

MTH 463 and MTH 563: Probability I 3 credits Sections 001, Fall 2017

Catalog Description: An introduction to probability theory; topics covered include: the axioms of probability, probability spaces and models, independence, random variables; densities, distributions, expectation, and variance; probability inequalities, the law of large numbers, and the binomial central limit theorem.

Prerequisites: MTH 312 required.

Meets: Three 50 minute lectures weekly at 1:00 pm MWF.

Instructor: Professor Ossiander, Kidder 298B, ossiand@math.oregonstate.edu

Office Hours: Monday and Wednesday: 1:30-3:30; Friday: 11:00-12:00; additional hours by appointment.

Course Description: Math 463/563 is the first term of Oregon State's senior and graduate course in probability theory. The main goal of this class is to develop an understanding of some basic probability models and use rigorous mathematics to understand their behavior. Results covered by the end of the first term will include the Law of Large Numbers and the Central Limit Theorem for binomial random variables. It is assumed that students in the class have had classes in differential and integral calculus and understand convergence of infinite series. Students are also expected to have had, at minimum, an introduction to real analysis such as OSU's advanced calculus sequence.

Course Content: The content of this course includes the following.

- Axioms of probability
- Application of combinatoric identities to calculate the probability of events
- Random variables
- Discrete and continuous distributions of random variables
- Expectation and variance
- Introduction of generating functions in probability
- Convergence of binomial random variables

Learning Resources: The required course text is 'Probability and Random Variables', by David Stirzaker, published by Cambridge University Press 1999.

Learning Outcomes: Upon completing MTH 463 a successful student is expected to be able to do the following.

1. Give the axioms of probability, compute conditional probabilities, determine independence of sets, and use Bayes's formula.
2. Apply combinatoric methods appropriately to calculate probabilities.
3. Understand basic discrete and continuous distributions for random variables both intuitively and computationally. In particular be able to compute expectations and variances.

4. Understand the law of large numbers and the central limit theorem in the theoretical sense and also be able to utilize both as tools for approximation.

Upon completing MTH 563 a successful student is expected to be able to do the following.

1. Clearly state and apply the axioms of probability in computing conditional probabilities, determining independence of sets, and using Bayes's formula.
2. Apply abstract counting methods appropriately in calculating probabilities in discrete spaces.
3. Derive basic discrete and continuous distributions for random variables using the axioms of probability. Additionally be able to derive and compute parameters such as the expectation and variance.
4. Understand and apply the law of large numbers and the central limit theorem in both the theoretical sense and as tools for approximation.

Course Plan: Class meetings will largely be devoted to lectures on course topics. We will move systemically through the text book; this term we should cover at least the first four chapters. Announcements and homework assignments will be posted on Canvas throughout the term.

Homework will be assigned weekly. Students are expected to write up homework solutions independently. The lowest homework grade of the term will be dropped. Late homework is strongly discouraged and will be penalized.

There will be one in-class midterm examination in addition to the final examination. (The final examination is scheduled to be given on Wednesday December 6 at noon.) No make-up examinations will be given.

Evaluation of Student Learning: (Approximate percentages given.)

- Homework problems 35 %
- Midterm 30 %
- Final Exam: 35 %

Students with Disabilities: Accommodations for students with disabilities are determined and approved by Disability Access Services (DAS). If you, as a student, believe you are eligible for accommodations but have not obtained approval please contact DAS immediately at 541-737-4098 or at <http://ds.oregonstate.edu>. DAS notifies students and faculty members of approved academic accommodations and coordinates implementation of those accommodations. While not required, students and faculty members are encouraged to discuss details of the implementation of individual accommodations.

Student Conduct: All students are expected to obey OSU's student conduct regulations. Here is the link to OSU's Statement of Expectations for Student Conduct: <http://studentlife.oregonstate.edu/studentconduct/offenses-0>