# NETWORK ANALYSIS AND SYNTHESIS

## (Common to ECE, EEE)

**Course Code:13EE1104**

| L | T | P | C |
|---|---|---|---|
| 4 | 1 | 0 | 3 |

### Pre requisites:

Knowledge of Mathematics and Basic Network Analysis.

### Course Educational Objectives:

This course trains the student to think deep into the subject for analyzing the time – domain and frequency domain analysis of systems in general and prepares the student for advanced learning and research.

### Course Outcomes:

Students will be able to solve the Network problems using differential equation approach and transform methods. They will also able to synthesize LC, RC & RL networks.

### UNIT-I (12 Lectures)

**NETWORK TOPOLOGY:**

Linear Graphs in Electrical Networks, Basic Definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-Set Matrices, Graph Theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks.

### UNIT-II (12 Lectures)

**NETWORK ANALYSIS - I (DIFFERENTIAL EQUATION APPROACH):**

Network elements, Initial and final conditions (Constant flux linkage and Charge theorems), Step and Impulse response of RC & RL Circuits (Concept of time constant), Solution of RLC- Series & Parallel circuits for the step and impulse excitations, Analysis of Transformer (Mutual Inductance).

## UNIT-III (12 Lectures)

**NETWORK ANALYSIS USING LAPLACE TRANSFORMS:**

The Transformed Circuit, Thevenin's and Norton's Theorems, The system function (with poles and zeros), the step and impulse responses, the convolution Integral, The Duhamel Superposition Integral.

## UNIT-IV (12 Lectures)

**NETWORK ANALYSIS – II (TWO- PORTS :**

Network functions, Two Port Networks: Z, Y, h and T (ABCD) Parameters, Relationship between Two Port parameters, Transfer function using two port parameters, inter connection of two port networks, Analysis of Ladder networks.

## UNIT-V (12 Lectures)

**SYNTHESIS OF NETWORKS:**

Causality and stability, Hurwitz polynomials, Positive Real Functions, Elementary Synthesis procedure, Properties of LC Immittance functions, Synthesis of LC driving point function by Foster's and Cauer Forms, Properties of RC & RL driving Point Function, Synthesis of RC & RL functions Foster's and Cauer Forms.

## TEXT BOOKS:


1. N.C. Jagan and C. Lakshmi Narayana, *"Network Analysis"*, B.S. Publications, 2nd Edition, 2008. (Unit-I).
2. Franklin F.Kuo, *"Network Analysis and Synthesis"*, Wiley International, 5th Edition, 2012. (Unit-II to Unit-V).


## REFERENCES:


1. M.E. Van Valkenburg, *"Network Analysis"*, Prentice Hall of India Pvt. Ltd., 2000.
2. M.E. Van Valkenburg, *"Introduction to Modern Network Synthesis"*, Wiley Eastern Limited, 1993.
3. Charles K. Alexander, Mathew N.O Sadiku, *"Fundamentals of Electric Circuits"* TMH Education Pvt. Ltd, 3rd Editions, 2008.