Academic Course Description

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

CO2113 RF SYSTEM DESIGN
Second Semester, 2013-14 (Even semester)

Course (catalog) description
This is a course on the design RF circuits for RF system. It deals with the design and analysis of RF filters, Amplifiers, Mixers and Oscillators.

Compulsory/Elective course: Elective for M.Tech(Communication Systems) students

Credit hours: 3 credits

Course coordinator(s)

Mrs. J. Manjula, Assistant Professor (S.G), Department of ECE

Instructor(s)

Name of the instructor	Class handling	Office location	Office phone	Email	Consultations
Mrs. J.Manjula	I yr M.Tech(CS)	12S3		manjula.j@ktr.srmuniv.ac.in	Day 2 – AN, Day 4-FN

Relationship to other courses

Pre-requisites   :   Nil

Assumed knowledge   :   Basic knowledge in RF receiver circuits
Following courses   :   Nil

References

1. Reinhold Ludwig, Gene Bogdanov**,** *"RF circuit design, theory and applications",* Pearson Asia Education, 2nd edition, 2009.

2. D.Pozar, *"Microwave Engineering"*, John Wiley & Sons, New York, 2008.
3. Bahil and P. Bhartia, *"Microwave Solid State Circuit Design",* Wiley-Interscience, 2003.

Computer usage: Nil

Class schedule : Four 50 minutes lecture sessions per week, for 12-13 weeks

Day 1	5th hr
Day 3	3rd & 4th hrs
Day 5	2nd hr

Professional component

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

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

Test Schedule

S. No.	Test	Portions	Duration
1	Cycle Test	Session 1 to 4	2 Periods
3	Model Test	Session 1 to 12	3 Hrs

Course objectives

The objectives of this course is to
1. To design and analyse basic resonators and RF Filters.
2. To study the operation and device characteristics of RF Active components.
3. To design and analyze RF transistor amplifier.
4. To understand the operation of Oscillators and mixers used in RF design

Course Learning Outcome

This course provides the foundation for designing and analysis of RF circuits. Through lecture and out-of-class assignments, students are provided learning experiences that enable them to:

1. To discuss design and analysis of filters and amplifiers.

2. To understand the working concepts of RF active components.

3. To study the operation of mixers and oscillators.

Syllabus

		L	**T**	**P**	**C**
CO2113	**RF SYSTEM DESIGN**	**3**	**0**	**0**	**3**
	Total Contact Hours – 45				
	Prerequisite: Nil				
PURPOSE					
To impart the modeling of RF system design in the field of communication system.					
INSTRUCTIONAL OBJECTIVES					
1.	RF Filter designing				
2.	Study of RF Active components				
3.	RF transistor amplifier design				
4.	Oscillators and mixers used in RF design				

SYLLBUS CONTENTS:

UNIT I - RESONATORS   (9hours)
Basic resonator and filter configurations-special filter realization-filter implementation-coupled filter.

UNIT II - RF DIODE AND BJT   (9 hours)

RF diodes-bipolar junction transistor - RF field effect transistor-high electron mobility transistors-diode models-transistor models-measurement of active devices-scattering parameter device characterization.

UNIT III - IMPEDANCE MATCHING   **(9 hours)**
Impedance matching using discrete components-microstrip line matching networks-amplifier classes of operation and biasing networks.

UNIT IV - CHARACTERISTICS OF AMPLIFIERS   **(9 hours)**
Characteristics of amplifier-amplifier power relations-stability consideration-constant gain-broadband, high power, and multistage amplifiers.

UNIT V - HIGH FREQUENCY OSCILLATORS   **(9 hours)**
 Basic oscillator model-high frequency oscillator configuration-basic characteristics of mixer.

Teaching plan:

Session Nos.	Topics	Text / Chapter
	Unit I - Resonators	
1.	Basic resonator	Reference book No.1, Chapter 5, Page No:202
2.	Filter configurations (LP, HP)	Reference book No.1, Chapter 5, Page No:206
3.	Tutorials	Reference book No1, Chapter 5, Page No:208
4.	Filter configurations(BPF, BRF)	Reference book No.1, Chapter 5, Page No:210
5.	Tutorials	Reference book No.1, Chapter 5, Page No:212
6.	Special filter realization	Reference book No.1, Chapter 5, Page No:220 - 231
7.	Special filter realization (contn)	Reference book No.1 Chapter 5, Page No:220 - 231
8.	Filter implementation	Reference book No.1, Chapter 5, Page No:241
9.	Filter implementation (contn)	Reference book No.1, Chapter 5, Page No:241
10.	Coupled filter.	Reference book No.1, Chapter 5, Page No:253
	Unit II - RF Diode and BJT	
11.	RF diodes	Reference book No.1, Chapter 5, Page No:293- 311

