Electrical Engineering Department

جامعة الملك فهد للبترول والمعادن
King Fahd University of Petroleum & Minerals

EE 533: Microwave (RF) Integrated Circuits
First Semester, 2013/2014 (131)

Instructor:
Dr. Mohammad S. Sharawi, Associate Professor
B-59, Room 1091
Tel: 03 860 4810
msharawi@kfupm.edu.sa

Office Hours:
7 – 8pm
Or by appointment (preferred).

Course Website: http://faculty.kfupm.edu.sa/ee/msharawi/

Course Content:
The course will cover the fundamentals of Microwave/Radio Frequency (RF) Integrated Circuit Design and Analysis, it will focus on:

A. Passive Components and Basic Concepts in RF design
B. Planar Transmission lines and Impedance matching methods
C. Multiport Networks, couplers and combiners
D. RF Filter Design
E. CMOS RF Amplifier Design:
   - Amplifier Power Relations
   - Stability criteria and Noise Figure
F. CMOS RF Mixer Design
G. CMOS RF Oscillator Design
H. System Level/Chip Level integration and design

Text:
Radio Frequency Integrated Circuit Design, J. Rogers and C. Plett, 2nd Edition, Artech House 2010.

Other Texts
Ref1: *RF Circuit Design: Theory and Applications*, R. Lydwig and P. Bretchko, Prentice Hall, 2000.
Ref2: *RF Microelectronics*, B. Razavi, Prentice Hall, 1998.
Ref3: *The Design of CMOS Radio Frequency Integrated Circuits*, T. Lee, Oxford Press, 2003.
Ref4: *IEEE Transactions on Solid State Circuits*, via IEEE Xplore within KFUPM.
Ref5: *Online Resources*, GOOGLE Search.

Class Times and Location: Saturday and Monday 8 – 9:15pm, Building 59, Room TBD.

CAD tools: The small projects will utilize the CAD tool Microwave Office (MWO) from AWR Corp. MWO is a widely used CAD tool for microwave and RF circuit design, both system level and chip level. We have 20 MWO licenses within the EE department at KFUPM, and you can access a license if you are connected to the network and you specify the license server name during the installation. More installation details to access the tool will be provided in class. To read more about MWO you can check www.awrcorp.com .

Course Description (per course catalogue): An overview of microwave integrated circuits (MIC). Hybrid and monolithic MIC. Analysis of microstrip lines. Slot lines and coplanar waveguides. Coupled microstrip and directional couplers. Microstrip circuit design: couplers, Hybrids and filters. Lumped elements. Ferrite components. Active devices for MIC: MESFET, Gunn diode, avalanche diode, Schottky-barrier diode and PIN diode. MIC modules: oscillators, amplifiers, mixers and phase shifters. TR modules..

Grading Policy:

HW: 15%, Computer Assignments: 20%, Term Project: 15%, Mid-Term Exam: 20%, Final: 30%.

Tentative Schedule				
Week		**Topic**	**Reading assignment**	**Homework / Projects †**
1	1 Sep.	Introduction		
		Basic Concepts in RF Circuit Design		
2	8 Sep.			
		Microstrip Transmission Lines I		
3	15 Sep.	Microstrip Transmission Lines II		
		Impedance Matching I		
4	22 Sep.	Impedance Matching II		
		Multiport Networks I		
5	29 Sep.	Multiport Networks II		
		CAD Modeling I		
6	6 Oct.	CAD Modeling II		
		Power Combiners and Couplers		
7	13 Oct.	Filter Design I		
		Filter Design II		
18 Oct. - 2 Nov.		EID AL-ADHA BREAK		
8	3 Nov.	**MID TERM EXAM**		
		Passive IC components I		
9	10 Nov.	Passive IC Components II		
		CMOS Transistor Modeling I		
10	17 Nov.	CMOS Transistor Modeling II		
		Amplifier Design I		
11	24 Nov.	Amplifier Design II		
		Amplifier Design III		
12	1 Dec.	Amplifier Design IV		
		CMOS LNA Design		
13	8 Dec.	CMOS Mixer Design I		
		CMOS Mixer Design II		
14	15 Dec.	CMOS Oscillator Design I		
		CMOS Oscillator Design II		
15	22 Dec.	System Level Architecture		
		MMIC Examples		
16	29 Dec.	**TERM Project Presentations**		

† Homeworks and Projects are due on dates shown. No Late submissions will be accepted.

All Projects are to be submitted in a form a full technical report with introduction, design, results and discussion and conclusions.