Instructor: Jonathan "Nate" Wells
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Course Description: This course will survey select topics in applied mathematics, with emphasis on stochastic processes, Markov chains, and the Monte Carlo method. A significant component of the course will be devoted to the development of mathematical research, writing, and presentation skills.

Prerequisites: MATH282 and MATH341, or Instructor Consent.

Textbook: This course does not have a required textbook. Parts of the course will make use of *Introduction to Stochastic Processes with R* by Robert Dobrow, which is available in electronic form for free to UO students and can be obtained by searching the UO library catalogue for the title, and logging in to the server using duckweb credentials. Other reference texts are available on Reserve at the Math Library in Fenton Hall. A current list of reserve titles is posted on Canvas.

Course Website: Documents, a daily schedule, assignments, and grades will be posted on our Canvas page at `http://canvas.uoregon.edu`

Technology: Access to a computer algebra system (like *Mathematica*, *SageMath*, *Maple*, or *Matlab*) will be necessary for some computations. Frequently, we will write scripts, perform calculations, and generate graphics using the R programming language (although several other common programming languages can also be used). The final project for this course will need to be typed with embedded mathematics, and while *LaTeX* is strongly recommended, other word processors with ability to embed mathematics inline may also be used.

Communication: If you would like to contact me, I can most easily be reached by email weekdays between 10am and 6pm. While I try to answer email as soon as possible, in some cases, I may not be able to respond until the following school day. You are also welcome to stop by my office outside of office hours—I usually have at least a few free minutes to help.

Course Outcomes: By the end of the course, a student should be able to:

1. Evaluate the quality, scope, audience, and applicability of a variety of mathematical sources (papers, textbooks, presentations, lectures)
2. Identify both effective and ineffective examples of mathematical writing and presentation.
3. Write mathematical papers that combine both technical and expository elements using fluent, efficient, and precise prose.
4. Deliver clear, coherent, and in-depth presentations on advanced mathematical topics.
5. Describe elements of stochastic processes using the language of probability theory.
6. Determine whether a given process is a Markov chain, and provide examples of processes which are, and which are not, Markov chains.
7. Use matrix algebra to calculate relevant quantities of Markov chains.
8. Describe and analyze the long-term behavior of a Markov chain.
9. Simulate probability distributions using the Markov chain Monte Carlo method.
10. Generate examples of stochastic processes using a programming language or a computer algebra system.

Workload: This course will require daily reading and class attendance, as well as weekly homework assignments. A typical, well-prepared student can expect to devote about 25 hours per week to this course (including time spent in class).

Class Structure: This course will be taught in a hybrid style. The first hour of each class will be devoted to a traditional lecture on select topics from applied mathematics. The second hour will take several different forms and will focus on the development of mathematical researching, writing, and presenting skills, but almost always will involve some amount of collaboration, student-driven learning, presentations, and discussion.

Grading Criteria: $A = 90 - 100\%$; $B = 80 - 89\%$; $C = 70 - 79\%$; $D = 60 - 69\%$; $F < 60$ (with upper and lower 2% of each division corresponding to $+/-$, respectively).

Your grade in the class will be determined by assessments of your proficiency in each of the *Course Outcomes*, weighted as follows:

1	Homework	20%
2	Class Participation	15%
4	Presentations	25%
5	Research Paper	20%
6	Final Exam	20%

Homework: Homework will be assigned weekly and will be collected every Monday at the start of class. Scores will be based on the completeness, organization, and clarity of solutions, in addition to their correctness.

Class Participation: Because of the collaborative nature of this course, it is essential that you strive to attend class every day. But if you aren't able to attend class for any reason, please notify me in advance. You may miss up to one class throughout the term without penalty, but more frequent absences will be reflected in your final course grade. **However, missing class on a presentation day (Thursday and Friday of Weeks 1-3, and Tuesday, Wednesday, and Thursday of Week 4) will result in a significant grade reduction.**

Presentations: Throughout the term, students will have the opportunity to give four oral presentations to their peers. The first three will be short (10 - 20 minutes) presentations on either an assigned or student-chosen topic, while the final presentation will be longer (30 - 45 minutes) and will be on the topic of the student's research project. These projects are each worth 3/6/6/10 % of the total grade, respectively.

Research Paper: At the end of the term, students will submit a typed copy of a 6 - 8 page research paper on an advanced topic in applied mathematics.

Final Exam: A final exam will be given in class on Friday, July 19th from 9:00am to 10:50am.

Accessibility: The University of Oregon is dedicated to creating inclusive learning environments. Please notify me as soon as possible if there are aspects of the instruction or design of this course that result in disability-related barriers to your participation. You may also wish to contact the Accessible Education Center in 164 Oregon Hall at 541-346-1155 or uoaec@uoregon.edu.

Academic Integrity: Students are allowed and encouraged to collaborate on most in-class and homework assignments. However, any work that you turn in for grading must be your own. Exams will be closed book, closed notes, and closed colleague, unless otherwise specified. All written work that references material outside of the textbook should be accompanied by an appropriate citation (APA or AMS format is preferred). The University of Oregon requires that all instances of academic dishonesty be reported, no matter the scope.