



# CHRIST

## COLLEGE OF ENGINEERING AND TECHNOLOGY

(Approved by AICTE, New Delhi and Affiliated to Pondicherry University)

Pitchaveeranpet, Moolakulam, Pondicherry - 605010.

(A Unit of Sam Paul Educational Trust)

### DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

#### SUBJECT WISE COURSE OUTCOMES (2022 – 2023)

#### I – SEMESTER

<b>T101 - Mathematics - I</b>		<b>Yr/Sem: I/I</b>
CO 1	Apply knowledge of mathematics to solve functions of several variables.	
CO 2	Identify, formulate and solve engineering problems like multiple integrals and their usage.	
CO 3	To solve differential equations that model physical processes using effective mathematical tools	
CO 4	Able to find equation of straight line of shortest distance, equation of plane, angle between straight lines.	
CO 5	Gain the knowledge to solve first order differential equation arising in engineering.	

<b>T102 - Physics</b>		<b>Yr/Sem: I/I</b>
CO 1	Apply knowledge of science and engineering to understand physics and its significant contribution in the advancement of technology and invention of new products that dramatically transform modern day society.	
CO 2	Identify different areas of physics which have direct relevance and applications to different engineering disciplines	
CO 3	Apply fundamental knowledge to understand applications of ultrasonics, optics and some optical devices, lasers and fiber optics, nuclear energy sources and wave mechanics.	
CO 4	Understand the basic operating principles of laser, its applications, optical fiber, and its types, transmission characteristics, applications of optical fibers.	
CO 5	Understand the basic operating principles of laser, its applications, optical fiber, and its types, transmission characteristics, applications of optical fibers.	

<b>T103 - Chemistry</b>		<b>Yr/Sem: I/I</b>
CO 1	Apply knowledge of science and engineering to understand the importance of chemistry in engineering domain.	
CO 2	Identify different electrochemical cells and their usage for industrial process.	
CO 3	Apply fundamental knowledge of chemistry and build an interface of theoretical concepts with industrial applications/engineering applications.	
CO 4	Guide the students to gain the knowledge about the cooling curves , phase diagrams, alloys and their practical importance.	
CO 5	Strengthen the fundamentals of chemistry and then build an interface of theoretical	

	concepts with their industrial/engineering applications.
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<b>T110 - Basic Civil and Mechanical Engineering</b>		<b>Yr/Sem: I/I</b>
CO 1	Understand the building classification as per National building code.	
CO 2	Get the idea about construction procedure for various components of the building.	
CO 3	Students understand the principles of surveying, construction procedure for roads, bridges and dams.	
CO 4	Student will be able know about the working of Internal and external combustion systems	
CO 5	Student will be able know about Non-Conventional Energy Systems	
CO 6	Student will be able to know about manufacturing process.	

<b>T111- Engineering Mechanics</b>		<b>Yr/Sem: I/I</b>
CO 1	Understand the basic laws of mechanics and resolution of forces using different methods.	
CO 2	Learn and apply the knowledge on analysis of forces acting on the trusses and effect of friction force on bodies.	
CO 3	Learn about the centroid and moment of inertia for plane and solid figures.	
CO 4	Understand the three laws of motion, principles of dynamics for particles.	
CO 5	The student will able to analyse the laws of motion for rigid bodies.	

<b>T112- Communicative English</b>		<b>Yr/Sem: I/I</b>
CO 1	Learnt about the definition of communication, importance, concept. Sender, Ideation, the levels in communication, channels, oral and written way of communication, body language and non verbal communication, Accuracy, Brevity and Clarity, different barriers for Communication, techniques in making effective communication, listening importance and types of listening.	
CO 2	Students learnt about the types of letters, report writing, notices and memo and also developed their skill in writing.	
CO 3	Understands the comprehension, identifies the difference between Skimming and scanning, guess the meaning of the words, Identify to make notes.	
CO 4	Students learnt the writing skills, how to write a paragraph in a proper manner, four modes of writing and how to make bibliographical entries.	
CO 5	Students were able to develop their spoken skills by making them to involve in many activities related to it.	

<b>P 104 – Physics Lab</b>		<b>Yr/Sem: I/I</b>
CO 1	Able to understand how to find the thickness of the specimen and also to find the radius of curvature of glass using the phenomenon of interference of light	
CO 2	Able to understand the specific rotatory power of an optical active solution using the principle of polarization.	
CO 3	To understand about the thermal conductivity of bad conductor and rubber tube.	
CO 4	Ability to understand about the optical properties like dispersive power, Resolving power by applying the knowledge of optics	
CO 5	To acquire knowledge about the magnetometer due to current coil and jolly method of	

	determining the pressure coefficient of air at constant volume.
CO 6	Ability to understand the basic knowledge of inference ,polarization ,Magnetic materials ,thermal conductivity that correlates the theory and practical

<b>P 105 – Chemistry Lab</b>		<b>Yr/Sem: I/I</b>
CO 1	Students will become well acquainted to test amount of hardness present in sample of water for their engineering needs.	
CO 2	Students will be efficient in estimating acidity/alkalinity in given samples.	
CO 3	Students will have knowledge about estimating amount of dissolved oxygen in water.	
CO 4	Students will become well acquainted to estimate copper in brass.	
CO 5	Students will have knowledge about determination of viscosity of sucrose using Ostwald’s viscometer.	
CO 6	To develop an understanding of basic titration setup and methodologies for determining strength, hardness and alkalinity of various unknown solutions	

<b>P 106 – Workshop Practice</b>		<b>Yr/Sem: I/I</b>
CO 1	Understand and comply with workshop safety regulations.	
CO 2	Student will be able to make various joints in the given object with the available work material.	
CO 3	Student will be able to know how much a joint will take for the assessment of time.	
CO 4	Students can able to Identify the hand tools and instruments.	
CO 5	Students can able to gain knowledge about various operations carried out in sheet metal.	
CO 6	Students can able to gain skills about various tools used in welding to make simple joints.	

