

**EEL 5547 (& 4540) Introduction to Radar  
Spring 2016**

1. Catalog Description – (3 credits) Basic principles of continuous wave and pulsed radar; angle, range, and Doppler tracking; accuracy and resolution; signal processing.
2. Pre-requisites: – Calculus and Junior Status or above in Electrical Engineering or permission of instructor. Coursework in communications, signal processing, and electromagnetics will be very useful but not required prerequisites.
3. Course Objectives - This course will familiarize students with the fundamental building blocks of radar components, techniques, and systems. The student will be able to analyze the system components necessary to meet capability requirements and describe limitations of specific radar systems. This course will provide a basic framework for designing and assessing radar systems as well as an understanding of target signatures and trends in modern radar design. While intended to serve as an introductory course, this class should prepare the student for practical application to systems as well as further study.
4. Contribution of course to meeting the professional component (ABET only – Radar design embraces electronic design, communication theory, fields and waves, signal processing, and increasingly software. In that regard, Radar becomes a good integrating application for electrical engineers to understand how the traditional fields of electrical engineering can converge to produce powerful capabilities.
5. Relationship of course to program outcomes: Skills student will develop in this course – Radar systems came into practical application during World War II and have come into everyday use today. Engineers have devised ever more complicated and capable modern radars while other radars see service in low-cost applications on cars, doors, and speed traps. While the military and civil aviation remain the predominant application, radar design is of growing importance to a wider market.
6. Instructor – Dr. Steven Butler (Adjunct Professor)
  - a. Office location: UF REEF, Shalimar, Florida
  - b. Telephone: 850-613-6860 (home) 937-474-3486 (cell)
  - c. E-mail address: [gatrdoc1@cox.net](mailto:gatrdoc1@cox.net) (home)
  - d. Class Web site: <https://lss.at.ufl.edu/> or <https://ufl.instructure.com/>
  - e. Office hours: Monday – Friday, 8-5 (no office in Gainesville)
7. Teaching Assistant – TBD
  - a. Office location:
  - b. Telephone:
  - c. E-mail address:
  - d. Office hours:
8. Meeting Times and Location - This is an online class offered through EDGE.

9. Class/laboratory schedule - 3 class periods per week consisting of 50 minutes each

10. Material and Supply Fees - None

11. Textbooks and Software Required – This textbook is recommended but not required. All necessary material will be presented in class but it is taken from the book so the textbook is very helpful.

- a. Title: Principles of Modern Radar
- b. Author: Mark Richards, James Scheer, William Holm
- c. Publication date and edition: SciTech Publishing, 2010
- d. ISBN number: 978-1891121524

12. Recommended Reading - None

13. Course Outline –

- a. Introduction
- b. Radar definitions
- c. Elements of the Range Equation
- d. Radar detection
- e. Atmospheric and clutter
- f. Radar Cross Section and target characteristics
- g. Doppler
- h. Antennas
- i. Radar components
- j. Signal processing
- k. Modern Radar design
- l. Special topics

<b>Week</b>	<b>Date</b>	<b>Holiday</b>	<b>Sessions</b>	<b>Topic</b>	<b>Chapter</b>
1	4-Jan		1	Intro to Course & Radar	1
2	9-Jan		3	Radar Fundamentals	1
3	16-Jan		3	Radar Range Equation	2
4	23-Jan		3	Signal Detection in Noise	3
5	30-Jan		3	Propagation	4
6	6-Feb		3	Target Clutter	5
7	13-Feb		3	Target Reflectivity	6
8	20-Feb		3	Doppler, MTI, Pulse-Doppler	8
9	27-Feb		3	Antennas, Transmitters	9
10	6-Mar	Spring Break	0		
11	13-Mar		3	Receivers & Signal Processing	10
12	20-Mar		3	Special Topics (e.g. FM/CW, Airborne)	11
13	27-Mar		3	Special Topics (Semi-Active, Bistatic)	
14	3-Apr		3	Student Project Presentations	
15	10-Apr		3	Student Project Presentations	

16	17-Apr	Reading Days	3	Student Project Presentations
17	24-Apr	Final	0	
		<b>Sum</b>	<b>43</b>	

14. Attendance and Expectations - Cell phones and other electronic devices are to be silenced. No text messaging during class or exams. There is no penalty for absence or tardiness.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

15. Grading – methods of evaluation (e.g., quizzes 20%, homework 15%, term paper 30%, final exam 35%)

	<u>4540</u>	<u>5547</u>
Assignments:	40%	25%
Midterm:	30%	25%
Final Exam:	30%	25%
Final Project:		25%

16. Grading Scale –

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
95-100	90-94	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	0-59

“A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better).”

Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

17. Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

18. Honesty Policy – UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/scr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore,

you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

19. Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.
20. UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
  - UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: <http://www.counseling.ufl.edu/cwc/Default.aspx>,
  - Career Resource Center, Reitz Union, career and job search services, 392-1601.
  - University Police Department, 392-1111 or 911 for emergencies
21. Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.
22. Course Evaluation – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: <https://evaluations.ufl.edu/results>.