Course Description

SRM University
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

EC1011 Transmission Lines and Networks

Fourth Semester, 2014-15 (Even semester)

Course (catalog) description

The course gives a strong foundation on the theory of transmission line and networks by highlighting their applications.This course deals with transmission line parameters, lossy and lossless lines, matching of transmission lines to their loads.This course gives idea about Smith Chart, Single and double stub matching and field analysis of transmission lines and waveguides.This course introduces different types of passive filters,Attenuators and Equalizers

Instructional Objectives (IOs):

1. To become familiar with propagation of signals through lines.
2. Calculation of various line parameters by conventional and graphical methods.
3. Need for impedance matching and different impedance matching techniques.
4. Design of different types of filters, equalizer and attenuators.

Compulsory/Elective course: Compulsory

Credit hours: 3 credits

Course coordinator(s)

Mrs .A.Maria Jossy, Assistant Professor (O.G), Department of ECE

Instructor(s)

Name of the instructor	Class handling	Venue	Class hours	Email @ktr.srmuniv.ac.in	Consultations
Mrs. A. Neelaveni Ammal	A	TP12S4	Day1-2nd hour, Day2-6thhour,Day5-1st hour	neelaveni.m	1.00PM -1.30PM
Mr. B. Viswanathan	B	TP10S5	Day1-2nd hour, Day2-6thhour,Day5-1st hour	viswanathan.b	1.00PM -1.30PM
Mrs. A. Maria Jossy	C	TP12S5	Day1-2nd hour, Day2-6thhour,Day5-1st hour	mariajossy.a	1.00PM -1.30PM
Ms. D. Vijayalakshmi	D	TP1203 A	Day1-2nd hour, Day2-6thhour,Day5-1st hour	vijayalakshmi.d	1.00PM -1.30PM
Dr. P. Eswaran	E	TP12S2	Day1-2nd hour, Day2-6thhour,Day5-1st hour	Eswaran.p	1.00PM -1.30PM
Mrs. S.	F	TP1003	Day1-5thhour, Day2-	kolangiammal.	1.00PM -1.30PM

Kolangiammal		A	2nd hour,Day3-7th hour	s	
Mr. S. Bashyam	G	TP103A	Day1-5thhour, Day2-2nd hour,Day3-7th hour	bashyam.s	1.00PM -1.30PM
Mr. S. Yuvaraj	H	TP10S4	Day1-5thhour, Day2-2nd hour,Day3-7th hour	yuvaraj.s	1.00PM -1.30PM
Mrs. P.Ponnammal	I	TP1006 A	Day1-5thhour, Day2-hour,Day3-7th hour	ponnammal.p	1.00PM -1.30PM
Mrs. A. Anilet Bala	J	TP1103 A	Day1-5thhour, Day2-hour,Day3-7th hour	aniletbala.a	1.00PM -1.30PM
Mrs. Charumitra Agarwal	K	TP1203 A	Day1-5thhour, Day2-hour,Day3-7th hour	charumitra.a	1.00PM -1.30PM

Relationship to other courses

Pre-requisite : EC1005- Electromagnetic Theory and Waveguides

Assumed knowledge : Basic knowledge in Electromagnetic theory and Electric circuits

Following courses : EC1021- Antenna and Wave propagation

Text book(s) and/or required materials

1. John D.Ryder, *"Networks, Lines and Fields"*, PHI, 2009.
2. Sudhakar. A, Shyammohan S Palli, *"Circuits and Networks – Analysis and Synthesis"*, Tata McGraw Hill, 4th Edition, 2010.

References

1. Umesh Sinha, *"Transmission Lines and Network"*, Satya Prakashan Publishing Company, New Delhi, 2012.

Professional component

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

Broad area: Communication | **Signal Processing** | Electronics | VLSI | Embedded

Course objectives

The objectives of this course is to	Correlates to Program Objective
1. To become familiar with propagation of signals through lines	(2)
2. Calculation of various line parameters by conventional and graphical methods	(3)
3. Need for impedance matching and different impedance matching techniques	(2)

4. To analyze and design various types of passive filters	(4),(5)
5. To analyze and design various types of Attenuators and Equalizers	(4)

