ECE 5022: Introduction to RF Systems

Autumn, 2012

Prof. Waleed Khalil

Meeting Time & Place: MW 5:20 - 6:40pm, Dreese Lab 260
OR recorded and delivered by internet

Instructor: Prof. Waleed Khalil
Office #1: ESL Lab, 1330 Kinnear Rd, room # 251 (main office)
Office #2: Dreese Lab, room # 468

Office hours (DL Office): W 4:20am-5:20pm
Office hours (ESL Office): M 1:30-2:30pm and by appt. only
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Grader: Sidharth Balasubramanian, balasubramanian.35@buckeyemail.osu.edu


Prerequisites: ECE 323 + knowledge in linear systems, analog/digital circuits and basic communication theory

Grading Policy: Homework: 40%
Two Exams: 60% (30% each)

Homework: Homework need to be submitted in the first 10 minutes of the class
No late homework is accepted
Homework solution will be posted on Carmen and will be activated for one week
Some homework will have a project as part of the homework

Exams: There will be two exams: one ~ the middle of the semester and cover the first half of the material
The second exam will be during the final week and will cover the second half of the material
Final exam will be held on Thursday, December 6 (6:00pm-7:45pm)

Lecture Notes: Lecture slides will be posted on Carmen at least one day before class
You are encouraged to review lectures notes before the class
Print lectures notes and bring to class.
Catalog Description:

This course is intended for senior and graduate students interested to learn about the issues involving the design of wireless transceivers (mainly at the system level). The course will provide the students with the tools and techniques needed to:

- Learn and apply RF terminology such as dB, dBm, S-parameters, VSWR, return loss, mismatch loss
- Understand propagation losses, link budgets and basic antenna principles
- Be proficient in measurement parameters such as noise figure, sensitivity, P1dB, IP3, IP2, BER, EVM, SFDR, phase noise and assess their impact on wireless systems
- Understand the tradeoffs between power efficiency, linearity and bandwidth efficiency in light of different transceiver architectures and in relation to a given communication standard
- Evaluate the impact of different impairments in radio front-ends on performance, including interference, different noise sources and circuit nonlinearity.
- Design (at block level) the most critical blocks in today’s RF transceivers (e.g. low noise amplifier, mixer, voltage-controlled oscillator, frequency synthesizer, power amplifier and baseband circuits).
- Analyze the trade-offs between circuit performance, choice of radio architecture and overall system performance (power and cost).

Examples of radio architectures from commercial systems (e.g. GSM, WCDMA, WLAN and Bluetooth) will be discussed.
More on Class Policies, Homework and Exams

Students with Disability
Any student who feels s/he may need an accommodation based on the impact of a disability should contact the instructor privately to discuss specific needs. Please contact the OSU Office for Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies.

Academic Misconduct
Any student found to have engaged in academic misconduct, as set forth in the Code of Student Conduct Section 3335-23-04, Prohibited Conduct, will be subject to disciplinary action by the university. Academic misconduct is any activity that tends to compromise the academic integrity of the university, or subvert the educational process.

Q&As regarding Exams and Homework

Q1: Due to urgent matter, I will not be attending class on one the HW due dates. Can I submit my HW earlier than the due date/time?
A1: Yes! You can 1) hand it out to me in the lecture before the due date, 2) drop it under my office door in ESL building or 3) drop it at my ECE mail box in DL.

Q2: Relating to Q1, will I be able to submit my HW after the due date?
A2: No! Homework will not be accepted after the due date. We have over 90 students in class and cannot allow for out of order HW submission process. The only excuse I will accept for not submitting HW on time, is by providing a medical evidence (in writing) stating the inability to work on the HW.

Q3: I have to travel sometime during the semester. Can you give me an estimate on midterm due date?
A3: I will determine exact midterm date after the 4th week in the semester. For planning ahead, the midterm will be held roughly during the middle of semester.

Q4: Will the midterm and final be open book, open notes, or closed book?
A4: Both midterm and final will be closed book. You will not be allowed to bring in anything with you except a calculator.

Q5: I have to travel on or before the final date and will therefore miss the final. Can I take the final either earlier or later?
A5: According to OSU laws, students are not entitled to make-up exams unless they can provide written medical evidence or proof of an emergency. This has to be discussed with me and I will judge it on a case by case basis.