

STAT 4508-A/5701-W Stochastic Models
School of Mathematics and Statistics
Carleton University
Winter 2020

- Instructor:** Dr. Yiqiang Q. Zhao; Office: 4328HP; Tel. 520-2600 ext. 2131
E-mail: zhao@math.carleton.ca
Coursepage: Available on cuLearn <https://carleton.ca/culearn/>
- Text:** Sheldon Ross, *Introduction to Probability Models*, 12th Edition, Academic Press, 2019.
- Lecture:** Room: Southam Hall 311
Tuesday & Thursday 2:35pm – 3:55pm
- Prerequisites:** STAT 3506; or permission of the School
- Office Hours:** Wednesday 4:00 – 5:00pm
(4328HP) or by appointment
- Description:** STAT 4508 is a continuation of STAT 3506. It is also cross-listed with STAT 5701 (MAT 5198 at U. of Ottawa). Students registered to STAT 5701 are required to complete additional course work.
- Marking Scheme:** Assignments (4): (due in class on Jan 21; Feb 6; Feb 20; and Mar 19)
20%
Term tests (2): 30% (on Feb 11 and Mar 19)
Final exam: 50%
- Important dates:**
- | | |
|----------------------|---|
| January 7 (Tuesday) | First lecture |
| January 17 (Friday) | Last day for registration or to make changes |
| January 31 (Friday) | Last day for withdrawal with full fee adjustment |
| February 14 (Friday) | April examination schedule available online |
| February 17 – 21 | Winter break |
| April 7 (Tuesday) | Last day of the class |
| | Last day for academic withdrawal from winter term courses |
| April 13–25 | Exam period |

Email communication with instructor: According to Carleton policy under the Freedom of Information and Protection of Privacy Act (FIPPA), please use your Carleton Connect account for all course related email.

Announcements: You are responsible for keeping up with all information announced in class, from the course web page at cuLearn and through e-mail.

Four (4) assignments (20%): 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.

Two (2) term tests (30%): The better one will be counted towards your final grade. Both tests are 75-minute long in lecture hours. No make up, early or late tests will be arranged. If you miss one test, the other will be counted. If you miss both, zero marks will be assigned, except for medical reasons (a doctor's note must be presented), or situations in accordance with Carleton's accommodation policies. In such a case, an arrangement will be made between the student and the instructor.

Final examination (50%): There will be a three (3) hour closed book exam scheduled by the University during the final exam period. It is the responsibility of each student to be available at the time of the examination. Final exam schedule will be available online on February 14.

Calculators: You may only use non-programmable, non-graphing calculators for the tests and the final examination in this course. No other electronic device is allowed, such as cell-phones, electronic dictionary, palm pilot, etc.

Paul Menton Centre: Students with disabilities requiring academic accommodations in this course must contact a coordinator at the Paul Menton Centre (PMC) for Students with Disabilities (500 University Centre, Tel: 613-520-6608) to complete the necessary Letters of Accommodation. After registering with the PMC, make an appointment to meet and discuss your needs with the instructor in order to make the necessary arrangements as early in the term as possible. Please notice the deadline for submitting completed forms to the Paul Menton Centre for formally scheduled exam accommodations.

Religious obligations: Students requiring accommodation on the basis of religious obligations should make a formal, written request for alternate dates and/or means of satisfying academic requirements. Such requests should be made within the first two weeks of the class or as soon as the need for accommodation is known to exist, but no later than two weeks before the compulsory event. Accommodation is to be worked out directly and on an individual basis between the student and the instructor. Accommodation is made in a way that ensures fairness and avoids academic disadvantage to the student. Please refer to the website of Equity Services for a list of holy days and Carleton's Academic Accommodation policies.

Pregnancy: Pregnant students requiring academic accommodation are encouraged to contact an Equity Advisor in Equity Services to complete a letter of accommodation. You should make an appointment with the instructor to discuss your needs at least two weeks prior to the first academic event in which it is anticipated that the accommodation will be required.

Course Outline:

| Week | Sections | Topics |
|-------------|------------------|--|
| 1 | Ch4, Ch5 | Review of discrete time Markov chains and Poisson process |
| 2 | 5.4 | Generalizations of the Poisson process |
| 3 | 6.1, 6.2, 6.3 | Continuous time Markov chains, birth and death processes |
| 4 | 6.4, 6.5 | Transition probabilities, limiting probabilities |
| 5 | 6.6, 6.7, 6.8 | Time reversibility, uniformization, computing transition probabilities |
| 6 | 7.1, 7.2, Test 1 | Introduction to renewal theory, Test 1 |
| 7 | 7.3, 7.4–7.10 | Limiting theorems, selected topics on renewal theory |
| 8 | 8.1, 8.2 | Introduction to queueing theory |
| – | – | Feb 17–21, Winter break |
| 9 | 8.3, 8.4 | Exponential models, networks of queues |
| 10 | 8.5–8.9 | Selected topics on queueing theory from these sections |
| 11 | Test 2, 10.1 | Test 2, introduction to Brownian motion |
| 12 | 10.2, 10.3 | Brownian motion, and variations on Brownian motion |
| 13 | 10.3 | Variations on Brownian motion, review |

Dates of Assignment dues and tests:

| Dates | Details |
|--------------|-------------------------|
| January 21 | Assignment 1 |
| February 6 | Assignment 2 |
| February 11 | Test 1 |
| February 20 | Assignment 3 |
| March 19 | Assignment 4 and Test 2 |