

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(For CSE, CSE (AI&ML), CSE (DS), IT, MECHANICAL, ME (ROBOTICS),
CHEMICAL)

Course Code: 22EE11D3

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Course Outcomes: At the end of the Course the student shall be able to

CO1: analyze the behavior of an electrical circuit. (L4)

CO2: measure the performance quantities such as losses, efficiency of DC machines (L3)

CO3: measure the performance quantities such as losses, efficiency of AC machines (L4)

CO4: understand the importance and application of p-n junction diode (L3)

CO5: evaluate the configurations and applications of Op-Amps. (L2)

UNIT-I

10 Lectures

BASIC LAWS AND THEOREMS: Ohm's law, Kirchoff's Laws, series and parallel circuits, source transformations, delta-wye conversion. Mesh analysis, nodal analysis. Linearity and superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem with basic problems.

Learning outcomes: Students should be able to

1. apply Ohms and Kirchoff's Laws (L3)
2. analyze theorems such as Linearity & superposition theorem, Thevenin's & Norton's theorem and maximum power transfer theorem. (L4)
3. determine the current, voltage and power in a given electrical circuit (L3)

UNIT-II

10 Lectures

DC MACHINES: Constructional features, induced EMF and torque expressions with simple problems, different types of excitation, performance characteristics of different types of dc machines, 3-point starter, losses and efficiency, efficiency by direct loading with basic problems

Learning Outcomes: Students should be able to

1. understand the constructional features of DC machines. (L2)
2. analyze EMF, torque and performance characteristics of DC machines. (L3)
3. estimate losses and efficiency of electrical machines. (L3)

UNIT-III

10 Lectures

AC MACHINES - Transformers: Constructional details, EMF equation, voltage regulation, losses and efficiency, open, short-circuit tests and determination of efficiency with basic problems.

Three Phase Induction Motors: Construction, working principle, Torque and Torque-Slip characteristics, efficiency with basic problems.

Synchronous Motor: Construction, EMF Equation, working principle.

Learning Outcomes: Students should be able to

1. outline the constructional details and principle of transformers. (L2)
2. analyze the efficiency and voltage regulation of a transformer. (L4)
3. explain the principle of three phase induction motor and synchronous motor. (L2)

UNIT-IV

10 Lectures

SEMICONDUCTOR DEVICES: p-n Junction diode - Basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave, rectifier with filter capacitor), Zener diode as Voltage Regulator; Metal oxide semiconductor field effect transistors (MOSFET): Operation of NMOS and PMOS FETs, MOSFET as an amplifier and switch

Learning Outcomes: Students should be able to

1. analyze the device structure, operation and characteristics of a p-n junction diode. (L3)
2. apply p-n diodes for various applications. (L3)
3. explain the construction, operation and applications of MOSFETs (L2)

UNIT-V

10 Lectures

OPERATIONAL AMPLIFIERS: The Ideal Op Amp, The Inverting Configuration, The closed loop gain, Effect of Finite open-loop gain, The Non Inverting Configuration, The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, the voltage follower, Difference amplifiers, A Single Op-amp difference amplifier.

Learning Outcomes: Students should be able to

1. illustrate the operation of Op Amps. (L2)
2. explain different modes of operation of Op Amps. (L2)
3. make use of Op Amp in different applications. (L2)

Text Books:

1. V. K. Mehta, Rohit Mehta, *Principle of electrical Engineering and electronics*, 3rd edition, S. Chand Publishing, New Delhi, 2016.(Unit-1, 2 and 3)
2. Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 6th edition, Oxford University Press, 2014. (Unit-4 & 5)

Reference Books:

1. S.K. Bhattacharya, *Basic Electrical and Electronics Engineering*, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, *Electronic Devices and Circuits*, 2/e, Pearson Education, 2008.
3. R.K. Rajput, *Basic Electrical and Electronics Engineering*, University Science Press, New Delhi, 2012.

Web References:

1. <https://nptel.ac.in/courses/108/105/108105053/#>
2. <https://nptel.ac.in/courses/108/101/108101091/>