

**STAT 461**  
Statistical Simulation  
**Summer 2023**

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**Office Hours:** Mondays, 8:30-10:00 AM.

**Note that the system does not allow one to reply to an email sent from Moodle. Thus, emails should be sent from one's own emailer, not Moodle.** Note, however, that if you missed a class, it is not reasonable to expect your professor to cover the missed material for you.

**Text:** *Simulation*, 6th Edition, by Sheldon M. Ross (Academic Press): available for download as e-book on Library website via Concordia Netname log in. A hard copy of the 6<sup>th</sup> Edition is being held as course-reserve in the Library and may be used by students as a reference.

**Objectives:** This course is an introduction to the methods of *simulation* and *Monte Carlo* techniques. In *Simulation*, we consider joint distributions of random variables, and more generally, stochastic models describing systems in economy, industry, insurance etc., which essentially are specifications of complex joint distributions; we then *generate* (pseudo) values of those variables using appropriate algorithms to study the models. Monte Carlo techniques are statistical methods for estimating, based on repeated simulations, various quantities of interest related to the models, which are difficult to compute theoretically. In Part I of the course, we shall review basic probability theory and study methods for generating random variables. In Part-II we shall study simulation of a few complex systems and their estimation using Monte Carlo methods.

**Content:** Part I: Review of Probability Theory (Ch. 2), Random Numbers (Ch. 3), Generating Discrete Random Variables (Ch. 4), Generating Continuous Random Variables (Ch. 5).

Part II: Discrete Event Simulation (Ch. 7), Statistical Analysis of Simulated Data (Ch. 8), Variance Reduction Methods (Ch.9).

**Assignments:** There will be 4 or 5 assignments, to be posted on, and returned via, Moodle. Most of the assignments will involve use of the software **R**. A freely downloadable student version can be found at <http://www.r-project.org>. A useful reference is the book, *A first course in statistical programming with R*, 3rd Edition, by W. John Braun and Duncan J. Murdoch (Cambridge University Press).

**Midterm Test:** Exam date: **Monday 24 July 2023 (in class)**. The midterm test, based on the content of Part I, will contribute up to 25% of your final grade (**see the Grading Scheme below**).

**NOTE:** It is the Department's policy that tests missed for any reason, **including illness**, cannot be made up. If you miss the midterm test because of illness ([Short-Term Absence form](#) or *medical note required*) the final exam will count for 85% of your final grade, and the assignments will count for the remaining 15%.

**Final Exam:** The final examination will be in person.

**NOTE:** Students are responsible for finding out the date and time of the final exams once the schedule is posted by the Examinations Office. Conflicts or problems with the scheduling of the final exam must be reported directly to **the Examinations Office, not to your instructor**. It is the Department's policy and the Examination Office's policy that students must be available to take the final exam on the selected date and time. Conflicts due to travel plans will not be accommodated.

**Final Grade:**

- a) Assignments (15%)
- b) Midterm test (25%)
- c) Final examination (60%)

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

**IMPORTANT:** **PLEASE NOTE THAT THERE IS NO "100% FINAL EXAM" OPTION IN THIS COURSE.**

#### **Academic Integrity and the Academic Code of Conduct**

This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: [concordia.ca/students/academic-integrity](http://concordia.ca/students/academic-integrity)." [Undergraduate Calendar, Sec 17.10.2]

#### **Behaviour**

All individuals participating in courses are expected to be professional and constructive throughout the course, including in their communications.

Concordia students are subject to the [Code of Rights and Responsibilities](#) which applies both when students are physically and virtually engaged in any University activity, including classes, seminars, meetings, etc. Students engaged in University activities must respect this Code when engaging with any members of the Concordia community, including faculty, staff, and students, whether such interactions are verbal or in writing, face to face or online/virtual. Failing to comply with the Code may result in charges and sanctions, as outlined in the Code.

### **Intellectual Property**

Content belonging to instructors shared in online courses, including, but not limited to, online lectures, course notes, and video recordings of classes remain the intellectual property of the faculty member. It may not be distributed, published or broadcast, in whole or in part, without the express permission of the faculty member. Students are also forbidden to use their own means of recording any elements of an online class or lecture without express permission of the instructor. Any unauthorized sharing of course content may constitute a breach of the [Academic Code of Conduct](#) and/or the [Code of Rights and Responsibilities](#). As specified in the [Policy on Intellectual Property](#), the University does not claim any ownership of or interest in any student IP. All university members retain copyright over their work.

### **Extraordinary circumstances**

In the event of extraordinary circumstances and pursuant to the [Academic Regulations](#) the University may modify the delivery, content, structure, forum, location and/or evaluation scheme. In the event of such extraordinary circumstances, students will be informed of the change.

### **Use of Zoom**

**Note: Zoom is included as an institutionally-approved technology. This means we have been assured of the privacy protections needed to use freely within the classroom.**

In the event of extraordinary circumstances, Zoom might be used in this course to facilitate learning at a distance. It may be used to record some or all of the lectures and/or other activities in this course. If you wish to ensure that your image is not recorded, speak to your instructor as soon as possible.

Also, please note that you may not share recordings of your classes and that the instructor will only share class recordings for the purpose of course delivery and development. Any other sharing may be in violation of the law and applicable University policies, and may be subject to penalties.