

UNIVERSITY OF TEXAS AT EL PASO
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

EE4389 HIGH RESOLUTION RADAR
Fall 2019 Semester
Monday and Wednesday 9:00-10:20 PM
Classroom Building C330

Instructor: Dr. Benjamin C. Flores
Office: Engineering A336
Office Hours: TR 2:00 PM to 4:00 PM or by appointment
E-mail: bflores@utep.edu

Course Description: In this course you will learn basic aspects of RADAR (Radio Detection and Ranging) theory and the signal processing required to obtain Doppler and range information from targets.

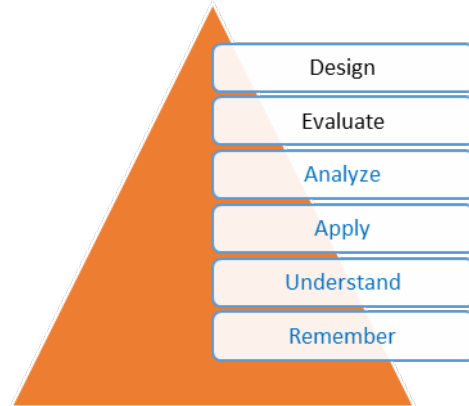
Prerequisites: EE3321 Electromagnetic Fields with a grade of "C" or better. Before starting the semester, review the following topics:

1. Fourier transform
2. Signal convolution
3. Circuit transfer function
4. Electromagnetic wave propagation

ABET Description: EE4389 is a senior elective course that builds on topics covered primarily in junior required courses. It is one of a menu of courses normally taken by students seeking a concentration in "fields, energy, and devices." It may also be taken as an elective by students seeking additional breath in the curriculum.

Learning Outcomes: From an educational perspective, you are expected to *remember* (recall facts and basic concepts), *understand* (explain ideas and concepts), *apply* (use information in new situations), and *analyze* (draw connections among ideas). This is part of a taxonomy that describes your depth of knowledge as shown in the figure below.

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You are expected to master the four lower levels of this taxonomy. Consequently, by the end of the semester, you will be able to:

1. Understand and apply the radar range equation.
2. Understand and apply antenna array scanning principles
3. Analyze radar signals in the time and frequency domains.
4. Apply Fourier Transform techniques and analyze Doppler frequency information.
5. Apply Matched Filter techniques and analyze obtain range information.

Class Attendance: Attendance is an essential component of this course. You're expected to come to all lecture sessions. A maximum of four (4) unexcused absences are allowed. Additional absences may result in course dismissal with an F grade.

We will dedicate most of our time to discussing topics in groups, solve problems, and review key concepts and analysis/design procedures. As a college student, you are expected to participate in class. Uncooperative behavior as determined by the instructor and classmates may be penalized with a grade reduction.

Study Habits: For every two class periods, you are expected to dedicate at least six (6) hours of study until you understand the material and finish your homework assignment. This is a standard expectation. Thus, you should study approximately 6 hours per week. Time on task is essential for your success!

Study Strategy: Dedicating time and effort to this course can be achieved systematically. The process is simple but it requires your commitment. As a college student you should strive to:

1. Study all reading materials assigned to you **before** each class period.
2. Attend class and participate in discussions.
3. Solve collaboratively the exercises in class handouts.
4. Study with a partner.
5. Do your homework and MATLAN assignments individually.

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6. Reflect on what you learned and need to improve upon.

This is a cycle that a good engineer student commits to practice. As the saying goes: **practice makes perfect**. The expectation is that you will do your best. Your final grade should be a reflection of this effort.

Course Materials: The following items are required for the course:

- Engineering graph paper for homework assignments.
- 1 ½ inch, 3 ring binder to keep homework problems, exams, and MATLAB assignment.
- Graphics or scientific calculator.
- MATLAB manual available at <http://www.mathworks.com/access/helpdesk/help/techdoc/matlab.shtml>.

Calculator Usage: You may use a calculator during examination periods but you may not share it with anyone.

MATLAB Projects: You are required to use MATLAB to conduct waveform simulations, antenna array patterns, Doppler and range signal processing. You will receive a handout for each assignment. Submit a report with the items described in the handout. This will include your MATLAB script which must be unique and well documented. No late projects will be accepted.

Study Groups: I encourage you to form study groups of two or three. You may get together to discuss homework problems and computer assignments. However, I expect your solutions to be a truly individual effort.

Tutoring Websites: The use of tutoring websites such as chegg.com is strictly prohibited. All work submitted for grading must be strictly your own.

Quizzes: There will be at least two quizzes for each learning objective. You may use a calculator and a crib sheet for each quiz. You may not communicate with any class peer during quiz time. The use of cell phones, lap tops, or pads during quiz periods is strictly prohibited.

Grading: Your final score will be determined as follows

Quizzes	25 points
MATLAB projects	<u>75 points</u>
Total	100 points

Final Examination: None required.

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Final Grade Scale: There will be no grade curve.

A	100-90	Outstanding
B	89-80	Above average
C	79-70	Average
D	69-60	Poor
F	60 or less	Failing

There will be no grading curves or negotiation on points earned. If you feel that a grading error was made, I will review the case individually. Remember you earn your grade based on the work you do.

EE5389 Section: Graduate students are required to do additional work for this course. This will entail a special assignment. Taking on a leadership role during class is also expected and appreciated.

Cell Phone Etiquette: Please set your phone to do not disturb before each class or exam period. Use of the phone in class is prohibited.

Note: This syllabus is subject to minor changes as determined by the instructor. Any such changes will be posted on a timely manner.

Prepared by Prof. Benjamin C. Flores

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INSTITUTIONAL POLICY

Academic Integrity and Professional Ethics: Every college student must abide by professional and academic integrity rules. I expect nothing but the best from you. However I will not hesitate to report all cases of misconduct to the **Office of Student Conduct and Conflict Resolution**. Check the OSCCR website for UTEP's policy on academic dishonesty. Also, carefully review the IEEE code of ethics below.

IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to *the highest ethical and professional conduct* and agree:

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1. to hold paramount the safety, health, and welfare of the public, to strive to comply with ethical design and sustainable development practices, and to disclose promptly factors that might endanger the public or the environment;
 2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
 3. to be honest and realistic in stating claims or estimates based on available data;
 4. to reject bribery in all its forms;
 5. to improve the understanding by individuals and society of the capabilities and societal implications of conventional and emerging technologies, including intelligent systems;
 6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
 7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
 8. to treat fairly all persons and to not engage in acts of discrimination based on race, religion, gender, disability, age, national origin, sexual orientation, gender identity, or gender expression;
 9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
 10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

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Learning Disabilities: The UTEP Center for Accommodation and Support Services (CASS) was established for the purpose of providing appropriate and reasonable accommodations as mandated in Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA). If you have needs regarding learning disabilities, please help me to help you by reporting those needs the first week of classes.

Discrimination. Members of the UTEP community are protected from discrimination and harassment by State and Federal Laws. Discrimination on campus on the basis of age, gender, race, ethnicity, genetic information, national origin, religion, veteran's status, disability, sexual orientation or gender identity is strictly prohibited.

Campus Concealed Carry. For details see <http://sa.utep.edu/campuscarry>. The instructor reserves the right not to engage individuals who carry a concealed weapon. The instructor will provide oral notice if needed.

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**EE4389 High Resolution Radar
Course Syllabus and Course Contract**

I've read the course syllabus and understand the policies and procedures that apply to this course. Furthermore, I understand that if I do not agree to sign this form and return it to the instructor I forfeit the opportunity to take any makeup exams.

Name _____

Signature _____

Student ID # _____

Date _____