B. Sc. (H) ELECTRONICS SCIENCE

COURSE OUTCOMES

CORE COURSES

C Basic Circuit Theory and Network Analysis

At the end of this course, Students will be able to:

CO1	Study basic circuit concepts in a systematic manner suitable for analysis and design.
CO2	Understand transient analysis.
CO3	Determine AC steady state response.
CO4	Analyse the electric circuit using network theorems.
CO5	Understand the two–port network parameters.

In lab course, Students will be able to

CO1	Verify the network theorems and operation of typical electrical circuits.
CO2	Choose the appropriate equipment for measuring electrical quantities and verify the same for different circuits.
CO3	Prepare the technical report on the experiments carried.

CI

CII Mathematics Foundation for Electronics

At the end of this course, Students will be able to

CO1	Use mathematics as a tool for solving/modeling systems in electronics,
CO2	Solve non-homogeneous linear differential equations of any order using a variety of methods, solve differential equations using power series and special functions,
CO3	Understand methods to diagonalize square matrices and find eigenvalues and corresponding eigenvectors for a square matrix, and check for its diagonalizability,
CO4	Familiarize with the concept of sequences, series and recognize convergent, divergent, bounded, Cauchy and monotone sequences.
CO5	Perform operations with various forms of complex numbers to solve equations.

In lab course, students will be able to

CO1	Perform operations with various forms of complex numbers to solve equations
CO2	Use mathematics as a tool for solving/modelling systems in electronics,
CO3	Prepare the technical report on the experiments carried

CIII Semiconductor Devices

At the end of this course, Students will be able to

CO1	Describe the behaviour of semiconductor materials
CO2	Reproduce the I-V characteristics of diode/BJT/MOSFET devices
CO3	Apply standard device models to explain/calculate critical internal parameters of semiconductor devices
CO4	Explain the behaviour and characteristics of power devices such as SCR/UJT etc

At the end of lab course, Students will be able to

CO1	Examine the characteristics of basic semiconductor devices.
CO2	Perform experiments for studying the behaviour of semiconductor devices for circuit design applications.
CO3	Calculate various device parameters, values from their IV characteristics
CO4	Interpret the experimental data for better understanding the device behaviour

CIV Applied Physics

At the end of this course, Students will be able to

CO1	Explain the limitation of classical physics and basic concepts of quantum physics
CO2	Describe the mechanical, thermal and magnetic properties of materials
CO3	Understand the various thermal effects life Seebeck and Peltier effect and their usefulness in solving the real-life problems.

At the end of lab course, students will be able to

CO1	Perform lab experiments for studying mechanical, thermal and magnetic parameters of materials
CO2	Calculate and determine mechanical parameters such as young modulus, rigidity etc.
CO3	Collect data and Present it in the form of lab report.

CV Electronics Circuits

At the end of this course, students will be able to

CO1	Illustrate about rectifiers, transistor and FET amplifiers and its biasing. Also compare the performances of its low frequency models
CO2	Describe the frequency response of MOSFET and BJT amplifiers
CO3	Explain the concepts of feedback and construct feedback amplifiers and oscillators. ❖ Summarizes the performance parameters of amplifiers with and without feedback

At the end of lab course, students will be able to

CO1	Study various stages of a zener diode based regulated power supply
CO2	Understand various biasing concepts, BJT and FET based amplifiers
CO3	Understand the concept of various BJT based power amplifiers and Oscillators. Prepare the technical report on the experiments carried

CVI Digital Electronics and Verilog/VHDL

At the end of this course, students will be able to

CVII CO1	Understand and represent numbers in powers of base and converting one from the other, carry out arithmetic operations
CVIII CO2	Understand basic logic gates, concepts of Boolean algebra and techniques to reduce/simplify Boolean expressions
CIX CO3	Analyze and design combinational as well as sequential circuits
CX CO4	Explain the concepts related to PLD 's
CXI CO5	**CXII** Use VLSI design methodologies to understand and design simple digital systems & understand the HDL design flow and capability of writing programs in VHDL/Verilog
CXIII CO6	Familiar with Simulation and Synthesis Tools, Test Benches used in Digital system design.