## II – SEMESTER

<b>T 107 – Mathematics - II</b>		<b>Yr/Sem: I/II</b>
CO 1	Apply knowledge of mathematics to solve matrix algebra technique for practical applications and Curl, divergence and integration of vectors in vector calculus.	
CO 2	Identify, formulate and solve engineering problems like Laplace transform and to solve differential and integral equations.	
CO 3	Apply formulae and analyze problems of Fourier transform techniques.	
CO 4	Determine the Fourier transform , Fourier cosine and sine transform of elementary functions, properties of transforms and its application in engineering	
CO 5	Acquire knowledge of matrix algebra technique, vector calculus, Laplace and Fourier Transform.	

<b>T108 – Material Science</b>		<b>Yr/Sem: I/II</b>
CO 1	Apply core concepts in material science to solve engineering problems.	
CO 2	Knowledgeable of contemporary issues relevant to material science and engineering	
CO 3	Understand about the ferrites and its application to magnetic materials.	
CO 4	Select materials for design and construction.	
CO 5	Understand the importance and properties of materials.	

<b>T109 – Environmental Science</b>		<b>Yr/Sem: I/II</b>
CO 1	Apply fundamental knowledge to understand about the environment.	
CO 2	Identify environmental pollution through science.	
CO 3	Apply basic knowledge to solve various environmental issues and problems.	
CO 4	Ability to consider issues of environment and sustainable development in his personal and professional undertakings.	
CO 5	Provides a comprehensive knowledge in environmental science, environmental issues and the management from an interdisciplinary perspective.	

<b>T104 – Basic Electrical and Electronics Engineering</b>		<b>Yr/Sem: I/II</b>
CO 1	Will learn the fundamentals of rotational and stationary machine operation, single-phase and three-phase power measurement, magnetic and electrical circuits, and these topics.	
CO 2	Will learn the fundamentals of measuring devices, communication systems, and network models.	
CO 3	Knowledge about non-conventional energy systems will be available to students.	
CO 4	The varieties of metal joining will be known by the students.	
CO 5	Students will learn about numerous engines, energies, and joints as well as construction and building components offered with diverse principles.	

<b>T105 – Engineering Thermodynamics</b>		<b>Yr/Sem: I/II</b>
CO 1	Apply knowledge of mathematics, science and engineering to understand the basics of thermodynamics.	
CO 2	Understand the importance of laws of thermodynamics applied to energy systems.	
CO 3	Understanding refrigeration, heat pump and their physical mechanism.	
CO 4	Understand the laws of motion for rigid bodies.	
CO 5	Understand the effects of forces acting on the bodies in practical situation.	

<b>T106 – Computer Programming</b>		<b>Yr/Sem: I/II</b>
CO 1	Know concepts in problem solving.	
CO 2	To do programming in C language.	
CO 3	To write diversified solutions using the C language.	
CO 4	To know about structures, pointers and its manipulation.	
CO 5	To know about the evaluation of computers, components and its applications. Basic knowledge on the internet, information technology, word processing and worksheets.	

<b>P101 - Computer Programming Laboratory</b>		<b>Yr/Sem: I/II</b>
CO 1	Students can work with command line interface OS's, like MS-DOS.	
CO 2	Students can solve most of the real time problems with C program.	
CO 3	Students can interact with computer using C program, through various input and output functions.	
CO 4	Students can make a use of various keywords, constants, variables, data types, operators, type conversion in C program.	
CO 5	Students will have knowledge about arrays, functions, structures and pointers in C	

	program.
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<b>P102 – Engineering Graphics</b>		<b>Yr/Sem: I/II</b>
CO 1	Perform freehand sketching of basic geometrical constructions and multiple views of objects.	
CO 2	Project orthographic projections of lines and plane surfaces.	
CO 3	Draw projections and solids and development of surfaces.	
CO 4	visualize and to project isometric and perspective sections of simple solids.	
CO 5	Students will be able to draw orthographic projections and isometric projections.	

<b>P103 - Basic Electrical and Electronics Laboratory</b>		<b>Yr/Sem: I/II</b>
CO 1	Know about basic electrical tools, applications and precautions	
CO 2	Perform different types of wiring used in domestic and industrial applications.	
CO 3	Measurements of voltage and phase using CRO, basic operation and applications of devices such as PN junction diode and transistors.	
CO 4	Understand the function and applications of basic logic gates and flip flops.	
CO 5	Gain knowledge in domestic wiring and application of electronics device in the field of electrical engineering.	

<b>P107 – NSS/NCC</b>		<b>Yr/Sem: I/II</b>
CO 1	to create awareness in social and environmental issues.	
CO 2	to participate in relief and rehabilitation work during natural calamities.	
CO 3	to develop some proposals for local slum area development and waste disposal.	
CO 4	to create team works among students and produce efficient results.	
CO 5	to operate scientific instruments or advanced software.	

### III – SEMESTER

<b>MA T31 – Mathematics – III</b>		<b>Yr/Sem: II/III</b>
CO 1	Identify complex variable function, apply CR equations for testing of analyticity of the complex function.	
CO 2	Construct conformal mappings between regions. Solve problems on bilinear transformation and find the Taylor's and Laurent's series.	
CO 3	Analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem and Cauchy's residue theorem.	
CO 4	Express any periodic function as fourier series, fourier sine and cosine series.	
CO 5	Finding fourier series for numerical values of any function. Interpret and use the basic concepts of analytic function, Taylor and Laurent series, singularities, residues, conformal mapping, fourier series an harmonic analysis.	

<b>EC T32 – Electrical Engineering</b>		<b>Yr/Sem: II/III</b>
CO 1	Ability to understand the construction, working principle and types of Single and three phase transformer.	
CO 2	To get acquainted with the concept of construction, types, characteristics and	

	application of DC Machines.
CO 3	To gain the knowledge about construction, types, N-T characteristics and speed control methods of AC machines.
CO 4	To acquire the scientific and technological understanding special machines.
CO 5	To gain the knowledge about the utilization of electrical energy in various industrial applications.

