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DHANALAKSHMI SRINIVASAN
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COURSE PLAN

Subject code: EC8651	**Branch/Year/Sem/Section: B.E ECE/III/VI**
Subject Name: TRANSMISSION LINES AND RF SYSTEMS	**Batch:2017-2021**
Staff Name:T.V.Vanitha	**Academic year:2019-2020**

COURSE OBJECTIVE

1. To introduce the various types of transmission lines and its characteristics
2. To give thorough understanding about high frequency line, power and impedance measurements
3. To impart technical knowledge in impedance matching using smith chart
4. To introduce passive filters and basic knowledge of active RF components
5. To get acquaintance with RF system transceiver design

TEXT BOOK:

1. John D Ryder, ―Networks, lines and fields‖, 2nd Edition, Prentice Hall India, 2015. (UNIT IIV)
2. Mathew M. Radmanesh, ―Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition,2002. (UNIT V)

REFERENCES:

1. Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.
2. D. K. Misra, ―Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.
3. E.C.Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005

WEB RESOURCES

W1: www.srmuniv.ac.in/openware_d_loads/u2L4.ppt
W2 :http://cc.ee.ntu.edu.tw/~thc/course_mckt/note/note2.pdf
W3: www.cdeep.iitb.ac.in/nptel/Electrical%20…/Lec25(m4).html

TEACHING METHODOLOGIES:

- BB - BLACK BOARD
- PPT - POWER POINT PRESENTATION

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	C
EC8651	**TRANSMISSION LINES AND RF SYSTEMS**	**3**	**0**	**0**	**3**

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV WAVEGUIDES 9

General Wave behavior along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides.

UNIT V RF SYSTEM DESIGN CONCEPTS 9

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors Basic concepts of RF design, Mixers, Low noise amplifiers, voltage control oscillators, Power amplifiers, transducer power gain and stability considerations.

TOTAL: 45 PERIODS

Topic No	Topic Name	Books For reference	Page No	Teaching Methodology	No of periods required	Cumulative periods
UNIT I	**TRANSMISSION LINE THEORY**					**(9)**
1.	Introduction	T2	1.1	BB	1	1
2.	General theory of Transmission lines the transmission line	T2	1.2,	BB	1	2
3.	wavelength, velocity of propagation	T2	1.5-1.12	BB	1	3
4.	Waveform distortion – the distortion-less line	T2	1.17-1.20	BB	1	4
5.	Loading and different methods of loading	T2	1.12-1.14	BB	1	5
6.	Calculation of Current, Voltage, Power transmission	T2	1.14-1.16	BB	1	6
7.	Open and short circuited lines	T1	252-261	PPT	1	7
8.	Input transfer impedance	T1	261-264	PPT	1	8
9.	reflection factor and reflection	T1	264-274	PPT	1	9
LEARNING OUTCOME: **At the end of unit , the students will be able to** • Understand the concept of propagation of signals through transmission lines.						
UNIT II	**HIGH FREQUENCY TRANSMISSION LINES**					**(9)**
10.	Transmission line equations at radio frequencies-Line of zero dissipation	T1	105-110	BB	1	10
11.	Standing Waves	T1	115-122	BB	1	11
12.	Nodes Standing Wave Ratio	T1	261-283	BB	1	12
13.	Input impedance of the dissipation-less line	T1	163-183	BB	1	13
14.	Voltage and current on the dissipation	T1	203-212	BB	1	14
15.	Power and impedance measurement on lines	T1	213-223	BB	1	15

16.	Reflection losses	T1	315-317	BB & VIDEO	1	16
17.	Measurement of VSWR and wavelength	T1	322-327	BB	1	17
18.	Input impedance of the dissipation-less line	T1	333-337	BB	1	18

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand the concept of Power and impedance measurement on lines
- Reflection losses

