

Basic Electrical Engineering

Course Frame Work

Credits: L-T-P: 3 – 0 – 0

Total Credits: 3

Contact Hours/Week: 4

Direct Teaching Hours: 45

Total Contact Hours: 45

Course Learning Objectives: This course will enable the students to

- Gain the knowledge of basic concepts of electrical engineering and electromagnetism.
- Learn the working of DC Machines for better appreciation of modern technology.
- Learn the working of AC Machines for better appreciation of modern technology.
- understand the basics of wiring in domestic applications and various components and measurement
- learning the applications of various measuring instruments like ammeter, voltmeter, multimeter etc

Course Outcomes: On completion of the course, student would be able to:

| C0s | Course outcomes | RBT |
|-----|---|-----|
| C01 | Identify the basics theorems to get knowledge of DC and AC circuit. | L1 |
| C02 | Illustrate the basic parts, operation, applications of DC machines. | L2 |
| C03 | Illustrate the basic parts, operation, applications of AC machines. | L2 |
| C04 | Explain the domestic wiring and its measurements | L2 |
| C05 | Relate various measuring instruments and its working principle | L2 |

Syllabus

Hours

Module-1

09

ELECTRIC CIRCUITS: Dependent and independent sources – Components – Ohm's law – Kirchhoff's laws – mesh current and node voltage methods – theorems – Thevenin's – Norton's – superposition – maximum power transfer- (DC Analysis only) Phasors – sinusoidal steady state response of simple RLC circuits-Applications.

Module – 2

09

| | |
|--|----|
| DC MACHINES: Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators – Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors– Applications. | |
| Module – 3 | 09 |
| AC MACHINES: Principles of single-phase transformers; EMF equation-Operation of three-phase induction motors-single-phase induction motor – double field revolving theory –starting methods. Principles of synchronous machines –Equation of induced EMF-Applications. | |
| Module-4 | 09 |
| DOMESTIC WIRING: Types of wiring – Single phase and three phase load – Power rating of household appliances – unit measurement and electricity bill calculations – Working principles of fuse – Earthing – MCB – Energy meters construction | |
| Module-5 | 09 |
| MEASUREMENTS AND ITS INSTRUMENTS: Functional elements of measurements – Standards and calibration principles – analog and digital ammeter and voltmeter – Multimeters – DC potentiometer – DC Bridges – Wein bridge, kelvin double bridges | |
| <p>Text Books:</p> <ol style="list-style-type: none"> 1. Nagrath I.J. and D. P. Kothari, “Basic Electrical Engineering”, 3rd edition Tata McGraw Hill, 2009. 2. Hayt and Kimberly, “Engineering Circuit Analysis”, 8th Edition, Tata McGraw Hill, 2013. 3. A.K. Sawhney, ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2010 <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Theodore Wildi, “Electrical Machines, Drives, and Power, Systems”, 5 th edition, Pearson 2007. 2. Hughes, “Electrical Technology”, International Students 9th edition, Pearson, 2005. 3. Vincent Del Toro, 'Electrical Engineering Fundamentals', 2nd Edition, Prentice-Hall, (Pearson Education Inc.), 2007. 4. H.S. Kalsi, ‘Electronic Instrumentation’, McGraw Hill, III Edition 2010. <p>e-Material:</p> <p>Web links and Video Lectures (e-Resources):</p> <p>https://onlinecourses.nptel.ac.in/noc20_mm14/preview</p> <p>https://youtu.be/qyKEw9X-yHQ</p> | |

Activity Based Learning/Practical Based Learning

<http://nptel.ac.in>

<https://swayam.gov.in>

<https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham>

Beyond the syllabus: Ohms law, Resistors in series and parallel, Basics of circuit laws, Fleming left hand rule, Faraday's Law, Types of DC generators, Characteristics of a DC Shunt and DC Series Generators, Characteristics of a DC Compound Motor. Types of Transforms, Transistors.

| Sl. No. | List of Experiments |
|---------|--|
| 1 | To verify the Norton Theorem |
| 2 | To verify the Thevenin Theorem |
| 3 | To study the Load Characteristics of DC shunt generator |
| 4 | To study the Speed Control of DC motor by field resistance control |
| 5 | Determination of Transformer equivalent circuit from Open Circuit and Short Circuit Test |
| 6 | Speed control of slipring Induction Motor |