DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Course Outcomes(Cos)

Sl. No.	Subject Code	Subject Name	Course Outcomes(COs)	
1	23ES1002	Basic Electronics	CO-1	Describe the basic concept of Semiconductors and PN junction diode
			CO-2	Understand the working principle and characteristics of Transistor.
			CO-3	Study the basic concept of FET, MOSFET and CMOS inverter.
			CO-4	Classify the OP-AMP with its applications as Integrator, Differentiator & Summing Amplifier and feedback amplifier
			CO-5	Relate the various Number systems and logic gates.
			CO-6	Study about the operation of CRO and DSO and principle of communication system
			CO-5	Apply it at their workplace for writing purposes such as Presentation/official drafting/administrative communication &use it for document/project/report/research paper writing.
			CO-6	Develop the confidence to make communication in all the situations with knowledge on soft skills.
2	23ES1202	Basic Electronics Lab	CO-1	Classify types of components so that they can use the components in designing a circuit.
			CO-2	Apply fundamental knowledge of hardware construction and operating principle of different electronics instruments like CRO, Function Generator to generate and measure different signal parameters like frequency, amplitude, phase etc
			CO-3	Apply knowledge on characteristics of semiconductor devices like diodes and BJT to design, implement and test circuits using diodes, and BJTs .

			CO-4	Apply knowledge on characteristics of semiconductor devices like diodes and BJT to design, implement and test circuits using OPAMPs.
			CO-5	Design different combinational circuits by the use the truth table of different logic gates, MUX, DEMUX to implement the circuits.
			CO-6	Design different sequential circuits by the use the truth table of different logic gates, MUX, DEMUX to implement the circuits.
			CO-6	
3	RMA3A001	Math-III	CO-1	Apply the knowledge of calculus, Gamma and Beta functions for analyzing engineering problems.
			CO-2	Analyze the first order differential equations using standard methods and use its application in engineering fields.
			CO-3	Demonstrate various physical models through higher order differential equation
			CO-4	Solve linear differential equations with variation of parameters.
			CO-5	Obtain series solution of differential equations and explain application of Bessel's function.
			CO-6	Apply Laplace transformations to determine complete solution of ordinary differential equations.
4	REC4C201	Electronic Device Lab	CO-1	Simulate wave propagation in conductors and dielectrics using HFSS/CST/MATLAB.
			CO-2	Design, test, and implement a rectangular wave guide using HFSS/CST/MATLAB.
			CO-3	Simulate uniform plane wave propagation and transverse electric waves.
			CO-4	Determine Dispersion, Group velocity, azimuth, elevation patterns, input impedance, and output impedance.
			CO-5	Design a cavity resonator.
			CO-6	Simulate reflection of plane waves.
5	REC3C001	Analog Electronics Circuit	CO-1	Apply the basic concept of MOSFET, Biasing of BJT and FET to analysis and design of basic transistor amplifier circuits.
			CO-2	Test and Analyze the behavior of BJT/FET in low and high frequency regions by performing frequency analysis of BJT and FET.

			CO-3	Analyze BJT/FET in small signal models.
			CO-4	Apply principle of Feedback Amplifiers and Oscillators.
			CO-5	Apply basic concepts of transistors to design different oscillator and power amplifier circuits of desired frequency and gain.
			CO-6	Implement knowledge of op-amp with basic circuits.
6	REC4G002	Data Structure	CO-1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation
			CO-2	Understand basic data structures such as arrays, linked lists, stacks and queues.
			CO-3	Describe the hash function and concepts of collision and its resolution methods
			CO-4	Solve problem involving graphs, trees and heaps
			CO-5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data
			CO-6	To impart the basic concepts of data structures and algorithms
7	REC3C002	Signals & Systems	CO-1	Test and analyze discrete time elementary signals, systems and their classification.
			CO-2	Test and analyze discrete time LTI systems.
			CO-3	Apply the concepts of elementary signals to develop continous time Fourier series and Fourier transform.
			CO-4	Test and apply the concepts of Z-Transform to the analysis of LTI systems.
			CO-5	Test and analyze the concepts of inverse Z-Transform.
			CO-6	Apply the concepts of continuous time Fourier series and Fourier transform to analyze discrete Fourier transform (DFT).
8	REC3C202	Signals & Systems Lab using Software	CO-1	Generate and plot different types of discrete time signals.
			CO-2	Apply the knowledge of Fourier transform to simulate a square pulse and find its amplitude with phase spectrum.
			CO-3	Design and simulate a rectangular periodic signal and find its trigonometric and exponential Fourier series coefficients.
			CO-4	Design and test the concept of Nyquist rate

