## ****Course Description****

This course teaches quantitative finance and algorithmic trading with an approach that emphasizes computation and application. The course has two Parts.

#### ****Part 1****

focuses on case studies in quantitative investment that illustrate key issues in allocation, attribution, and risk management. Students will have the chance to learn classic models as well as more modern, computational approaches, all illustrated with application.

#### ****Part 2****

focuses on designing, coding, and testing automated trading strategies in Python, with particular consideration to market models, infrastructure, and order execution. We will focus on giving you the implementation exposure of trading system and trading strategy. By the end of this part, you should have a good understanding on:

### Industry and Technical Tools

Each week we these cases, we discuss the following areas of the financial industry:

* asset managers (pensions, endowments, etc)
* mutual funds and ETFs
* hedge funds

In discussing these topics, we make use of various technical tools, including:

* OLS Regression
* Optimization
* Dimension reduction

### Prerequisites

Given the course's multidisciplinary nature, experience in many areas of finance, math, statistics, and computing are useful. In particular, students will find the following are important...

* Linear Algebra
* Probability and Statistics
* Regression Analysis

Additionally, it is highly recommended that students have...

* Hands-on experience with Python or another programming language
* Introductory knowledge of financial markets

****The course is meant to be accessible to a wide audience. If you have little background in areas above, it is still possible to take and master this course. It simply means your workload will be larger.****

### Course Staff

This course has an instructor and Teaching Assistant.

Read more about them at [Course Staff](https://canvas.uchicago.edu/courses/42908/pages/course-staff" \o "Course Staff)

### Course Materials

**Required**

* Lecture notes
* Harvard Business cases (cost is ~$15 for the course.)

**Supplementary**

[References](https://canvas.uchicago.edu/courses/42908/modules/274975" \o "References) listed in the [Modules](https://canvas.uchicago.edu/courses/42908/modules" \o "Modules) and throughout the course. These are NOT required unless explicitly stated. Rather, they are meant to give interested students a path to learning further about these topics.

* Textbook sections
* Notes
* Articles

## ****Course Plan****

#### ****Class****

Weekly class sessions are webcast on Zoom to enable full participation from those who are necessarily absent. ****All classes are recorded.****

Class is scheduled for 3 hours. Typically, the session will proceed as follows:

* Discussion centered around applications (including case studies) applying last week's concepts.
* Lecture on new topic and tools.
* Exploration of the topic with applied results.

Active learning is key to mastering this multidisciplinary content. Please participate and engage in what the class is doing.

#### ****Asynchronous Videos****

Periodically, extra videos will be posted. These will go over foundations, introduce advanced topics, or fill out material that we do not get to in class.

#### ****Reviews****

The TAs will put on weekly reviews where they will prepare to discuss the week's most interesting and challenging material--including from the homework. These will be available on Zoom, and they will be recorded.

#### ****Office Hours****

The instructor and TAs will be available for office hours on Zoom. You are welcome to ask questions about the course generally, the lectures, or the homework. Typically, the TA office hours are better suited for specific homework questions, while the instructor office hours are better suited for more general questions about the lectures, course, and industry application.

#### ****Canvas**[Discussions](https://canvas.uchicago.edu/courses/42908/discussion_topics" \o "Discussions)**

Discussions with your classmates, the TAs, and the instructor are an important way of engaging with the course. You are welcome to discuss anything related to the course there--including specifics about the homework.

Students actively participating in the Discussions learn more deeply and also provide a positive externality to their classmates. The participation grade is partly in recognition of this.

## ****Topics****

|  |  |
| --- | --- |
| ****Portfolio Management**** |  |
| Risk and Return | Risk, return, mean-variance optimization. |
| Analyzing Investments | Performance metrics, attribution, replication, hedging |
| Asset Pricing | Linear Factor Models, factor selection, pricing equivalence |
| Forecasting | Lagged regressions, time-series statistics, and return dynamics. |
|  |  |
| ****Algorithmic Trading**** |  |
| Overview of Trading and Markets | Trading and markets for a few asset classes (stocks, FX, fixed income) |
| Trading Strategy and Data-Mining | Use data mining to build a trading strategy |
| High Frequency | Architect a high frequency system |
| Trading System Design | Design a trading system |

### ****Grades****

Grades will be based on the following components and weights:

|  |  |  |
| --- | --- | --- |
| Homework | Part 1 | 15% |
| Midterm Exam | Part 1 | 30% |
| Quizzes | Part 1 and 2 | 10% |
| Homework | Part 2 | 10% |
| Project | Part 2 | 10% |
| Final Exam | Part 2 | 25% |

### ****Academic Honesty****

Though you are allowed to work in groups and use attributed sources, copied or unattributed work is considered a violation of the academic honesty policy.

Consequences have included failed grades and suspension from the University.

### ****Participation****

#### ****Quizzes****

* There will be various quizzes posted to Canvas throughout the quarter.
* They are mandatory and directly impact your participation grade.
* Some are surveys about your homework group and the class.
* Others are to give you feedback on how well you are doing as you prepare for the exam.

#### ****Other Participation****

This online course encourages the types of peer-to-peer and peer-to-instructor interactions that enhance a course. These activities include...

* Being a responsible, contributing member of your homework groups.
* Adding to the Canvas Discussions by responding to posts from your peers, pointing out typos, linking to references of interest, etc.

### ****Homework****

****Throughout the course:****

* Submit all supporting coding and calculation files.
* You can use any publicly available material. List any sources you use outside of class material.
* It is okay to discuss the homework with classmates outside your group, but it is not okay to copy their code, work, or conclusions.

****In Part 1:****

* Complete in your assigned homework group.
* Via Canvas, submit a clean writeup as a notebook (Jupyter, Colabs, etc.) or pdf.
* Discuss homework questions in your group, or if discussing outside your group, do so via the Canvas Discussions.
* Homework is graded on whether it is a good-faith analysis, not on whether the numbers match the solution.

****In Part 2:****

* Complete your assignment individually.
* Submit your code on Hacker Rank or on Canvas.
* Late Submission:

Prorated points will be applied according to the number of late days. 1 day late: 75% of the grade will be considered. 2 days late: 50% of the grade will be considered. 3 days late: 25% of the grade will be considered. After 3 days, no assignment will be accepted.

### ****Midterm Exam****

Timing

* Monday, July 11, 6-9pm CT.   
  If this date and time does not work for you, email [hendricks@uchicago.edu](mailto:hendricks@uchicago.edu" \t "https://canvas.uchicago.edu/courses/42908/assignments/_blank) ASAP.

Format

* The exam will be distributed and collected via Canvas.
* The exam will be open everything, but closed collaboration.
* The exam will have questions that are conceptual, theoretical, and empirical. (So you will do some coding.)
* The best preparation for the exam is to do the homework and follow the class discussion.

### ****Final Exam****

Timing

* Monday, Aug 15, 6-9pm CT.   
  If this date and time does not work for you, email [sdonadio@uchicago.edu](mailto:sdonadio@uchicago.edu" \t "https://canvas.uchicago.edu/courses/42908/assignments/_blank) ASAP.

Format

* The exam will be distributed and collected via HackerRank and/or Canvas.
* The exam will be open everything, but closed collaboration.
* The exam will have questions that are conceptual, theoretical, and empirical. (So you will do some coding.)
* The best preparation for the exam is to do the homework, quizzes, and in-class examples.