**BASIC ELECTRICAL ENGINEERING** (E**S-EE101)**

**Course Outcomes**

- To understand and analyze basic electric and magnetic circuits
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations

**CIRCUIT THEORY & NETWORKS (EC 301)**

- Analyze DC and AC circuits.
- Find Thevenin and Norton equivalents of circuit.
- Analyse Ac steady state response and transient response of resistance, inductance and capacitance in terms of impedance.
- Ability to express given electrical circuit in terms of Z, Y and ABCD parameter model and solve the circuits.
- Ability to solve problem using Laplace transform and Inverse Laplace transform

**SOLID STATE DEVICES (EC 302)**

**Module - 1**: Student gains the ability to ***identify semiconductors*** which are elemental or compound type; Direct and indirect band-gap type so that they may be used in optical and non-optical devices; this empowers the student ***to explain the importance of Fermi level*** in identifying intrinsic and extrinsic n- and p-type semiconductors, to predict how Fermi-level changes with doping; ***identify degenerate and non-degenerate*** semiconductors; indicate the ***effect of temperature on carrier concentration***.

**Module - 2**: Focus is on understanding the junction phenomena including alignment of Fermi-level at the interface of a p-n junction and Schottky junction, and its non-alignment due to the application of junction potential. The student will be able to draw the I-V characteristics; acquire the ability to evaluate the dependence of reverse saturation (drift) current on minority carrier concentration and forward diffusion component on potential barrier; the student will calculate the junction capacitances and compare the switching capability of the minority carrier p-n diode with the majority carrier based Schottky diode; to highlight the importance of peak-inverse voltage for a diode and compare the peak inverse voltages of Si and Ge diodes.

**Module - 3:** The student will appreciate the importance of varying the reverse saturation current across the reverse biased base-collector junction by varying the minority carrier concentration using electrical means i.e. forward biased emitter-base junction; acquire the ability ***to treat the BJT as a two port device*** and ***explain transistor action*** for output current control by changing input current; The student will be able ***to use CE, CB and CC modes*** for different applications and ***design biasing circuits*** with BJTs.

**Module - 4:** Ability ***to calculate the threshold voltages*** for different MOSFETs; ability to ***compute the effect of Gate voltages on the junction capacitances***; ability ***to bias MOSFETs and JFETs***.

**SIGNALS AND SYSTEMS (EC 303)**

The course will enable the students to study the various tools of signal analysis and acquire confidence in studying all other communication related subjects (in particular DSP) in the subsequent semesters.

**ANALOG ELECTRONIC CIRCUITS (EC 304)**

Students will be able to design, test and examine simple circuits with transistor, op-amp, amplifiers, oscillators etc. They will be able to test, repair, modify and take-up design exercise. They will have clear knowledge of basic circuit analysis and its functions and their limitations. Most importantly they will be able to recognize, understand, modify and repair majority of circuits used in professional equipment design.

**COs of EM Theory (EC 401)**

- Define and recognize different co-ordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory as they are functions of space and time. Apply different techniques of vector calculus to understand different concepts of electromagnetic field theory.
- Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.
- Determine the electromagnetic force exerted on charged particles, current elements, working principle of various electric and electromagnetic energy conversion devices are based on this force.
- Design electromagnetic energy storage devices like capacitor, inductor which are frequently used in electrical systems and choose suitable materials required to assemble such electromagnetic energy storage devices.
- Deduce and justify the concepts of electromagnetic waves, means of transporting energy or information, in the form of radio waves, TV signals, radar beams and light rays.

- Generalize the concepts of guided structures like transmission line, means of transporting energy or information, commonly used in power distribution and communication.

**Digital Electronic & Integrated Circuits EC 402**

**Course Outcome**

- Students will demonstrate knowledge of binary number system, Boolean algebra and binary codes.
- Students will analyze and design combinational systems using standard gates and minimization methods (such as K-Maps).
- Students will analyze and design combinational logic systems composed of standard combinational modules such as MUX, DEMUX, DECODER etc.
- Students will analyse and design sequential logic circuits such as flip-flops, counters and registers.
- Students will analyse and design simple systems composed of programmable logic circuits such as ROM and PLA.

