Department of Mathematics & Statistics
Concordia University

STAT 461
Statistical Simulation
Summer 2017

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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%.

Assignments: There will be 3 or 4 assignments. Most of the assignments will involve use of the software R. 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 Approach (Ch. 7), Statistical Analysis of Simulated Data (Ch. 8), Variance Reduction Methods (Ch. 9).