Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Second Year Bachelor of EC Engineering

Subject Code: EC-303 -N	Subject Title: NETWORK THEORY

Course Objective:

- To present a problem oriented introductory knowledge of Electrical Engineering Circuits.
- To understand the basics of circuit components, their characteristics and responses
- To solve the networks using various theorems and laws
- To reduce the complex network using network topology

Teaching Scheme (Credits and Hours)

Teaching scheme				Total Credit	Evaluation Scheme					
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	Total Marks
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
03	00	02	05	04	03	70	30	20	30	150

Outline of the Course:

Sr. No.	Title of the Unit	Hours
1	Concepts of Circuits	3
2	Basic Network Analysis methods	8
3	Network Theorems	10
4	Initial Conditions	3
5	Transients in First and Second order linear circuits-RL, RC and RLC	6
6	Fourier Series and Signal Spectra	4
7	Resonance and Filters	4
8	Two Port Parameters	6
9	Network Topology	4

Total hours (Theory): 48

Total hours (Tutorial): 32

Total hours: 80

Detailed Syllabus:

Unit No	Topics	Lectures (Hours)	Weightage
1.	**Concepts of Circuits:** Network classification, Energy sources, V-I relations for R, L and C. Graphical analysis of Voltage, Current and Charge for passive elements, Dot convention	**3**	**25%**
2.	**Basic Network Analysis methods:** Kirchhoff's laws (KVL & KCL), Branch current and mesh currents, Mesh analysis for independent, dependent and sinusoidal sources, Super mesh, Nodal analysis for independent, dependent and sinusoidal sources, Super node, Source transformation techniques, duality concept	**8**	
3.	**Network Theorems** Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tellegen's theorem for DC and AC circuits.	**10**	**25%**
4.	**Initial Conditions** Initial Conditions in elements, Derivative interpretation, Initial condition evaluation	**3**	**15%**
5.	**Transients in First and Second order linear circuits-RL, RC and RLC** First order differential equation and solution, Time constant, Second order homogeneous differential equation and solution, RL and RC sinusoidal transient	**6**	
6.	**Fourier Series and Signal Spectra** Discrete spectra and symmetry of waveform, exponential form of Fourier series, Fourier transform and continuous spectra, and steady state response of a network to non-sinusoidal periodic inputs	**4**	**15%**
7.	**Resonance and Filters** Behaviors of series and parallel resonant circuits Introduction to band pass, low pass, high pass and band reject filters.	**4**	
8.	**Two Port Parameters** Z-parameters, Y-Parameters, h- Parameters, g-Parameters, ABCD Parameters, Inverse T Parameters, Relations between various Parameters.	**6**	**10%**
9.	**Network Topology** Introduction, Definitions, Incidence Matrix, Loop or Circuit Matrix, Cut Sets and Cut Set Matrix	**4**	**10%**
	Total	48	100%

Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carry an importance of ten marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar/Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Learning Outcomes:

- The student can be acquired the basic knowledge of electric circuits, electrical fundamentals, thus being prepared to pursue any area of engineering spectrum in depth as desired.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use.

TEXT BOOKS:

- Network Analysis and Synthesis by U.A.Patel11th Edition, Mahajan Publishing House.
- Sudhakar, A., Shyammohan, S. P.; “Circuits and Network”; McGraw-Hill.

REFERENCE BOOKS:

- Circuit Theory (Analysis and Synthesis) By A. Chakrabarti, 6th Edition Dhanpat Rai & Company.
- Network Analysis by M.E.Vanvalkenburg, PHI Publication.
- Linear Circuit Analysis by De Carlo/Lin 2nd Edition, Oxford University Press Indian

LIST OF EXPERIMENTS

Sr. No.	Experiment Title
1.	To Verify Kirchhoff's Voltage Law (KVL) and Kirchhoff's current Law (KCL).
2.	To Verify Superposition theorem for Resistive Network.
3.	To Verify Thevenin's Theorem for Resistive Network.
4.	To Verify Norton's Theorem for Resistive Network.
5.	To Verify Maximum Power Transfer Theorem for Resistive Network.
6.	Transient Response of a RL Circuit.
7.	Transient Response of a RC Circuit.
8.	Determination of Z-Parameters of given Two Port Network.
9.	Determination of Y-Parameters of given Two Port Network.
10.	Determination of ABCD Parameters of given Two Port Network.
11.	First order filters-Low Pass Filter, High Pass Filter
12.	Filter design using LabView