

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER III

SL NO	COURSE CODE	COURSE NAME	CO No.	CO DESCRIPTION
1	MAT 201	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS	1	Understand the concept and the solution of partial differential equation.
			2	Analyse and solve one dimensional wave equation and heat equation.
			3	Understand complex functions, its continuity differentiability with the use of Cauchy Riemann equations.
			4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function.
			5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
2	ECT201	SOLID STATE DEVICES	1	Apply Fermi-Dirac Distribution function and Compute carrier concentration at equilibrium and the parameters associated with generation, recombination and transport mechanism.
			2	Explain drift and diffusion currents in extrinsic semiconductors and Compute current density due to these effects.
			3	Define the current components and derive the current equation in a pn junction diode and bipolar junction transistor.
			4	Explain the basic MOS physics and derive the expressions for drain current in linear and saturation regions.
			5	Discuss scaling of MOSFETs and short channel effects.
3	ECT 203	LOGIC CIRCUIT DESIGN	1	Explain the elements of digital system abstractions such as digital representations of information, digital logic and Boolean algebra
			2	Create an implementation of a combinational logic function described by a truth table using and/or/inv gates/ muxes
			3	Compare different types of logic families with respect to performance and efficiency
			4	Design a sequential logic circuit using the basic building blocks like flip-flops
			5	Design and analyze combinational and sequential logic circuits through gate level Verilog models.

4	ECT205	NETWORK THEORY	1	Apply Mesh / Node analysis or Network Theorems to obtain steady state response of the linear time invariant networks.
			2	Apply Laplace Transforms to determine the transient behaviour of RLC networks.
			3	Apply Network functions and Network Parameters to analyse the single port and two port networks.
5	HUT 200	PROFESSIONAL ETHICS	1	Understand the core values that shape the ethical behaviour of a professional.
			2	Adopt a good character and follow an ethical life.
			3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
			4	Solve moral and ethical problems through exploration and assessment by established experiments.
			5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.
6	MCN201	SUSTAINABLE ENGINEERING	1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
			2	Explain the different types of environmental pollution problems and their sustainable solutions
			3	Discuss the environmental regulations and standards
			4	Outline the concepts related to conventional and non- conventional energy
			5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

7	ECL 201	SCIENTIFIC COMPUTING LABORATORY	1	Describe the needs and requirements of scientific computing and to familiarize one programming language for scientific computing and data visualization.
			2	Approximate an array/matrix with matrix decomposition.
			3	Implement numerical integration and differentiation.
			4	Solve ordinary differential equations for engineering applications
			5	Compute with exported data from instruments
			6	Realize how periodic functions are constituted by sinusoids
			7	Simulate random processes and understand their statistics.
8	ECL 203	LOGIC DESIGN LAB	1	Design and demonstrate the functioning of various combinational and sequential circuits using ICs
			2	Apply an industry compatible hardware description language to implement digital circuits
			3	Implement digital circuits on FPGA boards and connect external hardware to the boards
			4	Function effectively as an individual and in a team to accomplish the given task

SEMESTER IV

1	MAT 204	PROBABILITY, RANDOM PROCESSES AND NUMERICAL METHODS	1	Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena.
			2	Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena.
			3	Analyse random processes using autocorrelation, power spectrum and Poisson process model as appropriate.
			4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
			5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

2	ECT202	ANALOG CIRCUITS	1	Design analog signal processing circuits using diodes and first order RC circuit
			2	Analyse basic amplifiers using BJT and MOSFET
			3	Apply the principle of oscillator and regulated power supply circuits.
3	ECT 204	SIGNALS AND SYSTEMS	1	Apply properties of signals and systems to classify them
			2	Represent signals with the help of series and transforms
			3	Describe orthogonality of signals and convolution integral.
			4	Apply transfer function to compute the LTI response to input signals.
			5	Apply sampling theorem to discretize continuous time signals
4	ECT 206	COMPUTER ARCHITECTURE AND MICROCONTROLLERS	1	Explain the functional units, I/O and memory management w.r.t a typical computer architecture.
			2	Distinguish between microprocessor and microcontroller
			3	Develop simple programs using assembly language programming.
			4	Interface 8051 microcontroller with peripheral devices using ALP/Embedded C
			5	Familiarize system software and Advanced RISC Machine Architecture.
5	EST 200	DESIGN AND ENGINEERING	1	Explain the different concepts and principles involved in design engineering.
			2	Apply design thinking while learning and practicing engineering
			3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

6	MCN202	CONSTITUTION OF INDIA	1	Explain the background of the present constitution of India and features.
			2	Utilize the fundamental rights and duties.
			3	Understand the working of the union executive, parliament and judiciary.
			4	Understand the working of the state executive, legislature and judiciary.
			5	Utilize the special provisions and statutory institutions.
			6	Show national and patriotic spirit as responsible citizens of the country
7	ECL 202	ANALOG CIRCUITS AND SIMULATION LAB	1	Design and demonstrate the functioning of basic analog circuits using discrete components.
			2	Design and simulate the functioning of basic analog circuits using simulation tools.
			3	Function effectively as an individual and in a team to accomplish the given task.
8	ECL 204	MICROCONTROLLER LAB	1	Write an Assembly language program/Embedded C program for performing data manipulation.
			2	Develop ALP/Embedded C Programs to interface microcontroller with peripherals
			3	Perform programming/ interfacing experiments with IDE for modern microcontrollers.

