

STAT 461, Sec. A
Statistical Simulation
Winter 2019

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Text: *Simulation*, 5th Edition, by Sheldon M. Ross (Academic Press).

Objectives: This course is an introduction to 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.

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.

Assignments: There will be 4 or 5 assignments. Most of the assignments will involve use of the software R that will be demonstrated during one or two classes. R is installed on the PCs in the Department's Computer Lab, and a freely downloadable student version can be found at <http://www.r-project.org>. There will be a few separate questions for undergraduate and graduate students in the assignments and exams.

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).

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." [*Undergraduate Calendar, Sec 17.10.2*]