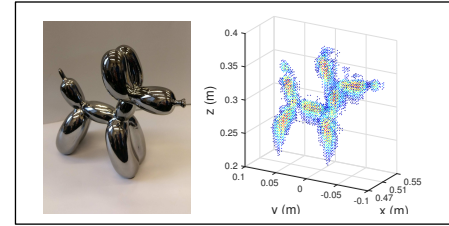


## EE 579 Spring 2023: Radar Signals and Systems

**Instructor:** Matt Reynolds  
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**Class Schedule:** Tu/Th 2:30-4:20pm, Rm ECE 269



### Objectives

This course will provide a hands-on introduction to radar system design with an emphasis on radar signal processing. We will focus on emerging commercial and industrial applications for radar, such as automotive radar, short-range radar sensing for UAVs, and radar imaging.

Students will construct a low-power radar system using a software defined radio (SDR) approach and conduct a series of hands-on experiments including data collection and building a signal processing pipeline to demonstrate such applications as person tracking, automotive adaptive cruise control, UAV identification and classification via micro-Doppler signatures, and synthetic aperture radar (SAR) imaging.

### Prerequisites

Electromagnetics (EE 361) and signal processing (EE 242) fundamentals. For the experimental work, Python examples will be provided, but students may work in MATLAB if they prefer. Students will need to provide a Windows 10 laptop capable of running either Python or MATLAB.

### Course Materials

Class web site - lecture notes and journal papers

Mark Richards, Fundamentals of Radar Signal Processing 3rd Ed, McGraw Hill 2022. ISBN 978-1-260-46871-7

Merrill Skolnik, Introduction to Radar Systems, 3rd Ed. McGraw Hill 2002. ISBN 0-07-288138-0

### Homework & Lab Projects

5 take-home signal processing assignments (Python / MATLAB). One self-directed final project showcasing data collection and analysis, preferably in real time.

### Course Topics

1. Radar Cross-Section and the Radar Equation
2. Radar System Design - Transmitters, Receivers, and Antennas
3. Radar Signal Processing: The Doppler space
4. Radar Signal Processing: Range-Doppler maps
5. Radar Signal Processing: Array processing
6. Radar Signal Processing: Synthetic Aperture Radar (SAR) and Inverse SAR (ISAR)

### Grading Policy

The final grade will be based on the final project reports and 5 take-home signal processing assignments. There will be no final exam.