EE 3025 Statistical Methods in Electrical and Computer Engineering

Updated: Feb. 12 2013

This course outline is to serve as a reference for instructors and students. It gives a general overview of course content and ABET Outcomes. Please consult the semester specific syllabus produced by the course instructor for more detailed information.

Course Prerequisites, Basic Content, and Outcomes

Catalog Description
(3.0 cr; Prereq-[3015, CSE] or instr approval; fall, spring, summer, every year)
Notions of probability. Elementary statistical data analysis. Random variables, densities, expectation, correlation. Random processes, linear system response to random waveforms. Spectral analysis. Computer experiments for analysis and design in random environment.

Contact Hours:
3 hours of lecture and 1 hour of discussion per week.

Text:
Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers, Roy D. Yates and David Goodman, 2nd Edition, Wiley, 2004.

Prerequisites by Topic:
Time and frequency analysis of signals and systems (EE 3015).

Course Outcomes:
1) An understanding of the laws of probability sufficient to enable calculations from a probability model.
2) An ability to apply conditional probability and the Bayes principle in engineering design.
3) An ability to compute expected values and variances, as well as an understanding of the meaning of these concepts.
4) An understanding of univariate probability models such as the uniform, Gaussian, binomial, and Poisson models.
5) An ability to simulate random data according to a probability model.
6) An ability to use correlation properties to design linear least squares estimators.
7) An understanding of the bivariate Gaussian probability model .
8) An ability to use the central limit theorem and the law of large numbers to design confidence intervals.
9) An understanding of some basic types of random processes, including stationary processes, ergodic processes, Gaussian processes, and the Poisson process.
10) An understanding of autocorrelation and power spectral density functions, as well as an ability to estimate these from observations of random data.
11) An understanding of the effect of linear filtering on a random process sufficient for elementary optimum filtering design problems.

Relationship to Student Outcomes:
In accordance with ABET accreditation criteria, all engineering programs must demonstrate that their students achieve certain outcomes. This list of outcomes may be found on the ABET.org website. Of the outcomes listed in the ABET criteria (enumerated as (a) through (k)), this course teaches skills which help the student achieve the following outcomes:

(a) an ability to apply knowledge of mathematics, science, and engineering
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outline

Week	Lecture Topics
1	Introduction
2	Experiments, outcomes, events, laws of probability, frequency interpretation, conditional probability, Bayes rule
3	Single Random Variables
4	Single Random Variables
5	Continuous Random Variables
6	Multiple Random Variables
7	Limit Theorems
8	Random Vectors
9	Sums of Random Variables
10	Estimation of a Random Variable
11	Stochastic Processes
12	Stochastic Processes
13	Random Signal Processing
14	Random Signal Processing
15	Random Signal Processing

Departmental and University Policies

Student Academic Integrity and Scholastic Dishonesty: Academic integrity is essential to a positive teaching and learning environment. All students enrolled in University courses are expected to complete coursework responsibilities with fairness and honesty. Failure to do so by seeking unfair advantage over others or misrepresenting someone else's work as your own, can result in disciplinary action. The University Student Conduct Code defines scholastic dishonesty as follows:

***Scholastic Dishonesty*:** Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering forging , or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis.

Within this course, a student responsible for scholastic dishonesty can be assigned a penalty up to and including an "F" or "N" for the course. If you have any questions regarding the expectations for a specific assignment or exam, ask.

Incompletes: A grade of I for Incomplete is given at the discretion of the course instructor when, due to extraordinary circumstances, the student who has successfully completed a substantial portion of the course's work with a passing grade was prevented from completing the work of the course on time. Students must fill out an Incomplete Grade Agreement form found in Keller 3-166. The maximum time to remove and replace an incomplete grade is one year.

Makeup Work for Legimate Absensces: Consult university policy here:
http://policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html

Personal Electronic Devices: Consult university policy here:
http://policy.umn.edu/Policies/Education/Education/CLASSROOMPED.html

Mental Health: As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via the Student Mental Health Website at http://www.mentalhealth.umn.edu