STAT 3506A, Stochastic Processes and Applications
School of Mathematics and Statistics
Carleton University
Winter 2021

Instructor: Dr. Minyi Huang
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Text: Sheldon M. Ross, *Introduction to Probability Models*, 12th Edition, Academic Press, 2019.

Lecture: This is an online course. The lectures will be delivered on cuLearn as a combination of
(i) posted short videos,
(ii) synchronous lecturing through ZOOM and/or BigBlueButton (BBB),
(iii) posted lecture slides.
For (ii), the scheduled meeting time is Tue and Thurs, 11:35 am – 12:55 pm.
Announcements regarding (ii) will be made on cuLearn in advance.
For admission to ZOOM, you are required to indicate your name by Given name + Family name.
The tests and final examination may be e-proctored.

Tutorial: Thursday, 1:35pm – 2:25pm

Prerequisites: STAT 2655 with a grade C- or higher; or permission of the School

Office Hours: Friday 4:00pm – 5:00pm (online)

Marking Scheme:
Quiz (5) 10%
Assignments (6): 12%
Term tests (3): 28% (conditionally best 2 out of 3)
Final exam: 50%

Important dates:

Jan 12	First lecture
Jan 25	Last day for registration or change of courses
Jan 31	Last day to withdraw
Feb 15-19	Winter break
Apr 13	Last lecture

Time used in this outline: All dates and time in this outline mean the Ottawa local time; see https://www.timeanddate.com/worldclock/canada/ottawa.

Email communication with instructor: Please use your Carleton account ONLY for all course related email, and write on the **subject line** your course code STAT3506, which I will use to manage email.

Announcements: You are responsible for keeping up with information announced through cuLearn, or sent to your e-mail account.

Quizzes, assignments and tests: A total of 5 quizzes worth 2% each: There will be a 15-min quiz in the tutorial in the designated weeks (see the last page). A total of 6 assignments worth 2% each: There will be six (6) assignments due in lecture in the designated weeks. Students should do independent work on the assignments. Late assignments will not be accepted unless a written request, describing the reason why you could not complete the work on time, has been submitted to the instructor before the due date, and an arrangement made by the instructor. Due to lack of TA support, your assignments might only be reviewed and roughly checked. Term tests: There will be three (3) 50-minute tests in the tutorial hours in weeks: **4, 7, 10 (see the last page).** You have to take all tests and get at least 20% in each test in order to count the best two out of three; otherwise, all three will be counted. No make-up, early or late tests or quizzes will be arranged; absence is excused only for medical reasons (a doctor's note may be presented), or situations in accordance with Carleton's accommodation policies. Any missing test will be counted as zero. Due to the pandemic situation, we understand it may be difficult to obtain a doctor's note. If you miss a midterm test due to illness, you may elect to submit within 3 business days the self-declaration form https://carleton.ca/registrar/wp-content/uploads/COVID-19_Self-declaration.pdf

Assignments: The assignments are due at 23:59 of the due date.

Students should do independent work on the assignments and no collaboration on the assignments is allowed, otherwise it would result in a zero mark for the assignment. Careful work on the assignments during the term is important and will make you better prepared for the tests and final exam. You should start to work early instead of waiting until the last minute. No medical declaration is accepted for missing an assignment deadline, except for extraordinary circumstances (like prolonged and severe illness with an official proof or a hospitalization record).

Final examination (50%): This is a three (3) hour open-book exam scheduled by the University during the final exam period from April 16–27, 2021. By open-book, it means you may consult the course materials. Collaboration with another person on the solution is prohibited. **When the exam is completed, you are given 20 minutes to upload your solution**. It is the responsibility of each student to be available at the time of the examination.

Solution submission for assignments, quizzes, tests and final exam: For each assignment or test or the final, you are required to submit the solution as **a single PDF file**. No other format is accepted for grading. If your solution is scanned, make sure you convert it into the PDF format. Never wait until the last minute to submit. In particular, when it seems you do not have enough time to complete your test or final solution, you must reserve time to scan and submit first. After your submission, make sure to immediately download from cuLearn to verify that your submitted PDF file is readable. No late submission or resubmission will be granted. A late submission actually submitted will **not** be counted.

Conditions to pass the course: You are required to achieve at least 30% of your overall term work (including Assignments, Minitest, and term tests) and 40% of the final examination to pass the course. Although the absence from some tests for medical reasons may be excused, this course requires the student's adequate workload and participation. If a student has missed too many parts of all assignments and tests, the student cannot pass this course due to inadequate workload and participation, regardless of the performance in the final examination.

Calculators: You may use only non-programmable, non-graphing calculators for the tests and the final examination in this course.

Intellectual property notice: All materials created for this course (including lecture notes, posted/recorded videos, assignments and tests and posted solutions, the final exam, etc) remain the intellectual property of the instructor. These materials are intended for the personal and non-transferable use of students registered in the current offering of the course. Students registered in

the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without written consent from the instructor. A student who publicly posts or sells an instructor's work, without the instructor's expressed consent, may be charged with misconduct under Carleton's Academic Integrity Policy and/or Code of Conduct.

Academic Accommodation: You may need special arrangements to meet your academic obligations during the term because of disability, pregnancy or religious obligations. Please review the course outline promptly and write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. Please make sure you respect these timelines particularly for tests and final exams.

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www2.carleton.ca/equity/accommodation.

Paul Menton Centre: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. The deadline for submitting completed forms to the Paul Menton Centre for April Examinations is March 19, 2021.

Academic Integrity: Any student violating the University's standards of academic integrity, including but not limited to misconduct in their coursework, tests, and final examination, will be subject to appropriate sanctions. For more details, visit the Registrar's Office website https://carleton.ca/registrar/academic-integrity/.

Course Outline (tentative):

Week	**Sections**	**Topics**
1	1.4, 3.2, 3.3	Conditional probability (for events, discrete r.v.s, continuous r.v.s)
2	3.4, 3.6.1	Computing expectations by conditioning; list model
3	3.5, 3.6.2	Computing probabilities by conditioning; random graph
4	4.1, 4.2, 4.3	Markov chains, classification of states
5	4.3, 4,4	Classification of states, limiting probabilities
6	4.5, 4.6	Applications of Markov chains, time spent in transient states
-	Feb 15-19	Winter break
7	4.7, 4.8,	Branching processes, reversibility
8	4.9, 4.11	Markov chain Monte Carlo, hidden Markov chains
9	5.1, 5.2	The exponential distribution
10	5.2, 5.3.1	The exponential distribution, counting processes
11	5.3.2, 5.3.3, 5.3.4	The Poisson process
12	5.3.4, 5.3.5	Applications of Poisson process
13	Review	

Dates of Quizzes and tests
(all during tutorial sessions):

Week	**Dates**	**Details**
2	Jan 21	Quiz 1
3	Jan 28	Quiz 2
4	Feb 4	**Test 1**
5	Feb 11	Quiz 3
-	Feb 15-19	Winter break
6	Feb 25	Quiz 4
7	Mar 4	**Test 2**
8	Mar 11	
9	Mar 18	Quiz 5
10	Mar 25	**Test 3**
11	Apr 1	

You are given (i) extra 10 minutes for uploading your quiz solution, (ii) extra 20 minutes for uploading your test solution to cuLearn.

Dates of assignment solution submission (due at 23:59 of that day):

Assignment 1 (Jan 26, week 3), assignment 2 (Feb 23, week 6), assignment 3 (Mar 9, week 8), assignment 4 (Mar 23, week 10), assignment 5 (Apr 5, week 11), assignment 6 (April 15, week 13)