



Finance & Risk Engineering

Figure 1: FRE logo

<course number>

Turning Math in Software using C++ and Excel

Instructor Information

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Course Information

- <course number and section>
- <course title>
- <course description>
- <prerequisites>
- <meeting day/time>
- <classroom>

Course Overview and Goals

“The purpose of computing is insight, not numbers.” – Richard Hamming

This lab will teach you how to turn mathematical equations into software that can be used from the most popular programming language in the world, Excel. Traders live in Excel but they have to use the production system built by their information technology group. They always insist it has an “Export to Excel” button.

There is a reason for that. Traders don’t always trust the numbers they see in the production system. If they can get those into a spreadsheet they can do

what they do and give feedback to the IT group if something is amiss.

One reason for Python's popularity is the large ecosystem of packages such as numpy, pandas, and pytorch written by people who know how to call C and C++ libraries from python to get good performance. You will learn how to call C and C++ from Excel. Some traders are familiar with Python, but all traders know Excel. If you give them a spreadsheet and an add-in they will look at your handiwork, tell you what looks right to them, make fun of you if you got something wrong, and often ask if there is something else you can do for them that solves a problem they are currently dealing with. It's a great way to get a front row seat to the action.

Since 2011 some of the smartest people in the world have been working, for no pay, on a 3 year cycle to standardize improvements to the language. This lab will not make you an expert in C++, but it will teach you a simple subset of C++23 that is as easy to write as Python. In this lab we will develop a financial analytics library that can be used from Excel.

Upon completion of the course, student will be able to:

- Turn mathematical equations into C++ code that can be called from Excel.
- Use GitHub to create a portfolio of code available to prospective employers.
- Value, hedge, and manage the risk of derivative securities.

Course Requirements

Class Participation

Assignments

Tests & Quizzes

Weekly homework and a final exam.

Assigned Readings Grading

of Assignments

The grade for this course will be determined according to the follow-ing formula:

Weekly homework is due at the beginning of the following week's class each graded out of 100 points. There is also an in-class final exam graded out of 100 points. The homework average and final have equal weight in determining the final grade.

Letter Grades

Letter grades for the entire course will be assigned as follows:

F	0
C	70
C+	76.67
B-	80
B	83.33
A-	90
A	93.3

Course Schedule

Topics and Assignments

Week	Topic	Reading
Week 1	Install Microsoft Visual	
	Studio, Excel, and the xll add-in library.	
Week 2	Monte Carlo - Random variates and generators.	
Week 3	Option Pricing - General European option pricing and greeks.	
Week 4	Unified Model - valuation, hedging,	

Week 5	applications Fixed Income - instrument, discount curve, bootstrap algorithm
Week 6	Trading simulation
Week 7	American option pricing

Course Materials

Required Textbooks & Materials

Visual Studio 2022

Microsoft 365 Excel add-in library

Resources

- Access your course materials: NYU Brightspace

- Databases, journal articles, and more: Bern Dibner Library (li-brary.nyu.edu) NYUVirtual Business Library (guides.nyu.edu/vbl)
- Obtain 24/7 technology assistance: Tandon IT Help Desk (soe-helpdesk@nyu.edu, 646.997.3123) NYUIT Service Desk (AskIT@nyu.edu, 212-998-3333)

Policies

Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
3. Plagiarism: Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
4. Unauthorized collaboration: working together on work that was meant to be done individually.
5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission have been received from the course instructor(s) or research adviser involved.

6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the Moses Center for Students with Disabilities (212-998-4980 or mosescsd@nyu.edu) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.

Inclusion Statement

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me