At the end of lab course, students will be able to

CO1	Apply VLSI design methodologies to understand and design simple digital systems
CO2	Familiarize with Simulation and Synthesis Tools, Test Benches used in Digital system design
CO3	Write programs in VHDL/Verilog
CO4	Prepare the technical report on the experiments carried

CXIV Programming and Data Structures

At the end of this course, students will be able to

CO1	Develop algorithms for arithmetic and logical problems and write programs in C language
CO2	Implement conditional branching, iteration and recursion.
CO3	Use concept of modular programming by writing functions and using them to form a complete program
CO4	Understand the concept of arrays, pointers and structures and use them to develop algorithms and programs for implementing stacks, queues, link list, searching and sorting

At the end of lab course, students will be able to

CO1	Develop algorithms and write programs in C language for arithmetic and logical operations
CO2	Write programs in C language to implement the concept of conditional branching, iteration, recursion, arrays and pointers
CO3	Write Programs in C language to implement data structures
CO4	Prepare the technical report on the experiments carried

CXV Operational Amplifiers and Applications

At the end of this course, students will be able to

CO1	Understand basic building blocks of an op-amp and its parameters for various applications design
CO2	Elucidate and design the linear and non-linear applications of an op-amp
CO3	Understand the working of multivibrators using IC 555 timer and V-F inter-conversion using special application ICs 565 and 566
CO4	Study various fixed and variable IC regulators

At the end of lab course, students will be able to

CO1	Understand the non-ideal behaviour by parameter measurement of Op-amp
CO2	Design application-oriented circuits using Op-amp ICs
CO3	Generate square wave using different modes of 555 timer IC. ❖ Prepare the technical report on the experiments carried

CXVI Signals & Systems

At the end of this course, students will be able to

CO1	Represent various types of continuous-time and discrete-time signals

CO2	Understand concept of convolution, LTI systems and classify them based on their properties and determine the response of LTI system
CO3	Determine the impulse response, step response and frequency response of LTI systems
CO4	Analyze system properties based on impulse response and Fourier analysis
CO5	Analyze the spectral characteristics of continuous-time periodic and a periodic signal using Fourier analysis
CO6	Understand Laplace transform and its properties and apply the Laplace transform to obtain impulse and step response of simple circuits

At the end of lab course, students will be able to

CO1	Learn the practical implementation issues stemming from the lecture material
CO2	Learn the use of simulation tools and design skills
CO3	Learn to work in groups and to develop Scilab/MATLAB/other mathematical simulation software simulations of various signals and systems
CO4	Prepare the technical report on the experiments carried

Electronic Instrumentation

At the end of this course, students will be able to

CO1	Describe the working principle of different measuring instruments
CO2	Choose appropriate measuring instruments for measuring various parameters in their laboratory courses
CO3	Correlate the significance of different measuring instruments, recorders and oscilloscopes

At the end of lab course, students will be able to

CO1	Perform experiments on the measuring instruments
CO2	Perform measurements of various electrical/electronic parameters using appropriate instruments available in the laboratory

CO3	Prepare the technical report on the experiments carried

CXVII

CXVIII Microprocessor and Microcontrollers

At the end of this course, students will be able to

CO1	Understand the basic blocks of microcomputers i.e., CPU, Memory, I/O and architecture of microprocessor ‘s and Microcontroller ‘s
CO2	Apply knowledge and demonstrate proficiency of designing hardware interfaces for memory and I/O as well as write assembly language programs for target microprocessor and microcontroller
CO3	Derive specifications of a system based on the requirements of the application and select the appropriate Microprocessor or Microcontroller

