ECE131:BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Outcomes: Through this course students should be able to

CO1 :: understand the fundamental behaviour of circuit elements and solve dc networks by different circuit reduction techniques.

CO2 :: understand the fundamental behaviour and notations of AC circuits and solve AC circuit problems.

CO3 :: discuss the working principles and applications of transformers and motors.

CO4 :: analyze the functionality of the semiconductor devices and their utilization in the daily life.

CO5 :: administer the application of diodes, MOSFETs and OP-Amp.

CO6 :: schedule the various stages of an embedded systems.

Unit I

Fundamentals of D.C. circuits : resistance, inductance, capacitance, voltage, current, power and energy concepts, ohm's law, Kirchhoff's laws, basic method of circuit analysis, intuitive method of circuit analysis- series and parallel simplification, voltage division rule, current division rule, star–delta transformation, mesh and nodal analysis, introduction to dependent and independent sources, network theorems- superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem

Unit II

Fundamentals of A.C. circuits : alternating current and voltage, concept of notations (i, v, I, V), definitions of amplitude, phase, phase difference, RMS value and average value of an AC signal, complex representation of impedance, steady state analysis of ac circuits consisting of RL, RC and RLC (series), resonance in series RLC circuit, power factor and power calculation in RL, RC and RLC circuits, three-phase circuits- numbering and interconnection (delta or mesh connection) of three phases, relations in line and phase voltages and currents in star and delta

Unit III

Fundamentals of electrical machines : Fleming's left hand and right hand rule, mutual inductance and mutual coupling phenomena in transformer, transformer – working, concept of turns ratio and applications, transformer on DC, instrument transformers, auto-transformer, dc machines- working principles, classification, starting, speed control and applications of dc motors, working principle of single and three phase induction motors, applications of ac motors

Unit IV

Fundamentals of semiconductor devices and digital circuits : digital abstraction- voltage levels and the static discipline, boolean logic, combinational gates, fan-in and fan-out of gates, noise margin in details, pn junction and zener diode characteristics and analysis, testing of diodes and its applications, basic operation and testing of BJT, MOSFET representation and its characteristics, handling of integrated circuits-ESD phenomena

Unit V

Fundamentals of filters and operational amplifier : filter examples- band-pass filter, low-pass filter, high-pass filter, operational amplifier abstraction- device properties of the operational amplifier, simple op amp circuits – virtual ground concept, inverting and non-inverting op-amp, op-amp as an adder and subtractor, op-amp RC circuits – op-amp integrator, op-amp differentiator, op-amp as a comparator and its application in anti-lock braking systems

Unit VI

Fundamentals of embedded system and its application in industrial processes : comparison of microprocessor and micro-controller, types of processors : SOC, ASIC, DSP and FPGA, introduction to embedded system, examples of real-time applications of embedded system : GPOS and RTOS, cyber physical world, role of IOT and cloud computing in condition monitoring of plant processes, health care, agriculture, manufacturing, automobiles and smart grid

Text Books:

1. FOUNDATIONS OF ANALOG AND DIGITAL ELECTRONIC CIRCUITS by AGARWAL, ANANT, AND JEFFREY H. LANG., ELSEVIER

References:

1. FUNDAMENTALS OF ELECTRICAL ENGINEERING AND ELECTRONICS by B.L.THERAJA, S. CHAND & COMPANY

2. INTRODUCTION TO ELECTRONICS by EARL GATES, DELMAR - CENGAGE LEARNING

3. BASIC ELECTRICAL ENGINEERING by D.C. KULSHRESTHA, MC GRAW HILL

4. INTRODUCTION TO EMBEDDED SYSTEMS by K. V. SHIBU, MC GRAW HILL