

KL UNIVERISTY
FIRST SEMESTER 2010-11
Course Handout
Academic Division

Dated: 07-07-2010

Course No. : EC C205
Course Title : Network and Transmission Lines
Course Structure : 3-1-0
Course coordinator : Mr D S Ram Kiran
Instructors : Ms.K. Nalini, YSV Raman, Ujwaldeep,

1. Course Description:

The main objective of an engineering course in Electronics & Communication Engineering is to prove the technical viability of the new technology, together with, as appropriate, its possible economic advantages. Demonstration activities are expected to speed up the adoption of new communication techniques by reducing the techno-economic uncertainties and risks associated with innovation, and to enhance the attractiveness of new technology and its approaches in industries and services. To analyze the ethical, social and legal issues raised by specific applications of electronics and communications in view of their being taken into account in public policy deliberations. 3rd generation (3G) UMTS (Universal Mobile Telephone Systems) of selected topics will be promoted, particularly as regards: channel capacity and quality improvement, signal processing algorithms developments, co-channel interference strategies etc.

To provide application oriented teaching with live demonstrations. To motivate the students in developing instruments and gadgets of social importance and also to design the products for real life problems. To train the students right from 2nd year to make him directly fit in the industrial and R&D environment.

2. Scope and Objective of the Course:

The scope and objective of this course is to learn about Network functions for the one port and two port, and network functions in Unit 1. In unit 2, Properties of symmetrical networks, Filter performance, different types of filters, Filter circuit design is studied. In unit 3 different types of attenuators, different types of Equalizer and their characteristics are studied. In unit IV Network Synthesis, Positive real functions, Reactance functions, RC and RL functions, Two Port functions, Minimum Phase Network, FOSTER and CAUER methods of Synthesis are studied. In unit V Transmission lines, Types of transmission lines, Applications transmission lines, Smith chart and applications, stubs, Double stubs are studied.

3. Books:

(i) Textbook:

- a. John D Ryder, "Networks, Lines And Fields", 2nd Edition, Pearson, 2003.
- b. M. E.Van Valkenburg, "Network Analysis", 3rd Edition Pearson Education, 2003

(ii) Reference Book:

- a. **A.P.Godse & U.A.Bakshi "Network Analysis" Technical Publishers.**
- b. K.M.Soni, "Circuits & Systems", Katson Publilishers.
- c. P.Ramesh Babu, "Network Analysis", Scietech, 2008

4. Syllabus:

UNIT –I: NETWORK FUNTIONS:

Network functions for the one port and two port, Poles and Zeros, Poles and zeros of network functions, Restrictions on pole and zero locations for driving point functions and transfer functions, Time domain

UNIT – II: FILTERS:

Characteristic impedance of symmetrical networks, Properties of symmetrical networks, Filter fundamentals, Pass and stop bands, Characteristic impedance, Constant K low pass filter, Constant K high pass filter, m - derived T section, m - derived π Section, Variation of characteristic impedance over the pass band, Termination with m-derived half section, Band pass filters, Filter circuit design, Filter performance, Composite filters.

UNIT: III: ATTENUATORS:

Symmetrical and Asymmetrical attenuators, T-type attenuator, π -type attenuator, Lattice attenuator, Bridged T attenuator, L-type attenuator.

EQUALIZERS:

Equalizer configuration, Inverse network, Two terminal equalizer, Constant resistance equalizer, Full series equalizer, Full shunt equalizer, Bridged –T equalizer, Lattice equalizer.

UNIT: IV: NETWORK SYNTHESIS:

Positive real functions, Reactance functions, RC and RL functions, Two Port functions, Minimum Phase Network, FOSTER and CAUER methods of Synthesis.

