NIRMA UNIVERSITY

Institute:	**Institute of Technology**
Name of Programme:	**B. Tech. in Electrical Engineering**
Semester:	**III**
Course Code:	**2EE502**
Course Title:	**Network Analysis**
Course Type:	**Core**
Year of Introduction:	**2023 – 24**

L	T	Practical component				C
		LPW	PW	W	S	
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Course Learning Outcomes (CLOs):

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

1. apply basic laws, methods and theorems for analysing electrical circuits **(BL3)**
2. determine the transient and steady-state response of electrical circuits **(BL5)**
3. utilize Laplace transform and Fourier analysis to solve electrical circuits **(BL2)**
4. analyse and simplify two-port networks using their properties and interrelationships **(BL4)**

Syllabus: **Teaching Hours: 30**

Unit-1 **Circuit Fundamentals** **04**

Mesh and Nodal Analysis - Super-mesh and Super-Node Analysis with independent and dependent sources, Duality, Tuned circuits.

Unit-2 **Network Theorems** **05**

Superposition, Thevenin's, Norton's, Maximum power transfer, Tellegen's, Millman's and Reciprocity theorem in DC and AC circuits.

Unit-3 **Time Domain Analysis** **05**

Steady state analysis, initial conditions, procedure for evaluating initial conditions, transient analysis of DC & AC circuits, revisiting concept of phasors.

Unit-4 **Laplace Analysis** **06**

Laplace transform of standard signals, Shifting theorem, initial and final value theorem, solution of circuit equations by Laplace transform, evaluation of circuit response for various signals.

Unit-5 **Fourier Analysis** **05**

Fourier series, evaluation of Fourier coefficients, Fourier transform and its properties, Fourier techniques applied in electrical networks.

Unit-6 **Network Function and Two Port Networks** **05**

Driving point functions, transfer functions, classification of networks, two port parameters (***Z, Y, ABCD, h***), condition of reciprocity and symmetry, interrelations between different parameters and interconnections of various networks.

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.

Laboratory Work:
This shall consist of at least 10 practical / simulations based on the above syllabus.

Suggested Readings:

1. M E Van Valkenburg, Textbook of Network Analysis, Prentice Hall India.
2. A. Chakrabarti , Circuit Theory- Analysis and Synthesis, Dhanpat Rai & Co.
3. U. A. Patel, Textbook of Network Analysis and Synthesis, Mahajan Publishing House.
4. Akhilesh A. Nimje, Electrical Circuit Analysis and Synthesis, New Age International Publishers
5. William D. Stanley, Textbook of Network Analysis with Applications, Pearson Education (I) Ltd.
6. Franklin F. Kuo, Textbook of Network Analysis and Synthesis, Wiley India.
7. Lawrance P. Huelman, Textbook of Basic Circuit Theory, Prentice Hall of India.
8. Alan V. Oppenheim, Alan S.Willsky, S .Hamid Nawab, Signals and Systems, Pearson Education.
9. Alkin Oktay, Signals and Systems, CRC press.
10. A.Anand Kumar Signals and Systems PHI Publication
11. A.Nagoor kani Signals and Systems , Tata McGraw-Hill Education

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

	Title of Experiment	Hrs.
1.	To verify Norton's and Thevenin's theorem.	2
2.	To verify Superposition's and Tellegen's theorem.	2
3.	To verify Maximum power transfer theorem.	2
4.	To determine the Z and Y- parameters of a two-port resistive network.	2
5.	To determine the h and g- parameters of a two-port resistive network.	2
6.	To determine the ABCD parameters of a two-port resistive network and .their cascade connection.	2
7.	To study the response in R-L-C series circuit and determine various time response specifications.	4
8.	To study the time response of First-order RL and RC circuits using MATLAB.	2
9.	To study the frequency Response of Second-order RLC circuits.	2
10.	To design filter circuits and measure its cut-off frequency.	4

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