

STAT 410-0101 - Spring 2010

Course Syllabus

Course Title: **Introduction to Probability Theory**

Time and Place: **TuTh 11 AM - 12:15 PM, MTH B0425**

Textbook: Sheldon Ross, *A First Course in Probability*, 8-th edition, Prentice Hall, ISBN-13 978-0-13-603313-4

Instructor: **Prof. Abram Kagan**

Office: **MTH 2306, phone x5-5456**

Office Hours: **TuTh 10 - 11 AM or by appointment**

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Prerequisite: **MATH 240-241 or consent of the instructor**

STAT 410 is an introduction to basic concepts and results of probability theory presented with mathematical rigor. After discussing axioms of probability and properties of probability and conditional probability, I'll turn to random variables and vectors. They will be studied using the moment generating functions, a powerful tool that allows, among other things, to prove the Central Limit Theorem. Distributions of special interest (binomial, Poisson, multinomial, normal, gamma and a few more) will be studied in detail.

**The students are responsible for all the material covered in class.
Out of respect for other students please no food in the class.**

Homework, tests, grading

Homework will be assigned and graded and represent 30% of the total score. Three 75 min exams will be given **tentatively** on Tuesday, February 23, Tuesday, April 6 and Tuesday, May 4, each representing 10% of the total score. Three quizzes will be given each representing 5% of the total score. The final exam is on Thursday, May 13 from 8 - 10 AM and represents the remaining 25% of the total.

A student who missed an exam/quiz and wants to take the make-up is required to submit a written explanation with supporting documents attached.

Topics to be covered:

- Sample space. Events, elementary events, algebra of events. Axioms of probability. inclusion-Exclusion formula. Conditional probability. Bayes' Theorem. Independence (Weeks 1, 2, 3).
- Discrete random variables. Expected value and variance. Basic discrete distributions (binomial, hypergeometric, Poisson, negative binomial) (Weeks 4, 5, 6).
- Continuous random variables. Probability density function. Basic continuous distributions (uniform, normal, exponential, gamma). (Weeks 7, 8).
- Random vectors. Joint, marginal, and conditional distributions. The bivariate normal distribution (Weeks 10, 11).
- Expectation and variance of sums of random variables. Moment generating functions. Conditional expectation and prediction (Weeks 12, 13).
- Chebyshev's inequality, the Law of Large Numbers and the Central Limit Theorem (Weeks 14, 15).