FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **III**

Course Code: **202050302**

Course Title: **Electrical Circuit Analysis**

Course Group: **Professional Core Course I**

Course Objectives: Electrical circuits are everywhere, from tiny ones in integrated circuits in mobile phones and music players, to giant ones that carry power to our homes. This course deals with analysis techniques that can be applied to all such circuits. We will first discuss electrical quantities-voltage and current-relevant to such circuits and then move on to general analysis techniques that can be applied to arbitrary circuits. After taking this course, one should be able to analyze any linear circuit.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	1	2	5	50 / 18	50 / 17	25/9	25 / 9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Nodal and Mesh Analysis of Resistive Circuits:** Review of Basic Concepts of Electrical Circuits, Nodal and Mesh Analysis of Resistive Circuits Containing Independent and Dependent Sources, Source Transformation with independent and Dependent Sources, Concept of duality and dual networks.	08
2	**Circuit Theorems:** Analysis of Resistive Circuits Containing Independent and Dependent Sources using following Circuit Theorems - Superposition theorem, Thevenin theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem and Compensation theorem.	08

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3	**Solution of First and Second order networks:** Initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response. Solutions of first and second order Series and parallel R-L, R-C and RLC circuits.	**10**
4	**Electrical Circuit Analysis Using Laplace Transforms:** Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots).	**08**
5	**Sinusoidal steady state analysis:** Representation of sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.	**07**
6	**Two Port Network:** Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.	**07**

List of Practicals / Tutorials:

1	Node and Mesh analysis of circuits with dependent sources
2	To verify the Superposition theorem.
3	To verify the Thevenin and Norton's theorems.
4	To verify the maximum power transfer theorem.
5	To verify the steady-state and transient time-response of R-L circuit.
6	To verify the steady-state and transient time-response of R-C circuit.
7	To verify the steady-state and transient time-response of R-L-C circuit.
8	Circuit analysis using Laplace transformation
9	Sinusoidal steady state analysis of ac circuits
10	Sinusoidal steady state analysis of three-phase and magnetically coupled circuits
11	To verify the impedance parameters for a two port network.
12	To verify the admittance parameters for a two port network.
13	To verify the hybrid parameters for a two port network.
14	To verify the transmission parameters for a two port network.

Reference Books:

1	Charles, K. Alexander, and N. O. Matthew, "Fundamentals of electric circuits", McGraw-Hill Education, 2017.
2	M. E. Van Valkenburg, "Network Analysis", Prentice Hall.
3	W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw-Hill Education
4	K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Publications, 2013.
5	A. A. Nimje and D. P. Kothari, "Electrical Circuit Analysis and synthesis", New Age International Publications, 2017.
6	K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishing,

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Supplementary learning Material:	
1	http://nptel.ac.in/
2	https://swayam.gov.in/

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
40%	20%	20%	10%	10%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Apply fundamental electrical laws and circuit theorems to electrical circuits.	**18**
CO-2	Implementation of the fundamental electrical theorems	**18**
CO-3	Steady state and transient analysis of a given circuit depending on types of elements.	**18**
CO-4	Apply Laplace Transformation technique for electrical circuit analysis	**16**
CO-5	Apply fundamental electrical laws and circuit theorems for AC circuit analysis	**15**
CO-6	Evaluate two-port network parameters	**15**

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Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025

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