

IE 525 Numerical Methods in finance

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<i>Lectures:</i>	MW 1:00 – 2:20pm in EH 106B1
<i>Office Hours:</i>	MW 2:30 – 3:30pm or by appointment
<i>Course Website:</i>	On <i>Compass2g</i> .
<i>TA:</i>	Qi Zhao (qiz2@illinois.edu)
<i>TA's Office Hours:</i>	TBD

Course Description.

The course focuses on numerical methods for *modeling*, *pricing* and *risk management* of financial instruments, including derivatives. Specifically, it covers:

- *Lattice Methods*: Order of convergence and round-off error of lattice schemes; pricing American options using lattices; multi-asset options; multinomial models.
- *PDE Methods*: Black-Scholes PDE; Finite-difference methods: Explicit, implicit, Crank-Nicolson, SOR; Free-boundary problems / finite-difference methods for American options: Projected SOR; PDE methods for path-dependent and exotic options.
- *Simulation Methods*: Option pricing via plain Monte Carlo; Stock/ Path generation; Variance reduction techniques; Monte Carlo methods for path-dependent and American options.

Course Objectives.

- *Learn* the basic numerical analysis methods.
- *Understand* how to apply these in option pricing.
- *Implement* the corresponding algorithms in C++.

Textbooks.

- *The Mathematics of Financial Derivatives: A Student Introduction*, by Willmott, Howison and Dewynne (Cambridge University Press).
- *Monte Carlo Methods in Financial Engineering*, by Glasserman (Springer).

Additional Readings.

- *Numerical Methods in Finance and Economics: A MATLAB-Based Introduction*, by P. Brandimarte (Wiley).

- *Stochastic Simulation*, by Asmussen and Glynn (Springer).
- *Tools for Computational Finance*, by Seydel (Springer).

Coursework.

- *Homework Assignments*: There will be 5 – 6 (mathematical) homework assignments accounting for 20% of the overall grade.
- *Computational Assignments*: Throughout the semester there will be 3 – 4 computational assignments where coding in C++ will be required, accounting for 20% of the overall grade.
- *Exams*: There will be *one* in-class midterm, accounting for 25% of the overall grade and a final exam, accounting for 35% of the overall grade. The tentative date for the midterm is *Monday, March 11 2019*.

All assignments will be *posted* and *submitted* on Compass2g. **Late submissions will *not* be accepted.**

Regrading.

If you want to dispute your work's grade, all requests should be made in writing (email is ok) within a week, after receiving your graded work. Please note that when you ask for a question to be re-graded, the entire assignment may be re-graded, and there is a possibility of losing points.

Grading Scheme.

Your grade is based upon your performance only. The grading scale is as follows:

<i>Grade</i>	<i>Percentage</i>
A	90.00 – 100.00
B	80.00 – 89.99
C	70.00 – 79.99
D	60.00 – 69.99
F	0.00 – 59.99

Academic Integrity.

It is expected that all students will support the idea of academic integrity and be responsible for the integrity of their work. The university has a published policy on academic integrity that may be found at: <http://www.library.illinois.edu/learn/research/academicintegrity.html>

Special Accommodation.

In compliance with the University of Illinois policy and equal access laws, appropriate academic accommodations are offered for students with disabilities.