Department of Electrical and Electronics Engineering

COURSE MODULES OF THE COURSE TAUGHT FOR THE SESSION_2024-2025

Course Syllabi with CO's

Faculty Name: **Dr. Parthasarathy L**		Academic Year: 2024-25

Department: **Electrical & Electronics Engineering**

Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours				Total Hrs/ Sessions
				L	T	P	S	
BEE302	**Electric Circuit Analysis**	**IPCC**	Basic Electrical Engineering, Engineering Mathematics –I and II	**3**	**0**	**2**	**0**	40 hours Theory + 10 Lab slots

Objectives

1. To familiarize the basic laws, source transformations, theorems and the methods of analysing electrical circuits.
2. To explain the use of network theorems and the concept of resonance.
3. To familiarize the analysis of three-phase circuits, two port networks and networks with non-sinusoidal inputs.
4. To explain the importance of initial conditions, their evaluation and transient analysis of R-L and R-C circuits.
5. To impart basic knowledge on network analysis using Laplace transforms.

Topics Covered as per Syllabus

Module-1: Basic Concepts: Active and passive elements, Concept of elements and practical sources. star – delta transformation. Analysis of networks by (i) Network reduction method including, (ii) Mesh and Node voltage methods for ac and DC circuits with independent and dependent sources. Concept of Super-Mesh and Super node analysis, Duality.
TLP: Chalk and Board, Problem based learning

Module-2: Network Theorems: Super Position theorem, Thevenin's theorem, Norton's theorem, and Maximum power transfer theorem. (Problems with independent AC and DC sources only).
TLP: Chalk and Board, Problem based learning

Module-3: **Resonant Circuits:** Analysis of simple series RLC and parallel RLC circuits under Resonances. Problems on Resonant frequency, Bandwidth and Quality factor at resonance.
Transient Analysis: Transient Analysis: Behavior of circuit elements under switching action, Evaluation of initial conditions. Transient analysis of RL and RC circuits under DC excitations.
TLP: Chalk and Board, Problem based learning

Module-4: Laplace Transformation: Laplace transformation (LT), Initial and Final value theorems. Solution of electrical circuits using LT.
TLP: Chalk and Board, Problem based learning

Module-5: Unbalanced Three Phase Systems: Analysis of three phase systems (3-wire and 4 wire systems), calculation of real and reactive Powers.
Two Port networks: Definition, Open circuit impedance, Short circuit admittance and Transmission parameters and their evaluation for simple circuits.
TLP: Chalk and Board, Problem based learning

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Practice (Laboratory) Part
(Experiments to be carried out using discrete components)

1) Study of the effect of Open and Short circuits in simple circuits.
2) Determination of resonant frequency, bandwidth, and Q of a series circuit.
3) Determination of resonant frequency, bandwidth, and Q of a parallel circuit.
4) Verification of Thevenin's theorem.
5) Verification of Norton's theorem.
6) Verification of Superposition theorem.
7) Verification of maximum Power transfer theorem.
8) Power factor correction.
9) Measurement of time constant of an RC circuit.
10) Measurement of power in three phase Circuits using two-watt meter method.

List of Text Books

TEXT BOOKS:

1 Engineering Circuit Analysis William H Hayt et al Mc GrawHill 8th Edition,2014
2 Engineering Circuit Analysis J David Irwin et al Wiley India 10th Edition,2014
3 Fundamentals of Electric Circuits Charles K Alexander Matthew N O Sadiku Mc Graw Hill 5th Edition,2013
4 Network Analysis M.E. Vanvalkenburg Pearson 3rd Edition,2014

List of Reference Books

1. **Electric Circuits Mahmood Nahvi Mc Graw Hill 5thEdition,2009**
2. **Introduction to Electric Circuits Richard C Dorf and James A Svoboda Wiley 9thEdition,2015**
3. **Circuit Analysis; Theory and Practice Allan H Robbins Wilhelm C Miller Cengage 5thEdition,2013**

List of URLs, Text Books, Notes, Multimedia Content, etc

1. https://www.youtube.com/watch?v=mNb1DpTjzbM
2. https://nptel.ac.in/courses/108/105/108105159/
3. https://asnm-iitkgp.vlabs.ac.in/exp/rlc-circuit-analysis/simulation.html
4. https://www.circuitlab.com/editor/

Course Outcomes	**At the end of the course the student will be able to:** **CO1: Understand** the basic concepts, basic laws, and methods of analysis of DC and AC networks and reduce the complexity of the network using source shifting, source transformation and network reduction using transformations. **CO2: Solve** complex electric circuits using network theorems. **CO3: Discuss** resonance in series and parallel circuits and also the importance of initial conditions and their evaluation. **CO4: Synthesize** typical waveforms using Laplace transformation. **CO5**: **Solve** unbalanced three-phase systems and also evaluate the performance of two-port networks.

CIE: Theory component are 25 marks and that for the practical component is 25 marks

Theory component (25): Internal Assessment Marks (15) + other assessment (10)

The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC

Practical component (25): 15 marks for the conduction of the experiment and preparation of laboratory record,

and 10 marks for the test to be conducted after the completion of all the laboratory sessions.

The student must secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

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The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's) & Program Specific Outcomes (PSOs)

Course Code:	BEE302	TITLE: Electric Circuit Analysis						Faculty Name:	Dr. Parthasarathy L				
List of Course Outcomes	Program Outcomes (PO's) & Program Specific Outcomes (PSOs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	3	-	-	-	-	-	-	3	3	-	3	3	-
CO-2	3	3	-	-	-	-	-	-	3	3	-	3	3	-
CO-3	3	3	-	-	-	-	-	-	3	3	-	3	2	-
CO-4	2	2	-	-	-	-	-	-	3	3	-	3	2	-
CO-5	3	3	-	-	-	-	-	-	3	3	-	3	2	-

Note: 3= Strong Contribution 2 = Average Contribution 1 = Weak Contribution "-" = No Contribution