DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
ECE 447 Syllabus - Fall 2025

Course description

This course will introduce the student to the fundamentals of analog and digital communication signals and systems, with more emphasis on the digital side. Laboratory exercises using software defined radios (SDRs) will be used to reinforce the concepts taught in the course and give cadets familiarity with contemporary test equipment.

Instructor

Lt Col Matthew Booth (Course Director)   2E36A   matthew.booth@afacademy.af.edu

Course Goal

To develop the ability to analyze, understand, and design analog and digital communication signals and systems and appreciate the role communications plays in modern electronic systems.

Course Objectives

- Analyze basic analog and digital communication principles and apply these principles to the solution of communications-engineering problems.

- Use contemporary test equipment to measure specific performance parameters for analog and digital communication systems.

Course Prerequistes

- **ECE 346, Math 356:**   Random variables, probability distributions and density functions, conditional probability.

- **ECE 333, ECE 346:**   Fourier series and transform analysis, Laplace transform analysis, time and frequency domains.

- **ECE 333:**   Linear systems theory, convolution.

Course Textbook

Modern Digital and Analog Communication Systems, B. P. Lathi and Zhi Ding, Oxford University Press, 2025.

The textbook is required and is only available digitally. You can get a discount by using this link (full link address on next page).

(https://view-su3.highspot.com/viewer/6f8613b4e0d3ad3da4b97879342ea312?iid=
6838256713d17dd25a3827f6&source=email.untracked)

Course Website

The course website contains the course schedule, lesson slides, lab descriptions, and more. The website will be updated when necessary, so bookmark it and return to it often.

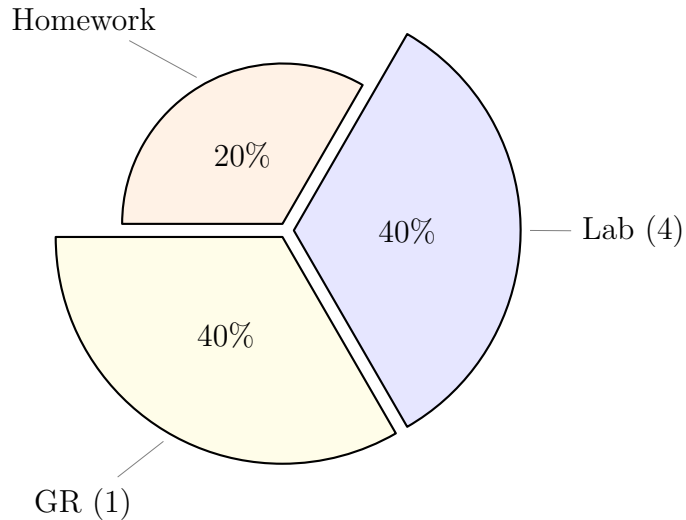https://usafa-ece.github.io/ece447-book/intro.html

Course Communication

- **Gradescope** Cadets will be enrolled in the course on Gradescope. All assignments will be submitted, graded, and/or returned through Gradescope.

- **Teams** Most communications regarding the course will be through Teams, including any changes made to the schedule on the course website.

- **Email** Bedrest, SCAs, and other communications requiring formal documentation **must be submitted *via email***.

Generative AI Policy

This course is generally a GenAI Usage Level 4 (use of GenAI to co-create and/or revise work), as described in the DF GenAI Policy AY 25-26, unless noted otherwise. You should use GenAI platforms (ChatGPT, etc) as tools rather than to complete assignments for you. It will become clear quickly if you are using GenAI irresponsibly. ChatGPT is not very good at math, and, if you aren't following in class and seeking EI, you should not miraculously have a perfect answer on your homework. If you utilize GenAI on *any* assignment, include a documentation statement as outlined in the DF GenAI Policy.

Prog Grade Weighting

Homework — 20%
Lab (4) — 40%
GR (1) — 40%

Final Grade Weighting

Final Exam — 30%
Homework — 20%
GRs (2) — 25%
Labs (8) — 25%
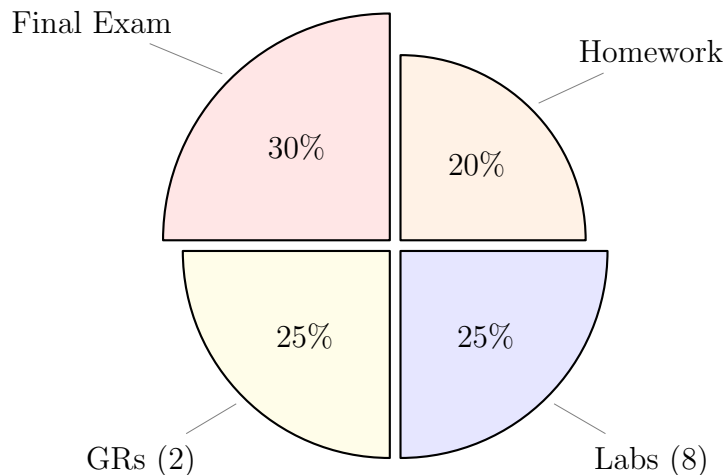
Homework will be assigned regularly and due dates will be published on the course website. Also, take note of Homework standards, as laid out in the syllabus. Do not wait until the last minute to complete the homework – work on a problem immediately after the relevant lesson.

