EECS 725 - Introduction to Radar (Spring 2019)

TR 11:00 a.m. - 12:15 p.m.
Room 3150 Learned Hall
KU course # 69020 (Lawrence), # 69582 (Edwards)
class website: http://people.eecs.ku.edu/~callen/725/EECS725.htm

Instructor: Prof. Chris Allen
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Office Hours: Room 3024 Eaton Hall:
Tuesday, Thursday: 10:00 am to 10:45 pm;
or by appointment

Catalog Listing: EECS 725 - Introduction to Radar (3)
Basic radar principles and applications. Radar range equation. Pulsed and CW modes of
operation for detection, ranging, and extracting Doppler information.
Prerequisites: EECS 360, EECS 420, and EECS 461.
EECS 622 recommended.

Prerequisites by Topic:
- Signal analysis
- Electromagnetics and travelling wave theory
- Probability and statistics

Course Objective: To introduce the student to the fundamentals of radar principles, applications, and
systems.

Outcomes: Students should be capable of:
- Describing the basic operating principles, characteristics, and block diagrams of radar
  systems
- Analyzing the performance characteristics of various radar systems


Grading: The following factors will be used to arrive at the final course grade
Homework & Quizzes 15 %
Design Project 15 %
Midterm Exam 35 %
Final Exam 35 %

Grading Scale: Grades will be assigned to the following scale:
A 90 - 100 %
B 80 - 89 %
C 70 - 79 %
D 60 - 69 %
F < 60 %

These are guaranteed maximum scales and may be revised downward at the instructor's
discretion.

Homework: Homework will be collected at the beginning of class on a roughly weekly basis.
Collaboration with classmates is permitted. Copying is not permitted.
Homework papers should address one problem per page (although multiple pages may be
used for a single problem) and work should be on one side of the paper only.
Exams: No make-ups for missed exams will be given. The score for a missed exam will be 90% of your other exam score.

Ethics Policy: Academic misconduct will not be tolerated. It may result in a failing grade and may result in further disciplinary action by the University. For details see the Academic Misconduct section (Article II, Section 6) of the Rules and Regulations of the University Senate.

Students with Disabilities Policy: The KU office of Disability Resources coordinates accommodations and services for all students who are eligible. If you have a disability for which you wish to request accommodations and have not contacted DR, please do so as soon as possible. Their office is located in 22 Strong Hall; their phone number is 785-864-2620 (V/TTY). Information about their services can be found at http://disability.ku.edu. Please also contact me privately in regard to your needs in this course.

Plagiarism: The issue of digital plagiarism has raised concerns about ethics, student writing experiences, and academic integrity. Various digital plagiarism detection programs may be used to check papers submitted in this course. You may be asked to submit your papers in a digital format so that your paper can be checked against web pages and databases of existing papers.

Class schedule: Classes are scheduled to meet on Mondays, Wednesdays, and Fridays each week beginning on Tuesday Jan. 16 through Thursday May 3 except for the following dates when the class will not meet — Tues/Thurs Mar. 12/14 (spring break).

The final exam is scheduled for 10:30 a.m. to 1:00 p.m. on Friday May 17.

Course Outline: (subject to change)

1. Radar fundamentals
   (block diagram, radar frequencies, antennas, radar equation, accuracy and resolution)
2. Radar design issues
   (signal-to-noise ratio, sampling criterion, coherence)
3. Signal processing and detection
   (analog-to-digital conversion, coherent and incoherent processing)
4. Waveforms
   (pulse compression, sidelobes)
5. Applications
   (tracking, surveillance, remote sensing)
6. Remote sensing radars
   (altimeters, scatterometers, sideloooking radar, synthetic-aperture radar)
7. Ground-penetrating radar
   (antenna issues, signal processing)
8. Bistatic and multistatic radar
   (motivation, geometries, synchronization issues)
9. Calibration and testing
   (internal/external calibration, measurement precision)
10. Scattering from natural targets
    (surface scatter, volume scatter, the sea, ice, snow, soil, vegetation)

The plan is to cover material selected material from the textbook plus other supplemental material as well.