### Academic Course Description

# BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Electrical and Electronics Engineering BEE402ELECTRICAL NETWORK ANALYSIS & SYNTHESIS Fourth Semester (EvenSemester)

## **Course (catalog) description**

To give the students a fair knowledge on the networks and on the filter designs.

Compulsory/Elective course	:Compulsory for EEE students
Credit hours& contact hours	:3 & 45 hours
Course Coordinator	: Mrs. S. Sherine
Instructors	:Mrs. S. Sherine

Name of the	Class	Office	Office	Email (domain:@	Consultation
instructor	handling	location	phone	bharathuniv.ac.in	
Mrs.Sherine	Second year EEE	KS 101	04422290125	sherine07@gmail.com	12:30pm- 1:30pm

## **Relationship to other courses:**

Pre – requisites :BEE 301 Circuit Theory

Assumed knowledge :The students will already have basic circuits analysis knowledge.

# Syllabus Contents

## UNIT I NETWORK THEORY

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Network graph, tree and cut sets – tie sets and cut sets schedules – Y shift and I shift – Primitive impedance and admittance matrices.

# UNIT II LAPLACE AND FREQUENCY DOMAIN ANALYSIS

S Domain network, Driving and Transfer impedence and their properties – Transform network analysis – Poles and Zeros of network functions – Time response from pole zero plots-Frequency response of RLC network – Frequency response from pole zero plots.

# UNIT III TWO PORT NETWORKS

Characterization of two port networks in term of Z, Y, H, T parameters and A, B, C, D parameters – Network equivalence – relation between network parameters – analysis of T ladder bridge – T and lattice networks – Transfer function of terminated two port networks.

## UNITIV ELEMENTSOFNETWORKSSYNTHESIS

Reliability of one port network – Hurwitz polynomial and properties – Positive and Real function and properties – synthesis of RL, RC and LC networks.

## UNIT V DESIGN OF FILTERS

Filters and attenuator – Design of constant K, M – derived and composite filters – qualitative treatment of a active filters – Butterworth and Chebyshev filters.

## Text book(s) and/or required materials

T1:Sudhakar and Shyammohan, "Network Analysis & Synthesis".
T2:Paranjothi S.R. "Electrical Circuit Analysis", New Age International, 2<sup>nd</sup> Edition 1994.
T3: Van Valkenberg M.E. "network Analysis" – Prentice Hall of India Pvt Ltd. Delhi, 3<sup>rd</sup> edition 1994.

## **Reference Books:**

 $R_1$ : EuoF.F."Network Analysis and Synthesis" – Wiley international Edition, 2<sup>nd</sup> edition – 1996.  $R_2$ : http://www.mathworks.com/access/helpdesk/help/toolbox/Network theory/

## Computer usage: NIL

Professional component		
General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	100%

Broad area : Circuit Theory | Electrical Machines | Electronics | Power System | Control & Instrumentation

## **Test Schedule**

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	February 2 nd week	Session 1 to 18	2 Periods
2	Cycle Test-2	March 2nd week	Session 19 to 36	2 Periods
3	Model Test	April 3rd week	Session 1 to 45	3 Hrs
1	University	TBA	All sessions / Units	3 Hrs.
+	Examination			

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# Mapping of Instructional Objectives with Program Outcome

		Correlat	es to
To give the students a fair knowledge on the networks and on the filter		program	l
designs.	outcome		
	Н	Μ	L
CO1: To understand basics of network topologies and the tieset and cutset schedules.	b	a,e,g,j,l	c,d,k
CO2: Able to relate pole and zero locations to characteristics of time-domain functions and frequency domain functions	a, b	e	c,d,j,k
CO3: Analyze the given network using different two port network parameters.	a,d,e	b,g	c,d,j,k
CO4: Understand basics of network synthesis.	a,d,e	b,g	
CO5: Identify the characteristics of Filters and determine the parameters for the design of various Filters& attenuators	a,d,e	b,c,g,l	j,k

