

MIE1613H: Stochastic Simulation (Winter 2022)

- **Instructor:** Prof. Vahid Sarhangian, Office: BA8108, Email: sarhangian@mie.utoronto.ca
- **Office hours:** TBD in class
- **Teaching assistant:** Mahdi Mirjalili, Email: mhdmjli@mie.utoronto.ca
- **Piazza homepage:** piazza.com/utoronto.ca/winter2022/mie1613hslec0101
- **Lectures:** Thursday, 9AM-12, Room: WB 219 (in-person); online lectures on [Zoom](#).

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 a strong background in undergraduate-level 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.

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 (see the table for tentative assignment dates - all homework will be due in 2 weeks from the assignment date)
- 30% Project (Assigned by Feb 10th; Proposal due on March 03, final report deadline to be announced)
- 30% Final exam (date and time to be announced)

Tentative course schedule

Date	Topic	Homework / Project
Jan 13	Intro. to stochastic simulation	
Jan 20	Probability and statistics review	Homework 1 assigned
Jan 27	Simulation examples (1)	
Feb 03	Simulation examples (2)	
Feb 10	Simulation as a stochastic process A framework for simulation modelling and analysis	Homework 2 assigned
Feb 17	Simulation input - input modelling and estimation	
Feb 24	Reading week (no class)	
March 03	Simulation input - random variate generation	
March 10	Simulation output	Homework 3 assigned
March 17	Design and analysis of simulation experiments	
March 24	Simulation optimization - ranking and selection	
March 31	Simulation optimization - gradient estimation	Homework 4 assigned
April 7	Variance reduction	

Video Privacy Considerations

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