays for radar and communication system.

				Analyze linear/planar array antennas with required side lobes, beam width, bandwidth etc., and determine their directivity & study various scanning techniques.
				Identify, formulate and analyze different antennas to form an array for a given application
				Formulate the array patterns using various synthesis techniques
				Apply different feeding mechanisms for resonant and travelling wave arrays & measure different parameters of the array
ECE	8	<b>ECE 422(b)</b>	<b>BIOMEDICAL INSTRUMENTATION</b>	Understand various methods of acquiring bio signals.
				Understand and analyze different biomedical electrodes and sensors used for clinical observation.
				Analyze ECG and EEG signal with characteristic feature points.
				Measure heart rate, blood pressure and respiration rate. And also understand various sources of blood flow meters.
				Understand bio-telemetry & instrumentation used for Clinical Laboratory.
ECE	8	<b>ECE 422(c)</b>	<b>OPTICAL COMMUNICATIONS</b>	Illustrate the structure and fabrication methods of Optical fibers
				Analyze the channel impairments: losses and dispersion
				Analyze the Optical sources (LED and LASER) and detectors(PIN and Avalanche Photo diode).
				Apply design considerations to analog and digital fiber optic systems
				Analyze the components of fiber optic networks: Couplers, multiplexers, switches and filters.
ECE	8	<b>ECE 422(d)</b>	<b>EMBEDDED AND REAL – TIME SYSTEMS</b>	Acquire knowledge of embedded systems architecture with respect to both hardware and software
				Acquire knowledge of real time systems
				Familiarize with the concepts of Embedded/Real-Time operating Systems
				Familiarize with various operating Systems
				Familiarize with the basics of embedded system development
ECE	8	<b>ECE 423(a)</b>	<b>SATELLITE COMMUNICATIONS &amp; GPS</b>	Describe and justify communication satellite subsystem with specifications.

				Analyze C/N ratio for satellite single link budgets in air and rain.
				Classify and analyze multiple access techniques required for satellite communication.
				Determine GPS receiver position using one & more satellite in 2D & 3D.
				Describe various GPS system segments, GPS signals & signal structures using PRN codes.
ECE	8	<b>ECE 423(b)</b>	<b>VLSI SIGNAL PROCESSING</b>	Represent the DSP algorithms and transforms as systems with block, signal flow and data flow diagrams.
				Design pipeline and parallel processed FIR filters.
				Perform retiming and minimize the registers and solve the systems of inequalities.
				Design systolic architecture using canonical mapping and generalized mapping
				Design and analyse parallel and pipeline IIR
ECE	8	<b>ECE 423(c)</b>	<b>WIRELESS SENSOR NETWORKS</b>	Understand the technologies that enable wireless sensor networks
				Identify various sensor network scenarios and architectures
				Distinguish between various classes of MAC protocols
				Understand allocation of addresses and management of names in WSNs
				Appreciate the growing demand for WSNs in diverse areas
ECE	8	<b>ECE 423(d)</b>	<b>COGNITIVE RADIO NETWORKS</b>	Illustrate the mathematical modeling and design issues of OFDM and MIMO
				Evaluation of Software Defined Radio architecture and its parameters
				Develop mathematical model for cognitive radio networks
				Analyze spectrum sensing network by using OFDMA and spectrum management by Heterogeneous Wireless Networks
				Interpret Regulatory Issues and International Standards
ECE	8	<b>ECE 424</b>	<b>MICROWAVE ENGINEERING LABORATORY</b>	Find the bench set up before start of the experiment, identifying the required apparatus and procedure of doing the experiment.
				Measure various parameters of the signal, load & characterize various microwave sources using microwave bench setup.

				Plot the radiation pattern of horn antenna and other antennas using antenna trainer system.
				Design the antenna with given specification using simulation tools.
				Measure and record the experimental data, plot it and analyse the results, and prepare a formal laboratory report.

#### COURSE OBJECTIVES AND COURSE OUTCOMES (R19 Regulation)

ECE	1	<b>ECE 111</b>	<b>Engineering Mathematics-I</b>	Solve the system of equations using the rank.
				Identify the special properties of a matrix such as the eigen values, eigen vectors, diagonal form and nature of the quadratic forms.
				Analyze the behavior of functions by using mean value theorems and estimate the maxima and minima of multivariable functions.
				Apply double and triple integration techniques in evaluating areas and volumes bounded by a region and evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates.
				Use special functions in evaluation of multiple integrals
ECE	1	<b>ECE 112</b>	<b>Communicative English</b>	Comprehend, interpret and analyze text and answer questions based on passages.
				Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence.
				Construct grammatically correct sentences and apply proper vocabulary in speech and writing.
ECE	1	<b>ECE 113</b>	<b>Basic Electronics Engineering</b>	Understand the behavior of PN diode under different biasing conditions and breakdown mechanisms.
				Calculate the efficiency and ripple factor of half wave, Full wave center tapped and Bridge rectifiers with and without filters.
				Obtain input and output characteristics of BJT in different configurations and identify the region of operation of transistor.
				Devise the characteristics of FET/MOSFET in different modes.
				Understand the operation of various other two-terminal devices, SCR, TRIAC, and UJT.

ECE	1	<b>ECE 114</b>	<b>Principles of Electrical Engineering</b>	Apply basic laws to understand the electrical circuits.
				Apply circuit theorems and evaluate power and energy quantities in DC circuits.
				Evaluate instantaneous, average and rms values of periodic function and to develop phasor diagrams for RL, RC, and RLC circuits.
				Apply circuit theorems and evaluate power and energy quantities in AC circuits.
				Understand constructional features and operation of DC machines and 3 phase Induction motor.
ECE	1	<b>ECE 115</b>	<b>Problem Solving With C</b>	Gain knowledge in problem solving and steps in Program development.
				Apply the basic concepts of C
				Implement different operations on arrays and string to solve any given problem.
				Demonstrate pointers and modularization
				Apply structures and unions and Implement file Operations in C programming for any given Application
ECE	1	<b>ECE 117</b>	<b>Problem Solving with C-Lab</b>	Develop C programs using operators
				Write C programs using conditional structures
				Write C programs using iterative structure arrays and strings
				Inscribe C programs that use Pointers to and functions
				Develop a c program for implementing user defined types and file processing
ECE	2	<b>ECE 121</b>	<b>ENGINEERING MATHEMATICS-II</b>	Solve the first order differential equations and solve basic application problems described by
				first order differential equations.
				Solve the complete solution of linear differential equations with constant coefficient and solve basic application problems described by second order linear differential equations with
				constant coefficients.
				Find numerical solution to a system of equations by using different methods.
				Find derivate and integration of a function by using different numerical methods.
ECE	2	<b>ECE 122</b>	<b>ENGINEERING PHYSICS</b>	Design and conduct simple experiments as well as analyze and interpret data in engineering applications

				Acquire capability to understand advanced topics in engineering
				identify formula and solve engineering problems
ECE	2	<b>ECE 124</b>	<b>NETWORK ANALYSIS AND SYNTHESIS</b>	Identify the parameters of the two port networks and coupled circuits.
				Analyze the effect of resonance and study of 3 phase circuits.
				Measure and analyze the transients in DC circuits.
				Write the Laplace transform equations and apply them to single port and two port networks.
				Realize a physical network for a given immittance function.
ECE	2	<b>ECE 126</b>	<b>ENGINEERING PHYSICS LAB</b>	Design and conduct experiments as well as to analyze and interpret data.
				Identify, solve and apply fundamental principles of physics to solve engineering problems
ECE	2	<b>ECE 128</b>	<b>ENGINEERING WORKSHOP</b>	Make different carpentry joints.
				Make simple fitting jobs.
				Make simple jobs like funnel, elbow etc. using sheet metal.
				Understand and build circuits for different types of applications like stair case wiring, godown wiring.
				Make simple circuits on bread board using soldering kit
ECE	3	<b>ECE 211</b>	<b>Engineering Mathematics – III</b>	Understand the need for a function or its approximation as an infinite Fourier Series to represent discontinuous function which occurs in signal processing and electrical circuits.
				Find different Fourier Transforms of non-periodic functions and also use them to evaluate Boundary value problems.
				Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.
				Understand Cauchy theorem and Cauchy integral formulas and apply these to evaluate complex contour integrals and represent functions as Taylor and Laurent series and determine their intervals of convergence and use residue theorem to evaluate certain real definite integrals.
				Understand the characteristics and properties of Z-transforms and its applications.

