Course Subject, Number and Title
MATH 632 – Introduction to the Stochastic Processes Section 001/003
Credits
3

Canvas Course URL

Course Designations and Attributes
Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Honors - Honors Optional Course

Meeting Time and Location
This course will be fully online.

Instructional Mode
The instructor will pre-record lectures and post them to Canvas. He will be available (virtually) to answer questions on the material during the scheduled class time MWF 8:50-9:40 AM (003) and 1:20-2:10 PM (001).

Credit Hours
The posted videos will correspond to the online equivalent of three 50-minute class periods each week over the fall/spring semester and carries the expectation that students will work on course learning activities (reading, writing, problem sets, studying, etc) for about 2 hours out of classroom for every class period. The syllabus includes additional information about meeting times and expectations for student work.

Instructor
Scott Smith, Van Vleck Assistant Professor

Instructor Availability
Office hours will be conducted virtually.
Office Hours: tba

Instructor Email
ssmith@math.wisc.edu

Official Course Description
Topics include discrete-time Markov chains, Poisson point processes, continuous-time Markov chains, and renewal procesees. Applications to queueing, branching, and other models in science, engineering and business.

Requisites
(MATH/STAT 431, 209, STAT 311 or MATH 531**) and (**MATH 320, 340, 341,375,421, or 531**) or graduate/professional standing or member of the Pre-Masers Mathematics (Visiting International) Program.

It is important to have a good knowledge of undergraduate probability. This means familiarity with basic probability models, random variables and their probability mass functions and distributions, expectations, joint distributions, independence conditional probabilities, the law of large numbers and central limit theorem. If you wish to acquire a book for review, the Math 431 textbook "Introduction to Probability" by Anderson, Seppalainen, and Valko is recommended.

LEARNING OUTCOMES

Recall and state the formal definitions of the mathematical objects and their properties for stochastic processes. Use such definitions to argue that a mathematical object does or does not have the condition of being a particular property (e.g. irreducibility, aperiodicity, recurrence, transience, the Markov property, etc.). Recall and state the standard theorems of stochastic processes (e.g. laws of large numbers for Markov chains, existence of limiting/stationary distributions, law of large numbers for renewal processes etc.) and recall arguments for these theorems and the underlying logic of their proofs. Construct mathematical arguments related to the above definitions, properties, and theorems including the construction of examples and counter examples. Model simple real life situations by the means of discrete-space stochastic processes and calculate probabilities associated with those processes.

GRADING
There will be weekly homework assignments, two midterms, and a final exam. The final exam will be comprehensive.
- 10% HW
- 25% Midterm 1
- 25% Midterm 2
- 40% Final Exam

The cutoffs for the course are [100,90] A, (90,87) AB, [87,76) B [76,74) BC, [74,62) C, [62,50) D, [50,0] F.

TEXTBOOK
Rick Durrett: Essentials of Stochastic Processes, 3rd edition. UW Madison students can download this textbook for free through SpringerLink. Separate lecture notes will also be provided through Canvas.

HOMEWORK

Homework will be assigned weekly or biweekly. You are encouraged to discuss problems with other students, but the work you submit must be written in your own words, with your own understanding. Late homework will not be accepted. The two lowest homework scores will be dropped.

Students will need to register for Gradescope and HW will be submitted and graded through this platform. Registration takes place on gradescope.com using the entry code 94N4G7.

Exams

There will be two Midterm exams, with the dates tba. These will occur in the evening, not during the normal class time. There will also be a final exam.

Exam Proctoring

Exams will be proctored virtually through Zoom. A Zoom room will be created and students will be expected to join and share a video feed during the exam.

Privacy of Student Information and Digital Proctoring Statement

The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully reviews and vets all campus-supported teaching and learning tools, including proctoring tools and takes necessary steps to ensure that tool providers prioritize proper handling of sensitive data in alignment with FERPA, industry standards and best practices.

Under the Family Educational Rights and Privacy Act (FERPA – which protects the privacy of student education records), student consent is not required for the university to share with Honorlock those student education records necessary for carrying out the proctoring service. 34 CFR 99.31(a)(1)(i)(B). FERPA specifically allows universities to treat vendors as school officials and to share student education records with them where they perform services for the university and are subject to FERPA requirements governing the use and redisclosure of personally identifiable information from education records. Honorlock is FERPA compliant and is bound by the terms of its agreement with the university to comply with FERPA's restrictions on the use of student education records.

PRIVACY OF STUDENT RECORDS and the USAGE of AUDIO RECORDED LECTURES

See information about privacy of student records and the usage of audio-recorded lectures.

Usage of Audio Recorded Lectures Statement

Lecture materials and recordings for [insert class name] are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

HOW TO SUCCEED IN THIS COURSE

Provide information on how students can best succeed in the course. For instance, instructors might include suggestions about completing assignments or studying for exams. Instructors might also include resource links to other campus services such as:

- [University Health Services](#)
- [Undergraduate Academic Advising and Career Services](#)
- [Office of the Registrar](#)
- [Office of Student Financial Aid](#)
- [Dean of Students Office](#)

STUDENTS' RULES, [RIGHTS & RESPONSIBILITIES](#)

During the global COVID-19 pandemic, we must prioritize our collective health and safety to keep ourselves, our campus, and our community safe. As a university community, we must work together to prevent the spread of the virus and to promote the collective health and welfare of our campus and surrounding community.

UW-MADISON [BADGER PLEDGE](#)

QUARANTINE OR ISOLATION DUE TO COVID-19

Student should continually monitor themselves for COVID-19 [symptoms](#) and get [tested](#) for the virus if they have symptoms or have been in close contact with someone with COVID-19. Student should reach out to instructors as soon as possible if they become ill or need to isolate or quarantine, in order to make alternate plans for how to proceed with the course. Students are strongly encouraged to communicate with their instructor concerning their illness and the anticipated extent of their absence from the course (either in-person or remote). The instructor will work with the student to provide alternative ways to complete the course work.

COURSE EVALUATIONS

Students will be provided with an opportunity to evaluate this course and your learning experience. Student participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

Digital Course Evaluation (AEFIS)
For instructors using the campus digital course evaluation survey tool, [AEFIS](#).

UW-Madison now uses an online course evaluation survey tool, [AEFIS](#). In most instances, you will receive an official email two weeks prior to the end of the semester when your course evaluation is available. You will receive a link to log into the course evaluation with your NetID where you can complete the evaluation and submit it, anonymously. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

ACADEMIC INTEGRITY

By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the

integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to studentconduct.wiscweb.wisc.edu/academic-integrity/.

ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

McBurney Disability Resource Center syllabus statement: "The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA." http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php

DIVERSITY & INCLUSION

Institutional statement on diversity: "Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals.

The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive community for people from every background – people who as students, faculty, and staff serve Wisconsin and the world." https://diversity.wisc.edu/