

22EE101 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Hours Per Week :

L	T	P	C
2	0	2	3



Source: <https://vita.vision.org.in/emerging-technologies-in-electrical-engineering/>

PREREQUISITE KNOWLEDGE: Electrostatics and Electromagnetism.

COURSE DESCRIPTION AND OBJECTIVES:

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

MODULE-1

UNIT-1

8L+0T+8P=16 Hours

FUNDAMENTALS OF ELECTRIC CIRCUITS

DC Circuits: Concept 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 resistive circuits with DC source.

AC circuits: Generation of AC voltage, Frequency, Average value, R.M.S. value, Form factor, Peak factor for sinusoidal only.

UNIT-2

8L+0T+8P=16 Hours

SEMICONDUCTOR DEVICES

Classification of semiconductors, P-N junction diode -operation and its characteristics, Half wave rectifier - operation, efficiency; Full wave rectifiers -types, operation, efficiency; Zener diode and its characteristics, Zener diode as Voltage regulator.

Bi polar junction transistor- operation, types (NPN & PNP)

PRACTICES:

- Verification of Ohm's law.
- Verification of Kirchhoff's current law.
- Verification of Kirchhoff's voltage law.
- Determination of R.M.S. Values of sinusoidal waveform.
- Verification of PN junction diode characteristics under both forward and reverse bias.
- Verification of Zener diode characteristics under reverse bias.

MODULE-2

UNIT-1

8L+0T+8P=16 Hours

ANALYSIS OF AC CIRCUITS

Analysis of single- phase ac circuits consisting of R, L, C, RL, RC (series and parallel) (simple numerical problems). Introduction to three phase system, Relation between phase and line quantities of voltages and currents in star and delta connected systems (Elementary treatment only).

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-2**8L+0T+8P=16 Hours****AC MACHINES**

Electromagnetism: Concepts of Magneto motive force, Reluctance, Flux and flux density, Concept of self-inductance and mutual inductance, Coefficient of coupling .

Static AC Machine: Principle of operation of single phase transformer, Constructional features, EMF equation (simple numerical problems).

Rotating AC Machine Principle of operation of three phase induction motor, Slip ring and squirrel cage motors, Torque equation; Constructional details of synchronous machine.

PRACTICES:

- Transformation ratio of a single phase transformer at different loads.
- Measurement of Energy in single phase resistive load circuit.
- Measurement of Power in single phase resistive load circuit.
- Determination of impedance in complex AC circuits.
- Verification of line and phase quantities in a balanced three phase system.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Analyze the resistive circuits with independent sources and find its solution.	Analyze	1,2	1,2,6,9
2	Solve the AC (single and three phase) and DC circuits using different methods.	Apply	1,2	1,2,9,12
3	Apply the concepts of electromagnetism for its applications.	Apply	2	1,2,3,9,12
4	Examine the different electrical equipment.	Evaluate	2	1,2,9,12
5	Acquire the knowledge of semiconductor devices to create circuits.	Create	1	1,2,3,9,12

TEXT BOOKS:

1. V. K. Mehta, "Principles of Electrical Engineering and Electronics", 1st edition, S.Chand & Co., Publications, New Delhi, 2019.
2. D.P. Kothari, "Basic Electrical and Electronics Engineering", 2nd edition, TMH, New Delhi, 2017.

REFERENCE BOOKS:

1. Millman and Halkias, "Electronic Devices and Circuits", Mc Graw Hill, 2006.
2. A.K. Thereja and B.L. Thereja, "Electrical Technology", Vol.-II, S. Chand & Co., Publications, 2020.
3. U. Bakshi and A. Bakshi, "Basic Electrical Engineering", 1st edition, Technical Publications, Pune, Nov 2020.