Sabanci University
EE 411 – RF Integrated Circuits Design
EE 633 – Microwave Devices and Circuits
Fall 2023

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Grading Policy
- Midterm 25%
- Final 35%
- Homework 15%
- Projects 25%

Course Schedule
Lecture Tuesday, 8:40-11:30, FENS L035
Recitation Thursday, 10:40-12:30, FENS G029

Tentative Course Planning
1. Introduction
2. General concepts
3. Active Devices, Passives
4. LNA
5. LNA
6. Mixer
7. Mixer
8. Midterm (Week of Nov 20)
9. PA
10. PA
11. VCO/PLL
12. Control Products
13. Transceiver Architectures
14. Extra

Books
- Behzad Razavi, RF Microelectronics (Main Text)
- John W. M. Rogers & Calvin Plett, Radio Frequency Integrate Circuit Design (Suggested Text)
- Sorin Voinigescu, High-Frequency Integrated Circuits (Suggested Text)
**Projects**
Students who are taking EE411 or EE633 for the first time, whether undergrad or grad, will do 2 course projects. The students who have taken EE411 before and now registered for EE633 will do the same 2 course projects, **plus an additional more comprehensive term-long project**. Projects will be based on the design/simulation of the building RFIC blocks covered in the class such as LNA, PA, etc. Students are expected to submit concise and accurate reports that are detailed enough to show their work and credibility.

**Some Links**

**Objectives**
1. To understand the concept of RF integrated circuits
2. To analyze RF circuit building blocks (through lectures, homework, and recitations)
3. To design these RF circuit building blocks (through lectures, homework, and recitations).
4. To design, simulate and optimize RF circuits with the aid of Cadence tools (through recit).
5. To design spiral inductors and transmission lines with the aid of SONNET tools (through recit).
6. To practice layout techniques in Cadence design environment (through recit).
7. To understand applications of RF circuits.

**Outcomes**
A student who successfully fulfills the course requirements will be able to demonstrate:
1. To understand the concept of analog and RF integrated circuits technology, devices, components, using CMOS and SiGe BiCMOS technology, and their RF- models.
2. To understand fundamental design parameters of RF integrated circuits such as S-parameters, nonlinearity, sensitivity, efficiency, noise figure, input, output dynamic ranges etc.
3. To design matching and impedance transformation networks using in integrated circuits and components.
4. To understand fundamentals of the following RF integrated devices, circuits and systems: Low Noise Amplifiers, Mixers, Oscillators, Frequency Synthesizers, Power Amplifiers, Phase Shifters, Attenuators, Switch, Filters, etc.
5. To be able to analyze, design and simulate integrated RF circuits as such.
6. To be able to use and implement RF integrated circuits design and simulation tools such as ADS, Cadence Spectre, MOMENTUM.
7. To be able to understand RF integrated system specifications and breakdown these specs to building block and circuit levels.
8. To be able to measure and characterize RF integrated components and circuits.