

**STAT 461**  
Statistical Simulation  
**Summer 2021**

**Note:** All lectures and office hours will be held online. The mid-term and final examination will also be held online.

**Instructor:** Dr. W. Sun  
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**Office Hours:** All questions will be answered during lectures or privately via emails. An online discussion platform on Moodle will be used for students to ask questions asynchronously, exchange information and interact with their peers. Announcements of all important clarifications and corrections will be made on Moodle.

**Text:** *Simulation*, 5th Edition, by Sheldon M. Ross (Academic Press): available for download as e-book on Library website via Concordia Netname log in.

**Objectives:** This course introduces the methods of *simulation* and the *Monte Carlo* techniques. Simulation consists of formulating a suitable statistical model for a given system (in economy, industry, insurance etc.) in terms of appropriate random variables and their (joint) distributions, and generating values of those variables on a computer to see how the system works. Monte Carlo techniques are statistical methods for estimating various quantities of interest for the system, based on repeated simulations, which are difficult to compute theoretically based on the model. In Part I of the course we shall review basic probability theory and study methods for generating (pseudo) random variables. In Part-II we shall study simulation of a few complex systems and their estimation using Monte Carlo methods.

**Calculators:** Only calculators approved by the Department such as **Sharp EL 531** or the **Casio FX 300MS**, are permitted for the class test and final examination. See <http://www.concordia.ca/artsci/math-stats/services.html#calculators> for details.

**Assignments:** There will be 3 assignments. Most of the assignments will involve use of the software **R** that will be demonstrated during one class. A freely downloadable student version can be found at <http://www.r-project.org>

Assignments and their due dates will be provided via Moodle; students are required to submit each assignment as a single pdf file on Moodle.

**Late assignments will not be accepted.**

**Term Exam:** There will be one term exam. Mid-term test via Moodle will be given during lecture time (exam date TBA). Mid-term test missed for any reason, cannot be made up.

**Final Exam:** Timed final exam via Moodle will be given during the period assigned by Concordia's Exams Office.

**Final Grade:** Midterm 20% + Final 60% + Assignments 20%.

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.

**Topics Covered:** 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).

#### **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*]

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.

Zoom will be used in this course to facilitate learning at a distance. It may be used to record some or all of the lecture 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.

**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 changes.