**Analog Communication (EC 501)**

**Course Outcome:**

- The learner must be able to appreciate the need for modulation and calculate the antenna size for different carrier frequencies. From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted. Solve problems.
- After understanding the basic concepts the learner must be able to compare between the different demodulation methods, design an envelope detector, calculate the IF and image frequencies for the super heterodyne receivers given the carrier and modulating frequencies, calculate the oscillator frequency.
- From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, and decide the type of generation method to be adopted. Solve problems.
- Appreciate the importance of Multiplexing, find out their application areas. The learner must be able to calculate the Noise temperature & SNR for different systems, also compare between the performance of the different modulation methods by comparing their SNR.

**Microprocessors & Microcontrollers (ECE-502)**

**Course Outcome:**

- Students will be able to understand the basic functioning of microprocessor.
- They will be able to write programs for different applications using 8085 & 8086 microprocessors
- They will be able to design memory systems and do programs for communication and peripheral interfacing.
- Students become able to understand various Interrupts and their uses using 8085/8086 Microprocessor and 8051 Microcontroller
- Students will also learn to interface 8255/8253/8251 peripheral chips and I/O devices with the same processors and controller.
- It is expected that students will be able to design systems based on above mentioned processors and controller by means of efficient assembly language programmings

**CONTROL SYSTEMS (EC503)**

**Course outcome:**

- MODULE 1: Students are expected to be capable of having the concepts of open loop & closed loop control systems, classifications, effect and characteristics of feedback system, mathematical models- differential equations, impulse response and transfer functions. They will also learn regarding the transfer function of linear system, block diagram representation of systems considering electrical systems, signal flow graph & reduction using mason's gain formula.
- MODULE 2: Students will learn time response of first order system, transient response of second order system, time domain specifications , steady state response ,error & error constant. They will also learn Routh's stability criterion and its limitations, concept of Root locus technique.
- MODULE 3 : Students will be capable to plot Bode diagrams, determination of frequency domain specification, transfer functions, stability analysis, phase margin & gain margin. They will be able to make polar plots, Nyquist plots and learn stability analysis in frequency domain.
- MODULE 4: Focuses on compensation techniques- lead, lag, lead-lag controllers design in frequency domain & PID controller. Students will have the concepts of state, state variables, state model & its derivation from block diagrams, solving the Time invariant state Equations, State Transition Matrix, Controllability and Observability.

**Digital Communication (EC 601)**

**Course outcome:**

- The student must have a clear idea of Probability Theory and Random Processes. The learner must have a clear idea of Conditional probability, communication example, joint probability, statistical independence, random variable-continuous and discrete, cumulative distribution function, probability density function – Gaussian, Rayleigh and Rician, random process.
- After understanding of Probability Theory and Random Processes learner must know the analogy between signal and vector, distinguishibility of signal, orthogonality and orthonormality, basis function, orthogonal signal space, Schwartz inequality, Gram-Schmidt orthogonalization procedure, response of the noisy signal at the receiver, maximum likelihood decision rule.
- The learner must have a clear understanding of Digital Data Transmission techniques, PAM,PCM, Digital transmission components, source, multiplexer, line coder, regenerative repeater, concept of line coding.
- Appreciate the importance of various digital modulation techniques: ASK, FSK and PSK, Coherent Binary Phase Shift Keying (BPSK), Quadrature Phase Shift Keying (QPSK), Minimum Shift Keying (MSK).

**Digital Signal Processing (EC 602)**

**Course Outcome:**

- Students will have the concept of DT Signals, Sampling Theorem, classification of DT signals and its properties.
- Students will be have the concept of transformed domains, Z- transforms, inverse Z-transforms, Discrete Fourier Transforms, & Inverse Discrete Fourier Transforms
- They will be able to specify and design IIR & FIR digital filters
- They will have the elementary idea about the architecture and important instruction sets of TMS320C 5416/6713 processor

**Telecommunication System (EC-603)**

**Course Outcome:**

- Students will have the concept of Telephone Systems
- They will have the concept of Telecommunication Transmission Lines, Subscriber Loop Systems and Switching Systems.
- They will be able to understand Stored Program Control & Traffic Engineering
- They will get the knowledge of Modems and Their Standards  IP Telephony

**Antenna Theory & Propagation (EC-604A)**

Course Outcome:

The Students will be able to understand

- the concept of antenna fundamentals and its radiation.
- various antenna parameters.
- radiation fields, Characteristics and applications of various basic antennas.
- radiation fields, Characteristics and applications of various array antennas.
- radiation fields, Characteristics and applications of various special antennas.
- various methods of radio wave propagation and its effects, Friss Transmission Formula, SNR of a Radio Link.