				with respect to a discrete time signal.
			CO-5	Design and simulate a low and high pass filter.
			CO-6	Simulate and observe the convolution and correlation of two discrete time signals.
9	RCS3C202	Data Structure Lab	CO-1	Describe the hash function concepts of collision and its resolution methods
			CO-2	Compute the complexity of various algorithms to solve the problem by involving graphs and trees
			CO-3	Implement the concepts of self-balancing Binary Search Trees for solving the real world scenarios
			CO-4	Understand the user defined data types and the representation of linear data structures for solving real world problems.
			CO-5	Student will be able to choose appropriate data structure as applied to specified problem definition
			CO-6	Analyze the efficiency of programs based on time complexity.
10	ROP3B201	OOP Using JAVA Lab	CO-1	Able to write programs for solving real world problems using java collection framework
			CO-2	Able to write programs using abstract classes.
			CO-3	Able to write multithreaded programs.
			CO-4	Able to write GUI programs using swing controls in Java
			CO-5	Demonstrate the Multithreaded programs.
			CO-6	Demonstrate event handling mechanism.
11	REC4C002	Digital Systems Design	CO-1	Apply knowledge about logic gates to investigate the behavior of different logic gates and analyze the gate level minimization.
			CO-2	Design and implement different combinational circuits using NAND/NOR gates only or using minimized number of logic gates.
			CO-3	Design and implement different sequential circuits such as flip-flops, registers, and counters.
			CO-4	Investigate the behaviour of a RAM and its storage capacity.
			CO-5	Design, test, and implement a clock pulse generator, parallel adder, accumulator, and binary multiplier.
			CO-6	Implement different combinational and

				sequential circuits using VHDL/Verilog.
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13	REC4D003	Sensors and Transducers	CO-1	Investigate static and dynamic characteristics of a measurement system.
			CO-2	Design and Implement resistive, inductive, and capacitive sensing elements.
			CO-3	Design and Test different deflection bridges.
			CO-4	Design and Test different amplifiers and filters.
			CO-5	Design and Implement thermoelectric sensing elements.
			CO-6	Design and Investigate electromagnetic sensing elements.
14	REN3E001	Engineering Economics	CO-1	Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering economy.
			CO-2	Understand the law of demand and law of supply.
			CO-3	Understand the environment and financial systems of the country and its impact on business, society and enterprise.
			CO-4	Analyze time value of money using engineering economy factors.
			CO-5	Gain knowledge of economics and engineering principles to solve engineering problems and to evaluate engineering projects considering upon depreciation, taxes and inflation.

