

Course Information

- Class webpage:
<http://www.ece.iastate.edu/~namrata/EE322/>
 - use for announcements
- We will use WebCT for most things - handouts, homeworks, solutions
- Instructor: Prof. Namrata Vaswani
 - Office Hours: Mon-Tues-Wed 4-5pm or by appointment
 - Email: namrata AT iastate.edu
 - Office: 3121 Coover Hall
 - Phone: 515-294-4012
- Teaching Assistants: Kai Zhu and Teng Zhao
 - Email: kzhu AT iastate.edu, tzhao AT iastate.edu

- Help Session (informal recitation) will be run by Kai Zhu
 - Time: TBD (decide in first lecture)
 - Location: TBD
- **Textbook:**
Bertsekas & Tsitiklis, Introduction to Probability, Athena Scientific
 - Textbook Website:
<http://www.athenasc.com/probbook.html>
 - Contains problem solutions for textbook problems

- **Course objectives:** The course will cover descriptions of discrete and continuous random variables (probability mass function, cumulative distribution function and probability density function); mean and variance computation; conditioning and Bayes rule; statistical independence; and joint, conditional and marginal pdf and cdf. Bernoulli, Binomial, Geometric, Poisson, Uniform, Exponential, Gaussian and other distributions of interest to EE students will be discussed. Moment generating functions, PMF, PDF of sums of random variables will also be covered. Covariance, correlation and Bayesian least squares (and linear least squares) estimation will be covered. Markov and Chebyshev inequality, law of large numbers, central limit theorem. Time permitting, we will also introduce basic concepts of (a) Monte Carlo and importance sampling and (b) Markov chains.

- *Disability accommodation: If you have a documented disability and anticipate needing accommodations in this course, please make arrangements to meet with me soon. You will need to provide documentation of your disability to Disability Resources (DR) office, located on the main floor of the Student Services Building, Room 1076, 515-294-7220.*
- **Handouts DO NOT replace the book. In most cases, they only provide a guideline on topics and an intuitive feel. To really understand the material I strongly recommend reading the book and solving more problems beyond just homework problems.**

- **Quiz Policy**

- There will be a 20-25 minute quiz every Friday (or almost every Friday) based primarily on what was covered on Monday and Wednesday of the same week
- There may also be some *unannounced* short quizzes on other days (usually very easy ones and sometimes just graded for completion).
- At most ONE quiz can be missed without a valid excuse (either the announced one or the unannounced one)

- **Homework Policy**

- At most ONE late homework allowed without a valid excuse
- Homeworks will be due almost every week (mostly Fridays)

- Problems may sometimes be repeated (from homework to quiz or hw/quiz to exam). So please go over solutions carefully.

- **Attendance policy**

- At most ONE class can be missed without excuse
- This will be indirectly ensured by the quiz policy

- **Grading policy:**

- Homeworks: 20 %
- Quizzes (announced and unannounced): 20%
- Midterm Exams(2): 15% x 2
 - * Midterm 1: March 9
 - * Midterm 2: April 22 (Friday before dead week): serve as a recap for final
- Final Exam: 30 %

- **Syllabus**

- Set theory basics, Conditional probability, Total probability, Bayes rule, Independence, Counting, Binomial, Reliability
- Discrete random variables: PMF, expectation, mean, variance, two random variables (joint PMF, conditioning, Bayes, independence), functions of r.v.'s
- Continuous random variables: PDF, CDF, expectation, mean, variance, functions of r.v.'s, two random variables (joint PDF, joint CDF, conditioning, Bayes, independence), derived distributions
- Sums of r.v.'s, Moment Generating Functions
- Covariance, correlation, Bayesian least squares estimation, linear LS
- Markov, Chebyshev inequalities, Weak law of large numbers, Central Limit theorem

- **Prerequisites:** EE 224, basic calculus, linear algebra
 - You should be familiar with basic calculus, e.g. you should be able to sum and integrate common sequences and functions, e.g., sum a geometric progression and integrate constants, exponentials, and sinusoids.
 - You should be familiar with elementary linear algebra, e.g. understand vector and matrix notation and be fluent with simple operations with matrices and vectors and know the meaning of inverse of a matrix and the determinant of a matrix.
- The class requires a **significant** time commitment: it may seem easy because homeworks take little time to write out. But they require some careful thinking, and sometimes may take long to figure out. Always advisable to attempt once 2 days before the due date once on the last day.

Motivation and Applications: Why Should I Study Probability?

- As stated by Laplace, “Probability is common sense reduced to calculation”.
- You need to first learn the theory required to correctly do these calculations. The examples that I solve and those in the book and the homeworks will provide a wonderful practical motivation as to why you need to learn the theory.
- If you patiently grasp the basics, especially the first 4 chapters of BT, it will be the most useful thing you’ve ever learnt - whether you pursue a career in EE or CE or Economics or Finance or Management and also while you try to invest in stocks or gamble in Las Vegas!
- Applications:

- Applications: communications (telephones, cell phones, TV, ...), signal processing (image and video denoising, face recognition, tracking moving objects from video,...), systems and control (operating an airplane, fault detection in a system,...), predicting reliability of a system (e.g. electrical system), resource allocation, internet protocols, non-engineering applications (e.g. medicine: predicting how prevalent a disease is or well a drug works, weather forecasting, economics).