

ECE 686: Introduction to Radar Systems
Department of Electrical & Computer Engineering
University of Massachusetts
Spring 2017

Purpose: This course covers the fundamental concepts needed to understand the design and operation of modern radar systems for a variety of applications. Topics covered include the radar range equation, signal-to-noise ratio, radar cross section, range and velocity ambiguity, radar clutter and statistics, detection and receiver design, transmitters and antenna systems. Applications surveyed include pulsed, continuous-wave, and frequency-modulated radars, Doppler radar, and synthetic aperture radar.

Time & Place: TR 2:30 pm – 3:45 pm in MRST 220

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Office hours: By appointment.

Prerequisites: Undergraduate background in electromagnetic fields, plane waves, probability and random processes, and signals and systems.

Required Text:

Introduction to Radar Systems, M.I. Skolnik, 3rd ed., 2001, McGraw-Hill, ISBN 0-07-290980-3.

Reference Texts (not required):

Doppler Radar and Weather Observations, R.J. Doviak & D.S. Zrnic, 2nd ed., 1993, Academic Press, ISBN 0-12-221422-6.

Microwave Remote Sensing, Active & Passive Vol. II, Radar Remote Sensing and Surface Scattering and Emission Theory, F.T. Ulaby, R.K. Moore, A.K. Fung, 1986, Artech House, ISBN 0-89006-191-2.

Microwave Radar and Radiometric Remote Sensing, F.T. Ulaby, D.G. Long, 2013, U. Michigan Press, ISBN 9780472119356.

Computer Requirements: Access to a scientific analysis and plotting package such as Matlab, IDL, Mathematica, Python, or whatever you like.

Course Grading:

Homework/Projects: 20% (assignments approximately bi-weekly)

Midterm: 40%

Final: 40%

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Spring 2017 - Preliminary Schedule

Week	Beginning	Topic	Assignment
1	T Jan 24	Intro, Radar Equation	Chap. 1-2
2	T Jan 31	Probability	Chap. 2
3	T Feb 7	Signals, Noise, Fading	Chap. 2
4	T Feb 14	MTI & Pulse-Doppler Radar	Chap. 3
5	T Feb 21	Surface & Volume Targets	Chap. 7
6	T Feb 28	Tracking	Chap. 4
7	T Mar 7	Signals & Noise	Chap. 5
	T Mar 14	*Spring Break*	
8	T Mar 21	Receivers & Transmitters	Chap. 10-11
	R Mar 23	Midterm Quiz	7-9 pm
9	T Mar 28	Pulse Compression	Chap. 6
10	T Apr 4	Propagation Effects	Chap. 8
11	T Apr 11	Antenna Systems	Chap. 9
12	R Apr 20	Phased Arrays	Chap. 9
13	T Apr 25	Synthetic Aperture Radar	
14	T May 2	Last class	
	TBD	FINAL EXAM	3:30-5:30 pm