**Wireless Communication and Networks (EC 701)**

**Course Outcome:**

- The learner must be able to appreciate brief introduction to mobile wireless communication and systems, concept of cellular network, frequency reuse, channel assignment and handoff strategies. They also need a clear view of characteristics of wireless channel and propagation path loss models.
- After understanding the basic concepts wireless communication and systems, students must acquire the knowledge of Modern Mobile Wireless Communication Systems. Appreciate students with the importance of Multiple Access Technologies in cellular communication, Cellular Communication Networks and Systems, Overview of CDMA systems: IS-95 Networks and 3G – The Universal Mobile Telecommunication System (UMTS).
- The learner must be known about Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra.
- The learner must have a clear understanding of Mobile Internet Protocol Basic Mobile IP, Mobile IP Type-MIPV4 and MIPv6, Mobile IP: Concept, Four basic entities for MIPv4, Mobile IPv4 Operations, Registration, Tunneling, MIPv4 Reverse Tunneling, MIPv4 Triangular Routing, Configuring PDP Addresses on Mobile Station, Mobility Classification, Seamless Terminal Mobility Management, Limitations of current TCP/IP networks for mobility support.

**VLSI & Microelectronics (EC 702)**

**Course Outcome:**

- Students will be able to design, simulate, built and debug complex combinational and sequential circuits based on an abstract functional specification.
- Students will be able to design fundamental units including adder, multiplexers, etc.
- They will be able to design sequential logic circuits using CMOS logic.
- Students will get the knowledge of Micro-electronic Processes for VLSI Fabrication

**Embedded Systems (EC704B)**

**Course outcome:**

- Students are expected to have the overall concepts of Embedded system, microprocessor & microcontroller, hardware architecture of real time systems ,understanding of Embedded system Vs General computing systems.
- Students will learn several communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Internet embedded system network protocols, USB & Bluetooth.
- Students will acquire knowledge on the fundamental issues in Hardware software co-design, Unified Modeling Language (UML), hardware Software trade-offs DFG model, state machine programming model & the model for multiprocessor system.
- Students will learn Operating system basics, tasks, process and threads, multiprocessing and multitasking, task communication, task synchronization, qualities of good Real Time Operating Systems.
- Students will get different examples of embedded system and applications. Popular microcontrollers used in embedded systems, sensors, actuators. After the completion of the course they are also expected to have Programming concepts and embedded programming in C, C ++, JAVA.

**COs of Digital Image Processing (EC 801B).**

- Review the fundamental concepts of a digital image processing system.
- Analyze images in the spacial domain using various transformation function.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques.
- Interpret Image compression standards.
- Interpret image segmentation and representation techniques.

**Material Science & Engineering EC 802B**

**Course Outcome:**

- Explain importance of materials in materials science and engineering field.
  - relate between material and engineering.

- classify materials according to their types.
- describe basic definition and conception of materials and physical properties of materials.
- follow new developments in materials application field.

➢ Give information about atomic structure, atomic bonds, crystal structure, crystal geometry and crystal defects.
- define structure of atoms.
- offer information about mass and count of atoms.
- explain atomic and molecular bonding and variety.
- define space lattice, unit cell, crystal systems and Bravais lattice.
- calculate unit cells and volumetric, planar and linear density values in unit cell.

➢ Explain solidification, crystal defects and diffusion in solids.
- explain solidification of metals and monocrystals.
- describe crystal imperfections.
- investigate atomic diffusion in solids.

➢ Give information about electrical properties of materials.
- examine electical conductivity of solids.
- describe energy model of electrical conductivity.
- compare semiconductors and insulator materials.

➢ Interpret mechanical properties of materials.
- draw strain-stress graph.
- make hardness experiments and calculations.
- investigate fatique, creepbehaviours of metals.

➢ Give information about metal, polymer, ceramic and composite materials and their properties.
- describe metallic materials and properties.
- describe ceramic materials and properties
- get information about polymer based materials and properties.
- describe composite materials.
- compare materials according to their properties.