25EEMJ204 : Electrical Circuits & Networks

w. e. f. Academic Year:	**2026-27**
Semester:	**3rd**
Category of the Course:	**PCC**
Prerequisite:	
Rationale:	

Course Outcomes:

After Completion of the Course, Student will able to:

	Course Outcome (CO)	RBT Level (Cognitive Domain)	Marks % Weightage
CO1	Understand mesh and nodal analysis techniques to solve DC and AC electrical circuits.	Remember, Understand	30
CO2	Analyze transient behavior of first- and second-order electrical circuits.	Analyze	10
CO3	Apply network theorems and topology methods to simplify electrical networks.	Analyze	20
CO4	Evaluate two-port network parameters and their interrelationships.	Evaluate, Create	20
CO5	Apply and analyze electrical circuit techniques and network concepts to interpret and solve real-life electrical system problems. Network considering sustainability and efficiency.	Apply, Analyze	20

Teaching and Evaluation Scheme:

Teaching Scheme					Examination Scheme				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**Theory**	**CIA**	**Practical**	**Total Marks**
2	0	2	3	4	40	60	30	20	150

IE: Internal Evaluation Theory: Theory Exam (End semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

Detailed Syllabus:

Topic		Hrs.	% of Weightage
UNIT: 1	**Basic Concepts of Circuit:** Basics of circuits and KCL, KVL law, Active and passive elements, Concept of ideal and practical sources. Source transformation, Analysis of networks by Mesh and Node,Duality, Dot convention. Study of basic circuit systems contributing to sustainable mobility.	**8**	**30**
UNIT: 2	**Initial Condition** Initial Conditions in elements, Derivative interpretation, Initial condition evaluation Analysis aimed initial condition used in electrical circuit.	**4**	**10**

UNIT: 3	**Transients in First and Second order linear circuits-RL, RC and RLC** First order differential equation and solution, Time constant, Second order homogeneous differential equation and solution, RL and RC sinusoidal transient. Transient circuit used enhance sustainable in Practice.	**6**	**20**
UNIT: 4	**Network Theorems & Network Topology** Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, Incidence Matrix, Loop or Circuit Matrix, Cut Sets and Cut Set Matrix, Network theorem applied in Electrical, and improving lifecycle sustainability.	**6**	**20**
UNIT: 5	**Two Port Parameters** Z-parameters, Y-Parameters, h- Parameters, g-Parameters, ABCD Parameters, Inverse T Parameters, Relations between various Parameters. Two port network considered enhance sustainable.	**6**	**20**
		30	**100**

List of Practical:

Sr No	Topic	Hrs
1	To Verify Kirchhoff's Voltage Law (KVL)	2
2	To Verify Kirchhoff's current Law (KCL).	2
3	Transient Response of a RL Circuit.	2
4	Transient Response of a RC Circuit.	2
5	To Verify Superposition theorem for Resistive Network.	2
6	To Verify Thevenin's Theorem for Resistive Network.	2
7	To Verify Norton's Theorem for Resistive Network.	2
8	To Verify Maximum Power Transfer Theorem for Resistive Network.	2
9	To Verify Receprocity Theorem for Resistive Network.	2
10	Determination of Z-Parameters of given Two Port Network.	2
11	Determination of Y-Parameters of given Two Port Network.	2
12	Determination of ABCD Parameters of given Two Port Network	2
13	Determination of h- Parameters of given Two Port Network	2
14	Determination of g Parameters of given Two Port Network	2
15	Determination of T Parameters of given Two Port Network	2
		30

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks in Percentage					
Remember	Understand	Apply	Analyze	Evaluate	Create
15	15	20	30	10	10

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 very slightly from above table.

Reference Books:

1. Network Analysis and Synthesis by U.A.Patel11th Edition, Mahajan Publishing House.
2. Circuit Theory (Analysis and Synthesis) By A. Chakrabarti, 6th Edition Dhanpat Rai & Company
3. Network Analysis by M.E.Vanvalkenburg, PHI Publication.
4. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994

Teaching Learning Method

- Chalk and Board teaching
- Multimedia presentations (PPT/animations) for clear conceptual understanding.
- Industrial visits for practical understanding.
- Expert talk from industrial and academic experts.
- Online NPTEL/SWAYAM video lectures.
- Incorporation of SDG-oriented case studies and sustainable design practices.

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/ PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Class Sessions (Lecture)
CO1	Understand mesh and nodal analysis techniques to solve DC and AC electrical circuits.	PO1,PO2,PO9, PSO1	Remember, Understand	Procedural	8
CO2	Analyze transient behavior of first- and second-order electrical circuits.	PO1, PO2, PO4, PO6, PSO1	Analyze	Conceptual	4
CO3	Apply network theorems and topology methods to simplify electrical networks.	PO1, PO2, PO4, PO8, PO10, PSO2	Analyze	Analytical	6
CO4	Evaluate two-port network parameters and their interrelationships.	PO1, PO2, PO3, PO7, PSO2	Evaluate, Create	Conceptual	6
CO5	Apply and analyze electrical circuit techniques and network concepts to interpret and solve real-life electrical system problems. Network considering sustainability and efficiency.	PO1, PO2, PO3, PO5, PO11, PSO1, PSO2	Apply, Analyse	Application	6

Mapping of COs with POs & PSOs:

CO	PO											PSO	
	1	2	3	4	5	6	7	8	9	10	11	1	2
CO1	3	3							2			3	
CO2	3	3		2		1						3	
CO3	3	3		2				1		1			3
CO4	3	3	2				1						3
CO5	3	3	2		1						1	3	3

3: High, 2: Medium, 1: Low,0 → No significant correlation

Sustainable Development Goals (SDG) Integration

This course integrates principles of sustainable engineering by emphasizing efficient Here's a structured SDG Mapping with Course Outcomes (COs) for Network Analysis / Electrical Circuits, with sustainability and efficiency clearly embedded in each outcome. SDG 7 SDG 9 SDG 12 SDG 13 (Sustainable Cities and Communities), and SDG 12 (Responsible Consumption and Production).

SDG Mapping with Course Outcomes

CO	Course Outcome	Relevant SDGs	Justification
CO1	Understand mesh and nodal analysis techniques to solve DC and AC electrical circuits.	SDG 7 SDG 9	Enables efficient circuit design and infrastructure reliability
CO2	Analyze transient behavior of first- and second-order electrical circuits.	SDG 7 SDG 13	Reduces energy loss and protects systems from transient inefficiencies
CO3	Apply network theorems and topology methods to simplify electrical networks.	SDG 9 SDG 12	Promotes simplified, resource-efficient circuit design
CO4	Evaluate two-port network parameters and their interrelationships.	SDG 9 SDG 12	Improves efficient power/signal transfer with minimal losses
CO5	Apply and analyze electrical circuit techniques and network concepts to interpret and solve real-life electrical system problems. Network considering sustainability and efficiency.	SDG 7, SDG 12 SDG 13	Supports sustainable, energy-efficient real-world solutions