At the end of lab course, students will be able to

CO1	Be proficient in use of IDE‘s for designing, testing and debugging microprocessor and microcontroller based system
CO2	Interface various I/O devices and design and evaluate systems that will provide solutions to real-world problem
CO3	Prepare the technical report on the experiments carried

CXIX Electromagnetics

At the end of this course, students will be able in

CO1	Getting familiar with vector algebra, coordinate system and coordinate conversion
CO2	Plotting of fields (Electrostatic and Magnetostatics) and solution of Laplace ‘s equation.
CO3	Physical interpretation of Maxwell ‘s equation and problem solving in different media
CO4	Understanding of propagation of an electromagnetic wave

At the end of lab course, students will be able to

CO1	Design capacitors & inductors and analyze their characteristics. Also, they become efficient in solving simple boundary value problems, using Poisson ‘s equation
CO2	Interpret a Smith chart and also become familiar with describing & recognizing fundamental properties of waveguide modes
CO3	Calculate the cutoff frequency and propagation constant for parallel plate, rectangular, and dielectric slab waveguides. Also, they can calculate the resonant frequency of simple cavity resonators
CO4	Analyze problems involving TEM-waves

CXX Communication Electronics

At the end of this course, students will be able to

CO1	Understand the basic concept of a communication system and need for modulation
CO2	Evaluate modulated signals in time and frequency domain for various continuous modulation techniques
CO3	Describe working of transmitters and receivers and effect of noise on a communication system
CO4	Understand baseband Pulse Modulation

At the end of lab course, students will be able to

CO1	Understand basic elements of a communication system
CO2	Analyze the baseband signals in time domain and in frequency domain
CO3	Build understanding of various analog and digital modulation and demodulation techniques
CO4	Prepare the technical report on the experiments carried

CXXI Photonics

At the end of this course, students will be able to

CO1	Describe the optics and simple optical systems

CO2	Understand the concept of light as a wave and the relevance of this to optical effects such as interference and diffraction and hence to lasers and optical fibers
CO3	Use mathematical methods to predict optical effects with e.g. light-matter interaction, interference, fiber optics, geometrical optics

At the end of lab course, students will be able to

CO1	Perform experiments based on the phenomenon of light/photons
CO2	Measure the parameters such as wavelength, resolving power, numerical aperture etc. using the appropriate photonic/optical technique
CO3	Prepare the technical report on the experiments carried

CXXII DISCIPLINE SPECIFIC ELECTIVES

CXXIII Power Electronics

At the end of this course, students will be able to

CO1	Explain the basic principles of switch mode power conversion, models of different types of power electronic converters including dc-dc converters, PWM rectifiers and inverters
CO2	Choose appropriate power converter topologies and design the power stage and feedback controllers for various applications They use power electronic simulation packages for analyzing and designing power converters
CO3	Describe the operation of electric machines, such as motors and their electronic controls
CO4	Analyze the performance of electric machine

At the end of lab course, students will be able to

CO1	Reproduce the characteristics of power semiconductor devices like SCR, DIAC, TRIAC etc.
CO2	Calculate the various device parameters from their characteristics.

CO3	Design power control circuits using semicondcutor power devices
CO4	Prepare the technical report on the experiments carried

CXXIV Digital Signal Processing

At the end of this course, students will be able to

CO1	Understand the basic concepts related to discrete time signals, systems, Z transform and Fourier transform
CO2	Apply knowledge and demonstrate proficiency of analyzing signals in time as well as frequency domain using Fourier and Z transforms
CO3	Design and analyze IIR/FIR filters with given specifications
CO4	Apply transform methods for representing signals and systems in time and frequency domain

At the end of lab course, students will be able to

CO1	Draw signal flow graphs of discrete time systems and analyze and derive properties of LTI systems
CO2	Apply transform methods for representing signals and systems in time and frequency domain
CO3	Simulate, synthesize and process signals using software tools .
CO4	Prepare the technical report on the experiments carried

