MIE1613H: Stochastic Simulation (Winter 2019)

- **Instructor:** Prof. Vahid Sarhangian, Office: BA8108, Email: sarhangian@mie.utoronto.ca
- **Office hours:** 12-1 PM after the class, or by appointment
- **Teaching assistant:** Emma Zhang, Email: emmaz.zhang@mail.utoronto.ca
- **Lectures:** Tuesdays (9:00-12:00) in WB 219

Course description and prerequisites

This course is a graduate level introduction to modelling and analysis of stochastic dynamical systems using computer simulation. The course provides a rigorous yet accessible treatment of the probability foundations of simulation, and covers programming simulation models in a lower-level language. Throughout the course, concepts and methods are illustrated using various examples from different application areas. In particular, applications to service and financial engineering are emphasized.

Students are expected to have an undergraduate-level background in probability and statistics, and be familiar with a general purpose programming language. Familiarity with stochastic processes would be helpful but not required. Students are required to use Python for the homework and project, although prior exposure to Python is not assumed.

Textbook and other resources

- Textbook (required):
  - Nelson, Barry. *Foundations and methods of stochastic simulation: A first course*. Springer Science & Business Media, 2013. (Available online at https://link.springer.com)
- Additional references:
  - Glasserman, Paul. *Monte Carlo methods in financial engineering*. Springer Science & Business Media, 2003. (Available online at http://library.utoronto.ca)
  - Asmussen, Søren, and Peter W. Glynn. *Stochastic simulation: algorithms and analysis*. Springer Science & Business Media, 2007. (Available online at https://link.springer.com)

Evaluation

40% Homework; 30% Project; and 30% Final exam. Details and deadlines to be announced.

Tentative course schedule

Date	Topic
Jan 08	Intro. to stochastic simulation
Jan 15	Probability and statistics review
Jan 22	Simulation examples
Jan 29	Simulation modelling and programming in Python
Feb 05	A framework for simulation modelling and analysis
Feb 12	Input modelling
Feb 19	(Reading week - no class)
Feb 26	Simulation output
March 05	Design and analysis of simulation experiments
March 12	Simulation optimization
March 19	Variance reduction
March 26	Intro. to commercial simulation software (Simio)
April 02	Additional topics (if time permits)