<b>EC T33 – Data Structures And Object Oriented Programming</b>		<b>Yr/Sem: II/III</b>
CO 1	To impart knowledge on the basis of creating and analyzing programs and also to know the stack process and learn how to represent them using C language.	
CO 2	Understand the Recursive process and ability to understand the basic data structures such as queue and linked list.	
CO 3	An ability to understand the basis of tree and apply problem solving techniques.	
CO 4	An ability to understand the basis searching and sorting methods and apply them into the problem solving methods.	
CO 5	An ability to understand the basis of graph and apply different problem solving techniques and the Student will be able to understand the data structures that associates keys with values by using tables, different external storage devices.	

<b>EC T34 - Electronic Devices and Circuits</b>		<b>Yr/Sem: II/III</b>
CO 1	Knowledge:Outline: --Outline the physics of semiconductors and describe the V-I characteristics of PN junction diode and Zener diode for practical applications.	
CO 2	Comprehension: classify:--Classify the construction, working and characteristics of different types of Bipolar Junction Transistor and Field Effect Transistors.	
CO 3	Knowledge:Recognize:--Describe the construction, working and characteristics of Silicon controlled rectifier, Uni-junction transistor, LED, LCD, Schottky Barrier	
CO 4	Comprehension: Describe:--Describe the biasing and stabilization concepts for different types of BJT, FET and MOSFET.	
CO 5	Knowledge :Outline:-- Outline the different components such as rectifiers and filters in power supply applications.	

<b>EC T35 – Circuit Theory</b>		<b>Yr/Sem: II/III</b>
CO 1	To introduce the fundamental principles of electric circuit theory and to make them applied in circuit theorems to find out solutions at DC circuits.	
CO 2	To introduce the fundamental principles of electric circuit theory and to make them applied in circuit theorems to find out solutions at AC circuits.	
CO 3	To analysis the three phase circuits and to introduce the fundamental of graph theory.	

CO 4	To study and analysis the response of transient in the electric's circuits.
CO 5	To analysis the concept of resonance circuits and the coupled circuits.

<b>EC T36 - Engineering Electromagnetics</b>		<b>Yr/Sem: II/III</b>
CO 1	Demonstrate the force, electrostatic field intensity, flux density for a point charge and group charges in free space using vector calculus and apply Gauss law for estimating the above parameters.	
CO 2	Employ the dielectric characteristics of dipole charges and solve the Capacitance of parallel plate, Spherical and Cylindrical Capacitors with the knowledge of Laplace and Poisson boundary condition and continuity equation.	
CO 3	Apply Biot Savart law for the straight and circular conductor to examine the Magnetic Flux and field intensity. Demonstrate the effect of magnetic field intensity on the Torque of closed coil, and to find force between two conductors.	
CO 4	Compute the Self inductance of solenoid, toroid, coaxial cable, and twin conductors by employing the Faraday's law over a varying Magnetic field. Describe the electromagnetic wave behavior using Maxwells and Poynting Theorem and discuss the behavior of waves in Boundary conditions.	
CO 5	Summarize the wave impedance, attenuation, phase Properties of an Electromagnetic wave in the Dielectric and conductor mediums. Recognize the Polarization and Reflection behavior of uniform plane waves in dielectric and Conducting mediums	

<b>EC P31 – Electrical Engineering Lab</b>		<b>Yr/Sem: II/III</b>
CO 1	Ability to conduct experiments on Transformer to determine the characteristics.	
CO 2	Ability to Pre-determine the performance characteristics of transformers.	
CO 3	Ability to conduct experiments on three phase transformer and recognize different connections of three phase transformer.	
CO 4	Ability to conduct experiments on DC Machines and to determine its performance characteristics.	
CO 5	Ability to conduct experiments on AC Machines and to determine its performance characteristics.	
CO 6	Ability to conduct experiments on speed control of DC and AC Machines.	

<b>EC P32 – Data Structures and Object Oriented Programming Laboratory</b>		<b>Yr/Sem: II/III</b>
CO 1	Understanding the concept of data abstraction and the problem of building implementations of abstract data types are emphasized with both Linear and Non linear data structures.	
CO 2	Understanding the Selection of relevant data structures and combinations of relevant data structures for the given problems in terms of memory and run time efficiency and improve the problem solving ability.	
CO 3	To create team work among students and produce efficient results.	
CO 4	The students were taught to operate scientific Instruments or Advanced softwares.	

CO 5	To motivate the students to prepare the professional and scientific reports.
CO 6	To make the students get developed and practice the observational skills.

<b>EC P33 – Electronic Devices and Circuits Laboratory</b>		<b>Yr/Sem: II/III</b>
CO 1	Demonstrate the V-I Characteristics of PN Junction diode, Point contact diode, Zener diode diode, photonic devices, Clipper circuits, SCR, TRIAC using diodes, input & output Characteristics of BJT, JFET, MOSFET and UJT transistor configuration.	
CO 2	Determination of ripple factor for of rectifiers with and without filters and Draw the Voltage regulation characteristics of shunt using IC.	

#### IV – SEMESTER

<b>MA T41 – Mathematics – IV</b>		<b>Yr/Sem: II/IV</b>
CO 1	Able to solve algebraic and transcendental equations using an appropriate numerical method.	
CO 2	Able to solve a linear system of equations using an appropriate numerical method.	
CO 3	Be familiar with numerical interpolation and approximation of functions. Also familiar with numerical integration and differentiation.	
CO 4	Be familiar with numerical solution of ordinary differential equations.	
CO 5	Able to solve Laplace, wave equation and Poisson equations by using an appropriate numerical method.	

<b>EC T42 - Electronic Circuits and Analysis</b>		<b>Yr/Sem: II/IV</b>
CO 1	Students can able to know the basics of Biasing & Stabilization of mathematics to analyze transistor low frequency and high frequency models.	
CO 2	Students can able to apply knowledge of mathematics to analyze transistor low frequency models.	
CO 3	Students can able to apply knowledge of mathematics to analyze transistor high frequency models.	
CO 4	Able to design & analyze multistage amplifiers like cascade, cascade, Darlington pair, feedback amplifiers	
CO 5	Students can able to study and analyze the different types of power supplies.	