CXXV Semiconductor Fabrication and Characterization

At the end of this course, students will be able to

CO1	Summarize the developments in the field of microelectronics technologies
CO2	Explain the semiconductor material characterization techniques like SEM, TEM, UVVis

CO3	Describe the lithography, etching and various film deposition processes
CO4	Explain the process sequence for BJT, CMOS and BiCMOS fabrication Processes

At the end of lab course, students will be able to

CO1	Operate the advanced computer simulations tools as well as visit research laboratories for better understanding of semiconductor fabrications processes
CO2	Perform the simulation of semiconductor device fabrication processes like oxidation and diffusion
CO3	Perform experiments to calculate the electronic parameters like resistivity, mobility, carrier concentration and band gap etc in semiconductors
CO4	Operate the deposition system for fabrications of thin films

CXXVI Electrical Machines

At the end of this course, students will be able to

CO1	Familiarize with the basics of DC Machines, Generators and Motors
CO2	Explain the concept of polyphase circuits and their applications in polyphase induction motors.
CO3	Describe the synchronous motors and their comparison with induction motors

At the end of lab course, students will be able to

CO1	Understand the working of DC series/shunt motors
CO2	Perform experiments and the circuit design and collect and analyze the data
CO3	Study working of SCR/phase transformer
CO4	Write a technical report on the experiment performed

CXXVII Transmission Lines, Antenna and Wave Propagation

At the end of this course, students will be able to

CO1	Describe the principals of electromagnetic wave propagation and various effects involved in it
CO2	Explain the phenomenon of transmission line, its types and finding out performance parameters of transmission lines like losses SWR
CO3	Calculate input impedance and reflection coefficient of an arbitrarily terminated transmission-line and can use Smith chart to convert these quantities
CO4	Concept of retarded potential to explain radiation, half wave dipole and characteristics of antenna, radar equation

At the end of lab course, students will be able in

CO1	Understanding the propagation of plan electromagnetic wave in different types of media
CO2	Study of various types of transmission line, power flow and power loss along the length
CO3	Study of various types of waveguide power flow and power attenuation along the length
CO4	Study of Antenna types, characteristics and radar Transmission equation

Control systems

CO1	Understand the concepts of closed loop control systems.
CO2	Analyse the stability of closed loop systems.
CO3	Apply the control techniques to any electrical systems.
CO4	Compute and assess system stability.

At the end of lab course, students will be able in

CO1	Perform experiments involving concepts of control systems
CO2	Design experiments for controlling devices like AC/DC motors etc.
CO3	Study the behaviour of First and Second Order systems.

CO4	Comparison of various types of control mechanisms.

CXXVIII SKILL ENHANCEMENT ELECTIVES

CXXIX Design and Fabrication of Printed Circuit Boards

At the end of this course, Students will be able to

CO1	Familiarize with the type of devices/components that may be mounted on PCB
CO2	Understand the PCB layout techniques for optimized component density and power saving
CO3	Perform design and printing of PCB with the help of various image transfer and soldering techniques
CO4	Understand the trends in the current PCB industry

CXXX Robotics

At the end of this course, Students will be able to

CO1	Familiarize with the programming environments used in robotics applications
CO2	Understand the working of sensors, actuators and other components used in design and implementation of robotics
CO3	Design timer/counter circuits and display their outputs using LCD and other indicator devices
CO4	Understand the communication standards like RS232 etc

CXXXI Internet and Java Programming

At the end of this course, Students will be able to

CO1	Describe the various aspects of internet technologies, java programming
CO2	Familiarize with data type, data operators, exception handling and file management

CO3	Use Java Applets

CXXXII Artificial Intelligence

At the end of this course, Students will be able to

CO1	Build intelligent agents for search and games
CO2	Solve AI problems through programming with Python.
CO3	Learning optimization and inference algorithms for model learning
CO4	Design and develop programs for an agent to learn and act in a structured environment