

16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course provides an in-sight into the functioning of basic electrical components like resistor, inductor and capacitor. It deals with the constructional and operational details of both DC and AC machines. It also deals with the basic electronic components like P-N junction Diode, Zener diode, transistor and their characteristics.

Course Outcomes:

Upon completion of the course, the student will be able to

- CO1: Analyse the resistive circuits and solution of resistive circuits with independent sources.
- CO2: Solve the AC (single and three phases) and DC circuits using different methods.
- CO3: Familiarize the concepts of electro magnetism and it's applications.
- CO4: Explain the types of electrical equipment, machines and its applications.
- CO5: Acquire the knowledge about the characteristics and working principles of semiconductor diodes, Bipolar Junction Transistor.

SKILLS:

- ✓ *Distinguish between linear and nonlinear elements by looking at VI characteristics.*
- ✓ *Develop a simple loop generator.*
- ✓ *Design a voltage regulator using Zener diode.*
- ✓ *Design a half wave rectifier using PN junction diode.*
- ✓ *Design a full wave rectifier using PN junction diodes.*

UNIT - 1 L-9

FUNDAMENTALS OF DC CIRCUITS: Circuit Concepts; Concepts of network- active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements; Ohm's Law; Kirchhoff's Laws; Application to simple series, parallel circuits, mesh and nodal analysis of simple resistive circuits (simple numerical problems).

UNIT - 2 L-9

FUNDAMENTALS OF AC CIRCUITS: Generation of AC voltage - frequency, average value, RMS value, form factor, peak factor for sinusoidal only; Phasor representation of alternating quantities; Analysis of simple series and parallel AC circuits (simple numerical problems).

BALANCED THREE PHASE SYSTEMS: Relation between phase and line quantities of voltages and currents in star and delta connected systems (elementary treatment only).

UNIT - 3 L-9

FUNDAMENTALS OF ELECTROMAGNETISM: Concepts of magneto motive force, reluctance, flux and flux density, concept of self Inductance and mutual Inductance, coefficient of coupling (only elementary treatment and simple numerical problems).

TRANSFORMERS: Principle of operation of single phase transformer, constructional features, EMF equation (simple numerical problems).

UNIT - 4 L-9

DC MACHINES: Constructional details of a DC machine, DC generator, principle of operation; EMF equation, types of DC generators (simple numerical problems).

DC motor- principle of operation, torque equation, types of DC motors (simple numerical problems)

AC MACHINES: Principle of operation of three phase induction motors, slip ring and squirrel cage motors, torque equation, constructional details of synchronous machine.

UNIT - 5 L-9

SEMICONDUCTOR DEVICES: Classification of solids based on energy band theory; Intrinsic and extrinsic semiconductors, P-type and N-type semiconductors, P-N junction diode and its characteristics; Half and full wave rectifiers; Zener diode and its characteristics; Voltage regulator; Bi polar junction transistor, operation, types and applications.

ACTIVITIES:

- *Decode the value of resistors.*
- *Design and fabricate a simple loop permanent magnet generator.*
- *Design and fabricate a simple air cored transformer.*
- *Fabricate full and half wave rectifiers using PN junction diodes.*
- *Fabricate a voltage regulator using Zener diode.*

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

Total hours: 30

1. Verification of Ohm's law.
2. Verification of Kirchhoff's current law.
3. Verification of Kirchhoff's voltage law.
4. Measurement of energy in single phase resistive load circuit.
5. Measurement of Power in single phase resistive load circuit.
6. Transformation ratio of a single phase transformer at different loads.
7. Verification of PN junction diode characteristics under both forward and reverse bias.

8. Verification of Zener diode characteristics under both forward and reverse bias.
9. Implementation of half wave rectifier without filter.
10. Implementation of full wave rectifier without filter.

TEXT BOOKS:

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", 3rd edition, S. Chand Publications, New Delhi, 2010.
2. D.P. Kothari, "Basic Electrical and Electronics Engineering", 1st edition, TMH, New Delhi, 2014.

REFERENCE BOOKS:

1. Millman and Halkias, "Integrated Electronics", McGraw Hill, 1979.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol– II, S. Chand Publications, 2007.
3. U. Bakshi and A. Bakshi, "Basic Electrical Engineering", 1st edition, Technical Publications, Pune, 2005.

WEB LINKS:

1. <http://nptel.ac.in/courses/108108076/>
2. https://books.google.co.in/books/about/Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC