

**Quantitative Finance**  
**Course Number: 22:839:686**  
**Course Title: Quantitative Equity Trading Strategies**

## **COURSE DESCRIPTION**

This course provides a comprehensive insight into quantitative trading strategies and covers most aspects of the development life cycle of a trading strategy. This includes idea conception, using data for research and alpha generation, appropriate modelling, back-testing and simulation, technology and infrastructure, regulatory compliance, risk management, and others. The course will provide an introduction to financial markets, nature of market and its mechanics, various constituents of the markets and their role, importance of order types and execution details, micro structure and more. It will also introduce few quantitative trading methods, educate on pitfalls and limitations, give a preview of regulatory compliance, and provide experience based view of what it takes to build and deploy a success trading strategy. The course will educate students on responsible capital allocation, risks involved in algorithmic trading, and appropriate performance matrices. An introduction to algorithmic investment management will also be provided.

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## **COURSE MATERIALS**

There is no formal text book. The instructor will provide reading and reference materials as handouts. The following optional books can be used for reference and to further your learning as optional reading. Few chapters from “Inside the Black Box” will be referred to, during the course.

1. Inside the Black Box: A Simple Guide to Quantitative and HF Trading, by Rishi K. Narang.
2. Algorithmic Trading: Winning Strategies and Their Rationale, by Ernest P Chan
3. Algorithmic Trading and DMA: An introduction to direct access trading strategies, by Barry Johnson

It also helps to read a good technical analysis book that is less theory, and gives an insight into market indicators, and methods used by technical traders, which can then be translated into appropriate factors, indicators and signals, when building a more sophisticated quantitative strategy. The following can be good additional reading material, totally optional, and not directly related to his course.

1. New Trading Systems and Methods, by Perry J. Kaufman
2. Technical Analysis Explained: The Successful Investor’s Guide to Spotting Investment Trends and Turning Points, by Martin J. Pring.

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## **MAIN TOPICS, COURSE WORK, ASSIGNMENTS**

This course is designed to help students develop skills and knowledge, who are interested in making a career in quantitative and algorithmic trading, algorithmic investing, and other related fields. We expect to cover the following topics during the semester, not necessarily in this order and subject to interest and make of the class.

1. Background and Introduction to Financial Markets and Quantitative Trading.
2. Market, its structure (including lit and dark venues, and exchange), order books, and introduction to micro structure.
3. An overview of some of the Quant and Algo strategies currently used in the market.
4. Life Cycle of Trading Strategy: Idea conception, research, alpha generation, strategy generation, and implementation.
5. Data and data sources; importance, limitations and pitfalls; and using it to your advantage.
6. Fundamental, Technical and Micro signals and smart factorization
7. Back-Testing, Simulation, & Optimization.
8. Execution and Liquidity. Order Types and Execution Algos (VWAP, TWAP, Participation etc).
9. Introduction to Algo Technology and Infrastructure
10. Performance Matrices, Risk Controls, and how to tie them together
11. Regulatory Compliance
12. Accessing real market - Broker Dealers, FCMs, Sponsored and Direct Market Access
13. Introduction to Trading Fees, Costs and Expenses.

**Assignments:** The instructor will provide 1-2 assignments related to the goal and description above, and let students develop appropriate models and simulation & optimization frameworks. These assignments are expected to provide students insight into real-life challenges.

**Group Project:** Students are divided into groups with complementing background and expertise. Each group is expected to conceive a quantitative trading strategy, do necessary research, and develop a functional strategy model that is back tested and simulated/optimized over appropriate data. The instructor will coordinate the formation of the groups, facilitate the trading strategy idea selection process based on students' interest and resource limitations, and guide the groups in the development process. Each group will present their strategy, and related results and findings with the rest of the class in a final presentation. Intermediary updates are also expected in front of the class and the instructor.

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## PREREQUISITES

This course requires basic familiarity with financial markets and products. In addition, it is expected the students are well acquainted with statistical modelling principles, tools (R, MatLab, Excel, Python etc. of your choice) and techniques. Not all trading strategies involve complex mathematics, but they still require certain quantitative skills and deep analytic capabilities.