ECE	3	<b>ECE 212</b>	<b>Computer Architecture And Organization</b>	Work with the typical assembly language instructions of a computer
				Organize the hardware involved in the CPU of a computer
				Design CPU & control unit of a basic computer
				Illustrate the concept of pipelining and multiprocessors.
				Use computing resources such as memory and I/O in an effective manner to improve the performance of a computer
ECE	3	<b>ECE 213</b>	<b>Digital Electronics and Logic Design</b>	Perform conversions between different number systems and codes and apply the Boolean algebra to minimize the given logic expressions.
				Minimize the given Boolean expressions using K-Map (up to four variables) and QM method (up to 5 variables).
				Design and Analyze combinational logic circuits.
				Design and Analyze sequential logic circuits.
				Analyze the characteristics of logic families and compare their performance in terms of performance metrics.
ECE	3	<b>ECE 214</b>	<b>Signals and Systems</b>	Identify the type of signals and systems and apply transformations on the independent variable.
				Characterize the LTI system and find its response for a given input signal.
				Analyze the continuous time signals and systems in the frequency domain using CTFS, CTFT and Laplace transforms.
				Analyze the discrete time signals and systems in the frequency domain using DTFT and Z transforms.
				Sample and reconstruct the low pass and band pass signal using sampling techniques. .
ECE	3	<b>ECE 215</b>	<b>Probability Theory and Random Processes</b>	Calculate probabilities and conditional probabilities of events defined on a sample space.
				Compute statistical averages of one random variables using probability density and distribution functions and also transform random variables from one density to another
				Compute statistical averages of two or more random variables using probability density and distribution functions and also perform multiple transformations of multiple random variables.



				Determine stationarity and ergodicity and compute correlation and covariance of a random process.
				Compute and sketch the power spectrum of the response of a linear time-invariant system excited by a band pass/band-limited random process.
ECE	3	<b>ECE 216</b>	<b>Electronic Circuits and Analysis-I</b>	Analyze the response of linear wave shaping circuits for the given non sinusoidal input signals such as step, pulse, square wave and ramp.
				Design and Analyze diode clippers and clampers.
				Design and analyze various biasing circuits used to select an operating point of a CE transistor amplifier in its active region. Also analyze transistor amplifier circuits by using the h-parameter model.
				Analyze the frequency response of multistage amplifiers using h-parameter model and single stage amplifier using hybrid- $\pi$ model.
				Design and Analyze BJT based Bistable, Astable and Monostable multi-vibrators.
ECE	3	<b>ECE 217</b>	<b>Electronic Circuits and Analysis-I Lab</b>	Obtain forward and reverse biased characteristics of a Silicon diode and use it to implement various applications such as different rectifier circuits and voltage regulation circuits used in regulated power supplies.
				Design and verify the output of linear and nonlinear wave shaping circuits for different inputs using Multisim
				Design a voltage divider bias circuit used to select an operating point of a CE transistor amplifier in its active region and derive the characteristics of a transistor in terms of h-parameters.
				Analyze the frequency response characteristics of single stage and multistage amplifiers using Multisim.
				Design and analyze different multi-vibrator circuits using Multisim.
ECE	3	<b>ECE 218</b>	<b>Simulation Lab (MATLAB and HDL Programming)</b>	Determine the convolution and correlation of signals using MATLAB
				Test the time invariant and Linearity property of a given system in MATLAB
				Plot the magnitude and phase spectrum of a given signal using various transformation tools.
				Implement the Adder, Subtractor, Decoder, Encoder, MUX and DeMUX in VHDL
				Simulate and Analyze Flip-Flops, Shift Register and Counters using VHDL

