IE 523 – Financial Computing

Section B, Fall 2024

Course information

Credit hours:	4
Instructor:	Chrysafis Vogiatzis
Email:	chrys@illinois.edu
Course website:	canvas.illinois.edu
Office:	211 Transportation Building
Office hours:	**T 3:45pm–4:45pm**
	R 9:00am–10:00am
	and by appointment

If you would prefer to meet with me online, please do so at the following link:

https://tinyurl.com/yxqdm847

The details of the Zoom room are:

Meeting ID:	450 021 1406
Password:	069901

Meeting times

The meeting time and room for the lecture is as follows:

Component	Section	Meeting time	Meeting room
Lecture	B	MW 3:00 pm–4:20 pm	3025 Campus Instructional Facility

Class description

The course is designed to introduce students to advanced programming and computational topics using C++ with examples and case studies from the world of financial engineering.

Course communication

All communication of announcements, assignments, and other materials will be done through the course website on canvas.illinois.edu. You can also email the instructor; when doing so, please begin your email subject line with [IE 523]. For example, for a question on Assignment 3, the preferred email subject line would be [IE 523] Asignment 3. This helps with class organization and will ensure a faster reply.

Teaching assistant

Our teaching assistant for the year is **Bruce Yang**. Their office hours will be announced shortly.

Text used

1. Slides and notes from the instructor.

All materials necessary for the students in the classroom will be provided by the instructor through Canvas.

Calendar

While we will do our best to adhere to the calendar, I will be flexible and do extra reviews or spend more time on specific topics, if need be. That said, the following calendar should help you be prepared for what is coming early. I will be posting announcements throughout the semester with the material we are bound to see every week.

Week	Lecture	Topic	Assignment
Week 1	1	Class introduction & software setup.	
	1	Topics in C++: Basic coding & bootcamp review	Assignment 0
Week 2		**Labor day: no class**	
	1	Topics in C++: Classes and pointers	Assignment 1
Week 3	2	Topics in C++: Recursion	
	2	Topics in C++: Recursion	Assignment 2
Week 4	3	Review of linear algebra	
	3	Optimization, mathematical formulations, and Gurobi	
Week 5	3	Using Gurobi for portfolio optimization problems	Assignment 3
	3	Q&A session on optimization	
Week 6	4	Bond yield to maturity and root finding	
	4	Bond yield to maturity and root finding	Assignment 4
Week 7	5	Bond durations and Taylor series	
	5	Bond durations and convexity	Assignment 5
Week 8	6	Methods: Statistics and simulation	
	6	Methods: Statistics and simulation	Assignment 6
Week 9	-	Exam 1 review	
	-	**Exam 1**	
Week 10	7	Methods: Network science and optimization	
	7	Methods: Network science and optimization	Assignment 7
Week 11	8	Options pricing: the binomial model	
	8	Options pricing: the binomial model	Assignment 8
Week 13	9	Options pricing: the Black-Scholes model	
	9	Options pricing: the Black-Scholes model	Assignment 9
Week 13	10	Pricing using the Hull-White interpolation method	
	10	Pricing using the Hull-White interpolation method	Assignment 10
Week 14	-	**Thanksgiving break: no classes**	
Week 15	11	Two-factor options pricing: Basket options	
	11	Two-factor options pricing: Basket options	Assignment 11
Week 16	-	Course review	
	-	**Final exam**	

Course description

This course will introduce you to programming and computational concepts in C++ using examples that are relevant to financial engineering and computing. Students enrolled in the Master of Science in Financial Engineering (MSFE) are eligible to take the course.

Recommended prerequisite

A working knowledge of C++ is *much* appreciated. That said, the instructor will provide all necessary background for students without the prerequisite.

Exams

There are two exams in the class: a midterm and a final exam. The final exam will be cumulative. **Both exams will contribute 20% towards the final grade of a student.** Both exams will be given as take-home exams. The midterm exam will be offered at or around the week of October 23, 2023. The final exam will be offered during finals week.

Make-up exams will **only** be provided if notified at least three days prior to the exam date. In the case of an emergency, a make-up exam will be provided with the proper and appropriate documentation justifying your absence no later than one week from the date of the exam.

All exams will be announced on Canvas and submitted online.

Homework assignments

There will be 10-11 homework (programming) assignments throughout the course of the semester. Homework assignments will be announced and submitted online through Canvas. The deadlines will be end of day (11:59pm) unless otherwise posted. **Homework assignments will count towards 60% of a student's final grade in the class.**

Re-grade policy

If you believe that an exam or a homework assignment was graded incorrectly, please reach out to me at the latest one week after the announcement of the results. In your email requesting the re-grade, please add an explanation of where and why a re-grade is desired.

General class policies

Behavior in the classroom

- Be courteous and kind to others (including me, please!).
- We will always build together a supportive and encouraging environment, approaching the problems we face from a point of mutual curiosity.
- "Take Space, Make Space": in many of our group activities, you may observe that you talk/offer too much. If that is you, make space for others to share, too. If you do not talk as often, I encourage you and invite you to share your thoughts with me and others!
- We all make mistakes and that is OK. Leaning into the discomfort of not knowing what went wrong, but being curious to find out more about it is central to our growth.

Class recording and other recorded materials

- All lectures will be recorded. If you have an issue with having your questions or participation recorded, please let me know and I will do my best to address this.

  - The recordings will only be made available to you through Canvas.

  - No one other than your class cohort and myself will get access to these recordings.

  - When impossible to record (or the quality of the recording is poor), I will share previous year recordings for our convenience and learning.

- If online, please mute your microphone, when not asking a question or actively participating in a discussion.

Supporting your learning

- I will prioritize supporting you, sharing all resources with you early and often, and communicating expectations and opportunities clearly.

- I will remain flexible throughout the semester. Simply ask for an appointment with me to discuss what I can do to contribute to your well-being in the class. If you need any accommodation, please do not hesitate to ask me.

- Please stay kind, flexible, and supportive to the people around you, too.

Grading policy

A: $[93, 100]$, A-: $[90, 93)$, B+: $[87, 90)$, B: $[83, 87)$, B-: $[80, 83)$, C+: $[77, 80)$, C: $[73, 77)$, C-: $[70, 73)$, D+: $[67, 70)$, D: $[63, 67)$, D-: $[60, 63)$, F: $[0, 60)$.

Midterm exam	20%
Final exam	20%
Homework assignments	60%
Total	**100%**

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

Illinois law requires the University to reasonably accommodate its students' religious beliefs, observances, and practices in regard to admissions, class attendance, and the scheduling of examinations and work requirements. You should examine this syllabus at the beginning of the semester for potential conflicts between course deadlines and any of your religious observances. If a conflict exists, you should notify your instructor of the conflict and follow the procedure at https://odos.illinois.edu/community-of-care/resources/students/religious-observances/ to request appropriate accommodations. This should be done in the first two weeks of classes.

Disability-Related Accommodations

To obtain disability-related adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 217.333.4603, email disability@illinois.edu, or go to the DRES website (at http://disability.illinois.edu).

If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Updates to the syllabus

The contents of the syllabus and the policies described are subject to change. If that happens, all the changes will be announced and described on the course website. A summary of the changes will be offered in this page, too.

08/09/2023: Created the document.

08/21/2024: Updated the TA information.

Prepared by:	Chrysafis Vogiatzis
Last updated:	August 21, 2024
Major changes:	Added TA name and email.