

## **EEL 4540 and 5547 Introduction to Radar**

1. Catalog Description – (3 credits) Basic principles of continuous wave and pulsed radar; angle, range, and Doppler tracking; accuracy and resolution; signal design and processing.
2. Pre-requisites – Calculus, Physics, basic concepts of wave propagation, typically at least Junior or Senior status in EE, competent in MATLAB or equivalent, and Fourier Transforms. Non-EE students with these backgrounds are also welcome.
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 – undergraduate courses) – elective contributing to the fundamental knowledge of electrical engineering
5. Relationship of course to program outcomes: Skills student will develop in this course (ABET only undergraduate courses) – elective contributing to the fundamental knowledge of electrical engineering
6. Instructor – Dr. Steven Butler
  - a. Office location: UF REEF, Shalimar, Florida
  - b. Telephone: 850-613-6860 (home) 937-474-3486 (cell)
  - c. E-mail address: [gatrdoc@ufl.edu](mailto:gatrdoc@ufl.edu)
  - d. Class Web site: <https://lss.at.ufl.edu/>
  - e. Office hours: Monday – Thursday, 9:30-11:30 a.m.
7. Teaching Assistant – Blake Kisshauer
  - a. Office location: TBD
  - b. Telephone: 407-256-9754
  - c. E-mail address: [hbkisshauer@ufl.edu](mailto:hbkisshauer@ufl.edu)
  - d. Office hours: TBD
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 – Recommended, not required
  - 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 – Lots of great books on radar out there

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

Week	Date	Holiday	Sessions	Topic	Chapter
1	7-Jan	Start Monday	3	Intro to Course & Radar (Lesson 1 & 2)	1
2	14-Jan		3	Radar Fundamentals (Lesson 2)	1
3	21-Jan		3	Radar Range Equation (Lesson 3 & 4)	2
4	28-Jan		3	Signal Detection in Noise (Lesson 5)	3
5	4-Feb		3	Propagation (Lesson 6)	4
6	11-Feb		3	Target Clutter (Lesson 7)	5
7	18-Feb		3	Target Reflectivity (Lesson 8)	6
8	25-Feb		3	Doppler and Mid-Term Exam (Lesson 9)	8
9	4-Mar	Spring Break			
10	11-Mar		3	Antennas (Lesson 10)	9
11	18-Mar		3	Transmitters (Lesson 11)	10
12	25-Mar		3	Receivers & Signal Processing, Autocorrelation (12)	11
13	1-Apr		3	Special Topics (FM/CW, Airborne, Synthetic - 13)	
14	8-Apr		3	Special Topics (Semi-Active, Bistatic, Passive - 13)	
15	15-Apr		3	Student Project Presentations	
16	25-Apr	Reading Days	3	Student Project Presentations	
	27-Apr	Final	0	Final Exam Period - Grades Due	
		<b>Sum</b>	<b>45</b>		

14. Attendance and Expectations – While in the live classroom or recording studio, 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

	<u>4540</u>	<u>5547</u>
Homework:	40%	25%
Midterm:	30%	25%
Final Exam:	30%	25%
Final Project:	25% (graduate students only)	

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/sccr/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>.