1/4 B.Tech. SCOND SEMESTER
BASIC ELECTRICAL ENGINEERING

CS 2T2   **Required**   **Credits: 4**
Lecture: 4 periods/week   **Internal assessment: 30 marks**
Tutorial: 1 period /week   **Semester end examination: 70 marks**

Course context and Overview: This course provides comprehensive idea about circuit analysis, working principles of machines and common measuring instruments.

Prerequisites: -

Objectives:
1. To understand basic principles underlying the behavior of "Electric circuits and Magnetic circuits".
2. Different forms of representation of AC quantities and DC Machines, AC machines.
3. Transformers and types of instruments used for measuring electrical quantities.

Learning Outcomes:
The Student will be able to
1.Analyze the electric circuits and magnetic circuits
2.Gain the knowledge regarding generation of electrical energy in DC & AC Machines.
3.Know how the power will be transformed in a transformer.
4.Know the different types of measuring instruments.

UNIT - I
Introduction to Electrical Engineering:

Essence of electricity, Conductors, semiconductors and insulators (elementary treatment only); Electric field; electric current, potential and potential difference, electromotive force, electric power, ohm's law, basic circuit components, electromagnetism related laws,

Magnetic field due to electric current flow ,force on a current carrying conductor placed in a magnetic field, Faradays laws of electromagnetic induction. Types of induced EMF's, Kirchhoff's laws, Simple problems. Introduction to 3 phase circuits and comparision between single phase and three phase.

UNIT-II
Network Analysis:

Basic definitions, types of elements , types of sources, resistive networks, inductive networks, capacitive networks, series parallel circuits, Network theorems- Superposition , Thevenins's, Maximum power transfer theorems and simple problem using independent sources only

UNIT-III Magnetic
Circuits:

Basic definitions, analogy between electric and magnetic circuits, self inductance and mutual inductance, coils connected in series and parallel.

UNIT-IV

Alternating Quantities:

Principle of ac voltages , waveforms and basic definitions, relationship between frequency, speed and number of poles, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits, single phase parallel circuits, single phase series parallel circuits, power in ac circuits.

UNIT-V
Secondary cells:

Led Acid cells, Nickel iron cell, Nickel cadmium cells, construction, principle of operation, charging and discharging, losses and efficiency and maintenance.

UNIT- VI
Transformers:

Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Efficiency and Regulation definitions (All the above topics are only elementary treatment and simple problems).

UNIT-VII
Electrical Machines:

1. Direct current machines: Principle of operation of dc machines, Torque production in a dc machine, Operation of a dc machine as a generator, operation of a dc machine as a motor.
2. C Machines: Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems). Synchronous Machines: Principle of operation.

UNIT VIII
Basic Instruments:

Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters and Voltmeters (elementary Treatment only), Introduction to Digital meters and micro controller base meters.

Learning Resources

TEXT BOOKS:
1. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
2. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshiah – TMH.

REFERENCES:
1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.

2. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson

3. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.