Course Learning Outcome

This course provides the foundation education in Transmission line theory and networks. Through lecture, laboratory, and out-of-class assignments, students are provided learning experiences that enable them to:	**Correlates to program outcome**		
	H	**M**	**L**
1. To discuss the fundamentals of transmission line theory and impedance matching in high frequency lines.	b	j	k
2. Analyze and design various passive filters, Attenuators and Equalizers.	b	k	j

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

Test Schedule

S. No.	Test	Portions	Duration
1	Cycle Test-1	Session 1-09	2 Periods
2	Cycle Test-2	Session 10-27	2 Periods
3	Model Test	Session 1-45	3 Hrs

Detailed Session Plan

Session#	Topics	Problem Solving (Yes/No)	Text Book[ ] /Chapter
1.	**Unit I TRANSMISSION LINE THEORY:** General Theory of Transmission Lines	No	[1] /Chapter -6
2.	Transmission line-General Solution-Voltage and Current equation	Yes	[1] /Chapter 6
3.	Physical significance of Infinite Line	Yes	[1] /Chapter 6
4.	Computation of Secondary Constants of Transmission Lines-Z_0, γ, α, β, λ, V	Yes	[1] /Chapter 6
5.	Computation of Primary Constants of Transmission Lines (R, L, G, C). Waveform Distortion – Frequency Distortion and Phase Distortion. Distrotionless Condition	Yes	[1] /Chapter 6
6.	Loading and different methods of loading	Yes	[1] /Chapter 6
7.	Line not terminated in Z_0(Open and Short Circuited Lines)-Reflection Coefficient	Yes	[1] /Chapter 6
8.	Calculation of current , voltage, power delivered and efficiency of transmission	Yes	[1] /Chapter 6

9.	Input and Transfer Impedance, Z_{OC},$Z_{SC,}$ Reflection Factor and Reflection loss	Yes	[1] /Chapter 6
10	**Unit II HIGH FREQUENCY TRANSMISSION LINES:** Transmission line equations at radio frequencies- Line of Zero dissipation	Yes	[1] /Chapter 1 [1]/ Chapter 7
11	Voltage and current on the dissipationless line, OC and SC lines	Yes	[1]/ Chapter 7
12	Standing Waves, Nodes and Antinodes , Standing Wave Ratio and its relation with Reflection Coefficient	Yes	[1]/ Chapter 7
13	Input impedance of the dissipation less line, Impedance of Open and Short line	Yes	[1]/ Chapter 7
14	Problems :Calculation of $V_{max,}$ V_{min}, I_{max}, I_{min}, S, K	Yes	[1]/ Chapter 7
15	Problems :Input Impedance, Location of V_{max}, V_{min}	Yes	[1]/ Chapter 7
16	Power and impedance measurement on lines	Yes	[1]/ Chapter 7
17	Measurement of VSWR and wavelength	Yes	[1]/ Chapter 7
18	Problems: calculation of VSWR	Yes	[1]/ Chapter 7
19	**Unit III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES** Need for Impedance Matching Techniques and its type , Quarter wave transformer	Yes	[1]/ Chapter 7
20	Impedance matching by stubs :Single stub matching – Derivation of distance between Stub and node point	Yes	[1]/ Chapter 7
21	Single stub matching – Derivation of Length of the stub	Yes	[1]/ Chapter 7
22	Disadvantage of Single Stub matching- Need of Double Stub Matching and its concept	No	[1]/ Chapter 7
23	Introduction to Smith Chart- Types of Circles and importance of R=1 Circle	No	[1]/ Chapter 7
24	Problem : Using Smith Chart find S, Vmax, Vmin and K for the given load impedance	Yes	[1]/ Chapter 7
25	Problem : Using Smith Chart find Input Impedance and Load Impedance	Yes	[1]/ Chapter 7
26	Problem : Single Stub Matching using Smith chart	Yes	[1]/ Chapter 7
27	Tutorial Problem 4: Double Stub Matching using Smith chart	Yes	[1]/ Chapter 7
28	**Unit IV Passive filters** Characteristic impedance of symmetrical networks – filter fundamentals	No	[2]/ Chapter 16
29	Characteristics of the Filter, Design of Filter – Constant K Low Pass Filter	Yes	[2]/ Chapter 16
30	Design of Filter – Constant K High Pass Filter	Yes	[2]/ Chapter 16
31	Design of Filter – Constant K Band Pass Filter	Yes	[2]/ Chapter 16
32	Design of Filter – Constant K Band Elimination Filter	Yes	[2]/ Chapter 16
33	m-Derived Filters, m-Derived Low Pass Filter	Yes	[2]/ Chapter 16
34	m-Derived High Pass, Band Pass Filters	Yes	[2]/ Chapter 16
35	m-Derived Band Stop Filters, Composite Filters	Yes	[2]/ Chapter 16
36	**UNIT V ATTENUATORS AND EQUALIZERS** Attenuators – Symmetrical Attenuators	Yes	[2]/ Chapter 16

