

STT 881: Theory of Probability, I Fall Semester, 2019

Time and Place: M-W-F, 11:30 AM – 12:20 PM; 218 Ernst Bessey Hall

Instructor: Yimin Xiao, A-437 Wells Hall

Phone Number and E-Mail: 432-5411 xiao@stt.msu.edu

Office Hours: M W F 2:00–2:50 PM, or by appointment.

Text: *Probability: Theory and Examples*, Fourth Edition, by Richard Durrett.

This course is the first of the series STT 881-882. The content of STT 881-882 includes measure and integration theory (review in nature), limit theorems for independent random variables and theory of stochastic processes. The objective of STT 881-882 is to lay a rigorous foundation on probability theory for graduate students who are interested in working in probability, statistics, data science, and related areas.

STT 881, in addition to a review of measure theory, covers limit theory of independent random variables. Some applications of probabilistic techniques in other areas will be mentioned. Specifically STT 881 will cover the following topics:

1. Review of measures and integration. Convergence theorems, L^p spaces and inequalities, the Lebesgue decomposition theorem, the Radon-Nikodym theorem, product measures and Fubini's theorem, Kolmogorov's extension theorem.
2. Independence and conditioning. Constructing independent random variables, Kolmogorov's zero-one law, the Borel-Cantelli lemma and its extensions, conditional expectations.
3. Law of large numbers. Convergence of random series, Cramér's large deviation theorem.
4. Central limit theorems. Weak convergence, characteristic functions, the Lindeberg-Feller theorem, the Berry-Esseen theorem, stable laws, Poisson convergence.

The final grade is determined from homework assignments, and two exams. The midterm exam will be given on Friday, October 25 and the final exam will be given on Wednesday, December 11, 2019. The time for the final exam will be announced later.