ECE	3	<b>ECE 219 Human Values and Professional Ethics(Mandatory non-credit course)</b>	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
			Identify the multiple ethical interests at stake in a real-world situation or practice
			Articulate what makes a particular course of action ethically defensible
			Assess their own ethical values and the social context of problems
			Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human
			Demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.
ECE	4	<b>ECE 221 Engineering Mathematics – IV</b>	Explain the characteristics of scalar and vector valued functions and provide a physical interpretation of the gradient, divergence, curl and related concepts.
			Transform line integral to surface integral, surface to volume integral and vice versa using Green's theorem, Stoke's theorem and Gauss's divergence theorem.
			Explain analytical methods for solving PDEs like applying Separation of Variables to solve elementary problems in linear second order Partial Differential Equations(Heat and Wave equations).
			Find numerical solution of ordinary differential equations.
			Analyze the statistical data by using statistical tests and to draw valid inferences about the population parameters.
ECE	4	<b>ECE 222 Control Systems</b>	<b>Apply</b> signal flow graph and block diagram reduction techniques to Linear time invariant systems.
			<b>Develop</b> mathematical modeling of mechanical and electrical systems.
			<b>Analyze</b> the performance of 1 <sup>st</sup> and 2 <sup>nd</sup> order Linear time invariant systems with and without feedback control.
			<b>Calculate</b> the time domain specifications, stability using Routh-Hurwitz criterion and Root locus technique for Linear time invariant systems.

				Calculate the frequency domain specifications, system stability using bode plots, polar plots and Nyquist plot technique for Linear time invariant systems.
ECE	4	ECE 223	<b>Electronic Circuits and Analysis-II</b>	Analyze negative feedback amplifiers to determine input impedance, output impedance, voltage gain and sinusoidal oscillators to determine condition for frequency of oscillations.
				Analyze class-A, class-B, class-AB, class-C power amplifiers.
				Analyze BJT current mirror circuits, BJT differential amplifier circuits and determine the resonant frequency for the tuned voltage amplifiers.
				Design and analyze FET biasing circuits.
				Analyze common source, common drain and common gate amplifiers.
ECE	4	ECE 224	<b>Analog Communication</b>	Explain basic concepts of Analog Communication Systems and Compare Generation, Detection Techniques of Amplitude Modulation.
				Illustrate DSBSC, SSB Modulation and Demodulation schemes.
				Analyze Generation, Detection of FM and compare with Amplitude Modulation.
				Analyze the functioning of AM, FM Transmitters and Receivers.
				Evaluate the impact of noise in AM and FM modulation schemes. Differentiate analog pulse modulation techniques like PAM, PWM & PPM.
ECE	4	ECE 225	<b>Transmission Lines and EM Waves</b>	Design stubs using smith charts based on the concepts of transmission lines
				Apply vector calculus and laws of physics to solve the problems of electrostatic fields.
				Apply magnetostatic laws to solve the problems related to magnetostatic fields.
				Analyze time varying fields using Maxwell's equations in differential and integral forms.
				Analyze the phenomenon of Electromagnetic waves in conducting and dielectric medium.
ECE	4	ECE 226	<b>Microprocessors and Microcontrollers</b>	<b>Gain comprehensive</b> knowledge of the architecture of 8 bit 8085 Microprocessor and its interrupt structure
				<b>Familiarize</b> the instruction set of 8085 & Apply them to write assembly language programs for Arithmetic & logical operations

				<b>Acquire</b> knowledge of the architecture and operation of Intel 8051 microcontroller and Analyze the hardware features like timers, memory, interrupts and serial communication available in 8051 Microcontroller Family of devices
				<b>Develop</b> assembly language programs for data transfer, arithmetic, logical, and branching operations using instruction set of 8051 and apply them in control applications
				<b>Develop</b> applications that will provide solution to real world problems by Interfacing 8051 Microcontroller with various peripherals such as ADC, DAC, keyboard, display, Interrupt and Serial communication modules, memory
ECE		4 ECE 227	<b>Electronic Circuits and Analysis-II Lab</b>	Design and determine input impedance, output impedance, band width and voltage gain of feedback amplifiers.
				Design sinusoidal oscillators for given frequency.
				Determine efficiency of given power amplifiers and obtain frequency response of tuned voltage amplifiers.
				Calculate the parameters of BJT differential amplifier.
				Obtain the frequency response of a MOSFET amplifiers.
ECE		4 ECE 228	<b>Microprocessors and Microcontrollers lab</b>	Program the 8085 using assembly level language to perform arithmetic operations.
				Program the 8085 using assembly level language to perform logical operations
				Program the 8051 using assembly level language to perform arithmetic and logical operations.
				Interface modules like ADC, DAC, Stepper motor, traffic lights to 8051 and control them using assembly level programs.
				Program timers of 8051 to generate waveforms with different frequencies.