

PUBH 8432, SECTION 001

Probability Models
Fall 2019

COURSE & CONTACT INFORMATION

Credits: 3

Meeting Day(s): Tues, Thur

Meeting Time: 1:00 – 2:15 pm

Meeting Place: Moos Health Science Tower 1-435

Instructor: Sandra Safo

Email: ssafo@umn.edu

Office Phone: 612-625-9142

Fax: 612-626-0660

Office Hours: Tuesdays 2:30 – 4:30 pm

Office Location: Mayo A466

COURSE DESCRIPTION

The course will focus on the construction and statistical analysis of probability models for real data. The course will provide a non-measure theoretic introduction to Markov chains, Discrete and Continuous Markov processes, Hidden Markov Models, Markov random fields etc. All these models will be illustrated with examples. Markov Chain Monte Carlo methods will be discussed briefly.

COURSE PREREQUISITES

Prerequisites are Stat 8101-2 or equivalent; PubH 7405 and PubH 7506; or instructor's consent. Some experience with R is useful; Real Analysis/Advanced Calculus at the level of Math 5615 is needed.

COURSE GOALS & OBJECTIVES

By the end of the course, students should have a good understanding of different stochastic processes and their applications in stochastic modeling of real datasets. We will primarily focus on Discrete Markov Chains, but Continuous Markov Process, Poisson Process; Brownian Motion will also be covered in this course.

METHODS OF INSTRUCTION AND WORK EXPECTATIONS

Course Workload Expectations

Probability Models is a 3 credit course. The University expects that for each credit, you will spend a minimum of three hours per week attending class or comparable online activity, reading, studying, completing assignments, etc. over the course of a 15-week term. Thus, this course requires approximately 135 hours of effort spread over the course of the term in order to earn an average grade.

- There will be 5 homeworks, due approximately every 2 weeks.
- Two in class quizzes
- One midterm (in class)
- One final exam (in class).

Learning Community [Note: you can customize this to your course or delete]

School of Public Health courses ask students to discuss frameworks, theory, policy, and more, often in the context of past and current events and policy debates. Many of our courses also ask students to work in teams or discussion groups. We do not come to our courses with identical backgrounds and experiences and building on what we already know about collaborating, listening, and engaging is critical to successful professional, academic, and scientific engagement with topics.

In this course, students are expected to engage with each other in respectful and thoughtful ways.

In group work, this can mean:

- Setting expectations with your groups about communication and response time during the first week of the semester (or as soon as groups are assigned) and contacting the TA or instructor if scheduling problems cannot be overcome.
- Setting clear deadlines and holding yourself and each other accountable.
- Determining the roles group members need to fulfill to successfully complete the project on time.

- Developing a rapport prior to beginning the project (what prior experience are you bringing to the project, what are your strengths as they apply to the project, what do you like to work on?)

In group discussion, this can mean:

- Respecting the identities and experiences of your classmates.
- Avoid broad statements and generalizations. Group discussions are another form of academic communication and responses to instructor questions in a group discussion are evaluated. Apply the same rigor to crafting discussion posts as you would for a paper.
- Consider your tone and language, especially when communicating in text format, as the lack of other cues can lead to misinterpretation.

Like other work in the course, all student to student communication is covered by the Student Conduct Code (<https://z.umn.edu/studentconduct>).

COURSE TEXT & READINGS

The textbook for this class:

Introduction to Probability Models. 11th Edition by Sheldon M. Ross, Academic Press, 2014.

Publisher link: <http://www.sciencedirect.com/science/book/9780124079489>

Some additional useful references:

- 1) Stochastic Processes (2nd edition) by Sheldon M. Ross, Wiley, New York.
- 2) A Probability Path by Sidney I. Resnick, Birkhäuser Boston.

COURSE OUTLINE/WEEKLY SCHEDULE

Week	Topic	Readings
Week 1	<ul style="list-style-type: none">Distribution, Moment Generating Function	<ul style="list-style-type: none">IPM Chapter 2
Week 2	<ul style="list-style-type: none">Conditional Probability, Conditional Expectation	<ul style="list-style-type: none">IPM Chapter 3
Week 3 - 6	<ul style="list-style-type: none">Discrete Markov Chain	<ul style="list-style-type: none">IPM Chapter 4
Week 7	<ul style="list-style-type: none">Midterm Review and Midterm	<ul style="list-style-type: none">IPM Chapters 2- 4
Week 8 - 9	<ul style="list-style-type: none">Poisson Process	<ul style="list-style-type: none">IPM Chapter 5
Week 10 - 11	<ul style="list-style-type: none">Continuous-time Markov Chain	<ul style="list-style-type: none">IPM Chapter 6
Week 12 - 13	<ul style="list-style-type: none">Gaussian Process Brownian Motion	<ul style="list-style-type: none">IPM Chapter 10
Week 14	<ul style="list-style-type: none">Study and Final Exam	<ul style="list-style-type: none">IPM Chapters 2,3,4,5,6,10

