ORIE 6580 Simulation, Peter Frazier, Fall 2014

syllabus updated 8/22/2014

Course Goals

Discrete-event simulation is one of the most widely used management science tools today with applications in, for example, manufacturing, finance, telecommunications, and chemistry. Its popularity stems from its versatility and power. The objectives of this course are

- To impart skills useful in a variety of simulation-related contexts,
- To provide a survey of simulation theory, and
- To give an idea of selected research topics in simulation.

Lectures

Tuesdays and Thursdays 10:10-11:25am in Upson 215
On 9/4, 10/16, and 11/11, Peter will be out of town, and class will be canceled.
We will make up these lectures on another day. We'll pick the makeup dates a few weeks into the semester, once our schedules have all settled down.

Lecturer

Peter Frazier
Office hours usually Tu, Th 1:30-2:30pm, Rhodes 232, check the course calendar (described below) for updates.

Course Calendar

Office hours may change from week to week, due to changes in Peter's schedule. Updates to office hours, as well as information about lectures, homework deadlines, and the final exam, will be maintained on a google calendar created for the course. It is visible on Blackboard, and available at this URL:
https://www.google.com/calendar/embed?src=nkb9qnsuqc4piuh2un77h97i1k%40group.calendar.google.com&ctz=America/New_York

Assessment

There will be approximately 5 homeworks and a final exam. Homeworks are worth a total of 49% with the lowest grade dropped. The exam is worth 49%. 2% of your grade will be based on whether you fill out the course evaluation (Please fill it out!)

Final Exam

The registrar has not determined a date for the final exam yet. This will be posted on September 19 at the following URL http://registrar.sas.cornell.edu/Sched/EXFA.html The final exam may be scheduled as late as December 18, so please do not book flights home for before this date until we see when the exam will be. We'll cross our fingers that our exam doesn't get scheduled too late.

Prerequisites

- Familiarity with basic probability, statistics and stochastic processes at, or close to, the level of ORIE 6500.
- Familiarity with real analysis, at the level of MATH 4130 or MATH 3110.
- A previous course in simulation (e.g., ORIE 5580) is **not** required, nor expected.
- Some programming experience. Students will be required to write small computer programs for the homeworks, and complete a larger program for the computer

assignment. No assistance in programming will be given. You should be familiar with, and have access to, a high-level programming language such as Matlab, C, C++, Java, R, Python, etc.

Textbook
The main textbook for the course will be,
Asmussen & Glynn. 2007. Stochastic Simulation: Algorithms and Analysis. Springer.

Additionally, some lectures will be drawn from these books:
Glasserman. 2003. Monte Carlo Methods in Financial Engineering.
Nelson. 2013. Foundations and Methods of Stochastic Simulation: A First Course
Henderson and Nelson (editors). 2006. Simulation, Handbooks in Operations Research and Management Science

Blackboard
Please sign up for the class webpage. Make sure it is ORIE 6580 you sign up for, as there are other similar websites for ORIE 5580, 5581 and 5582.

Course Content
We will cover the following topics (not necessarily in this order), with more depth in some than others.

- Overview of simulation: when it is needed, advantages/disadvantages
- Generating random samples:
  - Generating uniform pseudo-random numbers
  - Generating non-uniform random variates
  - Generating random vectors
  - Generating stochastic processes
- Monte Carlo Integration
- Efficiency improvement (variance reduction) techniques
  - Importance sampling
  - Control variates
- Output analysis for finite and infinite-horizon simulation
- Simulation Optimization
- Metamodeling and stochastic kriging

Academic Integrity
Each student in this course is expected to abide by the Cornell University **Code of Academic Integrity**. Any work submitted by a student in this course for academic credit should be the student's own work.

- You may discuss the homework problems with other students, but only at the level of a discussion in a corridor. No notes should be taken away from such discussions.
- You may not work through the solutions with others, and you cannot share computer files.
- You may not discuss the homework with past students who have significant knowledge of the details of the problem set, or derive advantage in any way from the existence of solutions prepared in prior years, whether they are instructor-supplied or a student's own work.

If you violate this policy then you risk failing the course.
If you have any questions about this policy, *please* do not hesitate to contact me.