

COURSE TITLE	ELECTRICAL CIRCUIT ANALYSIS
COURSE CODE	01EE1301
COURSE CREDITS	5

Objective:

- 1 To provide basic knowledge of fundamental laws of network theorems, Laplace transform and two port networks to make students capable of analysing steady state and transient response of any electrical network.

Course Outcomes: After completion of this course, student will be able to:

- 1 Demonstrate the use of fundamental laws and theorems in electrical circuit.
- 2 Examine the electrical network in time domain and frequency domain.
- 3 Solve two port network using different set of parameters.
- 4 Utilize graph theory concepts to calculate various circuit parameters.

Pre-requisite of course: Fundamental of Physics and Linear algebra

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Network Concept and Theorem: Basic definitions, types of sources, types of networks, , Mesh and Nodal Analysis, Source transformation, Duality, magnetically coupled circuit and Dot convention, Network Theorem: Superposition theorem, Thevenin's theorem, Norton theorem, Maximum power transfer theorem, Milliman's theorem, Reciprocity theorem and Compensation theorem.	12
2	Initial Condition and Transient Response Initial condition in R, L and C passive elements, Transient and steady state analysis of First order and second order circuit with AC and DC supply	12
3	Application of Laplace transform in circuit analysis Laplace transform of standard signals, Shifting theorem, initial and final value theorem, , Solution of circuit equations by Laplace transform, Evaluation of circuit response for unit step, unit ramp, unit parabolic and unit impulse signals, Transfer function representation	10

Contents : Unit	Topics	Contact Hours
4	Two Port Network Classification of networks, Two port parameters (Z, Y, h and ABCD parameters), Condition of Reciprocity and Symmetry, Interrelations between different parameters and series, parallel and cascaded connection of various networks.	12
5	Network Topology Basic concept of graph theory and define various terminology, Formation of incidence matrix, fundamental-tie set and fundamental-cut set matrix, relationship between matrices	10
Total Hours		56

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment No. 01 To verify the Mesh analysis for DC and AC supply by hardware and simulation tool.	2
2	Experiment No. 02 To verify the Node analysis for DC and AC supply by hardware and simulation tool.	2
3	Experiment No. 03 Verification of Superposition Theorem by hardware and simulation tool.	2
4	Experiment No. 04 Verification of Thevenin's and Norton's Theorem by hardware and simulation tool	2
5	Experiment No. 05 Verification Maximum Power Transfer Theorem for DC Circuits by hardware and simulation tool	2
6	Experiment No. 06 Verification of Millman's Theorem by hardware and simulation tool.	2
7	Experiment No. 07 Verification of Reciprocity's Theorem by hardware and simulation tool.	2
8	Experiment No. 08 Verification of various two port parameters by hardware and simulation tool.	2
Total Hours		16

Textbook :

- 1 Network Analysis and Synthesis, U. A. Patel, Mahajan Publishing House, 2007
- 2 Circuit Theory- Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co, 2018

References:

- 1 Network Analysis, Network Analysis, M E Van Valkenburg, Prentice Hall India , 2002
- 2 Network Analysis with Applications, Network Analysis with Applications, William D. Stanley, Pearson Education (I) Ltd., 2007
- 3 Network Analysis and Synthesis, Network Analysis and Synthesis, Franklin F. Kuo, Wiley India Pvt. Limited, 2006

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	30.00	25.00	10.00	5.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- 4 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory.

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/108105159>
- 2 <https://www.coursera.org/learn/linear-circuits-dcanalysis>
- 3 <https://www.edx.org/course/circuits-and-electronics-1-basic-circuit-analysi-2>