H: high correlation, M: medium correlation, L: low correlation

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter
UNIT I	NETWORK THEORY		
1.	Network Theory Introduction	Yes	
2.	Network graph, tree and cut sets	Yes	
3.	tie sets set schedules	Yes	
4.	cut sets schedules	Yes	
5.	tie sets and cut sets schedules	Yes	
6.	V shift and I shift	Yes	
7.	Primitive impedance Matrix	Yes	
8.	Admittance matrices	Yes	
9.	Review Of unit 1	Yes	
UNIT II	LAPLACE AND FREQUENCY DOMAIN ANA	ALYSIS	
10.	S Domain network	Yes	
11.	Driving and Transfer impedance and their	Yes	
	properties		
12.	Transform network analysis	Yes	$[T_1] / (nptel$
13.	Poles and Zeros of network functions	Yes	lectures)
14.	Time response from pole zero plots	Yes	
15.	Frequency response of RLC network	Yes	
16.	Frequency response from pole zero plots.	Yes	
17.	Review Of unit 2	Yes	
18.	Surprise Test	Yes	
	TWO PORT NETWORKS	Vaa	
19.	Z, Y, H, T parameters	res	
20.	Characterization of two port networks in term of A B C D parameters	Yes	
21.	Problems based on above	Yes	$[T_1] / (nptel$
22.	Network equivalence – relation between network	Yes	lectures)
	parameters		
23.	Analysis of T ladder bridge	Yes	
24.	T and lattice networks	Yes	
25.	Transfer function of terminated two port networks	Yes	
26.	Transfer function of terminated two port networks	Yes	
27.	Review Of unit 3	Yes	
UNITIV	ELEMENTSOFNETWORKSSYNTHESIS		

28.	Introduction	No	
29.	Hurwitz polynomial and properties	Yes	
30.	Positive and Real function and properties	Yes	
31.	Synthesis of RL networks	Yes	$\begin{bmatrix} \mathbf{I}_1 \end{bmatrix} / (\text{IIPter})$
32.	Synthesis of RC networks	Yes	iectures)
33.	Synthesis of LC networks	Yes	
34.	Problem Discussion	Yes	
35.	Review Of unit 4	Yes	
36.	Surprise Test	Yes	
UNIT V	DESIGN OF FILTERS		
37.	Filters and attenuators	Yes	
38.	Design of constant K	Yes	
39.	M – derived filters	Yes	
40.	Composite filters	Yes [T <sub>1</sub> ] / (nptel lectures)	
41.	Qualitative treatment of a active filters	Yes	
42.	Butterworth filters	Yes	
45.	Chebyshev filters	Yes	

# **Teaching Strategies**

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures
- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.
- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.
- Small periodic quizzes, to enable you to assess your understanding of the concepts.

## **Evaluation Strategies**

Cycle Test – I	-	05%
Cycle Test – II	-	05%
Model Test	-	10%
Attendance	-	05%
SEMINAR&ASSIGNMENT	-	05%
Final exam	-	70%

**Prepared by**: Mrs. S. Sherine Dated :

# Addendum

## ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:

- a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.
- b) An ability to identify, formulate, and solve engineering problems.
- c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- d) An ability to design and conduct experiments, as well as to analyze and interpret data.
- e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- f) An ability to apply reasoning informed by the knowledge of contemporary issues.
- g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- h) An ability to understand professional and ethical responsibility and apply them in engineering practices.
- i) An ability to function on multidisciplinary teams.
- j) An ability to communicate effectively with the engineering community and with society at large.
- k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.
- 1) An ability to recognize the need for, and an ability to engage in life-long learning.

## **Program Educational Objectives**

#### **PEO1: PREPARATION**

Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

#### **PEO2: CORE COMPETENCE**

Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

#### PEO3: PROFESSIONALISM

Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

#### **PEO4: SKILL**

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

#### **PEO5: ETHICS**

Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
Mrs. S. Sherine	

Course Coordinator (Mrs. S. Sherine) HOD/EEE

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