EE383V **Radar Principles** **Spring 2009**

Class meets T/Th 9:30-11 in ENS109 Unique No. 16775

Professor: Hao Ling Office Hrs: T/Th 11-12:30
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Text: D. R. Wehner, *High-Resolution Radar*, 2nd edition, Artech House, 1994.
References: M. I. Skolnik, *Introduction to Radar Systems*, 3rd edition, McGraw-Hill, 2001.
V. C. Chen and H. Ling, *Time-Frequency Transforms for Radar Imaging and Signal Analysis*, Artech House, 2002.

Prerequisites:

Graduate standing or consent of instructor. One prior course in electromagnetics (or acoustics) and one in signal processing are desirable, although no absolutely required.

Course Objectives:

(i) To build up a thorough understanding of radar principles from the fundamental aspects of electromagnetics and signal processing.
(ii) To gain in-depth knowledge of a radar-related topic through a student-defined term project.

Grading: Homework (40%) + Midterm (30%) + Term Project (30%)

Course Coverage:

1. Introduction (Wehner Chap. 1)
   Overview, radar frequencies, range resolution and bandwidth, Nyquist sampling, Doppler effect and resolution

2. Electromagnetics of Radar (Chap. 2)
   Radar range equation, antennas, electromagnetic scattering, radar cross section, propagation, detection threshold

3. Signal Processing of Radar (Chap. 3, 4, 5)
   Quadrature receiver, matched filter, ambiguity function, linear FM waveform, pulse compression, binary phase coding, stepped frequency waveform

4. Radar Imaging (Chap. 6, 7)
   Microwave imaging basics, synthetic aperture radar, chirp pulse waveform, SAR processing, inverse synthetic aperture radar, motion compensation

5. Other Types of Radars (dictated by time and class interests)
   FMCW, pulse-Doppler, MTI, tracking