Nirma University
School of Technology, Institute of Technology
Instrumentation & Control Engineering

B. TECH. SEMESTER -III

L	T	P	C
3	0	2	4

Course Code **2IC304**

Course Title **Circuit Theory**

Course Learning Outcome:
At the end of the course, students will be able to -

- develop an understanding of the fundamental principles & theorems of electrical networks
- analyze the performance of two port networks
- synthesize electrical networks

Syllabus	**Teaching Hours**
UNIT 1: Basics of Electrical circuits Electrical components, Classification of Networks, Sources of Energy	**4**
UNIT 2: Techniques of Network Analysis Kirchhoff's Laws, The number of Network Equations, Mesh Analysis, Nodal Analysis, Source Transformation, Duality.	**6**
UNIT 3: Network Theorems Superposition Theorem, Thevenin's Theorem, Norton Theorems, Maximum Power Transfer Theorem, Reciprocity Theorem, Millman's Theorem, Substitution Theorem, Compensation Theorem	**8**
UNIT 4: 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.	**7**
UNIT 5 : Initial conditions and Transient Analysis Initial Conditions in Elements, Solution of a First order and Second order differential equations, Transients in R-L and R-C Circuits, Transients in RLC Circuits.	**5**
UNIT 6: Sinusoidal Steady State Analysis Characteristics of Sinusoidals**,** Forced response to Sinusoidal Functions, The Complex Forcing Function, Phasor Diagram.	**3**
UNIT 7: Transform Impedance and Transform Circuits Representation of Electrical components in S-domain, Transform Methods in	**4**

Network Analysis

UNIT 8: Network Functions **4**

Terminal Pairs of Ports, Network Functions for Two-Port Networks, Poles and Zeros of the Network Functions, Time-Domain behavior from the Pole-Zero Plot.

UNIT 9: Network Synthesis **4**

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 semester. Around 10% of the questions will be asked from self study contents.

References:

(1) William H. Hayt, Jr , Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, Mc Graw Hill

(2) U. A. Patel, Circuits and Networks, Mahajan Publication

(3) K.M. Soni, Circuit Analysis and Synthesis, S.K. Kataria & Sons