UNIT – V: TRANSMISSION LINES:

Types of transmission lines, Applications transmission lines, Equivalent circuit of a pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, Lossless transmission lines, Distortion less line, Phase and Group velocities, loading of lines, Input impedance of transmission line, RF lines, Relation between reflection coefficient, load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio(VSWR), Lines of different lengths- $\lambda/8$, $\lambda/4$, $\lambda/2$ lines, Losses in transmission lines, Smith chart and applications, stubs, Double stubs.

5.Course Plan:

Lecture No	Learning objectives	Topics to be covered	Reference	Page No
1	Network functions for the one port and two port	Derivations, Network functions for the one port and two port, problems	T1	T1 74
2	Poles and Zeros of network functions	Derivations, Poles and Zeros of network functions, problems	T1	T1 81-85
3	Poles and Zeros of network functions	Poles and Zeros of network functions, problems	T1	T1 87-91
4	Restrictions on pole and zero locations for driving point functions and transfer functions,	Restrictions on pole and zero locations for driving point functions and transfer functions, problems	T1	T1 37-44
5	Restrictions on pole and zero locations for driving point functions and transfer functions,	Restrictions on pole and zero locations for driving point functions and transfer functions, problems	T1	T1 43-44
6	transfer functions	transfer functions, problems	T1	T1 64-80
7	Time domain	Time domain, problems, problems	T1	T1 398-400
8	Characteristic impedance of symmetrical networks	Derivations, Characteristic impedance of symmetrical networks, problems	T1	T1 410-420
9	Properties of symmetrical networks, Filter fundamentals	Properties of symmetrical networks, Filter fundamentals, problems	T1	T1 421-423
10	Filter fundamentals, Pass and stop bands, Characteristic impedance	Filter fundamentals, Pass and stop bands, Characteristic impedance, problems	T1	T1 411
11	Constant K low pass filter, Constant K high pass filter	Constant K low pass filter, Constant K high pass filter' problems	T1	T1 111-115
12	m - derived T section, m - derived π Section	m - derived T section, m - derived π Section, problems	T1	T1 119-122
13	Variation of characteristic	Variation of characteristic impedance over the pass	T1	T1 126-128

	impedance over the pass band	band, problems		
14	Termination with m-derived half section	Derivations, Termination with m-derived half section, problems	T1	T1 134, 139
15	Band pass filters	Band pass filters, problems	T1	T1 141
16	Filter circuit design	Filter circuit design, problems	T1	R1 4.36
17	Filter performance	Filter performance, problems	T1	T1 6.25
18	Composite filters.	Composite filters. problems	T1	T1 4.45
19	Symmetrical and Asymmetrical attenuators, T-type attenuator	Derivations, Symmetrical and Asymmetrical attenuators, T-type attenuator, Problems	T1	T1 276
20	□ -type attenuator, Lattice attenuator,	□ -type attenuator, Lattice attenuator, Problems	T1	T1 280
21	L-type attenuator	L-type attenuator, Problems	T1	T1 167-169
22	Equalizer configuration, Inverse network	Equalizer configuration, Inverse network, Problems	T1	T1 169
23	Two terminal equalizer	Two terminal equalizer, Problems	T1	T1 174
24	Constant resistance equalizer, Full series equalizer	Constant resistance equalizer, Full series equalizer, Problems	T1	T1 177-178
25	Full shunt equalizer,	Full shunt equalizer, Problems	T1	T1 5.23
26	Bridged –T equalizer, Lattice equalizer.	Bridged –T equalizer, Lattice equalizer, Problems	T1	T1 5.8
27	Positive real functions	Derivations, Positive real functions, Problems	T1	T1 217-219
28	Reactance functions	Reactance functions, Problems	T1	T1 219 225-226
29	RC and RL functions	RC and RL functions, Problems	T1	T1 227
30	Two Port functions	Two Port functions, Problems	T1	T1 239