			CO-6	Apply depreciation methods for individual/industrial/ public alternatives
15	REN3E002	Organisational Behaviour	CO-1	Demonstrate the applicability of the concept of organizational behaviour to understand the behaviour of people in the organization.
			CO-2	Demonstrate the applicability of analyzing the complexities associated with management of individual behaviour in the organization.
			CO-3	Analyze the complexities associated with management of the group behaviour in the organization.
			CO-4	Demonstrate how the organizational behaviour can integrate in understanding the motivation (why) behind behaviour of people in the organization.
			CO-5	Evaluate the impact of different cultures with in an organization
			CO-6	Develop a new technique to implement organizational change for the achievement of organizational goal.
16	REC4C001	Electromagnetic Theory	CO-1	Discuss different types of coordinate systems and Describe electrostatic and magneto static laws .
			CO-2	Describe energy density and potential gradient on electric or magnetic fields.
			CO-3	Derive the Maxwell's equations in static and dynamic fields and pointing theorem.
			CO-4	Analyze the EM wave propagation in different mediums
			CO-5	Classify the transmission lines and Formulate the wave propagation through transmission lines .
			C0-6	Classify the waveguides and study the radiation properties of different antennas.
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19	REC3C201	Analog Electronics Circuit Lab	CO-1	Design and simulate BJT/JFET/MOSFET bias circuits and compare the results.
			CO-2	Design and simulate BJT/JFET/MOSFET common emitter circuit and compare their DC and AC performance.
			CO-3	Apply the knowledge about a common emitter amplifier to simulate its frequency response and compare the performance in low-frequency, mid-frequency, and high-frequency regions.
			CO-4	Design a differential amplifier circuit with/without current source and compare its performance during DC and AC operation.
			CO-5	Design a differentiator, integrator, square wave generator using a OPAMP.
			CO-6	Design oscillators and power amplifiers using the knowledge of OPAMPs and transistors.
20	REC4C003	Network Theory	CO-1	Understanding basic electrical circuits and can apply different electrical laws and theorems to solve complex electrical networks
			CO-2	Analyze the transient and steady state response of 1st and 2nd order differential

				equations for series and parallel R-L, R-C and R-L-C networks.
			CO-3	Recognize the need of sinusoidal steady state response of single phase and three phase circuits
			CO-4	Analyze the electrical networks using Laplace transform for standard inputs.
			CO-5	Evaluate the stability of electrical circuit using frequency domain analysis. .
			CO-6	Understanding two port circuit behaviour and inter connection of two-port networks.
21	REC4C203	Network Theory Laboratory	CO-1	Apply the knowledge of network theorems to solve complex electrical engineering problems.
			CO-2	Apply the knowledge of network theorems to solve complex electrical engineering problems.
			CO-3	Evaluate the circuit parameters of different two-port networks.
			CO-4	Analyze the frequency response of different filters.
			CO-5	Evaluate the inductance parameter of coupled circuit.
			CO-6	Analyze the response circuit using oscilloscope.
22	ROP3B001	Object Oriented Programming Using JAVA	CO-1	List and use various Object Oriented Programming concepts for problem solving.
			CO-2	Describe various fundamental tokens as well as linear data structure using object oriented programming.
			CO-3	Solve problems on string and inheritance by applying different library function.
			CO-4	Analyze and Design program based on concept of multithreading and abstraction
			CO-5	Evaluate various GUI component using Applet and AWT to solve real world

				problem.
			CO-6	Design & Create various application based on swing by using javafx.
23	PET3I001	Semiconductor Devices	CO-1	State the Quantum theory of solids and semiconductors theory.
			CO-2	Explain the fomration of PN Junction and its operation.
			CO-3	Demonstrate modes of Bipolar Transistor.
			CO-4	Recognise the metal semiconductor devices and its operations.
			CO-5	Design MOS Capacitor and its charactaristics.
			CO-6	Justify various types of MOS Transistors.
24	PET3I104	Digital Electronics	CO-1	Define the combinational and sequential circuit operation.
			CO-2	Explain a counter having a specified count sequence using state diagrams and state table
			CO-3	Apply the HDL for all digital circuits.
			CO-4	Analyse the layout of various digital circuit.
			CO-5	Design digital circuits, use standard laboratory instrumentation to verify the operation of the circuits, and use PC-based electronic circuit simulation software.
			CO-6	Validate combinational logic circuits using programmable logic devices.
25	PET4I103	Electrical & Electronics Measurements	CO-1	Define working principle ,construction and application of all the electrical measuring instrument's .
			CO-2	Discuss the error between theoretical and practical value.
			CO-3	Demonstrate different electronic instruments for measuring basic parameters.
			CO-4	Detect the output power of a three phase power by using 2 wattmeter.
			CO-5	Evaluate different calibration of indicating type instrument with the help of different methods.
			CO-6	Create the B-H curve using CRO.
26	PET4I102	Electrical Machines & Power Devices	CO-1	List various working principle and evaluate the performance equation of D.C motor under various load condition and analyze the braking system
			CO-2	Describe the operating characteristics of 3 phase Induction Motor
			CO-3	Applying knowledge to design single phase Transformer in day to day life.

