Course Description
EE 4389 High Resolution Radar

2000-02 Catalog Data: Basic theory for design and analysis of radar systems that perform target and surface imaging. Concepts and definitions, the radar range equation, modern radar design, wideband waveforms and signal processing, synthetic high resolution radar, and synthetic aperture radar concepts. Prerequisites: EE3321 and EE3353, each with a grade of “C” or better.

Prerequisite by Topic
1. Doppler Effect
3. Fourier Transform
3. Convolution and Correlation
5. Wave Propagation

Textbook
High Resolution Radar

Course Outcomes
By the end of this course, students will be able to

1. Apply the radar range equation to high resolution radar
2. Analyze the performance of wideband radar systems in terms of delay and Doppler frequency shifts
3. Process typical wideband signals to achieve high range resolution
4. Analyze stepped-frequency radar systems
5. Process wideband signals to achieve synthetic aperture radar imagery

Topics Covered
The main topics are

- Radar Range Equation
- Wideband System Analysis
- Matched Filter and Ambiguity Function
- Wideband Signals
- Synthetic High Resolution
- Synthetic Aperture
- Inverse Synthetic Aperture

Class Schedule
Three hours of lecture per week

Contribution to Professional Component

EE4389 is a senior elective course that builds on topics covered primarily in junior required courses. It is one of a group of courses normally taken by students seeking a specialization in
communication and signal processing. It may also be taken as an elective seeking additional breath in the curriculum.

Relationship to Program Outcomes

- Ability to apply knowledge of mathematics, science, and engineering:

  Students use concepts from physics, calculus, networks, linear systems, and electromagnetism in the analysis of radar systems

- Ability to design a system or component to meet desired needs:

  Students solve homework problems that incorporate radar design issues.

- Ability to function in multidisciplinary teams:

  Students are assigned to study base teams from the start of the semester and are required to follow cooperative learning rules of engagement:

- Ability to identify, formulate and solve engineering problems

  Students work homework problems, perform design calculations, and implement signal and image processing approaches

- Ability to communicate effectively:

  Students make oral presentations of homework problems, give poster presentations of a team project, and write a final project report.

Computer Usage

Students use MATLAB to perform waveform analysis homework problems. Group projects require use of MATLAB for signal design.

Prepared by

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