MGT 4067 Syllabus

Trading and Structure, Sec A and B, 3 Credits

TR, 9.30 pm—10.45 pm, Sec A Room 4167 (Trading Room)

TR, 12.30 pm—1.45 pm, Sec B Room 4167 (Trading Room)

Hybrid Modality

Instructor Information

Instructor	Email	Office Hours
Satyajit (Jeet) Karnik	skarnik33@gatech.edu	On-demand, zoom or in-person

Description

The objective of the course is to introduce students to the various methods, algorithms and frameworks used in the financial industry for making trading and investment decisions. We will focus on many applications of well-known and established frameworks and will experiment with diverse portfolio types that include stocks, bonds and derivatives. The course will also attempt to provide a friendly introduction to the rapidly growing field of Machine Learning in finance.

Pre- &/or Co-Requisites

MGT 3076 or MGT 3078

Course Goals and Learning Outcomes

The course explores portfolio construction, market microstructure, algorithmic trading, bonds stocks and options markets, from a quantitative perspective. Upon successful completion of the course, you should be able to:

- Construct optimal portfolios using traditional mean variance analysis.
- Be able to decide best order execution using market and limit orders as well as other conditional orders.
- Construct algorithmic trading strategies like momentum, MACD, RSI, Fibonacci trading, bet against beta.

- Formalize and solve the pension fund liability funding problem using fixed income instruments.
- Find arbitrage opportunities in various markets, especially fixed-income and FX.
- Construct index funds and tracking portfolios.
- Use derivatives for efficient risk management.
- Use the options market to interpret implied signals.
- Understand basic machine learning applications intuitively.

Course Modality Information

The course is in hybrid mode. The design is such that we can quickly adapt to an online mode if necessary. I will also use the online mode in case I am unable to come to class due to travel or medical reasons.

We will have recorded videos that will reinforce the material taught in class.

All assignments and submissions will be conducted online using canvas.

Course Requirements & Grading

There are 4 components to your grades: Participation, quizzes, homework submissions and a final submission.

Participation 20%: Participation will involve discussion and class exercises that will be submitted at the end of each class.

5 Group Submissions 10% each (total 50%): Comprehensive problems essay type questions that will enforce and extend the exercises done in class. Please sign up with an assignment group on canvas. Submission will be on canvas.

5 quizzes 2% each (total 10%): In class or take-home quiz based on group submission immediately after the group submission.

1 Final Essay (20%): A final essay on any topic that we have covered in class. The essay should involve some data gathering, use of a technique we have discussed and conclusion. More details will be provided during the course.

Grading Scale

Your final grade will be assigned as a letter grade according to the following scale:

A 90-100%
B 80-89%
C 70-79%
D 60-69%
F 0-59%

To maintain fairness to all we will not allow extra credit opportunities in this course. All work is required to be completed and submitted by the due date and time. Late submissions will not be accepted.

Course Materials

Course Text

There is no text for this course as the topics have a wide diversity. Our focus will be more on applying the theory to specific practical examples from industry. I will put relevant readings and references as we go along.

Additional Materials/Resources/Software to be used

- Access to high-speed internet.
- Excel 2019 or above, with Solver.
- Trading Technologies Algorithmic Trading Software (Dr. Karnik will set this up for you).
- Matlab downloaded from GT website. Follow the instructions at matlab.gatech.edu.

Course Schedule

This schedule is subject to change if necessary and is intended to give you a general idea of the pace of the course. **Always refer to the most up to date schedule available on the syllabus page on canvas.**

