

STAT 462/662: Introduction to Stochastic Processes – Fall 2021  
Tu/Th 12:00-1:15pm, WRB 2008

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**Instructor:** Dr. Deena Schmidt

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**Office Hours:** Tuesday 3:30-4:30pm, Thursday 10:45-11:45am, or by appointment

**Course Website:** WebCampus aka Canvas: [unr.canvaslms.com](http://unr.canvaslms.com)

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- **Course Catalog Description:** Discrete and continuous time stochastic processes with applications to queuing and inventory theory, and population growth. Topics include: Markov chains, branching processes, Poisson and renewal processes, and birth-and-death processes.
- **Course Prerequisite:** STAT 461 or instructor permission
- **Required Textbook:**
  - *Introduction to Probability Models*, 12th edition by Sheldon Ross (2019); e-book available for 10th edition from <http://library.unr.edu/>
- **Additional Recommended Textbook:**
  - *An Introduction to Stochastic Modeling*, 4th edition by Pinsky and Karlin (2011).
- **Course Content:** Ross book chapters 4-7, and some additional material.
- **Class Procedure:** This course will be delivered **in person**. Students will be required to access course materials, such as homework assignments, via Canvas. The course schedule will be posted on Canvas and updated weekly. I will announce upcoming assignments/exams at the beginning of each lecture, but it is your responsibility to check the schedule each week.
- **Student Learning Outcomes:** Upon completion of Math 461/661, students will be able to:
  - Demonstrate understanding of the probability foundations for stochastic processes through proofs and examples.
  - Build and use stochastic processes, including random walks, Markov chains, branching processes, Poisson and renewal processes.
  - Build and use continuous time stochastic process to model real-world phenomena.

## COURSE REQUIREMENTS:

- **Homework:** Homework will be assigned weekly (most weeks) and will be due in class on the listed due date. A subset of the assigned problems will be graded. Please write legibly or type using LaTeX. Your solutions must show all relevant work and be a clear explanation of your reasoning. The same applies to exams. In addition to assigned homework, I expect students to read the relevant sections in the book.
- **Exams:** There will be two midterm exams and a comprehensive final exam. See the tentative course schedule at the end of the syllabus for more details.
- **Final Exam:** Monday December 13, 2021 12:10-2:10pm
- **Grading Scale:** Your grade for the course will be calculated as:

Homework: 30%		Midterm Exams: 40%		Final Exam: 30%	
A	93.0 – 100%	C	73.0 – 76.9%		
A-	90.0 – 92.9%	C-	70.0 – 72.9%		
B+	87.0 – 89.9%	D+	67.0 – 69.9%		
B	83.0 – 86.9%	D	63.0 – 66.9%		
B-	80.0 – 82.9%	D-	60.0 – 62.9%		
C+	77.0 – 79.9%	F	0 – 59.9%		

## Topics Outline:

- Ross Chapters 1-3: Probability Review
- Ross Chapter 4: Markov Chains
- Ross Chapter 5: Poisson Processes
- Ross Chapter 6: Continuous-time Markov Chains
- Ross Chapter 7: Renewal Theory
- Selected material from Ross Chapter 10: Brownian Motion

**Make-up/Late Policy:** Late homework will not be graded but may be turned in late to be graded on completion for a penalty. There will be no early or makeup exams, unless there is a compelling reason (medical/family emergency, university approved activity, religious holiday). Students participating in official university activities that interfere with exams must make arrangements with the instructor at least two weeks prior to the exam in question. UNR policies are provided in [UAM 3,020](#) and at <https://med.unr.edu/shc/insurance/clinic-policies>. Any student requiring accommodations through the DRC must schedule their exams on the same day as the in-class exam.

**Attendance:** Students are strongly encouraged to attend all classes.

**Etiquette:** Please be considerate of your fellow students and instructor. Please turn off all extraneous electronics (those not being used for class) before class. Behavior that may disrupt the learning

environment will not be tolerated. To clarify what counts as disruptive, please ask the instructor and see the definition given in the University Academic Standard policy: [UAM 6,502](#).

**Academic Dishonesty:** Cheating, plagiarism or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this university. Academic dishonesty will not be tolerated, and penalties can include canceling a student's enrollment without a grade, giving an F for the course or for the assignment. The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: [UAM 6,502](#), particularly Subsection C, *Levels of Academic Dishonesty*, so that you are familiar with examples of such violations, and the mandated consequences associated with the levels of academic misconduct. For more details, see the [University of Nevada, Reno General Catalog](#).

### **Failure to Comply with Policy (including as outlined in this Syllabus) or Directives of a University Employee**

In accordance with section 6,502 of the University Administrative Manual, a student may receive academic and disciplinary sanctions for failure to comply with policy, including this syllabus, for failure to comply with the directions of a University Official, for disruptive behavior in the classroom, or any other prohibited action. "Disruptive behavior" is defined in part as behavior, including but not limited to failure to follow course, laboratory or safety rules, or endangering the health of others. A student may be dropped from class at any time for misconduct or disruptive behavior in the classroom upon recommendation of the instructor and with approval of the college dean. A student may also receive disciplinary sanctions through the Office of Student Conduct for misconduct or disruptive behavior, including endangering the health of others, in the classroom. The student shall not receive a refund for course fees or tuition.

