G. NARAYANAMMA INSTITUTE OF TECHNOLOGY & SCIENCE

(For Women)

(AUTONOMOUS)
Shaikpet, HYDERABAD - 500 104

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BASIC ELECTRICAL ENGINEERING

(CSE & IT : I B.TECH-I SEM)
(EEE, ECE & ETE : I B.TECH-II SEM)

Prerequisites: -

Course Objectives:

1. To introduce the concepts of Basic Electrical parameters.
2. To analyze basic concepts of AC & DC circuits.
3. To carry out operational analysis of Electrical Machines, Transformers and power converters.

UNIT 1: (~ 10 Lecture Hours)
Magnetic Circuits and DC Circuits

Magnetic Circuits: Magnetic circuits - MMF, flux, reluctance, Inductance; B-H curve of magnetic materials; Minimization of Hysteresis and Eddy current losses.

DC Circuits: Electrical Circuit elements: R, L and C, voltage and current sources, Star – Delta Transformation, Kirchoff's laws, Nodal and Mesh analysis of simple circuits with dc excitation, Superposition, Thevenin's and Norton's Theorems with independent sources- Simple Problems.

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UNIT 2: (~ 8 Lecture Hours)
AC Circuits

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1-ϕ AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor; Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations, series and parallel resonance.

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3-ϕ AC Circuits: Three phase balanced circuits, voltage and current relations in star and delta connections – Simple Problems.

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UNIT 3: (~ 10 Lecture Hours)
DC Machines and Transformers

Basic Concepts: Faraday's laws of Electromagnetic induction – statically & dynamically induced emf-Lenz's law – Fleming's Right hand rule.

DC Machines: Principle of operation – Construction - working; Types of DC machines-EMF and Torque equation; Torque-Speed characteristics and speed control of separately excited DCMotor - Numerical problems.

Transformers: Ideal and practical transformer, EMF equation, Simple Problems.

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Equivalent circuit - losses in transformers, Three phase transformer connections (Descriptive treatment only).

UNIT 4: (~ 9 Lecture Hours)
AC Machines (Descriptive treatment only)
3ɸ Induction motors: Principle of Operation, Construction of a Three-Phase Induction Motor; Production of rotating magnetic field; slip- frequency of rotor emf – starting Torque – Torque under running conditions. Torque - Slip characteristics.
1ɸ Induction motors: Basic concepts of 1-ɸInduction motors: Split-phase Induction Motor;
Synchronous Machines: Principle of Operation of Synchronous Generators.

UNIT 5: (~ 8 Lecture Hours)
Power Converters & Switchgear (Descriptive treatment only)
Basic Concepts: Basic Semiconductor Devices: Diode, Transistor, SCR;
Power Converters: DC-DC Buck and Boost Converters; Single Phase Inverters- Half & Full, Bridge Configuration (Elementary treatment only).
Switchgear: Introduction to Components of LT (Low Tension) Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB. Types of Wires and Cables, Earthing.

Text Books:
1. T.K.Nagasarkar and M.S.Sukhija, Basic Electrical Engineering, 3rd edition 2018, Oxford University Press.
2. V.K Mehta, Rohit Mehta, Principles of Electrical Engineering, S.Chand Publications.

Reference Books:
1. D.P.Kothari and I.J.Nagrath "Basic Electrical Engineering", 2010, Tata McGraw Hill.
2. V.DelToro, "Electrical Engineering Fundamentals", 1989, Prentice Hall India.
3. D.C.Kulshreshtha, "Basic Electrical Engineering" , 2009, McGraw Hill.

Course Outcomes:
After completion of this course, students will be able to
1. Analyze the basic circuits with application of Network Reduction Techniques and Network Theorems.
2. Understand and analyze magnetic circuits.
3. Analyze the working principles of electrical machines and power converters.
4. Understand the components of low voltage electrical installations.
5. Apply the above conceptual theories to real world Electrical & Electronic problems and applications.
6. Understand and apply the Knowledge of various types of protective systems in real time.