

## **ES/MC -ELECTRICAL & ELECTRONICS ENGINEERING (3-1-0)**

### **Module I (10 Hours)**

#### **University Portion (80%)**

Fundamentals of Electric Circuits:

DC Circuits: Voltage and current sources (Ideal and Practical), Charge, current, Kirchhoff's laws, circuit elements and their characteristics, Resistance and Ohm's Law, Measuring Devices (Ohm meter, Ammeter, Volt meter). Node voltage analysis, Mesh current analysis, with controlled and uncontrolled sources, superposition, Thevenin's and maximum power transfer Theorem.

AC Circuits: Energy storage elements, time dependent signal sources, solution of circuits containing energy storage elements, phasor solutions of the circuits with sinusoidal excitations, AC circuit analysis. Transient Analysis, Writing differential equations for circuits, Star-Delta Conversion.

#### **College/Institute Portion (20%)**

DC steady state solutions of circuits, Resonance in series and parallel R-L-C circuit, Time response of second-order circuit OR any related topic as decided by the concerned faculty member teaching the subject.

### **Module II (10 Hours)**

#### **University Portion (80%)**

AC Power: Power in AC circuits, Complex Power, Three-phase power, three phase power measurement by 3 and 2 wattmeter methods, Generation and distribution of AC Power. Magnetic Circuits and Transformer: Electricity and Magnetism, Magnetic Circuits, Magnetic Materials and B-H curves, Single phase Transformers: Operating principle, emf equation and turns ratio.

Introduction to Machines: DC Machines, AC Machines

#### **College/Institute Portion (20%)**

Residential Wiring, Grounding and safety, Measurement Systems and Transducers, or any related topic as decided by the concerned faculty member teaching the subject.

### **Module III (12 Hours)**

#### **University Portion (80%)**

Semiconductor Diodes: Intrinsic semiconductors, Doped semiconductors, P-N junction with open circuit, P-N junction with an applied voltage, Ideal Diode, Terminal characteristics of junction diode, modeling the diode forward characteristics, Operation in the reverse breakdown region-Zener Diode, Rectifier circuit, special Diode.

Bipolar Junction Transistors (BJTs): Simplified structure and physical operation of n-p-n and p-n-p transistors in the active region, Current-voltage characteristics of BJT, BJT as an amplifier and as a switch BJT Circuits at DC, Biasing in BJT amplifier circuits, Small Signal Operation of BJT: Simplified hybrid- $\pi$  model and its application to single stage BJT amplifiers (Common-Emitter, Common-Base and Common-Collector configurations)

#### **College/Institute Portion (20%)**

The Operational Amplifier (Op-Amp): The ideal Op-Amp, Inverting and non-inverting configurations, Difference amplifier, CMRR, Application of Op-Amp (Instrumentation amplifier, Summing amplifier, Integrator and Differentiator) OR any related topic as decided by the concerned faculty member teaching the subject.

**Module IV (10 Hours)**

**University Portion (80%)**

Digital Electronic Principles: Introduction, Binary digits, Logic levels and Digital waveforms, Introduction to basic Logic operation, Number system, Decimal numbers, Binary numbers, Decimal-to-Binary conversion, Simple binary arithmetic. Logic Gates, Boolean algebra and Combinational Logic Circuits: The inverter, The AND, OR, NAND NOR, Exclusive-OR and Exclusive-NOR gate, Boolean operations and expressions, Laws and Rules of Boolean algebra, DeMorgan's theorem, Boolean analysis of logic circuits, Standard forms of Boolean expressions, Boolean expression and truth table. Basic combinational logic circuits, Implementation of combinational logic, the universal properties of NAND and NOR gates, Basic adders.

**College/Institute Portion (20%)**

Multiplexers and Demultiplexers. OR any related topic as decided by the concerned faculty member teaching the subject.

**Text Book**

1. Foundations of Electrical Engineering, Leonard S. Bobrow, Oxford University Press, Asian Edition published in 2013.
2. Edward Hughes (revised by Ian McKenzie Smith), "Electrical & Electronics Technology", Pearson Education Limited. Indian Reprint 2002, 10th Edition

**REFERENCE BOOKS**

1. Principles and Applications of Electrical Engg., Rizzoni, McGrawHill.
2. H.Cotton, "Advanced Electrical Technology", CBS Publishers, New Delhi, 7th Edition
3. Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.
4. Microelectronic Circuits (sixth Edition), Adel S. Sedra and Kenneth C. Smith, Oxford University Press,
5. Digital Fundamentals (Eighth Edition), Thomas L. Floyd and R.P. Jain, Pearson Education.
6. Basic Electrical and Electronics Engineering, D P Kothari, I J Nagrath, Mc Graw Hill Education (India) Private Limited, Copyright 2014
7. Basic Electrical and Electronics Engineering, M.S.Sukhija, T.K.Nagsarkar ,Oxford, First published 2012.