MATH 4410 Introduction to Stochastic Models

Time and place: 10:10 - 11:00 am MWF MARTIN M301

Instructor: Xin Liu
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Office hours: 11:00 – 12:15 MWF in Martin Hall O-324

♦ If you are unable to meet at these office times, schedule an appointment with the instructor for an alternative time.

♦ Feel free to ask questions after class.

♦ If the instructor is late, students should wait 15 minutes before leaving.

Textbook: Essentials of Stochastic Processes, 3rd Edition, by Richard Durrett. The ebook is downloadable from the library.

Prerequisites: MATH 4000, or equivalent.
Students should also be comfortable with both simple matrix algebra, and solving linear systems of equations. Other topics from linear algebra will be briefly reviewed as they are needed.

Attendance Policy: I will keep an official record of your attendance, but your attendance record will not have a direct impact on your grade. HOWEVER, you are expected to attend all classes and exams.

Goals: Upon completion of this course, students should be proficient in the following:

- Explaining how both the Strong and Weak Laws of Large Numbers, as well as the Central Limit Theorem, work.
- Understanding the definition of a Discrete-time Markov chain (DTMC), its connections with recursive equations, and how they are used to model random phenomena.
- Explaining when the state of a DTMC is recurrent or transient, and when a DTMC is irreducible. Students should also know how to compute the period of a state, and how irreducibility, positive recurrence and aperiodicity helps determine the long-run behavior of a DTMC.
- Deriving many quantities that describe the long-run behavior of a DTMC, such as its limiting distribution.
- Understanding the basics of Poisson processes on the line, and being able to compute probabilities of simple events associated with a Poisson process.
- Understanding the definition of a Continuous-time Markov chain (CTMC), its connections with DTMCs, and how they are used to model random phenomena.
- Deriving quantities that describe the long-run behavior of a CTMC, along with the long-run behavior of the process along random embedded epochs, using DTMCs.
- Using R to perform simple tasks in scientific computing (if time allows).

Homework: Homework will be assigned after each class meeting, and will be posted shortly after class at course site in Canvas. Homework assigned in the current week will be due next Wednesday.

All homework must be turned in at the regular class meeting; do not deposit homework in the instructor's mailbox, and do not slide homework under the instructor's office door.

All homework is required. Missed homework will receive a grade of zero. However, homework may be handed in late without penalty if there is a ***valid*** excuse and an arrangement has been made with the instructor ***in advance***.

Homework will not be accepted via email, disk, or any other electronic form. **Staple the entire assignment together in the correct order (that is, the order in which problems were assigned.) with your name printed (in blue or black ink) on every page.**

You are allowed to work with other students on the homework problems, however, verbatim copying of homework is absolutely forbidden; therefore each student must ultimately produce his/her own homework to be turned in and graded. You are also encouraged to ask the instructor for help on homework problems, after you have attempted to solve the problems on your own.

Your semester average for homework will count as 30% of your course grade.

Exams: There will be one Midterm exam, worth 30% of your course grade; Final Exam will be worth 40% of your course grade. All the exams are required, and there will be no make-up exams. Missed exams will receive a grade of zero. If you must miss an exam, talk to the instructor ***in advance (at least one week before midterm and at least three weeks before final exam).***

♦ **Schedule**:

Midterm Exam	Wednesday	October 9, 2019 (Wednesday before fall break)	30%
Final Exam	Tuesday	December 10, 2019 (3:00-5:30 p.m.)	40%
Homework Average		Every week	30%
Total			100%

♦ Each student is responsible for verifying his or her recorded scores (homework & midterm exam) during the semester in Canvas.

Grading Scale: A = [90, 100], B = [80, 90), C = [70, 80), D = [60, 70), F = [0, 60).

Official Statement of Academic Integrity: (From the Graduate Announcements) "As members of the Clemson University community, we have inherited Thomas Green Clemson's vision of this institution as a 'high seminary of learning'. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. In instances where academic standards may have been compromised, Clemson University has a responsibility to respond appropriately and expeditiously to charges of violations of academic integrity."

Disability access statement from the Office of Student Disability Services "It is University policy to provide, on a flexible and individualized basis, reasonable accommodations

to students who have disabilities. Students are encouraged to contact Student Disability Services to discuss their individual needs for accommodation."

Clemson University Title IX (Sexual Harassment) statement: Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran's status, genetic information or protected activity (e.g., opposition to prohibited discrimination or participation in any complaint process, etc.) in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus- life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 111 Holtzendorff Hall, 864.656.3181 (voice) or 864.565.0899 (TDD).