

ECE 5013: Introduction to Radar Systems

Course Description

Introduces the fundamentals of radar such as the main concepts and techniques used in modern radar systems. The class is a survey course exposing students to a wide range of radar applications and design issues.

Prior Course Number: 714

Transcript Abbreviation: Intro Radar System

Grading Plan: Letter Grade

Course Deliveries: Classroom

Course Levels: Undergrad, Graduate

Student Ranks: Senior, Masters, Doctoral

Course Offerings: Spring

Flex Scheduled Course: Never

Course Frequency: Every Year

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: 3050 (352), and 3010 (312) or 3010.01, and Stat 3470 (427); or Grad standing in Engr.

Exclusions: Not open to students with credit for 714 or 5194.01.

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

Master the use of the radar range equation in a variety of its many forms.
Master the basic concepts of pulse-Doppler radar systems and the fundamental equations.
Be competent with key concepts underpinning modern radar design.
Be familiar with the operation and trade-offs of modern radar systems.

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
History and background of Radar	3.0							
The radar equation, detection and clutter	12.0							
MTI and pulse Doppler radar	4.0							
Pulse compression and waveform design	6.0							
CW and FM radar	3.0							
Tracking radar	3.0							
Radar antennas and arrays	3.0							
SAR	4.0							

Representative Assignments

Write a description of any radar system of choice explaining its essential design parameters and method of operation.
Write a program (Matlab) to compute the output of a pulse compression filter for the following two cases; (i) for a single point target and (ii) for two point targets showing (a) when they are unresolvable and (b) where they are resolved.

Grades

Aspect	Percent
Homeworks	25%
Projects	25%
Mid term exam	15%
Final exam	35%

Representative Textbooks and Other Course Materials

Title	Author
<i>Principles of Modern Radar: Basic Principles</i>	Richards, M.A. et al

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.
*	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.

Course Contribution		College Outcome
**	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
***	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
*	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
*	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
***	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
*	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
*	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additional Notes or Comments

Used to be 5194.01

Added 5194.01 to exclusions 9/5/13

Make consistent with university tool 2/13/14

Update course goals 6.17.16 BLA

Add ABET outcomes. Need clarification from area on suggested hours for topics 6/14/2019
BLA

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