

<p style="text-align: center;">Stochastic Processes MATH 467/567—CRN 23788/23797 Winter 2016</p>

- Instructor:** **name:** Prof. C. Sinclair
 office hours: Wednesday 3-4, Friday 10-11.
 office: Deady 215M
 email: csinclai@uoregon.edu
- Course webpage:** <http://uoregon.edu/~csinclai/>
- Class Meetings:** **room:** 307 Deady
 lecture: Monday, Wednesday, Friday noon-12:50pm
- Text:** **Essentials of Stochastic Processes.** Richard Durrett. Springer
- Calculators:** Calculators can be helpful for homework and actually may be needed for some of the problems. Calculators will not be necessary for exams.
- Prerequisite:** Math 461/561
- Work Load:** This course will require *between eight and twelve hours of work per week* outside class, depending on your preparation.
- Grading:**
 - ▷ Your course grade will be computed from:
 - **homework**20%
 - **1 midterm exams** 30%
 - **1 final exam** 50%
- Homework:** Homework will be assigned weekly and due during lecture on Fridays.
- Tests:**
 - ▷ The first midterm will be during week 6 of the quarter. The exact date of the midterm will be announced at least a week before the exam.
 - ▷ The final exam will be given on the date and time assigned by the registrar, **10:15 Friday, March 18**. Final exam week is part of the regular quarter, and you are expected to be present. **If you cannot attend the final exam due to a conflicting obligation, do not take the course.**
 - ▷ Bring your UO student-ID to all your exams.
 - ▷ The use of cellular phones, or any device that communicates with the outside world is strictly forbidden during exams.

Documented Disabilities: Students who have a documented disability and anticipate needing accommodations in this course should see me as soon as possible. They should also bring a letter to the instructor from the Counselor for Students with Disabilities verifying the disability.

Academic Misconduct: Academic Misconduct: The University Student Conduct Code (available at conduct.uoregon.edu) defines academic misconduct. Students are prohibited from committing or attempting to commit any act that constitutes academic misconduct. By way of example, students should not give or receive (or attempt to give or receive) unauthorized help on assignments or examinations without express permission from the instructor. Students should properly acknowledge and document all sources of information (e.g. quotations, paraphrases, ideas) and use only the sources and resources authorized by the instructor. If there is any question about whether an act constitutes academic misconduct, it is the students obligation to clarify the question with the instructor before committing or attempting to commit the act. Additional information about a common form of aca-

demic misconduct, plagiarism, is available at www.libweb.uoregon.edu/guides/plagiarism/students.

Learning Objectives:

The successful student will leave the course with an understanding of basic stochastic processes, including Markov chains, martingales, poisson processes and Brownian motion. You will be able to classify states as transient or recurrent and compute the stationary distribution for finite state Markov chains. You will know the definition of hitting/stopping times and understand their importance in the study of stochastic processes.. You will apply martingales, and the optional stopping time theorem to various mathematical and non-mathematical problems. You will extend your knowledge of exponential random variables to Poisson processes and their properties, including thinning and superposition. Finally, you will have a basic understanding of the properties of Brownian motion including the Markov and reflection property, and hitting times.

Community Standards: The University of Oregon community is dedicated to the advancement of knowledge and the development of integrity. In order to thrive and excel, this community must preserve the freedom of thought and expression of all its members. The University of Oregon has a long and illustrious history in the area of academic freedom and freedom of speech. A culture of respect that honors the rights, safety, dignity and worth of every individual is essential to preserve such freedom. We affirm our respect for the rights and well-being of all members.

Syllabus:

Week 1: Introduction to Markov chains.

Week 2: Transience, recurrence, stationary distributions.

Week 3: Birth and death chains, detailed balance, applications of Markov chains.

Week 4: One step calculations, introduction to martingales.

Week 5: Martingales, stopping times.

Week 6: Midterm. Introduction to Poisson processes.

Week 7: Exponential random variables, Poisson processes.

Week 8: Compound Poisson processes, renewal processes.

Week 9: Brownian motion.

Week 10: Options and the Black-Scholes Equation.