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## ACADEMIC INTEGRITY

*I do NOT tolerate cheating.* Students are responsible for understanding the RU Academic Integrity Policy <http://academicintegrity.rutgers.edu/>

I will strongly enforce this Policy and pursue *all* violations. On all examinations and assignments, students must sign the RU Honor Pledge, which states, "On my honor, I have neither received nor given any unauthorized assistance on this examination or assignment." I will screen all written assignments

through *SafeAssign* or *Turnitin*, plagiarism detection services that compare the work against a large database of past work. Don't let cheating destroy your hard-earned opportunity to learn. See [business.rutgers.edu/ai](https://business.rutgers.edu/ai) for more details.

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## **ATTENDANCE AND PREPARATION POLICY**

Please be on time for the class. I will try to do the same. Expect me to attend all class sessions. I expect the same of you. If I am to be absent, my department chair or I will send you notice via email and Canvas as far in advance as possible. If you are to be absent, report your absence in advance at <https://sims.rutgers.edu/ssra/>. If your absence is due to religious observance, a Rutgers-approved activity, illness, or family emergency/death and you seek makeup work, also send me an email with full details and supporting documentation. It will not be possible for me to spend any significant one-to-one time to help you with the missed class. I can provide any reference material for the missed class and give a brief overview after any subsequent class after you are back. Please make a request by sending an email.

I expect you to be present for the entirety of class and all classes. If you miss, or leave early, it is your loss.

If you prepare well before the class, and send me relevant questions ahead of the class, I will come more prepared to answer your questions. This course covers a very wide range of topics, and we have to choose some area of focus. The more you cover outside the class on your own, and ahead of the class, the more you will gain from this course.

I strongly encourage collective discussion, participation, and brain-storming any ideas or thoughts you have. I expect professionalism and encouraging behavior during such discussions.

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## **CLASSROOM CONDUCT**

Not OK:

- Absolutely no food in the class
- Put your phone on silent mode with vibrate off.
- No headphone use in the class

OK:

- Bring your coffee or water
  - Leave the class without asking for a bathroom break
  - If late, join quietly without knocking.
  - Encouraging and collective discussions with the class and me.
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## **EXAM DATES AND POLICIES**

There is one Mid Term Exam and one End Term Project & Presentation, as detailed above under 'Main Topics, Course Work, and Assignments'. The dates will be announced in the beginning of the semester.

No cell phones or other electronics use is allowed during any quiz or exam. You are asked to turn these off.

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## GRADING POLICY

Course grades are expected to be determined as follows:

Class Participation: 0-10%  
Class Quiz(s): 20-30%  
Assignments: 20-30%  
Project & Presentation: 40%

These % ages are guidelines, and the Professor may change them during the course.

If you have any question or concern about your grade on any quiz, assignment, exam or project grading, or if you want to be regarded, you are asked to make a written or email request within 7 days of receiving the grade.

Your final grade is not subject to negotiation. If you feel I have made an error, submit your written argument to me within one week of receiving your final grade. Clarify the precise error I made and provide all due supporting documentation. If I have made an error, I will gladly correct it. But I will adjust grades only if I have made an error. I cannot and will not adjust grades based on consequences, such as hurt pride, lost scholarships, lost tuition reimbursement, lost job opportunities, or dismissals.

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## SUPPORT SERVICES

If you need accommodation for a *disability*, obtain a Letter of Accommodation from the Office of Disability Services. The Office of Disability Services at Rutgers, The State University of New Jersey, provides student-centered and student-inclusive programming in compliance with the Americans with Disabilities Act of 1990, the Americans with Disabilities Act Amendments of 2008, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1998, and the New Jersey Law Against Discrimination. More information can be found at [ods.rutgers.edu](http://ods.rutgers.edu).

