22EE230	ELECTRIC CIRCUIT ANALYSIS

Category	L	T	P	Credit
PC	3	0	0	3

Preamble

Electric circuit theory is the fundamental theory upon which all branches of electrical engineering are built. Many areas of electrical engineering, such as power, electric machines, control, electronics, communications, and instrumentation, are based on electric circuit theory. Therefore, the basic electric circuit theory course is the most important course for an electrical engineering student, and always an excellent starting point for a beginner in electrical engineering education. Circuit theory is also valuable to students specializing in other branches of the engineering because circuits are a good model for the study of energy systems in general, and because of the applied mathematics, physics, and topology involved.

Prerequisite

Nil

Course Outcomes

On the successful completion of the course students will be able to

CO Number	Course Outcome Statement	TCE Proficiency Scale	Expected Proficiency in %	Expected Attainment Level %
CO1	**Explain the fundamental components of Electric circuits**	TPS1	80	75
CO2	**Apply** mesh analysis, nodal analysis and network theorems to interpret the behaviour of the given electrical circuit	TPS3	80	75
CO3	**Demonstrate the resonance in series and parallel circuits.**	TPS3	80	75
CO4	**Find** the transient response of the given RL,RC and RLC circuit	TPS3	80	75

CO5	**Calculate** Z, Y ,h, and t parameters of the given two-port network.	TPS3	80	75
CO6	**Calculate** three-phase quantities of the given three phase circuit and mutual inductance of a coupled circuit	TPS3	80	75

Assessment Pattern: Cognitive Domain

Cognitive Levels	Continuous Assessment Tests		Assignment		Terminal Examination
	1	2	1	2	
Remember	10	10			10
Understand	30	30			30
Apply	60	60	100	100	60
Analyse					
Evaluate					
Create					

Assessment Pattern: Psychomotor

Psychomotor Skill	Miniproject /Assignment/Practical Component
Perception	-
Set	-
Guided Response	100
Mechanism	-
Complex Overt Responses	-
Adaptation	-
Origination	-

Syllabus

Electric Circuits: Circuit laws, Sources, Resistance, inductance, capacitance Reactance, Impedance, Types of connections, Equivalent circuit, Phasors, Phasor diagram

Sinusoidal steady state analysis: Mesh and Nodal analysis, Thevenin's Theorem, Norton's Theorem, Superposition theorem, Source transformation theorem and maximum power transfer theorem and frequency response of the circuit – resonance.

Transient Analysis: Source free, Step and sinusoidal response for RL, RC & RLC circuits.

Two-port Networks: Impedance, admittance, Hybrid and Transmission parameter, Inter relation and interconnection of networks, Duality.

Three Phase Circuits: Balanced, unbalanced star – delta connections. Power measurement.

Coupled Circuits: Mutual Inductance, Dot rules, Energy in coupled circuits.

Learning Resources

1. W.H. Hayt & J.K. Kemmerly and Steven M. Durbin, “Engineering circuit analysis”, Tata McGraw Hill, 7th edition, New Delhi, 2007
2. Charles K. Alexander, Matthew N.O. Sadiku, "Fundamentals of Electric Circuits", Tata McGraw Hill, 5th edition, 2013
3. Mahmood Nahvi, Joseph A Edminister, “Electric Circuits”, Tata McGraw - Hill Education, 5th Edition, 2010.
4. Sudhakar A and Shyam Mohan SP, “Electric Circuit Analysis”, Tata McGraw Hill, New Delhi, 2008
5. NPTEL E-Learning Courses: Basic Electrical Circuits https://onlinecourses.nptel.ac.in/noc17_ee13
6. https://www.electrical4u.com

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours	Course Outcome
1.0	**Electric Circuits**		
1.1	Circuit laws, Sources, Resistance, inductance, capacitance Reactance, Impedance	3	CO1
1.2	Types of connections, Equivalent circuit, Phasors, Phasor diagram, Power Triangle	3	CO1
2.0	Steady state analysis		
2.1	Mesh and Nodal analysis,.	2	CO2
2.2	Thevenin’s Theorem, Norton’s Theorem, Superposition theorem	2	CO2
2.2	Source transformation theorem and maximum power transfer theorem and frequency response of the circuit – resonance	2	CO2
2.3	Resonance	2	
4.0	**Transient Analysis**		
4.1	Source free response for RL, RC & RLC circuits.	2	CO4
4.2	Step response for RL, RC & RLC circuits.	2	CO4
4.3	Sinusoidal response for RL, RC & RLC circuits.	3	CO4
5.0	**Two-port Networks**		
5.1	Impedance and admittance parameters	3	CO5
5.1	Hybrid and Transmission parameters	2	CO5
5.2	Inter relation and interconnection of networks	2	CO5
5.3	Duality	2	CO5
6.0	**Three Phase Circuits**		
6.1	Balanced, unbalanced star – delta connections.	2	CO6
6.2	Power measurement	2	CO6
6.3	Mutual Inductance, Dot rule in coupled circuit	2	CO6
	TOTAL	36	

Course Designers:

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