

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech.in Electronics and Instrumentation Engineering
Semester:	III
Course Code:	2EI102
Course Title:	Circuit Theory
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical component				C
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. apply the basic concepts of electrical circuits. (BL3)
2. analyse and evaluate parameters of electrical circuits. (BL4)
3. predict the synthesise of electrical networks. (BL6)
4. design and develop electrical circuits. (BL6)

Teaching Hours: 30

Unit	Syllabus	Teaching hours
Unit- I	Introduction to Circuit Theory Electrical components, Classification of Networks., Sources of Energy, Super mesh and Super node, Source Transformation, Duality.	01
Unit- II	Circuit Concepts Super mesh and Super node, Source Transformation, Source of Energy, Duality	04
Unit-III	Network Theorems Superposition Theorem, Thevenin's Theorem, Norton Theorems, Maximum Power Transfer Theorem, Reciprocity Theorem, Millman's Theorem	06
Unit-IV	Initial conditions and Transient Analysis Initial Conditions in Elements, Transients in R-L and R-C Circuits, Transients in RLC Circuits.	04
Unit-V	Two-Port Network Parameters Two-Port Network, Open Circuit Impedance Parameters, Short Circuit Admittance Parameters, Transmission Parameters, Hybrid Parameters, Relationship between parameters, Interconnection of Two-Port Networks	07
Unit-VI	Transform Circuits and Network Functions Representation of Electrical components in S-domain, Terminal Pairs of Ports, Network Functions for Two-Port Networks, Poles and Zeros of the Network Functions.	04
Unit-VII	Network Synthesis Impedance and admittance functions of R-C, R-L and L-C Circuits. Representation of Transfer Functions in Foster and Cauer forms.	04

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

Suggested Reading:

1. William H. Hayt, Jr, Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, Mc Graw Hill.
2. M.E. Van Valkenburg, Printice-Hall.
3. U. A. Patel, Circuits and Networks, Mahajan Publication.
4. K.M. Soni, Circuit Analysis and Synthesis, S.K. Kataria & Sons.

**Suggested List of Experiments (not restricted to the following):
(Only for Information)**

	Title of Experiment	Hrs.
1.	To verify Reciprocity Theorem	2
2.	To verify Thevenin Theorem	2
3.	To verify Norton Theorem	2
4.	To verify Superposition Theorem	2
5.	To verify Maximum Power Transfer Theorem.	2
6.	To determine the z – parameters of a two-port resistive network.	2
7.	To determine the y – parameters of a two-port resistive network.	2
8.	To determine the ABCD parameters of a two-port resistive network	2
9.	Study the transient response of a series RC circuit and understand the time constant concept with square wave.	2
10.	Study the transient response of a series RL circuit and understand the time constant concept with square wave	2
11.	Study the transient response of a series RLC circuit.	2
12.	Study the transient response of a parallel RLC circuit	2

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2023 - 24 and onwards