

ELECTRICAL CIRCUIT ANALYSIS-I (Only for EEE during I B.Tech., II semester)

Course Code: EE2T5

Credits : 3

Lecture : 3 periods / week

Internal Assessment : 30 marks

Tutorial : 1 period / week

Semester end examination : 70 marks

Course objectives:

Electrical Circuit Analysis-I is the foundation for all subjects of the Electrical Engineering discipline.

- Apply basic laws: Ohms law, KVL, KCL.
- Analyze resistive networks' and simplify complicated networks.
- Use different circuit analysis techniques: Nodal analysis- mesh analysis to find branch currents and node voltages
- Deal with circuit containing energy storage elements.
- Perform Phasor frequency domain analysis.
- Find the Basic Cut-set and Basic Tie-set matrices for planar networks and duality.
- Know the basic concepts of ac circuits, three phase loads and power measurement for both balanced and unbalanced three phase circuits.

Course Outcomes:

- Apply knowledge of mathematics, science, and engineering to the analysis and design of DC and single phase ac electrical circuits.
- Identify, formulate, and solve engineering problems in the area of Electrical circuits
- Design an electric system, or process to meet desired needs within realistic constraint
- Understand the basic concepts of electrical circuits and also basic laws of electrical circuits and their application to electrical circuits.
- Learns the basic concepts of single phase AC circuits.
- Understand the basic concepts of three phase electrical circuits.
- Can measure the power in both balanced and unbalanced three phase circuits
- Student can do frequency domain analysis.
- Student will get the ability to participate and try to succeed in competitive examinations.

UNIT-I Basic Laws and Network topology

Circuit concepts –Resistor(R)-Inductor (L)-Capacitor(C)-Voltage and Current Sources - Voltage, Current relationship for passive bilateral elements - Ohm's law - Kirchhoff's laws - voltage division, current division - Source Transformation - wye-delta / delta-wye transformation –

Definitions – Graph – node – branch – links – twigs - Tree, co-tree Basic Cut-set and Basic Tie-set matrices for planar networks — Duality & Dual networks.

Unit – II Methods of Analysis:

Nodal analysis - mesh analysis - super node and super mesh analysis of Networks with dependent and independent voltage and current sources for both DC and AC excitation

UNIT-III

Part A: Single Phase A.C Circuits:

Sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J-notation, R.M.S, Average values and form factor for different periodic wave forms - Concept of Reactance, Impedance Susceptance and Admittance-Power Factor and significance-Real and Reactive power, Complex Power.

Part B: Locus diagrams & Resonance:

Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters - Resonance-series, parallel circuits, concept of band width and Q factor.

UNIT-IV Balanced Three phase circuits:

Three phase circuits: Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits- Measurement of Active and Reactive power in balanced Three Phase systems.

UNIT-V Unbalanced Three phase circuits:

Analysis of Three Phase unbalanced circuits-Loop Method- Application of Millman's Theorem- Star Delta Transformation Technique – Two Wattmeter Method of measurement of three phase active and reactive power

Text Books

- "Fundamentals of Electric Circuits "Charles K.Alexander, Mathew N.O.Sadiku, Tata McGraw-Hill.
- Circuits & Networks Analysis & Synthesis by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill.
- 3000 Solved Problems in Electrical Circuit by Schaum's solved problem series Tata McGraw- Hill.
- Circuit Theory by A.Chakrabarti Danapat Rai & Co publisher.

Reference Books:

- Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,Mc Graw Hill Company,6 th edition
- Network Analysis by N.C.Jagan, C.Lakshmi Narayana BS publications 2nd edition
- Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

e-learning resources:

<http://nptel.ac.in/courses.php>

<http://jntuk-coeerd.in/>