<b>EC T43 - Signals And System</b>		<b>Yr/Sem: II/IV</b>
CO 1	Employ the Fundamental characteristics, representation and operation on signals to classify he types Continuous and Discrete time signals as periodic, causal, energy, power and Periodic. Also classify the linear, time invariant, causal and stable types of systems.	
CO 2	Show the Continuous time signals can be represented in Frequency domains with the help f Fourier series for periodic signals and by means of Fourier and Laplace transforms for Aperiodic Signals.	



CO 3	Illustrate the Discrete time signals representation in Frequency domain by means of Discrete time Fourier transform and Z-transform and also evaluate its inverse.
CO 4	Use the Impulse response to obtain the output of a CT and DT system to obtain the output for an arbitrary input signal with help of convolutional sum and Integrals. Explain the use of State variable and State equations for Linear Time Invariant Continuous time and Discrete time systems to find the intermediate variables.
CO 5	Explain the properties of DFT and discuss the computation of DFT for discrete signals using Radix 2 FFT in DIT and DIF methods and also compute IDFT using FFT algorithms.

<b>EC T44 - Linear And Digital Control Systems</b>		<b>Yr/Sem: II/IV</b>
CO 1	Express a translational and Rotational mechanical system into its equivalent Electrical system using free body diagrams and Force-voltage, force-current, Torque-voltage and Torque-Current analogies. Solve for the transfer function for a given block diagram using block diagram reduction techniques and Mason's Gain formula.	
CO 2	Determine the output response and time domain specifications of first and second order closed loop systems through Laplace transform method and Apply the Positional, Integral and derivative controllers for reducing the steady state errors and transient response of first and second order control systems.	
CO 3	Synthesize the frequency response from the transfer function using Bode plot and Polar plot and analyses the stability of the given system.	
CO 4	Diagnose the stability of a given system from its transfer function with the help of Ruth-Hurwitz criteria and Root locus Techniques.	
CO 5	Illustrate the application of z Transforms for digital control systems with the help of Pulse Transfer function and check the stability of the system using Jury's Stability test. Discuss the evaluation of state space variables through State space modeling for digital control system using Jordan Canonical form and diagonal canonical form.	

<b>EC T45 - Digital Circuits</b>		<b>Yr/Sem: II/IV</b>
CO 1	<b>Comprehension: Explain:</b> --Explain the binary, octal, decimal & hexadecimal number system and discuss about the code conversion & methods for detecting and correcting errors in Binary codes.	
CO 2	<b>Application: Solve:</b> -- State the Basic theorems of Boolean algebra and solve the logic Function with the help of Karnaugh map and Quine-McCluskey methods for simplification and NAND gate and NOR gate realization	
CO 3	<b>Synthesis: Design:</b> --Design the Combinational Logic circuits Adder, Comparator, Encoders, Decoders and Multiplexers with help of logic gates and explaining the concepts of Programmable Logic devices	
CO 4	<b>Comprehension: Design:</b> --Describe the concept of Sequential Circuits, CPLD and Field programmable Gate Array and Design the counters and Registers	
CO 5	<b>Comprehension: Discuss:</b> --Discuss about classification of Memories and working principles with the knowledge of basic logic circuits	

<b>EC T46- Electronic Communication Systems</b>		<b>Yr/Sem: II/IV</b>
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CO 1	Comprehension: Discuss:-Discuss the Functional blocks of AM transmission and reception methods using SSB, VSB generation and De-modulation with Diode, Synchronous detection through Power relations and Frequency spectrum. Describe the choice of IF, LO, Tracking, Alignment, AVC, AFC in Communication receivers by AM characteristics.
CO 2	Application: Discover:-Discover the Functional blocks of FM transmission and reception methods using Direct and Indirect methods of Generations with De-modulation schemes using Slope detectors, Phase discriminators, Ratio detectors.
CO 3	Comprehension: Explain:--Explain the Noise performance of linear modulation system for SSB-SC, DSB-SC, AM and FM systems by classifying external and internal noises and defining Noise figure, noise temperature and AWGN. Defend the Pre-emphasis and De-emphasis effects in FM and Threshold effect in FM for audio frequencies.
CO 4	Knowledge: Identify:--Identify the principles of Pulsed radar, MTI radar, CW Doppler Radar, FM CW Radar, Phased array radars, Planar array radar employing principles of radar antennas, scanning & display methods, radar beacons and Radar range Equations.
CO 5	Comprehension: Describe:--Describe the B/W and colour-transmission and reception of Television systems through distinguished standards. Outline the working of Colour TV, Digital Television receivers, EDTV, HDTV, modern TV cameras, LCD and plasma displays.

<b>EC P41 - Electronic Circuits Design Laboratory</b>		<b>Yr/Sem: II/IV</b>
CO 1	With the help of design principles practice different types of amplifiers CE amplifiers, Differential amplifier, common Emitter, Darlington, FET Amplifier, Cascode and cascade amplifier, feedback amplifiers and power amplifiers.	
CO 2	With the help of design principles demonstrate low frequency and high frequency oscillators, integrator, differentiator and multivibrators.	

<b>EC P42 –Digital Circuits Laboratory</b>		<b>Yr/Sem: II/IV</b>
CO 1	<b>Comprehension:Discuss:--</b> Discuss the combinational circuit as Adder, Subtractor, Magnitude comparator, Multiplexers, Encoders, Decoders and Demultiplexers using basic logic gates.	
CO 2	<b>Comprehension:Discuss:--</b> Discuss the sequential circuits Shift register, Ripple Counters, Synchronous Counters with the help of digital basic logic gate.	
CO 3	<b>Application:Practice:--</b> Practice to simulate the performance of Ex-OR Gate, Full Adder, Multiplexer, Binary Up-Counter, and Binary Up-down Counter & Shift Register using Verilog HDL Language.	

