



Course title	Electrical Networks and Systems									Course No	EE5003			
Department	Electrical Engineering	New Credits	L	T	E	P	O	C	T H	Old Credits	L	T	P	C
			3	1	0	0	6	10	10		3	1	0	4
Offered for	MTech, MS, PhD									Status	New			
Faculty	Shanthi Pavan, Nagendra Krishnapura, Vinita Vasudevan, Saurabh Saxena, Qadeer Khan, Aniruddhan S									Type	Theory			
Pre-requisite										To take effect from	01-06-2019			
Submission date	Date of approval by DCC			Date of approval by BAC						Date of approval by Senate				
01-05-2019	08-04-2019													

Objectives:

This course will introduce students to circuits-oriented aspects of electrical systems, with an introduction to networks, feedback, noise, and effects of nonlinearity and time variance. The target audience will consist of first-semester graduate students. At the end of this course, the student will be able to understand and analyze the effects of feedback, noise, nonlinearity and time variance on circuits and systems.

Course Contents:

1) Circuits and Networks:

Review of nodal analysis/modified nodal analysis and basic circuit theorems. Nodal analysis with controlled sources and magnetically coupled systems. Resonant circuits.

2) 2-port networks, small signal analysis:

Linear two port networks and network theorems. Small signal analysis of networks.

3) Transmission lines:

2-port networks at high frequencies, s-parameters. Lumped vs distributed representations. Lossless vs lossy transmission lines. Special cases - quarter wavelength; short, open and matched loads.

4) Ideal opamps, feedback (system level):

Basics of operational amplifier. Op-amp based building blocks. Feedback theory, negative/positive feedback. Stability criteria, review of bode plot with gain and phase margin. Compensation.

5) Introduction to noise in circuits:

Thermal noise in resistors. Noise analysis in networks (including controlled sources). Input referred current and voltage sources. Noise correlation.

6) Nonlinearity, time variance:

Representations and effects of nonlinearities and time variance in circuits. Effects on noise.

Text Books:

None.

Reference Books:

- Behzad Razavi, "Design of Analog CMOS Integrated Circuits," McGraw Hill Education; Second edition (1 November 2017), ISBN-13: 978-9387067844
- Charles A. Desoer & Ernest S. Kuh, "Basic Circuit Theory," McGraw-Hill Book Company, 1969.