[Rutgers University-New Brunswick ODS phone (848)445-6800 or email [dsoffice@echo.rutgers.edu](mailto:dsoffice@echo.rutgers.edu)]

[Rutgers University-Newark ODS phone (973)353-5375 or email [ods@newark.rutgers.edu](mailto:ods@newark.rutgers.edu)]

If you are *pregnant*, the Office of Title IX and ADA Compliance is available to assist with any concerns or potential accommodations related to pregnancy.

[Rutgers University-New Brunswick Title IX Coordinator phone (848)932-8200 or email [jackie.moran@rutgers.edu](mailto:jackie.moran@rutgers.edu)]

[Rutgers University-Newark Office of Title IX and ADA Compliance phone (973)353-1906 or email [TitleIX@newark.rutgers.edu](mailto:TitleIX@newark.rutgers.edu)]

If you seek **religious accommodations**, the Office of the Dean of Students is available to verify absences for religious observance, as needed.

[Rutgers University-New Brunswick Dean of Students phone (848)932-2300 or email [deanofstudents@echo.rutgers.edu](mailto:deanofstudents@echo.rutgers.edu)]

[Rutgers University-Newark Dean of Students phone (973)353-5063 or email [DeanofStudents@newark.rutgers.edu](mailto:DeanofStudents@newark.rutgers.edu)]

If you have experienced any form of **gender or sex-based discrimination or harassment**, including sexual assault, sexual harassment, relationship violence, or stalking, the Office for Violence Prevention and Victim Assistance provides help and support. More information can be found at <http://vpva.rutgers.edu>.

[Rutgers University-New Brunswick incident report link: <http://studentconduct.rutgers.edu/concern/>. You may contact the Office for Violence Prevention and Victim Assistance at (848)932-1181]

[Rutgers University-Newark incident report link: [https://cm.maxient.com/reportingform.php?RutgersUniv&layout\\_id=7](https://cm.maxient.com/reportingform.php?RutgersUniv&layout_id=7) . You may also contact the Office of Title IX and ADA Compliance at (973)353-1906 or email at [TitleIX@newark.rutgers.edu](mailto:TitleIX@newark.rutgers.edu). If you wish to speak with a staff member who is confidential and does **not** have a reporting responsibility, you may contact the Office for Violence Prevention and Victim Assistance at (973)353-1918 or email [run.vpva@rutgers.edu](mailto:run.vpva@rutgers.edu)]

If students who have experienced a temporary condition or injury that is adversely affecting their ability to fully participate, you should submit a request via <https://temporaryconditions.rutgers.edu> .

If you are a military **veteran** or are on active military duty, you can obtain support through the Office of Veteran and Military Programs and Services. <http://veterans.rutgers.edu/>

If you are in need of **mental health** services, please use our readily available services.

[Rutgers University-Newark Counseling Center: <http://counseling.newark.rutgers.edu/>]

[Rutgers Counseling and Psychological Services–New Brunswick: <http://rhscaps.rutgers.edu/>]

If you are in need of **physical health** services, please use our readily available services.

[Rutgers Health Services – Newark: <http://health.newark.rutgers.edu/>]

[Rutgers Health Services – New Brunswick: <http://health.rutgers.edu/>]

If you are in need of *legal* services, please use our readily available services: <http://rusls.rutgers.edu/>

Students experiencing difficulty in courses due to *English as a second language (ESL)* should contact the Program in American Language Studies for supports.

[Rutgers–Newark: [PALS@newark.rutgers.edu](mailto:PALS@newark.rutgers.edu)]

[Rutgers–New Brunswick: [eslpals@english.rutgers.edu](mailto:eslpals@english.rutgers.edu)]

If you are in need of additional *academic assistance*, please use our readily available services.

[Rutgers University-Newark Learning Center: <http://www.ncas.rutgers.edu/rlc>

[Rutgers University-Newark Writing Center: <http://www.ncas.rutgers.edu/writingcenter>]

[Rutgers University-New Brunswick Learning Center: <https://rlc.rutgers.edu/>]

[Optional items that many faculty include:

- Students must sign, date, and return a statement declaring that they understand the RU Academic Integrity Policy.

- Students must sign, date, and return a statement declaring that they understand this syllabus.]