ECE 413: Probability with Engineering Applications

**Home page:** [http://courses.ece.uiuc.edu/ece413/spring06/](http://courses.ece.uiuc.edu/ece413/spring06/)

**Class hours:** There are two sections for this class:
Section C: Mondays, Wednesdays, and Fridays 10 AM - 10:50 AM in 260 EL
Section D: Mondays, Wednesdays, and Fridays 11 AM - 11:50 AM in 245 EL

**Prerequisite:** ECE 210: Analog Signal Processing

**Instructors:**
Narendra Ahuja, BI 2041, tel: 333-1837, e-mail: n-ahuja@uiuc.edu
Sujay Sanghavi, CSL 104, tel: 333-7916, e-mail: sanghavi@uiuc.edu

Both sections will be taught by the same instructor in the same week, but which instructor teaches the class depends on the week. A preliminary lecture and topic schedule for the semester is given below.

**Instructor Office hours:** Mondays 2 PM - 4 PM in BI 2041 (NA) or CSL 104 (SS)


**Teaching assistant:** Mustafa Kesal (kesal@uiuc.edu)
TA Office hours: Tuesdays and Fridays, 3 PM - 5 PM, in CSL 114.

**Homeworks:** Homeworks will be assigned on a weekly basis, and will be posted on the course home page on Wednesday evening or Thursday morning. They will be due at the beginning of class on the following Wednesday. *Late homeworks will not be accepted without prior permission.* If you cannot attend class on the homework due date, you must make arrangements to have your homework turned in to the instructor before class. Homeworks will cover material including the Friday class of the week in which they are assigned. Graded homeworks can be picked up during the office hours of the teaching assistant (more specific information on this will be given in due course, and posted on the course home page).

**Exams:** There will be two mid-term exams and one final exam. For the mid-terms, a single 8.5x11” sheet of notes is permitted (you may use both sides); but otherwise the exams are closed book. Laptops, calculators, palm-pilots, tables of integrals etc. will neither be necessary nor be permitted. For the final exam, three 8.5x11” sheets of notes are permitted (you may again use both sides). The sheets can be hand-written, but the font size should not be too small, necessitating the use of a magnifying glass; as a general rule, any size smaller than the equivalent of a 10 pt font is not permitted.

Schedules for the Exams:
Mid-Term 1: THURSDAY, February 23, 7:00 - 8:30 PM,
Mid-Term 2: THURSDAY, April 6, 7:00 - 8:30 PM,
Final: To be Announced

**Grading system:** In determining your grade, scores on homeworks and the three exams will be weighted as shown below:
10% Homeworks
25% Each Mid-Term Examination
40% Final Examination
Books on reserve in the Grainger Library:

Class schedule: The outline below is roughly how the class will be organized. Powerpoint slides from previous semesters are available at http://courses.ece.uiuc.edu/ece413/fall03/Slides.html
However, we emphasize that it is the material covered in class and assigned by the instructors that will be the basis for the two mid-terms and the final!

Lecture 1: Introduction to ECE 413  (January 18, 2006)
Lecture 2: The Probability Model
Lecture 3: The Axioms of Probability, Part I
Lecture 4: The Axioms of Probability, Part II
Lecture 5: The Axioms of Probability, Part III
Lecture 6: Random Variables
Lecture 7: Mean, LOTUS, and Variance
Lecture 8: Independent Trials (Monday, September 12)
Lecture 9: Statistical Estimation
Lecture 10: Confidence Intervals
Lecture 11: Important Counting Random Variables
Lecture 12: Conditional Probability
Lecture 13: The Theorem of Total Probability
Lecture 14: Bayes’ Formula

——— Material Cutoff for Mid-Term 1 ————

Lecture 15: Decision-making under uncertainty I
Lecture 16: Decision-making under uncertainty II

Midterm 1: Thursday, February 23, 7-8:30 pm, EVRT 269
Lecture 17: Decision-making under uncertainty III
Lecture 18: Independent Events
Lecture 19: System Reliability I
Lecture 20: System Reliability II
Lecture 21: The Cumulative Distribution Function
Lecture 22: Continuous Random Variables I
Lecture 23: Continuous Random Variables II
Lecture 24: Continuous Random Variables III
Lecture 25: Poisson Random Processes
Lecture 26: Gaussian Random Variables
Lecture 27: Functions of Random Variables
Lecture 28: Hazard Rates and System Reliability

——— Material Cutoff for Mid-Term 2 ————

Lecture 29: Decision-making under uncertainty IV
Lecture 30: Joint Distributions of Random Variables

Midterm 2: Thursday, April 6, 7-8:30 pm, MSEB 119
Lecture 31: Joint Probability Mass Functions
Lecture 32: Jointly Continuous Random Variables I
Lecture 33: Jointly Continuous Random Variables II
Lecture 34: Jointly Continuous Random Variables III
Lecture 35: Functions of Many Random Variables I
Lecture 36: Functions of Many Random Variables II
Lecture 37: Functions of Many Random Variables III
Lecture 38: Expectation, Covariance, and Correlation
Lecture 39: Jointly Gaussian Random Variables
Lecture 40: Mean-Square Estimation
Lecture 41: Limit Theorems

**Final Exam: To be Announced**