SEMESTER V

1	ECT301	LINEAR INTEGRATED CIRCUITS	1	Understand Op Amp fundamentals and differential amplifier configurations
			2	Design operational amplifier circuits for various applications
			3	Design Oscillators and active filters using op amps
			4	Explain the working and applications of timer, VCO and PLL ICs
			5	Outline the working of Voltage regulator IC's and Data converters
2	ECT303	DIGITAL SIGNAL PROCESSING	1	State and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods
			2	Compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms
			3	Design linear phase FIR and IIR filters for a given specification.
			4	Illustrate the various FIR and IIR filter structures for the realization of the given system function
			5	Explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations
			6	Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects
3	ECT305	ANALOG AND DIGITAL COMMUNICATION	1	Explain the existent analog communication systems.
			2	Apply the concepts of random processes to LTI systems.
			3	Apply waveform coding techniques in digital transmission.
			4	Apply GS procedure to develop digital receivers.
			5	Apply equalizer design to counteract ISI.
			6	Apply digital modulation techniques in signal transmission.

4	ECT307	CONTROL SYSTEMS	1	Analyse electromechanical systems by mathematical modelling and derive their transfer functions
			2	Determine Transient and Steady State behaviour of systems using standard test signals
			3	Determine absolute stability and relative stability of a system
			4	Apply frequency domain techniques to assess the system performance and to design a control system with suitable compensation techniques
			5	Analyse system Controllability and Observability using state space representation
5	HUT 310	MANAGEMENT FOR ENGINEERS	1	Explain the characteristics of management in the contemporary context .
			2	Describe the functions of management (Cognitive Knowledge level: Understand).
			3	Demonstrate ability in decision making process and productivity analysis .
			4	Illustrate project management technique and develop a project schedule
			5	Summarize the functional areas of management
			6	Comprehend the concept of entrepreneurship and create business plans
6	MCN 301	DISASTER MANAGEMENT	1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle
			2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment
			3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk
			4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community
			5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions
			6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level

7	ECL331	ANALOG INTEGRATED CIRCUITS AND SIMULATION LAB	1	Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs.
			2	Design and simulate the application circuits with Analog Integrated Circuits using simulation tools.
			3	Function effectively as an individual and in a team to accomplish the given task.
8	ECL333	DIGITAL SIGNAL PROCESSING LABORATORY	1	Simulate digital signals.
			2	verify the properties of DFT computationally
			3	Familiarize the DSP hardware and interface with computer.
			4	Implement LTI systems with linear convolution.
			5	Implement FFT and IFFT and use it on real time signals.
			6	Implement FIR low pass filter.
			7	Implement real time LTI systems with block convolution and FFT.

SEMESTER VI

1	ECT302	ELECTROMAGNETICS	1	To summarize the basic mathematical concepts related to electromagnetic vector fields.
			2	Analyse Maxwell's equation in different forms and apply them to diverse engineering problems.
			3	To analyse electromagnetic wave propagation and wave polarization
			4	To analyse the characteristics of transmission lines and solve the transmission line problems using Smith chart.
			5	To analyse and evaluate the propagation of EM waves in Wave guides.

2	ECT304	VLSI CIRCUIT DESIGN	1	Explain the various methodologies in ASIC and FPGA design.
			2	Design VLSI Logic circuits with various MOSFET logic families.
			3	Compare different types of memory elements.
			4	Design and analyse data path elements such as Adders and multipliers.
			5	Explain MOSFET fabrication techniques and layout design rules.
3	ECT306	INFORMATION THEORY AND CODING	1	Explain measures of information – entropy, conditional entropy, mutual information
			2	Apply Shannon’s source coding theorem for data compression.
			3	Apply the concept of channel capacity for characterize limits of error-free transmission.
			4	Apply linear block codes for error detection and correction
			5	Apply algebraic codes with reduced structural complexity for error correction
			6	Understand encoding and decoding of convolutional and LDPC codes
4	ECT352	DIGITAL IMAGE PROCESSING (ELECTIVE I)	1	Distinguish / Analyse the various concepts and mathematical transforms necessary for image processing
			2	Differentiate and interpret the various image enhancement techniques
			3	Illustrate image segmentation algorithm
			4	Understand the basic image compression techniques

5	HUT 300	INDUSTRIAL ECONOMICS & FOREIGN TRADE	1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. knowledge level:
			2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production.
			3	Determine the functional requirement of a firm under various competitive conditions.
			4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society
			5	Determine the impact of changes in global economic policies on the business opportunities of a firm.
6	ECT308	COMPREHENSIVE COURSE WORK	1	Apply the knowledge of circuit theorems and solid state physics to solve the problems in electronic Circuits
			2	Design a logic circuit for a specific application
			3	Design linear IC circuits for linear and non-linear circuit applications.
			4	Explain basic signal processing operations and Filter designs
			5	Explain existent analog and digital communication systems
7	ECL332	COMMUNICATION LAB	1	Setup simple prototype circuits for waveform coding and digial modulation techniques working in a team.
			2	Simulate the error performance of a digital communication system using standard binary and M -ary modulation schemes.
			3	Develop hands-on skills to emulate a communication system with software-designed- radio working in a team.

