

**Course Syllabi: UEE405: Network Theory and Design (L : T : P :: 3 : 1 : 2)**

1. **Course number and name:** UEE405: Network Theory and Design
2. **Credits and contact hours:** 8.0 and 6
3. **Text book, title, author, and year**

**Text Books / Reference Books**

- Hayt, W., *Engineering Circuit Analysis*, Tata McGraw–Hill (2006).
- Hussain, A., *Networks and Systems*, CBS Publications (2004).
- Valkenberg, Van, *Network Analysis*, Prentice–Hall of India Private Limited (2007).
- Gayakwad, A. *Op-Amps and Linear Integrated Circuits*, Prentice–Hall of India (2006).
- Chakarbarti, A., *Circuit Theory*, Dhanpat Rai and Co. (P) Ltd. (2006).
- Roy Chowdhury, D., *Networks and Systems*, New Age International (P) Limited, Publishers (2007).
- Sudhakar, A., *Circuits and Networks*, Tata McGraw–Hill (2006).
- Suresh Kumar, K.S. *Electrical circuits and Networks*, Pearson Education, (2009).
  - a. Other supplemental materials
    - Nil

4. **Specific course information**

- a. Brief description of the content of the course (catalog description)

**Graph Theory:** Graph, Tree and link branches, Network matrices and their relations, Choice of linearly independent network variables, Topological equations for loop current and topological equation for nodal voltage, Duality

**Network Theorems:** Source transformation, Superposition Theorem, Thevenin's theorem, Norton's theorem, Millman's theorem, Reciprocity theorem and Maximum power transfer theorem as applied to A.C. circuits, Compensation theorem, Tellegen's theorem and their applications.

**Two Port Networks:** Two port network description in terms of open circuits impedance, Short circuit admittance, Hybrid and inverse hybrid, ABCD and inverse ABCD parameters, Inter-connection of two port network, Indefinite admittance matrix and its applications.

**Network Functions:** Concepts of complex frequency, Transform impedance, Networks function of one port and two port network, concepts of poles and zeros, property of driving point and transfer function.

**Passive Network Synthesis:** Introduction, Positive Real Functions: Definition, Necessary and sufficient conditions for a function to be positive real, Synthesis vs. analysis, Elements of circuit synthesis, Foster and cauer forms of LC Networks, Synthesis of RC and RL networks.

**Filters and Attenuators:** Classification of filters, Analysis of a prototype low pass filter, High pass filter, Band pass filter, Band stop filter, M-derived filter, Attenuation, Types of attenuators: symmetrical and asymmetrical.

**Active Filters and Oscillators:** Introduction to Active filters, first and second order low pass Butterworth filter, First and second order high pass Butterworth filter, Band pass filter, Oscillators: Principles, types, Phase shift Oscillators, Wein Bridge Oscillators, Square wave generators.

**Laboratory Work:**

Verification of Network Theorems, Determination of Z, Y, hybrid and ABCD parameters of two port network, Inter-connection of two port networks, Analysis of T and  $\Pi$ -Attenuator Networks.

#### **5. Specific goals for the course**

After the completion of the course, the students will be able to:

- Apply the various laws and theorems related to electric networks.
- Explain the concept of two port networks.
- Familiarization with network synthesis.
- Theory and designing of passive filters and attenuators.
- Design of active filters.

#### **6. Brief list of topics to be covered**

- Graph Theory
- Network Theorems
- Two Port Networks
- Network Functions
- Passive Network Synthesis
- Filters and Attenuators
- Active Filters and Oscillators