<b>EC P43 - Communication Laboratory-I</b>		<b>Yr/Sem: II/IV</b>
CO 1	Demonstrate the modulation and demodulation schemes for AM, FM, PAM, PWM, PPM, Ring modulator and TDM circuits by tracing the input and output	
CO 2	Illustrate the frequency response of tuned & wideband amplifiers, frequency mixer circuits and discuss the sample-hold, simple delayed AGC circuits by	

	tracing its impacts.
CO 3	Sketch the time and frequency domain response of AM, FM, PAM, PWM, PPM signals using MATLAB and PSPICE/EWB.

<b>SP P44 – Physical Education</b>		<b>Yr/Sem: II/IV</b>
CO 1	Understanding the opportunities of students’ physical, cognitive, social and emotional development.	
CO 2	Understanding of individual and group motivation and behavior.	
CO 3	To create teamwork among students and produce efficient results.	
CO 4	The students were taught to operate advanced playing kits.	
CO 5	to motivate the students to prepare the professional and scientific reports	

### V – SEMESTER

<b>MA T51 – Probability and Random Process</b>		<b>Yr/Sem: III/V</b>
CO 1	Explain and illustrate the concept of a discrete random variable and its probability distributions.	
CO 2	Explain and illustrate the concept of a continuous random variable and its probability distribution.	
CO 3	Understand the concept of random processes in both deterministic and non deterministic types.	
CO 4	Familiar with Markov chains in discrete time with respect to state diagram, able to calculate transition probabilities.	
CO 5	To expose the basic characteristic features of a queuing system and acquire skills in analyzing queuing models.	

<b>EC T52 – Data Communication Networks</b>		<b>Yr/Sem: III/V</b>
CO 1	Discuss the LAN, PAN, MAN&WAN networks with the OSI/ISO, TCP/IP, ISDN-ATM, SONET/SDH protocol specification and applications of UWB, Bluetooth, WIFI with Cognitive radio.	
CO 2	Explain the types of errors, flow control, error correction and detection layer with MAC protocols. Describe the IEEE standards for wired LAN and wireless LAN	
CO 3	Define the network routing for logical addressing in IPv4 addresses, IPv6, Internet protocol, Transition from IPv4 to IPv6, mapping logical to physical address, Mapping physical to logical address, ICMP, Direct Vs indirect delivery, Forwarding. Explain the routing protocols and routing algorithms with differentiation routers and gateways.	
CO 4	Define the network routing for logical addressing in IPv4 addresses, IPv6, Internet protocol, Transition from IPv4 to IPv6, mapping logical to physical address, Mapping physical to logical address, ICMP, Direct Vs indirect delivery, Forwarding. Explain the routing protocols and routing algorithms with differentiation routers and gateways.	
CO 5	Describe the security issues in internet and Explain the Cryptography algorithm (AES and DES, RSA) with authentication protocols.	

<b>EC T53 - Microprocessors And Microcontrollers</b>		<b>Yr/Sem: III/V</b>
CO 1	Comprehension: Describe:- Describe the architecture of 8085 and development of assembly language program by using instruction sets, stack and subroutines,	

	looping statements and discuss about addressing modes of a typical microprocessor.
CO 2	Comprehension: Describe:- Describe the function of different peripheral IC's 8255,8279,8253,8251,8259,8237 to interface with external peripheral device.
CO 3	Application: Demonstrate:- Demonstrate the architecture of 8051 and also develop the assembly language program with the help of special function registers, timers and counters. Discuss the basic architecture of PIC16F877 and ARM processor.
CO 4	Comprehension: Describe:- Describe the architecture of 8086 and also develop the ASM program with the help of instruction set and addressing modes. Express the features of advanced processors 80826,80486 and Pentium Processors
CO 5	Comprehension: Discuss:- Discuss about the applications of Microcontroller based design employing ADC and DAC chips, push button switch, Stopwatch, DC Motors, stepper motor, Servomotors, Thermometer and Traffic light control for real time applications.

<b>EC T54 - System Design Using Integrated Circuits</b>		<b>Yr/Sem: III/V</b>
CO 1	Impart knowledge on linear ICs in designing various circuits in the field of electronics engineering.	
CO 2	Acquire knowledge in linear ICs 555, PLL565 and their IC7900.	
CO 3	Gain knowledge in different digital integrated circuits and their families with their comparisons.	
CO 4	Design the system and demonstrate state diagram and state machines using synchronous and asynchronous sequential logic circuits.	
CO 5	Understand the design concepts of processor and control unit with processor and bus organization..	

<b>EC T55 - Transmission Lines And Waveguides</b>		<b>Yr/Sem: III/V</b>
CO 1	Application: Demonstrate: Understanding about two port networks and how to use them. Analyze important two port networks like filters, attenuator and equalizer.	
CO 2	<i>Application: Employ:</i> Understanding the concept of transmission lines and the losses associated with them and to <i>Employ</i> use inductive loading to minimize the losses..	
CO 3	<i>Application: Understanding:</i> Understanding impedance transformation and matching	
CO 4	<i>Application: Analyze:</i> Analyze and Design Analyze the characteristics of EM wave propagation in Parallel plate, Rectangular waveguide.	
CO 5	<i>Comprehension: Analyze:</i> Analyze the characteristics of EM wave propagation in, Circular waveguide and Cavity resonators.	

EC E06 - VLSI Design		Yr/Sem: III/V
CO 1	Describe the IC Manufacturing Process and VLSI Fabrication (NMOS,PMOS,CMOS and BICMOS).Discuss about the Static and Dynamic power Dissipation and Reduction techniques, pull up to pull down ratio and propagation delay for mos transistor.Demonstrate the stick diagram and Layout diagram NMOS and CMOS Inverter with the help of design rules and choice of layers.	
CO 2	Demonstrate the Inverter,NAND ,NOR gates by using Pass Transistor,Transmissiongate,NMOS ,CMOS and BICMOS.Sketch the Parity generator, Multiplexers,Code Converters and Programmable Logic Devices with the help of nMOS PLA and pMOSPLA.Discuss about the clocked Sequential circuits,D-Latch,D- Flipflop,DRAM,SRAM and Pseudo Static RAM, inverting and noninverting registers,barrel shifters with the help of MOS Transistors.	
CO 3	Demonstrate the types of logic families such as Dynamic ,Domino ,Pseudo NMOS Logic.Demonstrate the types of adders and multipliers such as one bit adder Ripple carry ,Carry Look ahead ,Carry skip ,Signed parallel adder and Serial parallel multiplier ,2's complement array multiplication and booth encoding with the help of CMOS Transistors.	
CO 4	Discuss the methodologies for CMOS Testing such as Ad Hoc Testing ,Scan Based Test ,Boundary scan design,Built in Self Test.Describe the Test Pattern Generation,Fault Models,Test Pattern Generation and Fault Simulation with the help of CMOS Transistor.	
CO 5	Use the operators,datatypes Continuous assignment,Sequential and parallel statement groups, timing control, task and functions,blocking and non blockingassignments,If - Else and case statements,For,while - repeat and forever loops to demonstrate a verilog HDL Program. Use Behavioral modelling to write a verilog program for both Combinational and Sequential logic.	