			CO-4	Analyze the control strategies of 3 phase Induction Motor
			CO-5	Evaluate complex problems on Electronic Ballast,Static VAR compensator.
			CO-6	Justify the principle of Single Phase Induction and Special Machines.
27	PET4I101	Electromagnetics Engg	CO-1	State Field Equations; Wave Types; the Parallel-Plate Waveguide; the Rectangular Waveguide.
			CO-2	Explain Maxwell's Equations in Differential Form; Maxwell's Equations in Integral Form.
			CO-3	Apply integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory.
			CO-4	Calculate the solutions of problems related to the concepts related to uniform plane wave propagation in two dielectric regions
			CO-5	Develop Circuit Model of a Uniform Two Conductor Transmission Line.
			CO-6	Validate the Various Mathematical coordinate like Cartesian, Cylindrical and Spherical Coordinate Systems, Coulomb's Law and Gauss's Law.
28	REC4C001	Electromagnetic Theory	CO-1	Discuss different types of coordinate systems and Describe electrostatic and magneto static laws .
			CO-2	Describe energy density and potential gradient on electric or magnetic fields.
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			CO-5	Design a cavity resonator.
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30	REC5C003	Microprocessors and Microcontrollers	CO-1	Apply knowledge on organization of microprocessor and its hardware to interface with memory and I/O devices.
			CO-2	Apply the knowledge of instruction set, addressing mode, and assembler directives to write a program and execute it for different applications.
			CO-3	Design embedded systems for real time application by interfacing Intel 8086 Microprocessor with peripherals such as Intel 8255, Intel 8279, ADC, DAC, Printer, CRT terminal etc.
			CO-4	Apply the knowledge about the pin description and architecture of Intel 8051 Microcontroller to interface with Memory and I/O devices.
			CO-5	Design embedded systems for real time applications by programming the Intel 8051 microcontroller with the knowledge about its instruction set, addressing mode, and assembler directives.
			CO-6	Apply the knowledge about advanced microprocessors, such as Intel 80386, and 80486 microprocessors to design an embedded system for practical applications.
31	REC5D001	Fiber Optics & Optoelectronics Devices	CO-1	Investigate the construction of an optical fibre and its application in communication systems.
			CO-2	Apply the basic knowledge about optical fibre in studying wave propagation.
			CO-3	Apply the basic knowledge about optical fibre in investigating different optoelectronic sources.
			CO-4	Investigate about optoelectronic detectors and modulators.
			CO-5	Apply the basic knowledge about optical fibres in investigating optical amplifiers.
			CO-6	Investigate different WDM components.
32	REC5D006	Digital VLSI Design	CO-1	Investigate about the fabrication and operation of a MOSFET.
			CO-2	Apply the basic knowledge about

				MOSFETs to investigate the static and switching characteristics of a MOS inverter.
			CO-3	Apply the basic knowledge about MOSFETS to design and test different combinational MOS logic circuits.
			CO-4	Apply the basic knowledge about MOSFETs to design and test disfferent sequencial MOS logic circuits.
			CO-5	Investigate a VLSI design for testability.
			CO-6	Investigate different semiconductor memories.
33	REC6C201	Microwave Engineering	CO-1	Investigate high frequency transmission lines.
			CO-2	Investigate different waveguides and the components used.
			CO-3	Design different types of waveguides and test them.
			CO-4	Investigate the principle of operation as an amplifier at high frequencies.
			CO-5	Design and test different microwave antennas.
			CO-6	Investigate about microwave propagation and its measurement.
34	REC6C002	Wireless Communication	CO-1	Investigate high frequency transmission lines.
			CO-2	Investigate different waveguides and the components used.
			CO-3	Design different types of waveguides and test them.
			CO-4	Investigate the principle of operation as an amplifier at high frequencies.
			CO-5	Design and test different microwave antennas.
			CO-6	Investigate about microwave propagation and its measurement.
35	REC5C002	Analog and Digital Communication	CO-1	Investigate the basics of signals, systems, and different modulation schemes.
			CO-2	Apply the basic knowledge about different modulation schemes to investigate the effect of noise in them.
			CO-3	Apply the basic knowledge about modulation to investigate Pulse Code Modulation (PCM) and Delta modulation.
			CO-4	Investigate about the time division multiplexing and digital multiplexers.
			CO-5	Apply the basic knowledge about

