2/4 B.Tech. FOURTH SEMESTER

ME4T6 BASIC ELECTRICAL & ELECTRONICS ENGINEERING Credits: 3

Lecture:- 3 periods/week **Internal assessment: 30marks**
Tutorial: - - **Semester end examination: 70 marks**

Objectives:

1. For Computerization of power system operation, the software engineers should have knowledge in basics of Electrical Circuits, and Electrical Machinery and Measuring Instruments.
2. This is achieved from this course. This Course introduces basic electrical elements, and circuits, Description of Alternating Quantities.
3. These are very useful in handling all electrical Commodities. These are widely used in industries. This subject also facilitates to study of the performance of transformers and induction motors which are the major part of industrial drives and agricultural pump.
4. An understanding of how complex devices such as semiconductors diodes and field-effect transistors are modeled and how the models are used in the design and analysis of useful circuits.

Learning outcomes:

At the end of course the students will be able to:

1. Express how to develop and employ circuit's models for elementary electronic components, e.g., resistors, sources, inductors, capacitors, diodes and transistors.
2. Illustrate how the generators, motors and transformers will work
3. Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers.
4. Develop the capability to analyze and design simple circuits containing non-linear elements such as transistors.

Pre Requisites:

Engineering Physics

UNIT - I

BASIC ELECTRICAL CIRCUITS: Basic definitions, Types of network elements, Ohm's Law, Resistive networks, Kirchhoff's Laws, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta-star transformations.

UNIT – II

ALTERNATING QUANTITIES:

Principle of ac voltages, waveforms and basic definitions, relationship between frequency, speed and number of poles, Concepts of AC circuits – rms value, average value, form and peak factors, analysis of ac circuits with network elements (Series RLC network).

UNIT – III

ELECTRICAL MACHINES:

(a) **Direct current machines:** Construction of dc machine, Principle Operation of a dc machine as a generator and motor, Emf Equation of a DC generator, Torque production in a dc motor (Simple problems on Emf equation and torque).

(b) **A.C Machines:** Three phase induction motor, principle of operation, slip and rotor frequency, torque (All the above topics are only elementary treatment and simple problems). Synchronous Machines: Principle of operation of synchronous generator.

UNIT – IV

TRANSFORMERS:

Construction, Principle of operation of single phase transformers –Emf equation – losses –efficiency (All the above topics are only elementary treatment and simple problems).

Learning resources

Text books:

1. V.K.Mehta & Rohit Mehta, Principles of Electrical and Electronics.
2. Nagsarkar,Sukhija, Basic Electrical Engineering, Oxford Publications,2nd edition

Reference books:

1. M.S.Naidu and S.Kamakshiah, Basic Electrical Engineering, TMH Publications
2. Rajendra Prasad, Fundamentals of Electrical Engineering, PHI Publications,2nd edition

Part – B Electronics Engineering

UNIT V

DIODE AND ITS CHARACTERISTICS: PN Junction Diode, Symbol, V-I Characteristics, Diode Applications, Rectifiers – Half wave, Full wave and Bridge Rectifiers (Problems)

UNIT VI

TRANSISTORS: PNP and NPN Junction Transistor, Transistor as an Amplifier, Single Stage CE Amplifier, Frequency Response of CE Amplifier, Concepts of Feedback Amplifier, Necessary conditions for Oscillators, SCR Characteristics and applications

UNIT VII

INDUCTION HEATING: Theory of Induction Heating, Application to Industries
DIELECTRIC HEATING: Theory of Dielectric Heating and its Industrial Applications
RESISTANCE WELDING: Types of resistance welding-Electrical equipment required for resistance welding

UNIT VIII

TRANSDUCERS AND MEASURING INSTRUMENTS: Principles of Strain Gauge, LVDT, Thermocouples, CRO principles and applications
Measurement of Voltage, Current (MI & MC Meters), single phase dynamometer type wattmeter.

Text books:

1. Sudhkar and syam mohan, Networks and electrical circuits
2. Salivahanan, Electronic Devices and Circuits.
3. J.B. Gupta, Utilization of Electrical energy.
4. R.L. Boylestad and Louis Nashelsky, Electronic Devices and Circuits, 9^{th} edition, PEI/PHI 2006.
5. G.K. Mittal, Industrial Electronics, PHI