ECE Department
University of Arizona

ECE 538: Radar Signal Processing

Spring 2011

Course Objectives

To provide the student with an understanding of the physics and signal processing of radar systems. The student should complete the class with the background necessary to begin designing and analyzing system concepts and signal-processing algorithms for implementation in modern radar systems. The student should also become familiar with conventional applications of radar and with new techniques currently being researched and implemented.

Instructor

Nathan A. Goodman, Associate Professor
Office: ECE 456A
Phone: 520-621-4462
Email: goodman@ece.arizona.edu
Web: www.ece.arizona.edu/~goodman

Time and Place

Tuesdays and Thursdays 4:30 – 5:45 PM; Harvill 111

Office Hours

Tentative: Wednesdays and Thursdays: 3:30 – 4:30 PM

Textbook

Mark A. Richards, Fundamentals of Radar Signal Processing, McGraw-Hill, 2005.

Supplemental Texts

Radar Principles, by Peyton Z. Peebles
Radar Principles, by Nadav Levanon

Homework

Homework will be assigned approximately every 1-2 weeks and will be due one week after it is assigned. Some homework assignments may include reading a technical paper and writing a *brief* summary or they may include a short programming assignment.

Exams

No makeup exams will be offered. If you miss an exam (due to legitimate, unavoidable circumstances), the score for that exam will be 90% of the average of your other two exams. Exam dates are somewhat flexible. Please let me know in advance if you have a conflict.

Final Exam

Scheduled for Wednesday, May 11, 6:00 – 8:00 PM.

Grading

Homework	10%
Computer Assignments	20%
Exam #1	20%
Exam #2	25%
Final Exam	25%

Class Web Page

The course web page will often be the best way to convey announcements and assignments. The web page will have administrative announcements, homework assignments, and test solutions. I will usually email the class when new assignments are posted. The web page is:

http://www.ece.arizona.edu/~ece538

Course Outline

I. The Radar System (~ 2 weeks)
The radar range equation, scattering and RCS, RCS models, propagation, antennas, receivers, noise figure.

II. Radar Signal Processing Fundamentals (~ 6 weeks)
Detection and likelihood ratio, binary detection, matched filtering, radar ambiguity functions, pulse compression and radar waveforms, radar resolution.

III. Applications of Radar Signal Processing (~ 6 weeks)
Pulse-Doppler radar, CFAR detection, synthetic aperture radar (SAR), inverse synthetic aperture radar (ISAR), moving target indication (MTI), displaced-phase-center-antenna technique (DPCA), adaptive radar, superresolution (MUSIC), space-time adaptive processing (STAP).

IV. Other Topics (time permitting)

Academic Integrity: The University's Code of Academic Integrity (Section 2.1a) is based on the guiding principle that a student's submitted work must be the student's own. This policy will be applied to all work submitted for a grade, including exams, projects, and homework. Copying previously posted solutions or solution manuals is strictly forbidden; anyone violating this policy will receive zero credit for homework for the entire semester. All work must be original. The minimum penalty for submitting work that is not your own is an E grade. Repeated violations may result in expulsion from the university.

Study Groups: Working in study groups can be beneficial if everyone participates. Therefore, while working in study groups is allowed and even encouraged, all work submitted for a grade must be your own. When this rule is violated, the guilty student will receive a grade of zero on the offending item. Cheating will not be tolerated.