

**ECE 686: Introduction to Radar Systems**  
Department of Electrical & Computer Engineering  
University of Massachusetts  
Fall 2019

**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 10:00 am – 11:15 am in Elab 325

**Stephen J. Frasier**

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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.

**Other 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 any 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%

# ECE 686: Introduction to Radar Systems

Fall 2019 - Preliminary Schedule

Week	Beginning	Topic	Assignment
1	T Sep 3	Intro, Radar Equation	Chap. 1-2
2	T Sep 10	Probability	Chap. 2
3	T Sep 17	Signals, Noise, Fading	Chap. 2
4	T Sep 24	MTI & Pulse-Doppler Radar	Chap. 3
5	T Oct 1	Surface & Volume Targets	Chap. 7
6	T Oct 8	Tracking	Chap. 4
7	R Oct 17	Signals & Noise	Chap. 5
8	T Oct 22	Midterm Quiz	7-9 pm
	R Oct 24	Receivers & Transmitters	Chap. 10-11
9	T Oct 29	Pulse Compression	Chap. 6
10	T Nov 5	Propagation Effects	Chap. 8
11	T Nov 12	Antenna Systems	Chap. 9
12	T Nov 17	Phased Arrays	Chap. 9
	T Nov 26	Thanksgiving Break	
13	T Dec 3	Synthetic Aperture Radar	
14	T Dec 10	Last class	
	T Dec 19	FINAL EXAM	10:30 am – 12:30 pm, ELAB 325