### **Audio and Video Recording**

#### **Student-created Recordings**

Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents 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.

#### **Instructor-created Recordings (if we move online)**

Class sessions may be audio-visually recorded for students in the class to review and for enrolled students who are unable to attend live to view. Students who participate with their camera on or who use a profile image are consenting to have their video or image recorded. If you do not consent to have your profile or video image recorded, keep your camera off and do not use a profile image. Students who un-mute during class and participate orally are consenting to have their voices recorded. If you do not consent to have your voice recorded during class, keep your mute button activated and only communicate by using the "chat" feature, which allows you to type questions and comments live.

### **IMPORTANT DATES:**

- Wednesday October 27: Final day to drop with a 'W'

<https://www.unr.edu/academic-central/academic-resources/academic-calendar>

## **CAMPUS RESOURCES:**

**Academic Success Services:** Your student fees cover usage of the [University Math Center](https://www.unr.edu/university-math-center) (https://www.unr.edu/university-math-center), (775) 784-4433; [University Tutoring Center](https://www.unr.edu/tutoring-center) (https://www.unr.edu/tutoring-center), (775) 784-6801; and [University Writing & Speaking Center](https://www.unr.edu/writing-speaking-center) (https://www.unr.edu/writing-speaking-center), (775) 784-6030. 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.

### **Maintaining a Safe Learning and Work Environment**

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 the [Equal Opportunity and Title IX](#) page.

**Disability Services:** Any student with a disability needing academic adjustments or accommodations is requested to speak with me or the [Disability Resource Center](#) (Pennington Achievement Center Suite 230) as soon as possible to arrange for appropriate accommodations. This course may leverage 3<sup>rd</sup> party web/multimedia content, if you experience any issues accessing this content, please notify your instructor.

## **STATEMENT ON COVID-19 POLICIES**

### **Face Coverings**

In response to COVID-19, and in alignment local, state, and U.S. Center for Disease Control guidelines, face coverings are required at all times in all UNR indoor public spaces, including classroom, laboratory, studio, creative space, or any type of in-person instructional activity, and public spaces. Furthermore, individuals who have not been fully vaccinated against COVID 19 are required to wear a face covering at all times while on campus, including all indoor and outdoor public spaces.

A “face covering” is defined as a “covering that fully covers a person’s nose and mouth, including without limitation, cloth face mask, surgical mask, towels, scarves, and bandanas” (State of Nevada Emergency Directive 024).

Students that cannot wear a face covering due to a medical condition or disability, or who are unable to remove a mask without assistance may seek an accommodation through the Disability Resource Center.

### **Social Distancing**

In alignment with State of Nevada guidelines, social distancing is no longer required (although it’s still a good idea).

### **Disinfecting Your Learning Space**

Disinfecting supplies are provided for you to disinfect your learning space. You may also use your own disinfecting supplies.

**COVID-19, COVID-19 Like Symptoms, and Contact with Someone Testing Positive for COVID-19**

Students testing positive for COVID 19, exhibiting COVID 19 symptoms regardless of vaccination status will not be allowed to attend in-person instructional activities and must leave the venue immediately. Students should contact the [Student Health Center](#) or their health care provider to receive care and who can provide the latest direction on quarantine and self-isolation. Contact your instructor immediately to make instructional and learning arrangements.

**Accommodations for COVID 19 Quarantined Students**

For students who are required to quarantine or self-isolate due to 1) COVID-19 infection or 2) exposure while not vaccinated, instructors must provide opportunities to make-up missed course work, including assignments, quizzes or exams. In courses with mandatory attendance policies, instructors must not penalize students for missing classes while quarantined.

## CLASS SCHEDULE (tentative)

	Monday	Tuesday	Wednesday	Thursday	Friday
August	23	24 Syllabus, Ch. 1-2 (Prob review)	25	26 Ch. 2 (Prob review)	27
	30	31 Ch. 3 (Condition- al Probability)	1	2 Ch. 4 (Markov chains)	3
September	6 Labor Day	7 Ch. 4	8	9 Ch. 4	10
	13	14 Ch. 4	15	16 Ch. 4	17
	20	21 Ch. 4	22	23 Ch. 4	24
	27	28 Ch. 4	29	30 Ch. 4	1
October	4	5 <b>EXAM 1</b>	6	7 Ch. 5 (Poisson process)	8
	11	12 Ch. 5	13	14 Ch. 5	15
	18	19 Ch. 5	20	21 Ch. 5	22
	25	26 Ch. 6 (Cont-time Markov chains)	27 Last Drop Day	28 Ch. 6	29
November	1	2 Ch. 6	3	4 Ch. 6	5
	8	9 Ch. 6	10	11 Veteran's Day -No Class-	12
	15	16 <b>EXAM 2</b>	17	18 Ch. 7 (Renewal processes)	19
	22	23 Ch. 7	24	25 Thanksgiving -No Class-	26
December	29	30 Ch. 7	1	2 Ch. 10 (Brownian Motion)	3
	6	7 Ch. 10	8	9	10
	13 <b>Final Exam 12:10-2:10pm</b>	14	15	16	17