37	Symmetrical T Attenuator	Yes	[2]/ Chapter 16
38	Symmetrical Π Attenuator, Symmetrical Bridged –T-Attenuator	Yes	[2]/ Chapter 16
39	Symmetrical Lattice Attenuator, Asymmetrical T and L-Attenuator	Yes	[2]/ Chapter 16
40	Asymmetrical Π Attenuator	Yes	[2]/ Chapter 16
41	Equalizers – Classification, Series and Shunt Equalizer, Inverse Impedance	Yes	[2]/ Chapter 16
42	Inverse Network	Yes	[2]/ Chapter 16
43	Full Series Equalizer, Full Shunt Equalizer, Constant resistance T Equalizer	Yes	[2]/ Chapter 16
44	Constant resistance Π Equalizer , Constant resistance Lattice Equalizer, Bridged T network	Yes	[2]/ Chapter 16
45	Bridged T network	Yes	[2]/ Chapter 16

Evaluation methods

Attendance	-	5%
Cycle Test – I	-	10%
Cycle Test – II	-	10%
Model Test	-	20%
Surprise Test	-	5%
Final exam	-	50%

Prepared by:, Mrs .A.Maria Jossy, Assistant Professor (O.G), Department of ECE

Dated: 5th January 2015 **Revision No.:** 00 **Date of revision:** NA

Addendum

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

a. Graduates will demonstrate knowledge of mathematics, science and engineering.

b. Graduates will demonstrate the ability to identify, formulate and solve engineering problems.

c. Graduate will demonstrate the ability to design and conduct experiments, analyze and interpret data.

d. Graduates will demonstrate the ability to design a system, component or process as per needs and specifications.

e. Graduates will demonstrate the ability to visualize and work on laboratory and multi-disciplinary tasks.

f. Graduate will demonstrate the skills to use modern engineering tools, software's and equipment to analyze problems.

g. Graduates will demonstrate the knowledge of professional and ethical responsibilities.

h. Graduate will be able to communicate effectively in both verbal and written form.

i. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.

j. Graduate will develop confidence for self education and ability for life-long learning.

k. Graduate will show the ability to participate and try to succeed in competitive examinations.

Program Educational Objectives

1. To prepare students to compete for a successful career in Electronics and Communication Engineering profession through global education standards.
2. To enable the students to aptly apply their acquired knowledge in basic sciences and mathematics in solving Electronics and Communication Engineering problems.
3. To produce skillful graduates to analyze, design and develop a system/component/ process for the required needs under the realistic constraints.
4. To train the students to approach ethically any multidisciplinary engineering challenges with economic, environmental and social contexts
5. To create awareness among the students about the need for life long learning to succeed in their professional career as Electronics and Communication Engineers.

Course Teachers	Class	Signature
Mrs. A. Neelaveni Ammal	IV Sem ECE-A	
Mr. B. Viswanathan	IV Sem ECE-B	
Mrs. A. Maria Jossy	IV Sem ECE-C	
Ms. D. Vijayalakshmi	IV Sem ECE-D	
Dr. P. Eswaran	IV Sem ECE-E	
Mrs. S. Kolangiammal	IV Sem ECE-F	
Mr. S. Bashyam	IV Sem ECE-G	
Mr. S. Yuvaraj	IV Sem ECE-H	
Mrs. P.Ponnammal	IV Sem ECE-I	
Mrs. A. Anilet Bala	IV Sem ECE-J	
Mrs. Charumitra Agarwal	IV Sem ECE-K	

Course Coordinator
(Mrs.A.Maria Jossy)

Academic Coordinator
(Mrs. N. Saraswathi)

Professor In-Charge
(Dr. B. Ramachandran)