ICE 2154: NETWORK ANALYSIS AND SIGNALS [3 1 0 4]

Hours/ week: 3L+1T **Number of credits: 4**

Course Outcomes: At the end of the course student will be able to

1. Solve linear electrical networks using suitable methodologies.
2. Evaluate initial conditions, transient response and steady state response of first and second order circuits.
3. Analyze the electrical networks in transform domain and determine two port parameters of linear networks.
4. Characterize and perform mathematical operations on signals, classify systems and analyze LTI systems.
5. Understand the use of transforms to analyze signals and systems in continuous time domain.

Course Contents:

Analysis of Circuits with Dependent Sources: Mesh and node variable analysis**,** Network Theorems-Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem. **(8 hrs)**

Initial Conditions and Transient Analysis: Initial and final conditions in elements, geometrical interpretation of derivatives, evaluating initial conditions, Transient analysis of RL, RC and RLC circuits, Networks excited by external sources. **(8 hrs**)

Transform analysis and two port parameters: Applications of Laplace Transform in network analysis, Transform networks, solution for of R-L-C circuits, Network functions, Two port parameters for resistive network: short circuit parameters, open circuit parameters, transmission parameters, hybrid parameters. **(8hrs)**

Signals and Systems: Elementary signals and their characteristics, Operation on Signals, Basic system properties, LTI Systems- Representation of signals in terms of impulses, Convolution sum, convolution integral, properties of LTI systems. (**12 hrs)**

Fourier Analysis for Continuous Time Signals and Systems: Introduction, Response of Continuous time LTI systems to complex exponentials, Fourier series representation of periodic signals, convergence of Fourier series. Representation of non-periodic signals-Fourier transform, Inverse Fourier transform, Properties of Fourier transform, Fourier transform for periodic signals, Application of Fourier transform to systems characterized by linear constant coefficient differential equations. **(12 hrs)**

TEXTBOOKS:

1. Van Valkenberg, *Network Analysis*, 3e, PHI, 2010
2. Allan Oppenheim, Allan Willsky with Ian T Young, ., *Signals and Systems*, PHI, 1999.
3. Hayt W. H., J. E. Kemmerly & S. M. Durbin, *Engineering Circuit Analysis*, 7e, TMH, 2010
4. Schaum's outline series, *Electric Circuits*. MGH, 1992