

INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

1. **Name of the Academic Unit:** Department of Electrical Engineering

Commented [U1]: Please enter the name in Arial 12 font

2. **Subject Name:** Network Analysis

3. **L-T-P:** 3-1-0

4. **Credits:** 4

Commented [U2]: Please enter the details (use Arial 12 font)

5. **Pre-requisites:**

Commented [U3]: Please enter the pre-requisites (subject name and subject no. in Arial 12 font)

6. **Syllabus and reference books:**

Commented [U4]: 1. Please type the syllabus and reference books in the box provided below.

Syllabus:

This is an introductory subject of Linear Time-Invariant Network Analysis.

Please use "Arial" font with a font size of "12" and a line spacing of 1.0 for syllabus and reference books. Please use Justified Text (Ctrl+J) for the content entered in the boxes
Reference books should be numbered as 1), 2), 3)
Please provide all bibliographic details for the reference books

Reference Books:

1) Network Analysis by M. E. VAN VALKENBURG, Pearson Education India

7. **Lecture-wise break-up:**

Commented [U5]: Please provide lecture-wise break-up in the table given below:

Please use "Arial" font with a font size of "12" and a line spacing of 1.0

Commented [U6]:

| Sl. No. | Topic | No. of lectures |
|---------|--|-----------------|
| 1. | Introduction – Development of the circuit concept, charge, and energy, the relationship between field and circuit, circuit parameters, and conventions. | 1 |
| 2. | Network Equations – Kirchoff's laws, source transformation, loop and node analysis, duality. | 2 |
| 3. | Network Theorems – Thevenin's and Norton's theorem, Superposition and Reciprocity theorem, Maximum power transfer theorem, Millman's theorem, Tellegen's theorem, and Inclusion of dependent source. | 5 |
| 4. | Network Transients – Solution of networks represented by first-order and second-order differential equations, Inclusion of initial condition | 6 |
| 5. | Coupled circuits - Magnetic coupling, dot convention | 2 |
| 6. | Graph Theory – Graph of a network, Trees, Loops, Incidence matrix, Cut Set matrix, Derivation of relationships, Analysis of networks. | 6 |
| 7. | Network under Non-Sinusoidal Input - Steady-state | 2 |

| | | |
|------------------------------|---|-----------|
| | response of a network to non-sinusoidal periodic inputs, Power factor, and Effective values. | |
| 8. | Laplace Transform and Its Use in Network Solution - Region of convergence, Properties of the Laplace Transforms, The Unilateral Laplace Transform and its examples and properties, Inverse Laplace Transform, Initial- and Final-value Theorems, Partial Fraction expansion, Heaviside's theorem, Singularity functions, Waveform synthesis, Analysis of RC, RL, and RLC networks with and without initial conditions using Laplace transforms, Evaluation of initial conditions. | 8 |
| 9. | Network Functions & Two Port Network Parameters – Network functions for One-Port and Two-Port networks, Poles & Zeros of Network Functions, Time domain behavior from Poles & Zeros, Open Circuit Impedance parameters, Short Circuit Admittance Parameters, Transmission Parameters, The Hybrid Parameters, Combination of Two-Port Networks. | 6 |
| 10. | Analog Filters – Introduction to Low Pass, High Pass, Band Pass and Band Reject filters, Brief mention of ideal Operational Amplifier, Second-Order Low Pass and Band Pass filters (e.g., Sallen-Key), Butterworth Filter – Butterworth response – Pole locations – Low Pass filter specification, Chebyshev Filter – The Chebyshev Polynomial – Magnitude response – Location of Poles – filter design | 7 |
| Total number of hours | | 45 |

Commented [U7]: Please convert the template into PDF and upload it in ERP