

Course Syllabus

Course Information

EERF 6330 RF Integrated Circuit Design, Spring 2017
Tuesday and Thursday 4:00-5:15 PM
CB3 1.302

Professor Contact Information

Instructor: Kenneth K. O
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Office hours: Monday 4:30 – 5:30 PM, Friday 3:00 – 4:00 PM or by appointment, ECSN 3.302

Teaching Assistant Contact Information

Name : Ibukunoluwa Momson
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Office hours: Tuesday 1:00 – 2:00 PM, Thursday 1:00 – 2:00 PM (ECSN 3.808)

Course Pre-requisites: EERF6311 & EECT6325, or permission of instructor

Course Description

Introduction to RF and wireless systems; basic concepts of RF design: selectivity and sensitivity, linearity (P_{1dB} , IIP_3), noise analyses, CMOS technology, components for RF design (transistors, inductors, varactors and capacitors), low noise amplifier, mixer, oscillator

Student Learning Objectives/Outcomes

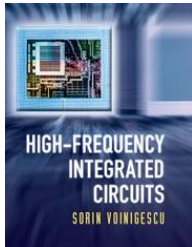
1. Ability to understand performance metrics of RF circuits.
 2. Ability to design and analyze RF circuits.
 3. Ability to understand the influence of active and passive device characteristics on RF circuit performance.
 4. Ability to analyze parasitics effects in integrated circuits that influence RF performance.
 5. Ability to implement RF integrated circuits.
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Preliminary Course Outline

Lecture	Date	Topic	Reading (Voinigescu)
1	Jan 10	Introduction to RF systems and RFIC design	2.2, 2.3
2	Jan 12	Review of microwave fundamental concepts (two port, transmission lines)	3.1.1-3.1.5
3	Jan 17	Review of microwave concepts (S-parameters, Smith chart)	3.1.4-3.1.6
4	Jan 19	Review of microwave concepts (Smith chart and matching)	3.1.6, 3.1.7
5	Jan 24	CMOS transistors and technology	4.2.1-4.2.4 up to p.175
6	Jan 26	Parasitic resistance and capacitance estimation	4.2.5-4.2.6
7	Jan 31	f_T and f_{max} , Trans-capacitance	4.2.5, 4.2.7, 4.18, 4.1.9
8	Feb 2	Spiral inductors	4.5.1, Greenhouse paper
9	Feb 7	Spiral inductor modeling	4.5.1
10	Feb 9	Spiral inductor Quality factor and optimization	4.5.1, handout
11	Feb 14	Quiz 1	
12	Feb 16	Capacitors/packageing	4.5.4, handout
13	Feb 21	Amplifier input/output matching and gain	handout, 7.4-7.4.2
14	Feb 23	LNA, common-source with source degeneration	7.4-7.4.2
15	Feb 28	LNA, input matching of a cascode amplifier with source degeneration	7.4-7.4.2
16	Mar 2	LNA, output matching of a cascode amplifier with source degeneration	7.4-7.4.2
17	Mar 7	Power gain and noise of a cascode LNA	handout, 7.4.1-7.4.2, 4.2.9
18	Mar 9	Noise factor and optimization for noise	handout, Schaeffer and Lee (p. 745-750)
	Mar 14	Spring Break	
	Mar 16	Spring Break	
19	Mar 21	Linearity	2.5, 2.6.1-2.6.4
20	Mar 23	Quiz 2	
21	Mar 28	Linearity	handout
22	Mar 30	Amplifier stability and effects of substrate resistance	3.1.9, 3.1.10, 4.26, handout
23	Apr 4	Oscillator basic operation	10.1.1-10.1.3
24	Apr 6	MOS varactors, Voltage Controlled Oscillator (VCO) phase noise	4.5.5, 10.1.4, 10.1.5
25	Apr 11	VCO topologies	10.2.5
26	Apr 13	VCO optimization and implementation	handout
27	Apr 18	Basic operation of mixer	9.1.1-9.1.6
28	Apr 20	Mixer specifications, topologies	9.2, 9.3.3-9.3.5, handout
29	Apr 25	RF system (sensitivity, noise)	2.4, 2.5
30	Apr 27	RF system (linearity, output power, EVM, PSD Mask)	2.6.1-2.6.4, 2.6.5-2.7

Required Textbooks and Materials

***High-Frequency Integrated Circuits*, Sorin Voinigescu, ISBN: 978-0-521-87302-4, Cambridge University Press**



Suggested Texts, Readings & Materials

Handouts from the class

***Microwave Transistor Amplifiers, Analysis and Design 2nd Edition*, G. Gonzalez, Prentice Hall**
***RF Microelectronics, 2nd Edition*, Behzad Razavi, Prentice Hall**
***The Design of CMOS Radio-Frequency Integrated Circuits*, Thomas H. Lee, Cambridge University Press**

Computer Software

Cadence

Assignments & Academic Calendar

Quiz 1: Feb. 14 th	4:00PM – 5:15 PM
Quiz 2: Mar. 23 rd	4:00PM – 5:15 PM
Final:	TBA

Grading Policy

2 Quizzes: 40%
Final: 30%
5-6 Homework assignments and 1 Design project 30%

Course & Instructor Policies

- 1. Class attendance is highly recommended.**
- 2. Assignments are due at the beginning of the class on the due date.**
- 3. Collaborative learning without copying among students is highly recommended.**

Technical Support

If you experience any problems with your UTD account you may send an email to:

assist@utdallas.edu or call the UTD Computer Helpdesk at 972-883-2911.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

“As a Comet, I pledge honesty, integrity, and service in all that I do.”

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University’s policies and procedures segment of the course syllabus.

Please go to <http://go.utdallas.edu/syllabus-policies> for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.