

Department of Electrical and Computer Engineering

1. Course Number and Name:

EEE 4550 – Introduction to Radar Systems

2. Period:

Fall 2022

3. Credit and Contact Hours:

3 Hours

4. Instructor’s Details:

Satheesh Bojja Venkatakrishnan, Assistant Professor
Electrical and Computer Engineering Dept.


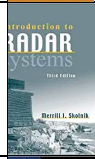

Office: EC 2947

Office Hours: By appointment, Tu: 2.00 PM – 3.00 PM

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5. Textbook(s):

<ul style="list-style-type: none"> • (Mandatory) Principles of Modern Radar, Basic Principles, Vol – 1 Mark .A. Richards et al 1st edition ISBN-13: 978-1891121524 	
<ul style="list-style-type: none"> • (Optional) Introduction to Radar Systems Merrill Skolnik 3rd edition ISBN-13: 978-0072881387 	
<ul style="list-style-type: none"> • (Optional) Fundamentals of Radar Signal Processing Mark Richards 2nd edition ISBN-13: 978-0071798327 	

6. Course Information:

a. Description:

In EEE 4550, the principles of modern radar systems are examined, introducing the main concepts and techniques used in modern radar implementations. The class is a survey course, with the goal of exposing students to a wide range of radar concepts, applications and design issues.

b. Prerequisites:

Students are required to have a basic understanding of signals and systems (EEL 3135), communications systems (EEL 3514), and wave propagation (EEL 1140). Problems and the project will require the use of MATLAB; numerous MATLAB tutorials are available on the Internet. **Non-ECE students with these backgrounds are also welcome.**

7. Specific Goals for the course:

The goal of this course is to provide a comprehensive introduction to the functions of a modern radar system, the elements that comprise it, and the principles of their operation and analysis. Hence, students in this class will not only gain a fundamental understanding of these RADAR concepts, but also complete a project that demonstrates the generation of multiple RADAR waveforms required for its realization. The course will give students the opportunity to learn and apply the knowledge and skills they will need as working professionals in this field. Some specific goals include students:

- Knowing the major functions and applications of a modern radar systems.
- Learning to solve the radar range equation
- Understanding the radar environment and its effect on radar performance
- Understanding the major components of a modern radar system
- Determining target probability of detection and probability of false alarm
- Learning basic radar signal processing techniques

8. Topics to be Covered:

1. Introduction to Radar Basics
2. Radar Range Equations
3. Wave Propagation
4. Target Reflectivity (RCS)
5. Radar Antennas
6. Monopulsing and Phase Arrays
7. Radar Transceivers
8. Pulse Compression
9. Waveforms
10. Doppler Phenomenology
11. Radar Detection
12. Noise and clutter detection
13. Constant False Alarm Detectors
14. Doppler Processing

9. ABET Relationship of course to program outcomes:

(Select corresponding boxes below to applicable program outcomes for the course.)

- 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.

10. Grading Scheme:

Grades for the course will be based upon midterm and final examinations, homework and a research project. Weights are assigned as follows:

Homework	25%
Research Project	15%
Midterm Exam	25%
Final Exam	35%
Total	100%

a. Grading Scale:

Grade	A	A-	B+	B	B-	C+	F
Score	>90	89-80	79-75	74-70	69-60	59-50	< 49

b. Exam Policy:

The mid-term and final exam will allow use of a one page “cheat sheet”. The details of the cheat sheet will be explained in class. Both the mid-term and final exams are subject to the rules of the Honor code. Use of any electronic devices such as cellphones, smart phones, tablets, laptops is not permitted. No discussion is permitted during the exams. Instructor is not compelled to give credit for something he cannot read or follow logically. Make-up examinations will be given only in the case of an emergency.

c. Homework Policy:

There will be six problem sets assigned throughout the semester. **Due dates are two week after assignment dates.** These assignments will be available on canvas for download and will not be handed out in class. Working in groups on the problem sets is encouraged but answers must be provided individually and should not be copies of one another. Do note that there is a very strong correlation between homework effort and exam performance and therefore overall grade score. All material presented in class will be examinable.

d. Project Details:

Each student is required to complete an individual research project. The essence of the project is to realize modern radar applications using existing hardware. Assessment of the project will be based on a written report. Further and more detailed instructions will be given prior to the commencement of the project during the course.

e. Other:

I'm always very interested in your opinions on the course pace, content and difficulty. Please feel free to stop by during office hours or other times to let me know your thoughts on the course. Questions in class are also strongly encouraged; they give the entire class direct feedback on the issues being addressed at that time. I appreciate your help in the continual improvement of this course.

11. Honor Rules:

a. University's Code of Academic Integrity

Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, the rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational Mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook. More information can be found at http://academic.fiu.edu/academic_misconduct.html

b. Plagiarism:

Please note copying and pasting directly from the resources rather than expressing things in your own words is not allowed and is plagiarism. Please check the FIU's note on plagiarism at the following links:

** <http://education.fiu.edu/plagiarism/>

** <http://libguides.fiu.edu/plagiarism>

** <http://academic.fiu.edu/academicbudget/misconductweb/1acmisconductproc.htm>

c. Department Regulation Concerning Incomplete Grades

To qualify for an Incomplete, a student:

1. Must contact the instructor or the department senior secretary as to the reasons leading to the request of an incomplete grade.
2. Must be passing the course prior to that part of the course that is not completed
3. Must make up the incomplete work through the instructor of the course
4. All missed work must be finished before last two weeks of the following term.

University policies on sexual harassment, and religious holidays, and information on services for students with disabilities, Please visit the following websites:

<http://academic.fiu.edu/>; <http://drc.fiu.edu>

d. Course Policies:

- **Academic Misconduct:** For work submitted, it is expected that each student will submit their own original work. Any evidence of duplication, cheating or plagiarism will result at least a failing grade for the course.
- **Deadlines:** Assignments are due at the beginning of the class period on the date specified. Assignments submitted the next day will receive 75% of the full credit and two days after will receive half (%50) credit.
- To get assistance, students are encouraged to see the TA and/or the course instructor by an appointment.
- Students are encouraged to ask questions and to discuss course topics with the instructor and with each other.
- Any work submitted should display Panther ID number and should be signed, as the students' own work, and that no unauthorized help was obtained.
- Cell phones, communicators, MP3 players, head-sets are not allowed to be used in the class.
- Instructor reserves right to change course materials or dates as necessary and should inform the students if any change is needed.