Subject: Introduction to Probability and Stochastic Processing for Engineering

Spring 2014

11:15 am - 12:05 pm M W F

13 Life Sciences Bldg.

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Class attendance is important for this course

Home Work:
Visit the course web page http://sites.stat.psu.edu/~babu/418/ regularly for Home Work assignments. They should be submitted in class on the due dates. Late submissions will not be accepted. About ten home work assignments will be given, each carrying approximately 3% of the grade.

Examinations:
Two in-class midterms (February 17 and March 28) and a final exam. They will be closed-book exams. Make-ups will not be given.

Evaluation:
Each of the two midterm exams will carry 20% weight, final exam 30%, and Home work 30% of the grade.

Textbook:

Course description:
This course is an introduction to Probability and Stochastic Processes for engineering students. Combinatorial analysis as a preparation for the main material will be covered in the beginning of the course. The topics include probability axioms, conditional probability, Bayes theorem, independence, random variables, expectation, continuous and discrete distributions, joint distribution functions, conditional distributions, conditional expectations, covariance, correlation, probability inequalities and limit theorems, stochastic processes including Poisson, Brownian motion, and Gaussian processes. (Chapters 1-6, 10 and 12)

Course Expectations:
After completing Chapter 1, the students will be able to write axioms of probability, derive simple consequences of these axioms; use set notation or Venn diagrams; define conditional probability and understand intuitively what the conditional probability mean; state use multiplication rule of conditioning; state and use Bayes's theorem; work with independent two or more independent events, understand independent trials; learn to use rules of counting (multiplication rule, permutations, and combinations).
After completing Chapters 2 and 3, the students will be able to work with random variables, both discrete and continuous; list properties of probability mass function and density functions; find constant multiplier for a density function; define and derive expectation, variance and standard deviation of random variables and functions of random variables; learn the properties of special distributions such as Bernoulli, binomial, Poisson, geometric, uniform, exponential, gamma, chi-square and normal/Gaussian; derive cumulative distribution function; use cumulative distribution function method to find the distribution of a function of a random variable.

After completing Chapters 4 and 5, the students will be able to understand joint probability mass function, density and cumulative distributions of two or more random variables; derive marginal probabilities, conditional density and mass functions given a random variable; check when the given random variables and random vectors are independent; derive expectations of functions of random vectors; derive covariance and correlation coefficient; write down the density of bivariate Gaussian random variable; understand and become familiar with vector notation; derive covariance matrix.

After completing Chapter 6, the students will be able to derive expectation and variance of sum of random variables; derive cumulative distribution function and probability density function of sum of two random variables; define and derive moment generating function of a random variable; derive moments from the moment generating function; work with random sums of independent random variables; learn to use conditional expectations to get unconditional mean and variance; state and work with central limit theorem; derive and use probability inequalities such as Chernoff bound, Markov and Chebyshev's inequalities.

After completing Chapters 10 and 12, the students will be able to work with stochastic processes such as Poisson process and Brownian Motion; able to check if a given process is stationary or not; derive autocovariance function; learn about Gaussian processes; learn about discrete-time Markov Chains; derive limiting state probabilities for a finite Markov Chain; and evaluate stationary probabilities for Ergodic Markov chains.

All Penn State and Eberly College of Science policies regarding ethics and honorable behavior apply to this course. See http://www.psu.edu/ufs/policies/.

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: http://equity.psu.edu/ods/dcl. For further information, please visit the Office for Disability Services Web site: http://equity.psu.edu/ods.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.