EE-3003 NETWORK ANALYSIS

COURSE OBJECTIVE

This Course introduces examination of electrical & electronic circuit analysis & synthesis tools & techniques such as the Laplace transform, nodal analysis & two port network theory.

COURSE CONTENT

Introduction to circuit elements R,L,C and their characteristics in terms of linearity & time dependent nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC&RLC Circuits, initial conditions, time constants. Steady state analysis- Concept of phasor & vector, impedance & admittance, Network topology, concept of Network graph, Tree, Tree branch & link, Incidence matrix, cut set and tie set matrices, dual networks, Dot convention, coupling co- efficient, tuned circuits, Series & parallel resonance.

Network Theorems for AC & DC circuits- Thevenins & Norton's, Superpositions, Reciprocity, Compensation, Substitution, Maximum power transfer, and Millman's theorem, Tellegen's theorem, problems with dependent & independent sources.

Frequency domain analysis – Laplace transform solution of Integro-differential equations, transform of waveform synthesized with step ramp, Gate and sinusoidal functions, Initial & final value theorem, Network Theorems in transform domain

Concept of signal spectra, Fourier series co-efficient of a periodic waveform, symmetries as related to Fourier coefficients, Trigonometric & Exponential form of Fourier series.

Network function & Two port networks – concept of complex frequency, Network & Transfer functions for one port & two ports, poles and zeros, Necessary condition for driving point & transfer function. Two port parameters – Z, Y, ABCD, Hybrid parameters, their inverse & image parameters, relationship between parameters, Interconnection of two ports networks, Terminated two port network.

REFERENCES

1. M.E. Van Valkenburg, Network Analysis,Pearson
2. William H Hayt. & Jack E. Kemmerly, Steven M Durbin; Engineering Circuit Analysis;McGrawHill
3. Richard C Dorf, James A Svoboda, Introduction to Electric Circuits, Wiley India, 2015
4. Charles K. Alexander & Matthew N.O. Sadiku: Electrical Circuits; McGrawHill
5. J David Irwin, Robert M Nelms, Engineering Circuit Analysis, Wiley India,2015
6. Robert L Boylestad, introductory circuit analysis, Pearson,2016
7. M S Sukhija, T K Nagsarkar; Circuits and Networks, Oxford University Press, 2015
8. Samarajit Ghosh, Network Theory Analysis and Synthesis

COURSE OUTCOME

Student after successful completion of course must be able to apply the Thévenin, Norton, nodal and mesh analysis to express complex circuits in their simpler equivalent forms and to apply linearity and superposition concepts to analyze RL, RC, and RLC circuits in time and frequency domains and also to analyze resonant circuits both in time and frequency domains.

EVALUATION

Evaluation will be continuous an integral part of the class as well through external assessment. Laboratory assessment will be based on external assessment, assignments, presentations, and interview of each candidate.

Topics for the laboratory (Expandable):

1. To Verify Thevenin Theorem.
2. To Verify Superposition Theorem.
3. To Verify Reciprocity Theorem.
4. To Verify Maximum Power Transfer Theorem.
5. To Verify Millman's Theorem.
6. To Determine Open Circuit parameters of a Two Port Network and to Determine Short Circuit parameters of a Two Port Network.
7. To Determine A,B, C, D parameters of a Two Port Network
8. To Determine h parameters of a Two Port Network
9. To Find Frequency Response of RLC Series Circuit.
10. To Find Frequency Response of RLC parallel Circuit.