Course Name	Circuit Theory and Network
Course Code	EE301
Course Credit	3
Contact Hour	3L-1T
Prerequisite	Basic Electrical Engineering (EE101)

Course Objective

The objectives of this course are

1. To prepare students to analysis of any Continuous & Discrete, Fixed & Time varying, Linear & Nonlinear, Lumped & Distributed, Passive & Active networks and systems.
2. To teach principles of Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.
3. To empower students to understand the working of Network equations like Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem, Millman's theorem and its application in three phase unbalanced circuit analysis and Two port networks analysis.
4. To expose the students to the concepts of various types of Transient analysis of different electrical circuits with and without initial conditions using Laplace Transform and also Fourier series and Fourier Transform analysis of different types of waveform.
5. To analyze Graph theory and Networks equations and Filter Circuits.

Course Outcome

On completion of the course students will be able to

1. Understand and explain the Continuous & Discrete, Fixed & Time varying, Linear & Nonlinear, Lumped & Distributed, Passive & Active networks and systems.
2. Analyze the response of Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.
3. Solve two port networks analysis.
4. Analyze Graph theory and Networks equations.
5. Calculate Fourier series and Fourier Transform analysis of different types of waveform, Laplace Transform, Source transformation, Loop variable analysis, Node variable analysis. Network theorem,
6. Formulate and then analyze the Transient analysis of different electrical circuits with and without initial conditions using Laplace Transform and also Fourier series and Fourier Transform analysis of different types of waveform.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	H											
CO 2	H	M	L									
CO 3			M	H								
CO 4			M	H								
CO 5			H									
CO 6			M	H								

Course Content

Introduction:

Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.

Coupled circuits:

Magnetic coupling, Polarity of coils, Polarity of induced voltage, Concept of Self and Mutual inductance, Coefficient of coupling, Modeling of coupled circuits, Solution of problems.

Network equations:

Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.

Two port networks analysis:

Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems

Laplace transforms:

Impulse, Step & Sinusoidal response of RL, RC, and RLC circuits. Transient analysis of different electrical circuits with and without initial conditions. Concept of Convolution theorem and its application. Solution of Problems with DC & AC sources.

Fourier method of waveform analysis:

Fourier series and Fourier Transform (in continuous domain only). Application in circuit analysis, Solution of Problems.

Graph theory and Networks equations:

Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials. Duality, Solution of Problems.

Filter Circuits:

Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of problems.

Text Books:

1. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
2. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
3. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli, 4th edition. Tata Mc Graw Hill Education Pvt. Ltd.
4. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd.

Reference Books:

1. Network Analysis, M.E. Valkenburg, Pearson Education.
2. Fundamental of Electric circuit theory, D. Chattopadhay & P.C. Rakshit,S. Chand.
3. Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly & S.M. Durbin, The Mc Graw Hill Company.
4. Electric Circuit, M. Nahvi & J.A. Edminister, Schum's outline series, The Mc Graw Hill Company.
5. Electric Circuit Analysis, S. Sivanagaraju, G. Kishor, C.Srinivasa Rao, Cengage Learning

6. Fundamental of Electric Circuits, Charles K. Alexander, Mathew. N.O. Sadiu, Tata Mc Graw Hill Education.
7. Engineering Circuit Analysis, W.H. Hayt, J.E. Kemmerly, S.M. Durbin, The Mc Graw Hill Companies
8. Introduction to Electric Circuits, Richard C. Dorf, James A. Svoboda, Wiley India Edition.
9. Electric Circuits, Syed A. Nasar, Schaum's solved problem series, Tata Mc Graw Hill Publishing Company Limited.
10. Transient response of R-L and R-C network: simulation with MATLAB / Hardware