<b>EC P51 – Microprocessor and microcontroller lab</b>		<b>Yr/Sem: III/V</b>
CO 1	Demonstrate the programming of 8085 microprocessor using various addressing modes and instruction sets for data movement, arithmetic and logical operation.	
CO 2	Illustrate the interfacing of LCD, ADC/DAC, stepper motor, Traffic Light and serial communication by programming 8051 microcontroller.	
CO 3	Use the Keil software tool for simulating the interfacing of Relay switches, Pulse width Modulation, LCD and LED.	

<b>EC P52 - System Design Using Integrated Circuits Laboratory</b>		<b>Yr/Sem: III/V</b>
CO 1	Discuss the performance of the Operational amplifier as inverting-non inverting amplifier, voltage follower, summer & subtractor, differentiator & integrator, comparator, signal convertor, active filters, log-antilog & instrumentation amplifier and multivibrator, precision rectifier using IC 741.	
CO 2	Determine the performance of data convertors, frequency synthesizers and multivibrator circuits by using R-2R ladder and successive approximation types, PLL IC565 and IC 555.	

<b>ECT 53 - Networks And Transmission Lines Laboratory</b>		<b>Yr/Sem: III/V</b>
CO 1	Experiment different types of filters, equalizer, attenuators and LC resonant circuit with help of network design Principle.	
CO 2	Identify the Impedance (Z) and ABCD Parameters of a Two port transmission line	
CO 3	Practice the simulation of magnitude response for Low pass, High pass, Bandpass and Bandstop filter using MATLAB tool.	

<b>HS P54 – General Proficiency – I</b>		<b>Yr/Sem: III/V</b>
CO 1	To understand and practice the art of communication	
CO 2	able to practice and showcase soft skills.	
CO 3	To understand the importance of writing.	
CO 4	To practice speaking skill.	
CO 5	To practice verbal, non verbal and numerical aptitude.	

**VI- SEMESTER**

<b>EC T61- Digital Communication</b>		<b>Yr/Sem: III/VI</b>
CO 1	Explain the transmission and reception of the basic types of Base Band modulation schemes- PCM, DPCM, DM & ADM systems and discuss about the multilevel transmitters, companding techniques, correlation receiver and the matched filters used in the detection of Baseband signals.	
CO 2	Discuss about the principles of passband transmission schemes- ASK, FSK, PSK, QPSK, DQPSK, MSK, QAM with error performance for the coherent and non coherent detection of binary and M-Ary signaling.	
CO 3	Demonstrate the CDMA processes using the spread spectrum communication techniques and spread spectrum types - DSSS, FHSS & Hybrid systems with RAKE receiver in demodulator section for multiple access communication..	
CO 4	Describe the Symbol and frame synchronization and Network synchronization in receivers, open and closed loop synchronization in the transmitters and Tracking and acquisition in the spread spectrum system used in digital communication.	
CO 5	Compute the classical encryption, Cipher principles, Data encryption, Stream encryption, Key management, Diffie-Hellman key exchange, Elliptic curve architecture and cryptography, Public key encryption system, RSA algorithm encryption and decryption processes used in digital communication.	

<b>EC T62 - Wireless Communication</b>		<b>Yr/Sem: III/VI</b>
CO 1	Explain the principle of cellular network and multiple access schemes for environment with multipath fading, spectrum limitations and Interference limited systems also give the requirements and types of services	
CO 2	Discuss the propagation mechanisms in wireless using propagation models in a multipath environment for small scale fading types	
CO 3	Explain the signal reception tech using diversity, signal combining Techniques and equalization and Explain the effect of channel coding and speech coding in reception	
CO 4	Discuss the multiple access systems using SS, CDMA, OFDMA employed over GSM, IS95 and 3G	
CO 5	Explain the mobile data services for low speed and high speed internet and IP based wireless Networks like 3GPP, 3GPP2.	

<b>EC T63 - Digital Signal Processing</b>		<b>Yr/Sem: III/VI</b>
CO 1	Design of IIR digital filters using analog Butterworth and Chebyshev approximation and Impulse invariance and bilinear transformation methods for the given specification and Realize in Direct form I, II, cascade, parallel and adder realization.	
CO 2	Design of N tap FIR filters using frequency sampling techniques and windowing technique from the given desired frequency response. Realize the given FIR filter using Transversal, linear phase and polyphase realization	

	structures.
CO 3	Estimate the Quantization noise for input quantization error, coefficient quantization error and product quantization error and find the Overflow limit cycle oscillation with Scaling to prevent overflow and Limit cycle oscillations from the basic number representation techniques.
CO 4	Summarize the parametric and non parametric Power spectral Estimation Techniques for random signals and the application of multirate conversion using decimation and Interpolation over subband coding of speech.
CO 5	Explain the VLIW architecture of TMS DSP processors with reference to addressing modes and on chip peripherals.