				modulation to investigate different digital modulation techniques.
			CO-6	Investigate about the detection theory.
36	REC6C201	Microwave Engineering Lab	CO-1	To simulate the characteristics of reflex klystron, gunn diode, and directional coupler.
			CO-2	Measure the voltage standing wave ratio and radiation pattern of a horn antenna.
			CO-3	Measure the impedance, wavelength, and frequency.
			CO-4	Determine the polarization of horn antenna and measure scattering parameters.
			CO-5	Measure coupling of H-plane, E-plane, and Magic Tee junctions.
			CO-6	Measurement of dielectric constant, phase shift, and scattering parameters of circulators/isolators.
37	REC5C201	Analog and Digital Communication Lab	CO-1	Simulate and analyze spectrum of different signals.
			CO-2	Design and test a AM/FM modulation and demodulation.
			CO-3	Simulate the process of frequency division multiplexing and frequency division demultiplexing.
			CO-4	Simulate different channel coding and decoding techniques.
			CO-5	Transmit and receive a signal through a satelite link.
			CO-6	Simulate and compare different forms of BPSK, QPSK, and OQPSK anlyze the spectrum with spectrum analyzer.
38	REC5D001	Digital Signal Processing	CO-1	Apply knowledge of basic signals and systems to analyse different LTI Systems.
			CO-2	Apply knowledge of Z - transformation techniques to analyse the signal in LTI Systems.
			CO-3	Apply the knowledge of Discrete Fourier Transform (DFT), its properties in linear filtering.
			CO-4	Apply the knowledge about DFT for its efficient computation using different FFT algorithms.
			CO-5	Apply the basic knowledge about signals and systems to design and implement different filters.
			CO-6	Design different adaptive filters and implement them using MATLAB.
39	REC5C202	Digital Signal	CO-1	Familiarization with the architecture of a a

		Processing Lab		standard DSP kit.
			CO-2	Generate different types of waveforms using MATLAB and DSP kit.
			CO-3	Compute the linear, circular convolution, and correlation of two sequences using MATLAB and verify the result using a DSP kit.
			CO-4	Implement DIT-FFT and DIF-FFT algorithm using MATLAB.
			CO-5	Design and implement a FIR & IIR filter using MATLAB.
			CO-6	Compute convolution of long duration sequences using overlap save and overlap add method in MATLAB.
40	REL5C005	Renewable Power Generation Systems	CO-1	Explain renewable energy sources & systems.
			CO-2	Apply engineering techniques to build solar, wind, tidal, geothermal, biofuel, fuel cell, Hydrogen, and sterling engine.
			CO-3	Analyze and evaluate the implication of renewable energy.
			CO-4	Concepts in solving numerical problems about solar radiation geometry and wind energy systems.
			CO-5	Demonstrate self -learning capability to design & establish renewable energy systems.
			CO-6	Conduct experiments to assess the performance of solar PV, solar thermal, and biodiesel systems
41	REC7D001	Digital Image Processing	CO-1	Apply basic knowledge of digital image processing system.
			CO-2	Analyze images in the frequency domain using various transforms.
			CO-3	Apply basic knowledge of different techniques for image enhancement.
			CO-4	Implement and analyze different techniques for image restoration.
			CO-5	Acquired knowledge about color image processing.
			CO-6	Acquired knowledge about various compression techniques.

