

ECE 549

Radar Systems and Design

Spring 2024

Prerequisites: ECE 341, ECE 342

Course Credits: 3

Instructor: V. Chandrasekar

Textbooks:

1. Introduction to Radar Systems 3rd Edition by Merrill Skolnik
2. Introduction to Dual Polarization Weather Radar: Fundamentals, Applications, and Networks by V. Chandrasekar, Robert M. Beauchamp, Renzo Bechini

Objective:

This will be a Senior/Graduate course for those interested in the areas of Radars, Microwaves, and Remote Sensing. The course will introduce the basic ideas of radar operations and will cover the essential design principles of various radar systems. There will be a quick introduction given to Antenna theory so that those without this background can take this course. Also, an introduction to some microwave devices such as directional couplers, mixers, circulators, etc. will be given. Basic EM theory (not a comprehensive knowledge), basic antenna concepts are preferred. Consult the instructor regarding the adequacy of your background.

Course Outline:

- I. The Nature of Radars
Introduction; the simple form of radar equation; application of radar
Basic scattering theory
- II. Radar Antennas
Antenna parameters; antenna radiation pattern; parabolic-reflector antennas;
scanning antennas; pattern synthesis
- III. The Radar Equation
Range prediction; min. detectable signal; receiver noise; radar cross section of
targets

IV. Pulsed Doppler radars

Pulse repetition frequency; MTI; noncoherent MTI; pulse Doppler radar

V. Radars for observing volume targets/Remote Sensing

VI. CW and FM-CW Radars

CW radar; frequency-modulated CW radar; airborne Doppler navigation; multiple-frequency radar

VII. Tracking Radars

Tracking with radars; sequential lobing; conical scan; monopulse tracking radar; tracking in range

Grading and Exams:

Homework 34%

Midterm 33%

Final 33%