<b>EC T64 - Antennas And Wave Propagation</b>		<b>Yr/Sem: III/VI</b>
CO 1	Define the fundamental characteristics of the antenna. Discuss the radiation characteristics and near/far field current distribution of a current element, monopole, halfwave dipole. Describe the electromagnetic radiation from the broadside, end-fire, and binomial array antennas considering two-point sources	
CO 2	Outline the radiation mechanism of uniform and tapered rectangular aperture along with the concept of aperture blockage. Define the Babinet's principle for aperture antennas. Explain the structure, radiation mechanism, and applications of horn antenna, reflector antenna, slot antenna, and microstrip antennas	
CO 3	Explain the construction, design parameters, radiation mechanism, and applications of Travelling wave wire, V and Rhombic antenna, folded dipole, Yagi-Uda antenna, Log-periodic antenna, Biconical antenna, Spiral antenna, Helical antenna, Loop antenna.	
CO 4	Recognize the construction, radiation mechanism, and applications of special antennas like Electromagnetic compatibility antenna, Reconfigurable antenna, Active antenna, Dielectric antennas, Patch antenna, Smart antenna. Identify the gain, radiation pattern, polarization, and VSWR of the antenna using different antenna measurement techniques.	
CO 5	List the factors involved in radio wave propagation. outline the concept of ground wave propagation along with the reflection of radio waves by the earth's surface. Define the space wave propagation along with the considerations and atmospheric effects. Recognize the ionospheric propagation, its radiation mechanism.	



<b>EC E02- Consumer Electronics</b>		<b>Yr/Sem: III/VI</b>
CO 1	Describe the Construction and working principle of Crystal Loudspeaker, Dynamic Loudspeaker, Electrostatic loudspeaker, Permanent Magnet Loudspeaker, Woofers and Tweeters, Crystal Microphone, Carbon Microphones, Dynamic Microphones and Wireless Microphones.	
CO 2	Describe the working principle of monochrome and color television standards and system with the knowledge of basic electronics.	
CO 3	Explain the construction, processing and recording of audio signals and video signals involving optical source for CD and DVD player.	
CO 4	Discuss the working principle of PSTN, PABX switching, ISDN, GSM, GPRS, DECT, UMTS, IMT2000, Limited range Cordless Phones and Facsimile, Wifi and Bluetooth with help of functional diagram.	
CO 5	Discuss the Basic working principle and block diagram of microwave oven, washing machine hardware and software, components of air conditioning and refrigeration systems, Proximity Sensors and accelerometer sensors in home appliances.	

<b>EC P61 - Communication Laboratory- II</b>		<b>Yr/Sem: III/VI</b>
CO 1	Describe the baseband and passband modulation and demodulation techniques for the transmission of signals implemented through wired channels	
CO 2	Demonstrate the functionality of DS-CDMA and frequency synthesizer circuits to understand spread spectrum communication	
CO 3	Interpret the BER and encryption performance of a digital communication system through MATLAB simulation.	

<b>EC P62 - Computer Networks Laboratory</b>		<b>Yr/Sem: III/VI</b>
CO 1	Analyze the generation of traffic models of voice, data, video and ISDN model using MATLAB & performance of various encryption, decryption, flow control algorithms,	
CO 2	Analyze the error control algorithms in the network strategy, shortest routing algorithms using MATLAB. Analyze the various routing protocol/algorithms	

<b>EC P63–Digital signal Processing Laboratory</b>		<b>Yr/Sem: III/VI</b>
CO 1	Practice the using MATLAB the simulation of Convolution , Filter design in both IIR and FIR methods, Spectrum estimation and equalization of digital audio with the help of DSP techniques.	

CO 2	Demonstrate using TI TMS DSP processor the practical implementation of waveform generation, Convolution, Filter design in both IIR and FIR methods and spectrum estimation through FFT.
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<b>HS P63 – General Proficiency – II</b>		<b>Yr/Sem: III/VI</b>
CO 1	Understand the composition analysis.	
CO 2	Developing letter and resume writing skills.	
CO 3	Understand and practice oral skills through group discussions and negotiation activities.	
CO 4	Practice corporate etiquette, grooming and dressing.	
CO 5	Practice verbal, non-verbal and numerical aptitude.	

### VII – SEMESTER

<b>EC E11 – Digital Image Processing</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Determine the fundamental concepts in image processing and the mathematical concepts related to image transforms and investigate the different image enhancement techniques, image restoration techniques and image compression techniques.	
CO 2	understand the importance of different image segmentation techniques.	
CO 3	Acquire more knowledge on digital image processing algorithms and system	
CO 4	Analyze 2D signals in frequency domain through Image transforms.	
CO 5	Design and implement digital image processing operations like image enhancement, restoration, compression and denoising algorithms using Matlab	

<b>EC E14 – Cryptography and Network Security</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Determine comprehend the fundamental concepts of Security Services, Attacks and Mechanisms and the mathematical concepts related to Symmetric key Cryptography	
CO 2	understand Public Key Cryptography and its types about different Authentication and Signature techniques and recognize the importance of Network Security.	
CO 3	Identify network security threats and determine efforts to counter them	
CO 4	Design and Simulate cryptographic algorithms for secure communication	
CO 5	Determine authentication requirements and design their own network security techniques like digital signature and firewall.	

<b>EC T71 - Microwave and Optical Engineering</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Knowledge: Outline:- Outline the working principle of Gunn, IMPATT, TRIPATT, Microwave BJT and MESFET semiconductor devices with the knowledge of semiconductor physics. outline the microwave generation and amplification methods through two cavity, reflex klystron oscillator, helix travelling wave tube, cylindrical magnetron devices.	
CO 2	Comprehension: Summarize:- Summarize the characteristics and applications of microwave passive components using S – parameters calculation.	
CO 3	Comprehension: Discuss:- Describe the various elements of fiber optic system and the characteristics light in the optical fiber cable. Discuss the various attenuation mechanisms like absorption, scattering and bending losses, Material and waveguide dispersion, Signal distortion in SM fibers, Polarization Mode dispersion.	
CO 4	Comprehension: Describe:- Describe the characteristics and operations of the optical sources like LED and LASER, Optical detectors like PIN and APD. Summarize the operation and applications. Erbium Doped Fiber Amplifiers- principle.	
CO 5	Comprehension: Generalized:- Generalize the first and second generation optical network architectures namely SONET/SDH, WDM, wavelength routed networks. Summarize the recent optical technologies like solitons, optical CDMA, PON and FTH.	

