

# ECE 7013: Advanced Radar Systems

## Course Description

Advanced and emerging topics in radar sensing. For graduates conversant with radar systems. Combination of lectures and student projects based on tutorials. Distributed sensing, bio-inspired sensing, and cognitive sensing will be covered. For each area, students will propose and study in detail a topic, and report on the theoretical foundation, state of the art, and future challenges.

**Prior Course Number:** 714

**Transcript Abbreviation:** AdvRadar Systems

**Grading Plan:** Letter Grade

**Course Deliveries:** Classroom

**Course Levels:** Graduate

**Student Ranks:** Masters, Doctoral

**Course Offerings:** Spring

**Flex Scheduled Course:** Never

**Course Frequency:** Even Years

**Course Length:** 14 Week

**Credits:** 3.0

**Repeatable:** No

**Time Distribution:** 3.0 hr Lec

**Expected out-of-class hours per week:** 6.0

**Graded Component:** Lecture

**Credit by Examination:** No

**Admission Condition:** No

**Off Campus:** Never

**Campus Locations:** Columbus

**Prerequisites and Co-requisites:** Prereq: 5013 or 5194.01, or permission of instructor.

**Exclusions:**

**Cross-Listings:**

**Course Rationale:** Existing course.

**The course is required for this unit's degrees, majors, and/or minors:** No

**The course is a GEC:** No

**The course is an elective (for this or other units) or is a service course for other units:** Yes

**Subject/CIP Code:** 14.1001

**Subsidy Level:** Doctoral Course

## Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

## Course Goals

Become familiar with key concepts of advanced radar systems.
Understand the operation of distributed sensing systems
Understand strategies used by natural echolocating systems and how they can be exploited in radar

Understand the key characteristics of cognitive sensing, perception action and their roles in advanced radar systems

## Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Distributed radar sensing	2.0							
Netted radar	4.0							
MIMO	4.0							
Passive radar	2.0		3.0					
Bio-inspired sensing	4.0							
Waveform diversity	4.0							
Micro-Doppler	2.0							
Target classification	2.0							
Cognitive sensing	4.0							
Adaption and feedback	4.0							
Resource management	4.0							
Perception and action	2.0							
Navigation and collision avoidance	2.0							
Processing architectures	2.0							

## Representative Assignments

Using a tutorial-based research paper or chapter in an advanced text critique an advanced radar topic within the domain of distributed radar sensing. A report will be written also detailing the current state of the art and future research challenges.

Using a tutorial-based research paper or chapter in an advanced text critique an advanced radar topic within the domain of bio-inspired radar sensing. A report will be written also detailing the current state of the art and future research challenges.

Using a tutorial-based research paper or chapter in an advanced text critique an advanced radar topic within the domain of cognitive radar sensing. A report will be written also detailing the current state of the art and future research challenges.

## Grades

Aspect	Percent
Written reports	100%

## Representative Textbooks and Other Course Materials

Title	Author
<i>Waveform design and diversity for advanced radar systems</i>	F. Gini, A. De Maio. and L. Patton
<i>MIMO radar signal processing</i>	P. Stoica and J. Li

## ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
*	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
*	c	An ability to design a system, component, or process to meet desired needs.
*	d	An ability to function on multi-disciplinary teams.

<b>Course Contribution</b>		<b>College Outcome</b>
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
**	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
***	i	A recognition of the need for, and an ability to engage in life-long learning.
***	j	A knowledge of contemporary issues.
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**Prepared by:** Betty Lise Anderson