Math 475 – Probability

Course Description from Bulletin: Elementary probability theory; combinatorics; random variables; discrete and continuous distributions; joint distributions and moments; transformations and convolutions; basic convergence theorems; simulation. Credit not granted for both MATH 474 and MATH 475. (3-0-3)

Enrollment: Required for AM majors, elective for other majors.

Textbook(s): Dennis D. Wackerly, William Mendenhall III and Richard L. Scheaffer, *Mathematical Statistics with Applications*, 7th Ed., Brooks/Cole, 2008.

Other required material: None

Prerequisites: MATH 251

Objectives:

1. Students will learn basic probability tools such as ways of counting.
2. Students will learn the concepts of: probability as a measure of chance of occurrence of random events, discrete and continuous random variables, univariate and multivariate distributions of random variables, dependence in probability and statistics, conditional distributions and their properties, expectations of both conditional and unconditional distributions.
3. Students will learn asymptotics in both probability and statistics, such as the various laws of large numbers and the Central Limit Theorem.
4. Students will learn particular discrete and continuous distributions and how they behave in nature, they will learn how to sum various types via both through the moment generating functions and cumulative distribution function.

Lecture schedule: 3 50 minute (or 2 75 minute) lectures per week

Course Outline:

	Hours
1. Basics of probability including counting and conditional probabilities, Bayes Rule.	7
2. Introduction to random variables both univariate and multivariate.	6
3. Mathematical expectation, variance, conditional expectations, covariances and correlations.	7
4. Various discrete distributions such as binomial, geometric, negative binomial, Poisson, hypergeometric.	5
5. Various continuous distributions such as the Normal, Beta, Gamma, which includes the χ^2 and exponential distributions.	5
6. Transformations of random variables via both the moment generating function and through Jacobians.	8
7. Various asymptotics such as laws of large numbers and the Central Limit Theorem.	5

Assessment:

Homework	0-20%
Computer Programs/Projects	0-20%

Quizzes	10-60%
Exams	0-60%
Final Exam	20-40%

Syllabus prepared by: André Adler and Tomasz Bielecki
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