<b>EC T72 - Embedded Systems</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Get the basic knowledge to understand the system software and computer hardware of an embedded system along with its buses and devices.	
CO 2	Understand and implement the logical thinking through embedded C programming.	
CO 3	Apply the knowledge to design and demonstrate novel embedded system with RTOS.	
CO 4	Understand the reliability and clock synchronization in hardware.	
CO 5	Gain the knowledge in power consumption issues and power minimization approaches.	

**EC P71 – Communication Laboratory - III****Yr/Sem: IV/VII**

CO 1	Examine the V-I and characteristics of Klystron, Gunn diode in the X band and also determine the characteristics of Antenna, Dielectric, matched load, Directional coupler, Magic Tee, circulator and isolator by measuring VSWR
CO 2	Discuss the Frequency response, Attenuation, Coupling loss, bending loss, Numerical aperture and Acceptance angle of a fiber and its bit error performance by establishing end to end digital optical fiber link

<b>EC P72 - Embedded Systems Laboratory</b>		<b>Yr/Sem: IV/VII</b>
CO 1	<b>Examine</b> the concept and use of potentiometer for measuring the voltage, water pump controller to sense the water level, digital clock, temperature sensor interfacing ,PC through RS232 Interface	
CO 2	<b>Apply</b> the knowledge and implement the logical thinking of embedded C program in FM link between to microcontrollers, Obstacle detection ,Hot chamber controller, moisture sensor ,lamp controller	

<b>EC P73 – Seminar</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Students must be able to make critical review of literature.	
CO 2	Preparation of report on the topic.	

<b>EC P74 –Industrial Visit/ Training</b>		<b>Yr/Sem: IV/VII</b>
CO 1	Students must be able to undertake an industrial visit and training.	
CO 2	Understand industrial culture and practical knowledge.	

<b>EC PW7 – Project Work – I</b>		<b>Yr/Sem: IV/VII</b>
CO 1	On completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.	
CO 2	Formulate a real world problem in electrical and electronics sector, identify te requirement and develop project.	
CO 3	Identify technical ideas, strategies and methodologies to find solution to the proposed project.	
CO 4	Utilize new tools and techniques that contribute to obtain solution to the project.	
CO 5	Prepare report and present oral demonstrations.	

### VIII– SEMESTER

<b>EC T82 –Industrial Management And Engineering</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	Understanding factors to be considered in selection of Plant Location and material handling equipments.	
CO 2	A deep understanding of the various sources to start a business and the types of organization.	
CO 3	Introduction to inventory control, materials and production management.	
CO 4	A basic understanding of financial management systems	
CO 5	To Study the Core concepts of marketing and Human Resources Management	

<b>EC E16 - SATELLITE COMMUNICATION SYSTEMS</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	<b>Comprehension: Discuss:--</b> Discuss the types of Satellite, orbits, orbital equation, orbital elements, look angle determination, limits of visibility, eclipse, sub satellite point, sun transit outage of a satellite system and also discuss the Structural, power, Attitude and orbit control, thermal, propulsion, TTCM, communication and antenna subsystems through the use of block diagram.	
CO 2	<b>Comprehension: Explain:--</b> Explain terrestrial interface, Transmitter, receiver, antenna systems with the help of block diagram and Express the Uplink and Downlink equation, Link power budget & Eb/No calculation and also discuss about the Inter modulation interference, Propagation characteristics and frequency consideration, system reliability and design lifetime of a satellite.	
CO 3	<b>Comprehension: Describe:--</b> Describe the FDMA, TDMA concept with the help of Frame and burst structure and also discuss CDMA concept using DS and FH CDMA system and also compare the FDMA, TDMA and CDMA systems.	
CO 4	<b>Comprehension: Discuss:--</b> Discuss the Inter satellite links, Optical communication for Satellite networks, laser crosslink analysis and Optical beam acquisition, Tracking and pointing of a satellite with the help of block diagram.	
CO 5	<b>Comprehension: Explain:--</b> Explain Packet Satellite, Fixed Satellite, Broadcast satellite, Mobile Satellite, Maritime satellite networks and services, VSAT, GPS, Gateways, ATM over satellite with the help of block diagram and also discuss the role of Satellite in future networks.	

<b>EC E20 – Cellular Mobile Communication</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	Outline the fundamentals of cellular Mobile communication concepts using frequency reuse, Interferences, Trunking and Analyze various techniques in improving coverage and system capacity.	
CO 2	Illustrate Mobility Management through Handoff detection, Channel assignment techniques, Network signaling and authentication. Summarize the Significance of network signaling and Services using PACS and cellular digital packet data.	
CO 3	Discover the enhancement of second generation cellular network through GSM mobile architecture and its services include SMS, MNP, Roaming, & VoIP with advantages and limitations.	
CO 4	Express the working Principle of Wireless Application Protocol using its model, Gateway, Developer Tool kits and execution environment.	
CO 5	Recall the Real time applications of Cellular Mobile Communication with 3G, WLL, Bluetooth technologies.	

<b>EC T81 – Professional Ethics</b>	<b>Yr/Sem: IV/VIII</b>
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CO 1	Discuss engineering ethics, moral issues, ethical theories and their uses in engineering.
CO 2	Realize code of ethics, engineer's responsibility for safety, rights and responsibilities.

<b>EC P81-Advanced Communication Laboratory</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	Discuss engineering ethics, moral issues, ethical theories and their uses in engineering.	
CO 2	Realize code of ethics, engineer's responsibility for safety, rights and responsibilities.	

<b>EC P82 – Comprehensive Viva</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	Remember all areas of electronics and communication engineering.	

<b>EC PW8 – Project Work II</b>		<b>Yr/Sem: IV/VIII</b>
CO 1	Practice of working harmoniously in a group.	
CO 2	Create a project involving analytical, experimental, design combinations related to electronics and communication engineering.	
CO 3	Prepare a report consisting of a literature survey, problem statement, methodology,	

	results and conclusions.
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