Quizzes, if deemed necessary by the instructor, will generally **not** be announced in advance, may be taken in class or assigned as "take home" via Gradescope, and will typically take 10-15 minutes. The content may be similar to homework problems or lab questions. They will be worth one homework grade.

GRs and the Final Exam are individual efforts. Note there is only 1 GR before Prog, worth a considerable portion of your Prog grade.

Labs may be individual or with a partner. However, each cadet must submit individually. Each lab will have an accompanying description detailing what must be submitted to Gradescope.

Grade Scale

F	D	C-	C	C+	B-	B	B+	A-	A

≤ 60%   70%   73%   77%   70%   83%   87%   90%   93%   100%
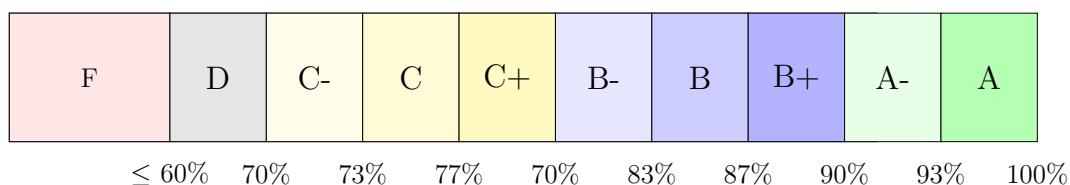
1. **Homework Standards**
   - To be successful in this course, you MUST work problems outside of class.

   - Collaboration is authorized as noted in the Collaboration policy.

   - The distribution of homework problems is provided in a table on the Teams Channel.

   - All homework must be complete, error-free, and neatly organized. **Points may be deducted for sloppy and illegible work**.

   - Work should be organized using the **Known/Given, Find, Solution, Answer** method.

   - Answers should be clearly indicated by a box.

   - Use engineering with proper units.

   - Work will be submitted on Gradescope, unless directed otherwise by your instructor. Scans/uploads must be of excellent quality and legibility/neatness standards apply.

2. **Collaboration**

   - Collaboration (not copying) on homework is highly encouraged, unless your instructor provides direction otherwise.

   - A good litmus test to distinguish between copying and collaboration is as follows: students must be able to explain every step indicated on their submitted work to be considered collaboration and not copying.

   - All help received on work submitted for grading must be documented in accordance with the course documentation policy.

   - Quizzes, GRs, and the Final Exam are individual effort. No collaboration is allowed while taking these exams.

   - All electronic devices (phones, smart watches, computers, tablets, etc.) must be placed out of sight for the duration of the event. If any electronic device is seen during the event, the student will receive a zero for that graded event.

3. **Documentation**
   In accordance with the Dean's policy for documentation, all ECE assignments must have a documentation statement. For group projects, you are not required to document collaboration within your own team, as such collaboration is expected and authorized. The documentation statement should be clearly identified with the word "Documentation." If you did not collaborate, then the statement "Documentation: None," is appropriate. Assignments without a documentation statement are incomplete and may be returned to the student for completion. The assignment will then be assessed the appropriate penalty according to the late work policy. Your instructor may assess a 1-day-late penalty (up to 25%) in lieu of returning the assignment. In this case, a documentation statement must still be received, before the grade can be posted.

1. **Instructor Philosophy**

   You have chosen one of the most challenging majors at USAFA. I applaud your commitment! My role in your journey is to enable your success. My goal is not to make you feel inferior or unintelligent. I firmly believe that, having come this far, you can not only survive this major – you can thrive! If you put in the work and communicate with me, I will do everything in my power to make sure you succeed. Have questions? Ask – I truly believe there's no such thing as a stupid question. Have concerns? Let's talk. You face many challenges here at USAFA; I am in your corner – so let's go!

2. **Academic Honor**

   Your honor is extremely important. The course's academic security policies are designed to help you succeed in meeting academic requirements while practicing the honorable behavior our country rightfully demands of its military. Do not compromise your integrity by violating academic security or by taking unfair advantage of your classmates.

3. **Extra Instruction**

   EI is one of the best and easiest ways to succeed in this class; EI is recommended early and often.

4. **Absences**

   In the event of an absense, communicate with your instructor **beforehand.** If a cadet will miss any graded event due to a scheduled absence such as an SCA, sport team trip, or scheduled medical procedure, a makeup plan should be in place **before** the absense occurs. In the even of bedrest, please notify your instructor ASAP after receiving bedrest approval.

5. **Late Policy**

   25% of available points will be deducted for each calendar day (the first calendar day being anywhere from one minute, to 24 hours after the assignment is due) the graded assignment is late. Your instructor may waive part or all of this penalty for legitimate, pre-coordinated (if possible) extenuating circumstances.