8	ECD334	MINI PROJECT	1	Be able to practice acquired knowledge within the selected area of technology for project development.
			2	Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach.
			3	Reproduce, improve and refine technical aspects for engineering projects.
			4	Work as a team in development of technical projects.
			5	Communicate and report effectively project related activities and findings.

SEMESTER VII

1	MCN401	INDUSTRIAL SAFETY ENGINEERING	1	Describe the theories of accident causation and preventive measures of industrial accidents.
			2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.
			3	Explain different issues in construction industries.
			4	Describe various hazards associated with different machines and mechanical material handling.
			5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

2	ECT401	MICROWAVES AND ANTENNAS	1	Understand the basic concept of antennas and its parameters.
			2	Analyse the far field pattern of Short dipole and Half wave dipole antenna
			3	Design of various broad band antennas, arrays and its radiation patterns.
			4	Illustrate the principle of operation of cavity resonators and various microwave sources.
			5	Explain various microwave hybrid circuits and microwave semiconductor devices.

3	ECT413	OPTICAL FIBER COMMUNICATION	1	Understand the working and classification of optical fibers in terms of propagation Modes
			2	Solve problems of transmission characteristics and losses in optical fiber
			3	Explain the constructional features and the characteristics of optical sources and Detectors
			4	Describe the operations of optical amplifiers
			5	Understand the concept of WDM, FSO and LiFi
4	ECL411	ELECTROMAGNETICS LAB	1	Familiarize the basic Microwave components and to analyse few microwave measurements and its parameters.
			2	Understand the principles of fiber-optic communications and the different kind of losses, signal distortion and other signal degradation factors.
			3	Design and simulate basic antenna experiments with simulation tools
5	EET455	ENERGY MANAGEMENT	1	Explain the significance and procedure for energy management and audit.
			2	Discuss the energy efficiency and management of electrical loads.
			3	Discuss the energy efficiency in boilers and furnaces.
			4	Explain the energy management opportunities in HVAC systems
			5	Compute the economic feasibility of the energy conservation measures.

6	ECQ413	SEMINAR	1	Identify academic documents from the literature which are related to her/his areas of interest
			2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
			3	Prepare a presentation about an academic document
			4	Give a presentation about an academic document
			5	Give a presentation about an academic document
7	ECD415	PROJECT PHASE I	1	Model and solve real world problems by applying knowledge across domains
			2	Develop products, processes or technologies for sustainable and socially relevant applications
			3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			5	Identify technology/research gaps and propose innovative/creative solutions
			6	Organize and communicate technical and scientific findings effectively in written and oral forms
SEMESTER VIII				
1	ECT402	WIRELESS COMMUNICATION	1	Summarize the basics of cellular system and cellular design fundamentals.
			2	Describe the wireless channel models and discuss capacity of wireless channels.
			3	Analyze the performance of the modulation techniques for flat- fading channels and multicarrier modulation.
			4	Illustrate how receiver performance can be enhanced by various diversity techniques.
			5	Identify advantages of various equalization techniques and multiple-access techniques in wireless communication.
			6	Calculate system parameters such antenna height, range, maximum usable frequency in different modes of radio wave propagation.

2	ECT414	BIOMEDICAL ENGINEERING	1	Understand basic bioelectric potentials and its implications in diagnostics
			2	Understand the principles used for diagnosis of abnormalities in the cardiovascular system
			3	Explain the techniques used for diagnosis and therapy in the neuromuscular system
			4	Understand the principle and working of different types of bio medical equipment/device
			5	Classify various diagnostic medical imaging techniques.
3	ECT416	MODERN COMMUNICATION SYSTEMS	1	Explain OFDM, OFDMA and SC-FDMA techniques used in cellular communication
			2	Discuss the different wireless communication standards for short range communication.
			3	Explain the IoT architecture and various connectivity technologies used in IoT Systems
			4	Understand the various communication standards for connected autonomous vehicles
			5	Explain the significance and architecture of software defined radio and cognitive radio.
4	ECT448	LOW POWER VLSI	1	Identify various short channel effects and various sources of power dissipation in MOSFET
			2	Apply various power reduction techniques to circuits.
			3	Apply various clocked and non clocked design styles for logic implementation.
			4	Apply Adiabatic and reversible logic for circuit implementation.

5	ECT404	COMPREHENSIVE COURSE VIVA	1	Competent in placement tests and other competitive examinations.
6	ECD416	PROJECT PHASE II	1	Model and solve real world problems by applying knowledge across domains
			2	Develop products, processes or technologies for sustainable and socially relevant applications
			3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			5	Identify technology/research gaps and propose innovative/creative solutions
			6	Organize and communicate technical and scientific findings effectively in written and oral forms