

## Syllabus

**Instructor:** O. Ozan Koyluoglu (ozan@email.arizona.edu).

**Class Times and Office Hours:** Class meets TTh 8:00am - 9:15am in EDU Bldg., Rm 308. Office hours are F 1:00pm - 2:00pm in ECE Bldg., Rm 456C. If you can not make it to the office hours, we can schedule a meeting via email.

**Topics:** This course helps the students to develop a solid understanding of the fundamental concepts in detection and estimation theory with applications to some engineering problems. Topics covered in this course include the followings.

1. Elements of Hypothesis Testing
  - (a) Bayesian hypothesis testing
  - (b) Minimax hypothesis testing
  - (c) Neyman-Pearson hypothesis testing
  - (d) Composite hypothesis testing
2. Signal Detection in Discrete Time
  - (a) Deterministic signals
  - (b) Stochastic signals
  - (c) Performance evaluation and Chernoff bounds
  - (d) Sequential detection
3. Elements of Parameter Estimation
  - (a) Bayesian parameter estimation
  - (b) Minimum-variance parameter estimation
  - (c) Properties of estimators
  - (d) Maximum-likelihood parameter estimation

**Prerequisite:** ECE 503 (Probability).

**Course Materials and references:** The course closely follows the required textbook [1].

- [1] H. Vincent Poor, An Introduction to Signal Detection and Estimation, Springer, 1994.
- [2] Steven M. Kay, Fundamentals of Statistical Signal Processing, Volume 1: Estimation Theory, Prentice Hall, 1993.
- [3] Steven M. Kay, Fundamentals of Statistical Signal Processing, Volume 2: Detection Theory, Prentice Hall, 1998.

- [4] Carl W. Helstrom, Statistical Theory of Signal Detection, Pergamon, 1968.  
[5] Carl W. Helstrom, Elements of Signal Detection and Estimation, Prentice-Hall, 1995.

**Grading policy:**

Homeworks 20% (5 Homeworks)  
Midterm I 25% (February 16)  
Midterm II 25% (April 5)  
Final 30% (May 12)  
Bonus Quizzes 12% (12 Quizzes)

**Exam policy:** Both midterms and final are closed book exams. Students are allowed to use their notes: One sheet of paper (i.e., two sides of standard letter size -  $8.5 \times 11$  inches - paper) for midterm 1, two sheets for midterm 2, and three sheets for the final exam. Only one make-up exam will be administered during the semester and it will be for those students who have missed an exam with a valid excuse that is recognized by the university.

**Late policy:** No late material will be accepted unless prior arrangements have been made with the instructor. Arrangements must be made at least 24 hours in advance. Emergency situations will be handled on a case by case basis.

**Homework policy:** Students are encouraged to discuss homework problems with each other. Final submitted material must be students' own work. A subset of the homework problems will be graded.

**Email policy:** Students need to use "ECE 639" at the beginning of the subject line when emailing to the instructor.

**Special needs and accommodations:** It is our goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources Center (520-621-3268, <http://drc.arizona.edu>) to establish reasonable accommodations.

**Student code of academic integrity:** Students are encouraged to share intellectual views and discuss freely the principles and applications of course materials. However, graded work/exercises must be the product of independent effort unless otherwise instructed. Students are expected to adhere to the UA Code of Academic Integrity as described in the UA General Catalog. See: <http://deanofstudents.arizona.edu/codeofacademicintegrity/>.

**Course lectures and materials will be online. Please check D2L regularly. Information contained in the course syllabus may be subject to change with advance notice.**