31	Minimum Phase Network	Minimum Phase Network, Problems	T1	T1 232
32	FOSTER methods of Synthesis	FOSTER methods of Synthesis, Problems	T1	T1 5.29
33	FOSTER methods of Synthesis	FOSTER methods of Synthesis, Problems	T1	T1 5.29-5.38
34	CAUER methods of Synthesis.	CAUER methods of Synthesis. Problems	T1	T1 276
35	CAUER methods of Synthesis.	CAUER methods of Synthesis. Problems	T1	T1 280
36	Types of transmission lines, Applications transmission lines, Equivalent circuit of a pair of transmission lines	Types of transmission lines, Applications transmission lines, Equivalent circuit of a pair of transmission lines, Problems	T1	T1 134, 139
37	Primary constants, Transmission line equations, Secondary constants,	Primary constants, Transmission line equations, Secondary constants,	T1	T1 141
38	Lossless transmission lines, Distortion less line, Phase and Group velocities	Lossless transmission lines, Distortion less line, Phase and Group velocities	R1	R1 4.36
39	loading of lines, Input impedance of transmission line	loading of lines, Input impedance of transmission line, problems	R1	R2 193-195
40	RF lines, Relation between reflection coefficient, load and characteristic impedance	RF lines, Relation between reflection coefficient, load and characteristic impedance	R1	R2 197-202
41	Relation between reflection coefficient and voltage standing wave ratio(VSWR)	Relation between reflection coefficient and voltage standing wave ratio(VSWR)	R1	R2 202-205
42	Lines of different lengths- $\lambda/8$, $\lambda/4$, $\lambda/2$ lines	Lines of different lengths- $\lambda/8$, $\lambda/4$, $\lambda/2$ lines	R2	R2 205-209
43	Losses in transmission lines	Losses in transmission lines	R2	R2 189-190
44	Smith chart and applications	Smith chart and applications	R2	R2 193-195
45	stubs, Double stubs.	stubs, Double stubs. problems	R2	R2 197-202

6. Self learning material:

S.no	Unit	Topic	Source
1	I	NETWORK BASICS	REFERENCE BOOKS
2	II	INTRODUCTION TO FILTERS	REFERENCE BOOKS
3	III	Introduction to attenuators	REFERENCE BOOKS
4	V	ELECTROMAGNETIC THEORY BASICS	REFERENCE BOOKS
5	V	INTRODUCTION TO SMITH CHART	REFERENCE BOOKS

7. Evaluation Scheme:

Component	Duration (minutes)	% Weightage	Marks	Date & Time	Venue
Test-1	50 Min	10	10	12-08-2010 9.30 to 10.20 A.M	CSE001,002, 004, 005, 101, 102,104,105, 106,201,204, 205,301,502, 509, NSH
Test-2	50 Min	10	10	16-09-2010 9.30 to 10.20 A.M	CSE001,002, 004, 005, 101, 102,104,105, 106,201,204, 205,301,502, 509, NSH
Assignment submission		5	5	Continuous	
Assignment Test	50 Min	5	5	28-10-2010 9.00 to 10.20 A.M	CSE001,002, 004, 005, 101, 102,104,105, 106,201,204, 205,301,502, 509, NSH
Quiz	30 Min	5	5	28-10-2010 9.00 to 10.20 A.M	CSE001,002, 004, 005, 101, 102,104,105, 106,201,204, 205,301,502, 509, NSH
Regular Lab Evaluation	Continuou s	0	0		
Comprehensive Lab Exam	3 Hrs	0	0		
Comprehensive Exam	3 Hrs	60	60		
Attendance for Theory & Tutorial		5	5	Continuous	
Attendance for Lab		0	0	Continuous	

8. Chamber consultation hour: Informed in the class in first week.

9. Notices: All notices regarding the course will be put in E-learning website.

10. Tutorial: Tutorial will be conducted by the respective in charge faculty. The tutorials are planned to supplement the material taught in the lectures and clear doubts. Student must attend registered section for tutorial in the respective classroom. Class assignment, class tests and other evaluation components will also be conducted during tutorials. Students must actively participate in the tutorial and come prepared for it.

Course Coordinator