

**Course Name:** Monte Carlo Methods and Financial Applications

**Course Number:** FM9593B

**Academic Term:** Winter, 2022

**Lecture Hours:** MWF 1:00 – 2:00 PM

**Online lecturing:** From Jan 10 to Jan 31, all lectures are scheduled online with synchronous Zoom lecturing. Any change will be notified in advance.

A third-year undergraduate understanding of probability and statistics is required for this course. Students should be comfortable with commonly used univariate and multivariate distributions, expectations (including variance and covariance), transformation of variables, linear regression, estimation, and basic statistical tests. The ability to program in a quantitative programming environment such as R is also required. It would be helpful (although not necessary) to have basic knowledge of ordinary and partial differential equations, stochastic processes, stochastic differential equations, and Ito calculus. As most of the examples are from financial applications, some knowledge of finance and derivatives pricing would also be useful.

This course is intended to be an introduction to Monte Carlo simulation methods. Topics to be covered include

1. Random number generation (RNG) for uniform, non-uniform, discrete and continuous Distributions. How to check RNG quality.
2. Simulation of stochastic processes. Introduce some R packages to simulate SDE.
3. Variance reduction techniques. Many techniques are introduced.
4. Special topics as time allows

**Reference Book:** D.L. McLeish. Monte Carlo Simulation & Finance. HG6024.3.M357 2005

**Software needed:** A personal computer/laptop that has R and RStudio installed (Windows, Mac, Linux) is highly recommended since it is required to complete assignments.



*Final grades*



