GIANI ZAIL SINGH CAMPUS COLLEGE OF ENGINEERING & TECHNOLOGY, MRSPTU, BATHINDA-151001

Department of Electronics & Communication Engineering

TEACHING PLAN

NETWORK THEORY: ANALYSIS & SYNTHESIS (BECES1-304)

L T P C 3 1 0 4 **Duration: 60 Hrs**

COURSE OBJECTIVES:

1. To introduce nodal, mesh analysis and network theorems for network analysis.
2. To give knowledge of Trigonometric, exponential Fourier series and Laplace transforms along with its properties.
3. To provide overview of network functions and network synthesis techniques.
4. To familiarize with the classifications of filters and their design.

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Apply Laplace Transform for steady state and transient analysis.
4. Determine different network functions.
5. Appreciate the frequency domain techniques.
6. Students will be able to design analog filters.

SYLLABUS CONTENTS

UNIT-I (15 Hrs)

FUNDAMENTALS OF NETWORK ANALYSIS: Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactances, Source transformation and duality.

NETWORK THEOREMS: Superposition, Reciprocity, Thevenin"s, Norton"s, Maximum Power Transfer, Compensation and Tallegen's theorem as applied to A.C. circuits.

UNIT-II (15 Hrs)

TRIGONOMETRIC AND EXPONENTIAL FOURIER SERIES: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra.

LAPLACE TRANSFORMS AND PROPERTIES: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

UNIT-III (15 Hrs)

NETWORK FUNCTIONS: Transient behaviour, concept of complex frequency, Driving points and transfer functions, poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and Two port network and interconnections, Behaviour of series and parallel resonant circuits.

UNIT-IV (15 Hrs)

NETWORK SYNTHESIS: Fundamental concepts of network synthesis, Hurwitz Polynomials, Properties of RC, RL & LC networks, Foster and Cauer forms of realization.

NETWORK FILTERS: Classification of filters, characteristics impedance and propagation constant of pure reactive network, Design of constant-K, m-derived and Composite filters.

TEXT/REFERENCE BOOKS:

1. Van, Valkenburg.; “Network analysis”; Prentice hall of India, 2000
2. Sudhakar, A., Shyammohan, S. P.; “Circuits and Network”; Tata McGraw-Hill New Delhi,1994
3. A William Hayt, “Engineering Circuit Analysis” 8th Edition, McGraw-Hill Education
4. Chakrabarti A., “Network Analysis and Synthesis” DhanpatRai& Co.

Chp.	Proposed Month(s)	Proposed Hrs.	Lec.	Topic/Content to be Covered
				UNIT 1
FUNDAMENTALS OF NETWORK ANALYSIS	Jul 2019	07Hrs	L-01	Syllabus Discussion along with Course Objectives and Outcomes
			L-02	Introduction to Network Analysis & Synthesis, Network Basics
			L-03	Node analysis
			L-04	Mesh analysis
			L-05	Matrix approach of network containing voltage & current sources & reactances
			L-06	---Do---
			L-07	Source transformation and duality
NETWORK THEOREMS	Jul/Aug 2019	08Hrs	L-08	Introduction to various network theorems and their applications
			L-09	Superposition theorem
			L-10	Reciprocity theorem
			L-11	Thevenin's theorem
			L-12	Norton's theorem
			L-13	Maximum Power Transfer theorem
			L-14	Compensation theorem
			L-15	Tallegen's theorem as applied to A.C. circuits.
				UNIT 2
TRIGONOMETRIC AND EXPONENTIAL FOURIER SERIES	Aug 2019	07Hrs	L-16	Introduction
			L-17	Discrete spectra and symmetry of waveform,
			L-18	Steady state response of a network to non-sinusoidal periodic inputs
			L-19	Power factor
			L-20	Effective values
			L-21	Fourier transform and continuous spectra.
			L-22	---Do---
LAPLACE TRANSFORMS AND PROPERTIES	Aug/Sep 2019	08Hrs	L-23	Introduction to Laplace Transform and its properties
			L-24	Partial fractions
			L-25	Singularity functions
			L-26	Waveform synthesis
			L-27	Evaluation of initial conditions.
			L-28	Analysis of RC network with and without initial conditions with Laplace transforms
			L-29	Analysis of RL network with and without initial conditions with Laplace transforms
			L-30	Analysis of RLC network with and without initial conditions with Laplace transforms
				UNIT 3
NETWORK FUNCTIONS	Sep/Oct 2019	**15Hrs**	L-31	Introduction
			L-32	Transient behaviour
			L-33	Concept of complex frequency
			L-34	Driving points and transfer functions
			L-35	---Do---
			L-36	Poles and zeros of immittance function and their properties
			L-37	---Do---
			L-38	Sinusoidal response from pole-zero locations
			L-39	---Do---
			L-40	Convolution theorem
			L-41	Two port network and interconnections
			L-42	Behaviour of series resonant circuits
			L-43	---Do---
			L-44	Behaviour of parallel resonant circuits
			L-45	---Do---

Chp.	Proposed Month(s)	Proposed Hrs.	Lec.	Topic/Content to be Covered
			UNIT 4	
NETWORK SYNTHESIS	Oct/Nov 2019	07Hrs	L-46	Fundamental concepts of network synthesis
			L-47	Hurwitz Polynomials
			L-48	Properties of RC, RL & LC networks
			L-49	---Do---
			L-50	Foster and Cauer forms of realization.
			L-51	---Do---
			L-52	---Do---
NETWORK FILTERS	Nov 2019	08Hrs	L-53	Classification of filters
			L-54	Characteristics impedance and propagation constant of pure reactive network
			L-55	---Do---
			L-56	Design of constant-K filters
			L-57	---Do---
			L-58	Design of m-derived filters
			L-59	---Do---
			L-60	Composite filters

1ST MID SEMESTER TEST: 17TH - 21TH SEP., 2019

2ND MID SEMESTER TEST: 18TH - 22ND NOV., 2019

(SUKHJINDER SINGH)

PLACE: BATHINDA
DATED: 16.07.2019