

BE 2102 - BASIC ELECTRICAL ENGINEERING (3-0-0)

This is a foundation course aimed at explaining the basic and underlying principles of Electrical circuits, Electro-mechanical devices used for Generation, Transmission, Distribution, Utilization and Measurement of electric energy.

MODULE-I

(12 Lectures)

1. **Introduction:** Ideal and Practical Sources, Source Conversion, Induced EMF, Energy Stored in Inductor & Capacitor, Electric Power. (1)
2. **DC Networks:** Laws and Theorems applicable to DC networks (KCL & KVL, Node voltage & Mesh current analysis, Delta-Star & Star-Delta conversion, Superposition principle, Thevenin & Norton theorem), Transients in R-L and R-C circuits with DC excitation. (4)
3. **Magnetic Circuits:** Introduction to Electromagnetism, B-H curve, Permeability, Reluctance, Solution of simple magnetic circuits, Hysteresis and Eddy current loss. (3)
4. **D.C. Machines:** Construction, Classification and Principle of operation of DC machines, EMF equation of DC generator, Speed Equation of DC Motor. (3)

MODULE-II

(12 Lectures)

5. **Single-Phase AC Circuits:** Single-phase EMF Generation, Waveform and Phasor representation, Average and Effective value of sinusoids, Peak factor & Form factor, Complex Impedance and Power using j-operator, Power factor. (5)
6. **Three-Phase AC Circuits:** Comparison between single-phase and three-phase systems, Three-phase EMF Generation, Line and Phase quantities in star and delta networks, Power and its measurement in three-phase balanced circuits. (3)
7. **Single-Phase Transformers:** Construction and principle of operation, EMF Equation, Transformation ratio, Practical and Ideal transformers, Transformer losses, Brief idea on transformer phasor diagram and transformer rating. (3)

MODULE-III

(12 Lectures)

8. **Induction Motors:** Introduction to Three-phase and Single-phase Induction Motors, Concept of Slip, Slip-Torque characteristics (no derivations). (2)
9. **Measuring Instruments:** Introduction, PMMC Ammeters and Voltmeters with extension of range, Moving-Iron Ammeters and Voltmeters, Study of Digital Voltmeters and Multi-meters, Dynamometer type Wattmeter, Energy meter. (6)
10. **Power Systems:** Brief idea about various generating plants (Thermal, Hydel, and Nuclear), Transmission, Distribution and Utilization of Electric Energy. (3)

Text Books:

1. Prasanta Kumar Satpathy, "Basic Electrical Engineering", Oxford University Press (Printed in India), First Published-2008, Second Impression-2008.

Reference Books:

2. Hughes, "Electrical & Electronic Technology", Ninth Edition (Revised by J Hiley, K Brown, and I Smith), Pearson Education, First Impression-2007.
3. Nagsarkar & Sukhija, "Basic Electrical Engineering", Oxford University Press (Printed in India), First Published-2005, Third Impression-2006..
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", Prentice-Hall of India, 2nd Printing-2006.