

Stochastic Models and Simulation (STAT 753) Syllabus

Spring 2020

DMSC 106, TR 10:30-11:45am

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Office Hours: Wed 3-4pm, Thurs 2:30-3:30pm, or by appointment

Course Website: <https://deenaschmidt.com/Teaching/Sp20/Stat753>

- **Course Catalog Description:** Stochastic process models with applications. Analytic and computer modeling techniques for Markov chains, Poisson processes, Markov processes, Empirical processes, Brownian motion, and special topics.
- **Course Prerequisites:** Math 330, Stat 461.
- **Required Textbooks:**
 - *Introduction to Probability Models* by Sheldon Ross, 11th Edition (10th Ed. Free PDF)
 - *Simulation* by Sheldon Ross, 5th Edition
- **Course Content:** Probability Models book chapters 1-7, 10-11 (approximately) and corresponding methods for simulation.
- **Student Learning Outcomes:** Upon successful completion of this course:
 - Students will be able to demonstrate understanding of the probability foundations of various stochastic process models through proofs, examples, and computer simulations.
 - Students will be able to use appropriate stochastic processes to model various scientific phenomena.
 - Students will be able to use analytic and numerical techniques to analyze essential stochastic processes, including Markov chains, Poisson processes, Markov processes, and Brownian motion.
- **General Rules:** All students in this class are expected to respect each other and the instructor. Any form of disruption or disrespect to other students or to the instructor will not be tolerated. Please be on time. All electronic devices (i.e. phones) need to be turned off (or silent) during class.
- **Attendance:** Lecture attendance is strongly recommended but not required. It is your responsibility to know the material covered and announcements made in class.
- **Homework:** Homework will be assigned weekly and collected at the beginning of class on Thursdays. A subset of the assigned problems will be graded. Please write legibly or type up solutions. Your solutions must show all relevant work and be a clear explanation of your reasoning. The same applies to exams.
- **Exams:** There will be one take-home midterm exam and a comprehensive final project. Tentatively, the midterm exam will be the week of March 9 (subject to change).

- **Final Project:** Each student will complete a project at the end of the course. The instructor will help students identify a good topic and will consult closely with them during the semester. Students will give a presentation on their final project during the final exam time:

Tuesday May 12, 9:50-11:50am.

- **Computing Resources:** This course will use mathematical software, which is either free or is available to students through UNR. Students are assumed to have access to a computer with R (free, available at www.r-project.org) and/or Matlab. Students using R are strongly encouraged to use the front-end RStudio (www.rstudio.com). These applications are available in DMSC 106.

- **Grading Scale:**

Homework	50%
Midterm Exam	30%
Final Project	20%

Letter	A	A-	B+	B	B-	C+	C	D+	D	F
Min. Score	93%	90%	87%	83%	80%	75%	70%	65%	60%	<60%

- **Course Topics:**

- Review of probability theory
- Generating random numbers
- Sampling from probability distributions
- Discrete-time Markov chains
- Poisson processes
- Continuous-time Markov chains
- Renewal theory
- Brownian motion

- **Attendance:** Lecture attendance is strongly recommended but not required. It is your responsibility to know the material covered and announcements made in class.
- **Makeup/Late Policy:** There will be no early or makeup exam. Late homework will not be accepted unless there is a serious reason (illness, emergency) why it could not be completed on time. Students participating in official university activities that interfere with exam or homework due dates must make arrangements with the instructor in advance.
- **Academic Dishonesty:** A student may receive academic and disciplinary sanctions for cheating, plagiarism or other attempts to obtain or earn grades under false pretenses. The University Academic Standards Policy defines academic dishonesty and mandates specific sanctions for violations. See the University Academic Standards policy: UAM 6,502. Academic sanctions may include: filing a final grade of "F", reducing the student's final course grade one or two full grade points, awarding a failing mark on the coursework in question, or requiring the student to retake or resubmit the coursework.
- **Disability Services:** The Department of Mathematics and Statistics supports providing equal access for students with disabilities. Any student with a disability needing academic adjustments or

accommodations is requested to speak with me and the Disability Resource Center (PSAC 230, www.unr.edu/drc) as soon as possible to arrange for appropriate accommodations.

- **University Recording Policy:** This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded. Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy.
- **Available Resources:** Your student fees cover usage of the Math Center (PSAC 300, www.unr.edu/mathcenter), Tutoring Center (PSAC 320, www.unr.edu/tutoring), and University Writing Center (PSAC 350, www.unr.edu/writing_center). These centers support your classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign of a responsible and successful student.
- **Equal Opportunity and Title IX:** The University of Nevada, Reno is committed to providing a safe learning and work environment for all. If you believe you have experienced discrimination, sexual harassment, sexual assault, domestic/dating violence, or stalking, whether on or off campus, or need information related to immigration concerns, please contact the University's Equal Opportunity & Title IX office at 775-784-1547. Resources and interim measures are available to assist you. For more information, please visit: <https://www.unr.edu/equal-opportunity-title-ix>.
- **Pack Provisions:** ASUN Pack Provisions strives to support all members of the University with daily resources they need to ensure success. This mission is carried out by providing access to basic necessities to students in need such as food, school supplies, hygiene items and more. To utilize this service, visit ASUN Center for Student Engagement on the Third Floor of the Joe Crowley Student Union or email packprovisions@asun.unr.edu.