



# THE OHIO STATE UNIVERSITY

COLLEGE OF ARTS AND SCIENCES

*Syllabus: STAT 6540  
Applied Stochastic Processes  
Spring 2022*

## Course overview

### Instructor

Instructor: Shili Lin  
Email address: [shili@stat.osu.edu](mailto:shili@stat.osu.edu)  
Class website: <http://carmen.osu.edu>  
Lectures: Hayes Hall 025, Wednesdays and Fridays, 9:35 – 10:55 AM  
Office hours: Wednesdays 3:00 – 4:00 PM and Fridays, 1:00 – 2:00 PM

### Grader

Ms. Meijia Shao; email: [shao.390@buckeyemail.osu.edu](mailto:shao.390@buckeyemail.osu.edu); OH: Tuesdays 12:40 – 1:40 PM

## Course description

An introduction to some of the commonly encountered stochastic processes, including Markov chains and population processes. Both discrete-time and continuous-time stochastic processes will be covered. Basic theory as well as applications will be discussed. **Prerequisites:** 6301, or permission of instructor.

## Course learning outcomes

By the end of this course, students should be able to:

- Understand some common types of stochastic processes.
- Master techniques for answering questions pertaining to a set of selected common stochastic processes.
- Work proficiently with discrete-time Markov chains; understand transition probability matrix, convergence, and stationary and limiting distributions.
- Gain familiarity with a number of continuous-time stochastic processes, including Poisson processes, branching processes, and birth and death processes.

## Course materials

### Required text

Taylor and Karlin (1998) An Introduction to Stochastic Modeling, 3rd Edition. Academic Press (electronic, on Carmen)

### Course technology

For help with your password, university e-mail, Carmen, or any other technology issues, questions, or requests, contact the OSU IT Service Desk. Standard support hours are available at <https://ocio.osu.edu/help/hours>, and support for urgent issues is available 24x7.

- **Self-Service and Chat support:** <http://ocio.osu.edu/selfservice>
- **Phone:** 614-688-HELP (4357)
- **Email:** [8help@osu.edu](mailto:8help@osu.edu)
- **TDD:** 614-688-8743

## Grading and faculty response

### Homework and Exams

Assignment or category	Percentage
Participation	5
Homework	25
Midterm Exam	30
Final Exam	40
Total	100

**Participation.** Students are expected to participate in various activities throughout the semester, including surveys, feedback, and discussions.

**Homework.** There are (approximately) weekly homework assignments throughout the semester. You may discuss with other students, but DO NOT simply copy any part of someone else's work or solutions from any other sources. *Violations will be treated as academic misconducts and will be referred to the Committee on Academic Misconduct for investigation.* You are encouraged to talk to the instructor and the grader if you have questions after serious attempts have been made to work on an assignment. The lowest score will be dropped from the final grade calculation.

**Exams.** There is one in-class midterm, tentatively scheduled to be on March 4, 2021; any date changes will be communicated well in advance. The exam will be closed book, but *one* 8.5" X 11" sheet of notes (double-sided) may be used for the exam. The final exam will take place according to the schedule posted by the University Registrar. The exam will also be closed book, and you are allowed *two* 8.5" X 11" sheets of notes (double-sided). A basic calculator is permitted; however, using a cell phone, tablet, laptop, or any other communication device for this purpose is not permitted.

**Logistics and policies.** Homework will be submitted through the class website. Typically, no late homework will be accepted, and no make-up exams will be given. However, if you are unable to complete an assignment on time or have an emergency that prevents you from taking the exams on the dates specified, please get in touch with the instructor as soon as possible so that a solution can be worked out ahead of time.

## Faculty feedback and response time

### Grading and feedback

Sample solutions to homework assignments will be posted soon after all the papers are submitted. You can generally expect feedback within **7 days**, but there may be exceptions (e.g. grader has her own exam in a particular week).

### E-mail

The instructor will reply to e-mails within **24 hours on weekdays**.

## Other course policies

### Health and safety

The Ohio State University Wexner Medical Center's Coronavirus Outbreak site (<https://wexnermedical.osu.edu/features/coronavirus>) includes the latest information about COVID-19 as well as guidance for students, faculty and staff. Guidelines and requirements for "Safe and Healthy Buckeyes" are also available (<https://safeandhealthy.osu.edu>).

### Student academic services

Student academic services on the OSU main campus: <http://advising.osu.edu/welcome.shtml>.

### Student support services

Student support services offered on the OSU main campus: <http://ssc.osu.edu>.

## Academic integrity policy

- **Reusing past work:** In general, you are prohibited in university courses from turning in work from a past class to your current class, even if you modify it. If you want to build on past research or revisit a topic you've explored in previous courses, please discuss the situation with me.
- **Falsifying research or results:** All research you will conduct in this course is intended to be a learning experience; you should never feel tempted to make your results or your library research look more successful than it was.
- **Collaboration and informal peer-review:** While study groups are encouraged, remember that copying solutions from another student or from any other sources is not permitted. If you're unsure about a particular situation, please feel free just to ask ahead of time.

## Ohio State's academic integrity policy

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed and illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

## Copyright disclaimer

The materials used in connection with this course may be subject to copyright protection and are only for the use of students officially enrolled in the course for the educational purposes associated with the course. Copyright law must be considered before copying, retaining, or disseminating materials outside of the course.

## Statement on title IX

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <http://titleix.osu.edu> or by contacting the Ohio State Title IX Coordinator at [titleix@osu.edu](mailto:titleix@osu.edu)

## **Accessibility accommodations for students with disabilities**

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

## **Your mental health**

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student's ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life's Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org)

## **Disclaimer**

This syllabus should be taken as a fairly reliable guide for the course content. However, you cannot claim any rights from it and in particular we reserve the right to change due dates, exam dates or the methods of grading and/or assessment if necessary. Any changes will be communicated to you through official course announcements.

## Course schedule (tentative)

Note: Reading assignments are from the text by Taylor and Karlin: An Introduction to Stochastic Modeling, 3rd Edition.

Week	Dates	Topics	Assigned Readings
1	1/12, 1/14	Introduction to stochastic processes and review	Ch 1 and Ch 2
2	1/19, 1/21	Random sum; Stochastic processes	Ch 2, Sec 3, 4.
3	1/26, 1/28	Markov chain; N-step transition probabilities	Ch 3, Sec 1-5
4	2/2, 2/4	Markov chain and examples	Ch 3, Sec 6, 7
5	2/9, 2/11	Markov chain and examples	Ch 3, Sec 8
6	2/16, 2/18	Branching processes; Limiting distribution	Ch 4, Sec 1, 2
7	2/23, 2/25	Operation research and other examples	Ch 4, Sec 2, 3
8	3/2, 3/4	Classification of states	Ch 4, Sec 3, 4
8	3/4	Midterm ( <b>tentative</b> )	
9	3/9, 3/11	Poisson processes	Ch 5, Sec 1, 2
10	3/15, 3/17	Spring break – no classes	
11	3/23, 3/25	Poisson processes and associated distributions	Ch 5, Sec 1-3
12	3/30, 4/1	Spatial point processes and simulating PP	Ch 5, Sec 3, 4
13	4/6, 4/8	Continuous time MC; Birth/Dead Processes	Ch 6, Sec 1-3
14	4/13, 4/15	Transition probability functions; sojourn time	Ch 6, Sec 4-6
15	4/20, 4/22	Martingale; Brownian Motion; Gaussian Proc.	
	4/27	Final Exam; Wednesday, 10:00 am – 11:45 pm	