42	REC7D006	Radar and TV Engineering	CO-1	To study the functions of various blocks of CW Radar, FM-CW Radar, MTI and Pulse Doppler Radars, Tracking radar and their limitations and applications.
			CO-2	To study the functions of various blocks of Radar receivers and detection of Radar signals in noise in detail.
			CO-3	To study the analysis and synthesis of TV Pictures, Composite Video Signal, Receiver Picture Tubes and-Television Camera Tubes
			CO-4	To study the principles of Monochrome Television Transmitter and Receiver systems and various Colour Television systems with a greater emphasis on PAL.
			CO-5	Apply Transmission line principles for Digital TV.
			CO-6	Analyse channel coding, errors, interferences and modulation techniques for Digital TV.
43	RIT7D001	Internet Of Things (Iot)	CO-1	Describe what IoT is and how it works today
			CO-2	Describe different types of management information systems
			CO-3	Design and program IoT devices
			CO-4	Use real IoT protocols for communication
			CO-5	Secure the elements of an IoT device
			CO-6	Design an IoT device to work with a Cloud Computing infrastructure.
44	RED7E001	Enterpreneurship Development	CO-1	Communicate effectively both orally and in writing.
			CO-2	Demonstrate knowledge of the legal and ethical environment impacting business organizations and exhibit an understanding and appreciation of the ethical implications of decisions.
			CO-3	Demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern organizations.
			CO-4	Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
			CO-5	Demonstrate an ability to work effectively with others.
			CO-6	Demonstrate knowledge of current information, theories and models, and

				techniques and practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.
45		Soft Computing	CO-1	Understand about the basics of soft computing techniques
			CO-2	Explain about the neural network
			CO-3	Explain about the fuzzy logic concept
			CO-4	Understand the basic concepts of genetic algorithem
			CO-5	Describe about hybrid soft computing techniques and its application
			CO-6	Identify and describe soft computing techniques and their roles in buildings
46	RGT6A003	Green Technology	CO-1	Understanding global warming and its effects
			CO-2	Analyze straties to reduce global warming
			CO-3	Evaluate business opportunities in India for control of carbon emissions and accumulations.
			CO-4	Classify various technologies available for energy production
			CO-5	Illustrate measures taken to reduce carbon emission at personal and city wide levels.
			CO-6	Cite India's national action plan to low carbon path
47	RSM6H202	Seminar - I	CO-1	Apply effective strategies in literature searches for the seminar topics and its abstract.
			CO-2	Analyse, design and develop a system/component/ process for the required needs under the realistic constraints.
			CO-3	Coherent step-by-step plan for the design under guide supervision.
			CO-4	Evaluate data and analyse the results using critical thinking skills.
			CO-5	Improve on his/her own learning process and extract the new technologies and adopt the appropriate knowledge
			CO-6	Write technical documents and give oral and visual presentations related to the work completed.
48	RSM7H202	Seminar - II	CO-1	Apply effective strategies in literature searches for the seminar topics and its abstract

			CO-2	Analyse, design and develop a system/component/ process for the required needs under the realistic constraints.
			CO-3	Coherent step-by-step plan for the design under guide supervision.
			CO-4	Evaluate data and analyse the results using critical thinking skills.
			CO-5	Improve on his/her own learning process and extract the new technologies and adopt the appropriate knowledge
			CO-6	Write technical documents and give oral and visual presentations related to the work completed.
49	PET7N202	Minor Project	CO-1	Identify the issues related with the recent trends in the field of computer science and its applications
			CO-2	Formulate the problem definition, analyze and do functional simulation of the same
			CO-3	Design, implement, test and verify the proposed solution related to problem definition
			CO-4	Compile, comprehend and present the work carried out
			CO-5	Analyze the pros and cons of applying the different design paradigms in different Contexts.
			CO-6	Exposure to randomization as a tool for developing algorithms.
50	PET8N202	Major Project	CO-1	Students should be able to design and construct a hardware and software system, component, or process to meet desired needs.
			CO-2	Students are provided to work on multidisciplinary Problems.
			CO-3	Students should be able to work as professionals, with portfolio ranging from data management, network configuration, designing hardware, database and software design to management and administration of entire systems
			CO-4	Learn to apply the knowledge gained through various courses in solving a real life problem.
			CO-5	Practice different phases of software/system development life cycle.
			CO-6	To introduce the student to a professional environment and/or style typical of a global IT industry,