UNIT – III	**STORAGE MANAGEMENT**					**(9)**
19.	Impedance matching	T2	3.1-3.5	BB	1	19
20.	Quarter wave transformer	T2	3.5-3.14	PPT	1	20
21.	Impedance matching by stubs - Single stub and double stub matching	T2	3.35-3.41	BB	1	21
22.	Smith chart	T2	3.15-3.21	BB	1	22
23.	Solutions of problems using Smith chart	T2	3.22-3.27	BB	1	23
24.	Solutions of problems using Smith chart	T2	3.22-3.27	BB	1	24
25.	Single and double stub matching using Smith chart	T2	3.29-3.33	BB	1	25
26.	Single and double stub matching	T2	3.29-3.33	BB	1	26
27.	Single and double stub matching using Smith chart	T2	3.29-3.33	BB	1	27

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand & Analyze signal propagation at Radio frequencies.

UNIT IV	**FILE SYSTEMS AND I/O SYSTEMS**					**(9)**
28.	General Wave behavior along uniform guiding structures	T1	143-146	BB	1	28
29.	Transverse Electromagnetic Waves	T1	152-162	BB	1	29
30.	Transverse Electric Waves	T1	174-179	BB	1	30
31.	Transverse Magnetic Waves	T1	179-181	BB	1	31
32.	TM and TE Waves between parallel plates	T1	162-168	BB	1	32

33.	Field Equations in rectangular waveguides	T2	4.39-4.40	BB	1	33
34.	Bessel Functions	T1	315-317	BB	1	34
35.	TM waves in Circular waveguides	T1	322-327	PPT	1	35
36.	TE waves in Circular waveguides	T1	333-337	BB	1	36

LEARNING OUTCOME:

At the end of unit , the students will be able to

- Understand the concept of Wave Behaviour
- Bessel Functions

UNIT V	**RF SYSTEM DESIGN CONCEPTS**					**(9)**
37.	Active RF components	T1	781-786	BB	1	37
38.	Semiconductor basics in RF	T1	789-791	BB	1	38
39.	bipolar junction transistors	T1	792-799	BB	1	39
40.	RF field effect transistors	T1	800-808	BB	1	40
41.	High electron mobility transistors	T1	815-817	BB	1	41
42.	Basic concepts of RF design	T1	809-818	BB	1	42
43.	Mixers, Low noise amplifiers	T1	657	PPT	1	43
44.	voltage control oscillators, Power amplifiers	T1	661	PPT	1	44
45.	transducer power gain and stability considerations.	T1	672	PPT	1	45

LEARNING OUTCOME:

At the end of unit , the students will be able to

- RF System Design Concepts

COURSE OUTCOME

At the end of the course, the student should be able to:

- Explain the characteristics of transmission lines and its losses
- Write about the standing wave ratio and input impedance in high frequency
- transmission lines Analyze impedance matching by stubs using smith charts
- Analyze the characteristics of TE and TM waves
- Design a RF transceiver system for wireless communication

CONTENT BEYOND THE SYLLABUS

Input impedance of lossless lines
Inductance loading of telephone cables.

CONTINUES INTERNAL ASSESSMENT DETAILS

ASSESMENT NUMBER	I	II	MODEL
TOPIC NO.(UNIT)	1-18 (1st & 2nd units)	19-36 (3rd & 4th units)	1-45 (units 1-5)

ASSIGNMENT DETAILS

ASSIGNMENT NUMBER	I	II	III
TOPIC NUMBER FOR REFERENCE	1-18 (1st & 2nd units)	19-36 (3rd & 4th units)	1-45 (units 1-5)
DEAD LINE			

ASSIGNMENT NUMBER	BATCH	DESCRIPTIVE QUESTIONS/TOPIC (Minimum of 8 Pages)
I	B1	1. Waveform distortion 2. Open and short circuited lines 3. Measurement of VSWR and wavelength
II	B1	1. Smith chart 2. Solutions of problems using Smith chart 3. Single and Double stub matching using Smith chart.
III	B1	1. TM and TE waves in Circular waveguides 2. Transducer power gain and stability considerations 3. High electron mobility transistors

PREPARED BY **VERIFIED BY**

T.V.VANITHA, AP/ECE **HOD/ECE**

APPROVED BY

PRINCIPAL