Tentative schedule of homework and tests

Activity/Assignment	Due Date
Homework 1	Sep 19
Quiz 1 (in class, closed book)	Oct 10
Homework 2	Oct 10
Review for Midterm	Oct 15
Midterm (in class, closed book)	Oct 17
Homework 3	Nov 7
Homework 4	Nov 28
Quiz 2 (in class, closed book)	Nov 28
Homework 5	Dec 12
Final Exam	TBD

SPH AND UNIVERSITY POLICIES & RESOURCES

The School of Public Health maintains up-to-date information about resources available to students, as well as formal course policies, on our website at www.sph.umn.edu/student-policies/. Students are expected to read and understand all policy information available at this link and are encouraged to make use of the resources available.

The University of Minnesota has official policies, including but not limited to the following:

- Grade definitions
- Scholastic dishonesty
- Makeup work for legitimate absences
- Student conduct code
- Sexual harassment, sexual assault, stalking and relationship violence
- Equity, diversity, equal employment opportunity, and affirmative action
- Disability services
- Academic freedom and responsibility

Resources available for students include:

- Confidential mental health services
- Disability accommodations
- Housing and financial instability resources

- Technology help
- Academic support

EVALUATION & GRADING

Course evaluation will be based on homework assignments (40%), Two Quizzes (10% each, 20% total), Midterm (20%) and a final exam (20%).

Grading Scale

The University uses plus and minus grading on a 4.000 cumulative grade point scale in accordance with the following, and you can expect the grade lines to be drawn as follows:

% In Class	Grade	GPA
93 - 100%	A	4.000
90 - 92%	A-	3.667
87 - 89%	B+	3.333
83 - 86%	B	3.000
80 - 82%	B-	2.667
77 - 79%	C+	2.333
73 - 76%	C	2.000
70 - 72%	C-	1.667
67 - 69%	D+	1.333
63 - 66%	D	1.000
< 62%	F	

- A = achievement that is outstanding relative to the level necessary to meet course requirements.
- B = achievement that is significantly above the level necessary to meet course requirements.
- C = achievement that meets the course requirements in every respect.
- D = achievement that is worthy of credit even though it fails to meet fully the course requirements.
- F = failure because work was either (1) completed but at a level of achievement that is not worthy of credit or (2) was not completed and there was no agreement between the instructor and the student that the student would be awarded an I (Incomplete).
- S = achievement that is satisfactory, which is equivalent to a C- or better
- N = achievement that is not satisfactory and signifies that the work was either 1) completed but at a level that is not worthy of credit, or 2) not completed and there was no agreement between the instructor and student that the student would receive an I (Incomplete).

Evaluation/Grading Policy	Evaluation/Grading Policy Description
Scholastic Dishonesty, Plagiarism, Cheating, etc.	<p>You are expected to do your own academic work and cite sources as necessary. Failing to do so is scholastic dishonesty. Scholastic dishonesty means plagiarizing; cheating on assignments or examinations; engaging in unauthorized collaboration on academic work; taking, acquiring, or using test materials without faculty permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain dishonestly grades, honors, awards, or professional endorsement; altering, forging, or misusing a University academic record; or fabricating or falsifying data, research procedures, or data analysis (As defined in the Student Conduct Code). For additional information, please see https://z.umn.edu/dishonesty</p> <p>The Office for Student Conduct and Academic Integrity has compiled a useful list of Frequently Asked Questions pertaining to scholastic dishonesty: https://z.umn.edu/integrity.</p> <p>If you have additional questions, please clarify with your instructor. Your instructor can respond to your specific questions regarding what would constitute scholastic dishonesty in the context of a particular class-e.g., whether collaboration on assignments is permitted, requirements and methods for citing sources, if electronic aids are permitted or prohibited during an exam.</p> <p>Indiana University offers a clear description of plagiarism and an online quiz to check your understanding (http://z.umn.edu/iuplagiarism).</p>
Late Assignments	
Attendance Requirements	
Extra Credit	