NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B Tech Electronics and Instrumentation Engineering**
Course Code:	**2EI102CC25**
Course Title:	**Circuit Theory**
Course Type:	**Core**
Year of Introduction:	**2025-26**

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 synthesize of electrical networks. (BL5)
4. design and develop electrical circuits. (BL6)

Unit	Contests	Teaching hours (Total 30)
Unil- I	**Introduction to Circuit Theory** Electrical components, Classification of Networks., Sources of Energy, Super mesh and Super node, Source Transformation, Duality.	03
Unit- II	**Circuit Concepts** Super mesh and Super node, Source Transformation, Source of Energy, Duality	04
Unit-III	**Network Theorems** Maximum Power Transfer Theorem for DC and AC circuits, Reciprocity Theorem, Millman's Theorem, Compensation Theorem	04
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** 04

Impedance and admittance functions of R-C, R-L and L-C Circuits. Representation of Transfer Functions in Foster and Cauer forms.

Self-Study: The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work: Laboratory work will be based on above syllabus with minimum 10 experiments/exercises to be incorporated.

Suggested Readings:

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:

Sr. No.	Name of Experiments/ Exercises	Hours
1.	To verify Reciprocity Theorem	02
2.	To verify Maximum Power Transfer Theorem.	02
3.	To verify compensation theorem.	02
4.	To determine the z – parameters of a two-port resistive network.	02
5.	To determine the y – parameters of a two-port resistive network.	02
6.	To determine the ABCD parameters of a two-port resistive network	02
7.	To determine the Hybrid parameters of a two-port resistive network	02
8.	Study the transient response of a series RC circuit and understand the time constant concept with square wave.	02
9.	Study the transient response of a series RL circuit and understand the time constant concept with square wave	02
10.	Study the transient response of a series RLC circuit.	02
11.	Study the transient response of a parallel RLC circuit	02