Time	Meeting	Topics*	Submissions*
Week 1	Tue	Introduction	
	Thu	Wealth distribution, maximizing return under downside risk, concentration control.	
Week 2	Tue	Fundamental Calculations, covariance matrix, sigma, beta.	
	Thu	Portfolio Optimization, maximizing return, minimizing risk and efficient frontier.	
Week 3	Tue	limit orders, market orders, iceberg orders, stop orders. comparisons. Introduction to TT software	Submission 1
	Thu	Transaction costs, limit versus market, when is limit order profitable?	Quiz 1
Week 4	Tue	Optimal stop loss and order splitting problem	
	Thu	Introduction to auctions markets	
Week 5	Tue	TT Software and Algo basics	
	Thu	Algo design: Momentum, MACD, RSI, momentum crash	Submission 2/quiz 2
Week 6	Tue	Algo design: Bollinger bands, Fibonacci trading	
	Thu	Overflow	
Week 7	Tue	Fixed Income Arb	
	Thu	Pension fund problems	Submission 3/quiz 3
Week 8	Tue	FX Arbitrage	
	Thu	Betting against beta, momemtum trades, momentum crashes	
Week 9	Tue	Black-Litterman, Tracking portfolios	
	Thu	Mean-Absolute deviation, index creation, portfolio adjustment with minimum transaction cost	Submission 4/quiz 4

Week 10	Tue	Derivatives Basics	
	Thu	Futures and Options	
Week 11	Tue	Hedging using Options	
	Thu	Trading/Risk Management using options spreads	
Week 12	Tue	Options Greeks	Submission 5/quiz 5
	Thu	Hedging with Greeks, Implied signals, implied vol, vol smile, quiz	
Week 13	Tue	Introductory K means clusters: Index creation	
	Thu	Introductory Heirarchical Clusters: Statistical Arb, Pairs trading	
Week 14	Tue	Introductory Decision trees and Random Forests: Buy or sell signals, Bond defaults and default probability, credit scoring.	
	Thu	Introductory Logistic regression and support vector machines: Buy or sell signals, Bond defaults and default probability, credit scoring	
Week 15	Tue	Office hours	Final Paper
	Thu	Office hours	
* Subject to change			

Academic Integrity

Honesty and transparency are important features of good scholarship. On the flip side, plagiarism and cheating are serious academic offenses with serious consequences. If any student is discovered engaging in either behavior in this course, they will earn a failing grade on the assignment in question, and further disciplinary action may be taken.
Additionally, any student suspected of cheating or plagiarizing on an assignment will be reported to the Office of Student Integrity, which will investigate the incident and identify the appropriate penalty for violations.

My aim is to foster an environment where you can learn and grow, while ensuring that the work we all do is honest and fair.

Here at Georgia Tech the aim is to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at (404)894-2563 or http://disabilityservices.gatech.edu/, as soon as possible, to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail me as soon as possible to set up a time to discuss your learning needs.

Religious Holiday

A student who wishes to observe a religious holiday/event should email the instructor within the first two weeks of the semester regarding the holiday/absence for planning purposes. If the absence falls on an examination date, the student will be allowed to complete make-up work.

Dean of Students Office, CARE Center, Counseling Center, Stamps Health Services, and the Student Center:

The **CARE Center** and the **Counseling Center**, Stamps Health Services, and the Dean of Students Office will offer both in-person and virtual appointments. Student Center services and operations are available on the **Student Center** website. For more information on these and other student services, contact the Dean of Students or the **Division of Student Life**.

Information Related to Covid-19:

Students are expected to be familiar with and abide by the Institute guidelines, information, and updates related to Covid-19. Find campus operational updates, Frequently Asked Questions, and details on campus surveillance testing and vaccine appointments on the **Tech Moving Forward site.**

Recordings of Class Sessions and Required Permissions:

Classes may not be recorded by students without the express consent of the instructor unless it is pursuant to an accommodation granted by the Office of Disability services. Class recordings, lectures, presentations, and other materials posted on Canvas are for the sole purpose of educating the students currently enrolled in the course.

Students may not record or share the materials or recordings, including screen capturing or automated bots, unless the instructor gives permission. Digitally proctored exams may require students to engage the video camera, but those recordings will not be shared with or disclosed to others without consent unless legally permitted.

- For classes where participation is voluntary, students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded.
- For classes requiring class participation, if students are identifiable by their names, facial images, voices, and/ or comments, written consent must be obtained before sharing the recording with persons outside of currently enrolled students in the class.

Student-Faculty Expectations Agreement

At Georgia Tech we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. Simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.