

16EE102 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	-	30	5	40	-	8	5	5

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 D.C & A.C machines. It also deals with the basic electronic components like P-N Junction Diode, Zener diode, Transistor and their characteristics.

Course Outcomes:

The student will be able to:

- understand the notation and usage of components in electric circuits.
- analyze AC (single and three phase) and DC, AC circuits using different methods and laws.
- operate various electrical machines.
- understand the concepts of semiconductor devices and their operation.

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 A.C. CIRCUITS: Generation of A.C. voltage - Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only, Phasor representation of alternating quantities, Analysis of simple series and parallel A.C. 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 D.C. Machine, D.C. Generator, Principle of operation, EMF equation, Types of D.C. generators (simple numerical problems), D.C. Motor, Principle of operation, Torque equation, Types of D.C. motors (simple numerical problems).

A.C 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, Applications.

ACTIVITIES:

- *Decoding 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**Course Outcomes:**

The student will be able to:

- apply the ohm's law, KVL and KCL laws to different circuits.
- calculate the power and energy in electric circuits.
- operate and find the transformation ratio of transformer at different loads.
- study and verify the characteristics of semiconductor devices.
- calculate the efficiency of both HWR and FWR.

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 & 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 & A Bakshi, "Basic Electrical Engineering", 1st edition., Technical Publications, Pune, 2005.

WEB LINKS:

1. [http:// nptel.ac.in/courses/108108076/](http://nptel.ac.in/courses/108108076/)
2. [https:// books.google.co.in/books/about/Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC](https://books.google.co.in/books/about/Basic_Electrical_Engineering.html?id=xN8qZFRkLpYC)