12.	Bipolar junction transistor	Reference book No.1, Chapter 5, Page No:312 -327
13.	RF field effect transistor	Reference book No.1, Chapter 5, Page No:328
14.	High electron mobility transistors	Reference book No.1, Chapter 5, Page No:338
15.	Diode models-transistor models	Reference book No.1, Chapter 5, Page No:352
16.	Measurement of active devices-	Reference book No.1, Chapter 5, Page No:357
17.	Scattering parameter device characterization.	Reference book No.1, Chapter 5, Page No:393
18.	Tutorials.	Reference book No.1, Chapter 5, Page No:395
	Unit III- Impedance Matching	
19	Impedance matching using discrete components	Reference book No.1, Chapter 5, Page No:406
20.	Impedance matching using discrete components (contn)	Reference book No.1, Chapter 5, Page No:415
21.	Microstrip line matching networks	Reference book No.1, Chapter 5, Page No:431
22.	Amplifier classes of operation and biasing networks	Reference book No.1, Chapter 5, Page No:444
23.	Amplifier classes of operation and biasing networks(contn)	Reference book No.1, Chapter 5, Page No:455
24.	Tutorials	Reference book No.1, Chapter 5, Page No:450, 452
25.	Tutorials	Reference book No.1, Chapter 5, Page No:458
	Unit IV - Characteristics Of Amplifiers	
26.	Characteristics of amplifier	Reference book No.1, Chapter 5, Page No:464
27.	Amplifier power relations	Reference book No.1, Chapter 5, Page No:465
28.	Amplifier power relations (contn)	Reference book No.1, Chapter 5, Page No:468
29.	Tutorials	Reference book No.1, Chapter 5, Page No:469
30.	Stability consideration	Reference book No.1, Chapter 5, Page No:470
31.	Stability consideration (contn)	Reference book No.1, Chapter 5, Page

		No:480
32.	Constant gain (concepts)	Reference book No.1, Chapter 5, Page No:483
33.	Broadband Amplifier	Reference book No.1, Chapter 5, Page No:511
34.	High power amplifier	Reference book No.1, Chapter 5, Page No:522
35.	Multistage amplifiers	Reference book No.1, Chapter 5, Page No:526
36.	Tutorials	Reference book No.1, Chapter 5, Page No:528
	Unit V - High Frequency Oscillators	
37.	Basic oscillator model	Reference book No.1, Chapter 5, Page No:540
38.	Basic oscillator model : design steps and classifications	Reference book No.1, Chapter 5, Page No:550
39.	High frequency oscillator configuration ,Types of oscillators	Reference book No.1, Chapter 5, Page No:556
40.	Basic characteristics of Mixer	Reference book No.1, Chapter 5, Page No:574
41.	Basic characteristics of Mixer: Frequency domain considerations	Reference book No.1, Chapter 5, Page No:578
42.	Single ended mixer design	Reference book No.1, Chapter 5, Page No:580
43.	Tutorials	
44.	Single balanced mixer	Reference book No.1, Chapter 5, Page No:588
45.	Double balanced mixer	Reference book No.1, Chapter 5, Page No:590

Evaluation methods

Cycle Test – I	-	25%
Model Test	-	25%
Assignment	-	5%
Surprise Test	-	5%
Term paper	-	10%
Final exam	-	30%

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Prepared by: Mrs. J.Manjula, AP (S.G), ECE.

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RFSA2113 - Variable Attenuators from RFMD. Download the Datasheet, Request a Quote and get pricing for RFSA2113. The RFSA2113 from Qorvo is an analog voltage controlled attenuator (VCA) that operates from 50 MHz to 18 GHz. It features excellent linearity over a typical temperature compensated 30 dB attenuation range. This attenuator incorporates a revolutionary new circuit architecture which enable it to have a high IP3, high attenuation range, low DC current, broad bandwidth and temperature compensated linear in dB control voltage characteristic. CO2113 - RF System Design. * * CO2111 - Optical. Networks and Photonic Switching. CO2005 - Mobile Communication Systems and Standards. CO2007 - Wireless and MIMO Communications. CO2008 -. CO2108 â€" Multi. * User Detection. Fundamentals and Applications MEMS. * Communication. M. Tech (Full Time) â€" COMMUNICATION SYSTEMS (FULL TIME) Curriculum & Syllabus (2013-2014) Faculty of Engineering & Technology, SRM University, SRM Nagar, Kattankulathur â€" 603 203. . 1 M. Tech. COMMUNICATION SYSTEMS (FULL TIME) Curriculum & Syllabus Batch 2013â€" 2014 and onwards No. of Credits S. No. 2 Course code Course Title L T P C CO2112 RF MEMS for wireless Communication 3 0 0 3 CO2113 RF System Design 3 0 0 3 CO2114 Satellite Communication 3 0 0 3 CO2115 Statistical Signal Processing 3 0 0 3 CO2116 Statistical Theory of Communications 3 0 0 3 CO2117 Ultra wideband Communication Systems 3.