

# STAT 706: Probability and Measure Spring 2019

WRB 2024, TR 3:00-4:15pm

**Instructor:** Deena Schmidt

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**Office Hours:** Monday/Wednesday 2:30-3:30pm & by appointment

**Course Website:** <https://wolfweb.unr.edu/~drschi/Stat706>

- **Catalog Description:** Measure theoretic foundations of probability theory. Random variables and distributions, convergence, laws of large numbers, central limit theorems, random walks, martingales, Brownian motion, special topics.
- **Prerequisite:** MATH 713 (or one semester of measure theory) and STAT 461 or 661 (or equivalent).
- **Required Textbooks:** *Probability and Measure* by Patrick Billingsley, 3<sup>rd</sup> Edition.  
*A First Look at Rigorous Probability* by Jeffrey Rosenthal, 2<sup>nd</sup> Edition.
- **Optional Textbook:** *Probability: Theory and Examples* by Rick Durrett, 4<sup>th</sup> Edition.
- **Course Content:** Selected material from chapters 1-6 (Billingsley).
- **Student Learning Outcomes:** Upon successful completion of STAT 706, students will be able to:
  - Understand and apply the fundamental results of measure theory and integration.
  - Derive and apply convergence theorems in probability and statistics problems.
  - Apply conditional probability and martingale results to problems in stochastic analysis.
- **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! Your solutions must show all relevant work and be a clear explanation of your reasoning. The same applies to exams.
- **Exams:** There will be two in class midterm exams and a comprehensive take-home final exam that will be due on the final exam date listed below. Tentatively, Exam 1 will be February 28 and Exam 2 will be April 16. You may bring a sheet of paper (8.5 x 11) with notes on both sides to each exam. No other materials are permitted during exams.
- **Final Exam:** Wednesday May 15, 2:30-4:30pm

- **Grading Policy:**

Homework	30%
Midterm Exams	40% (20% each)
Final Exam	30%

Letter	A	A-	B+	B	B-	C+	C	D+	D
Min. Score	92%	90%	88%	82%	80%	78%	70%	65%	60%

- **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 exams. If you miss an exam for a valid reason, your final exam will be weighted accordingly. 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 exams or homework due dates must make arrangements with the instructor in advance.
- **General Rules:** All students 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. cell phones) need to be turned off (or silent) during class.
- **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. Students in this course are expected to abide by the academic standards and policies of UNR. The University Academic Standards Policy defines academic dishonesty, and mandates specific sanctions for violations. See the University Academic Standards policy: [UAM 6,502.](#)"
- **Disability Services:** Any student with a disability needing academic adjustments or accommodations, please notify the Disability Resource Center (Pennington Student Achievement Center, Suite 230), and then me, as soon as possible to arrange for appropriate accommodations.
- **Audio and Video Recording:** 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 be given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.
- **Statement for Academic Success Services:** Your student fees cover usage of the Math Center (784-4433 or [www.unr.edu/mathcenter/](http://www.unr.edu/mathcenter/)), Tutoring Center (784-6801 or [www.unr.edu/tutoring-center/](http://www.unr.edu/tutoring-center/)), and University Writing Center (784-6030 or <http://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.

- **Title IX Statement:** 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.

## Course Schedule

Week	Topic	Exams	Reading
1	Introduction and probability measures		<b>R: Sections 1, 2</b> B: Sections 1, 2
2	Existence and extension		<b>R: Section 2</b> B: Section 3
3	Simple random variables and independence		<b>R: Section 3</b> B: Sections 4, 5
4	Limit sets, Borel-Cantelli lemmas, expected value of simple RVs		<b>R: Sections 3, 4</b> B: Sections 4, 5
5	General random variables, expected value, inequalities and convergence		<b>R: Sections 4, 5</b> B: Sections 20, 21
6	Laws of large numbers	Midterm 1	<b>R: Section 5</b> B: Sections 6, 22
7	Distributions of random variables		<b>R: Section 6</b> B: Sections 14, 20
8	Stochastic processes, gambler's ruin		<b>R: Section 7</b> B: Sections 7, 23
9	Discrete Markov chains		<b>R: Section 8</b> B: Section 8
10	Markov chains (continued), limit theorems, large deviations		<b>R: Sections 8, 9</b> B: Sections 8, 9
11	Weak convergence, characteristic functions		<b>R: Sections 9, 10</b> B: Sections 25, 26
12	Central limit theorem	Midterm 2	<b>R: Section 11</b> B: Sections 27-30
13	Decomposition of probability laws, conditional probability and expectation		<b>R: Sections 12, 13</b> B: Sections 32-34
14	Martingales		<b>R: Section 14</b> B: Section 35
15	Brownian motion	Final	<b>R: Section 15</b> B: Section 37

Note for Readings: B = Billingsley, R = Rosenthal