New York University Tandon School of Engineering

Finance and Risk Engineering

Course FRE 7211: Forensic Financial Technology and Regulatory Systems

Professor Roy S. Freedman
When: (Check Albert) Where: Brooklyn TBA (Check Albert)

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Course Pre-requisites: Graduate status. FRE 6153 or permission of instructor.

Course Description

This course helps students understand the technology behind financial forensics and regulatory systems. Topics include innovative database techniques ("dataveillance", "big data"), artificial intelligence, data mining, and statistical outlier methods used by the Securities Exchange Commission (SEC), the Financial Industry Regulatory Authority (FINRA), as well as the FBI, and other federal and state agencies. Student teams will prepare and present projects or case studies applying these concepts covered in class.

Course Objectives

1. Understand the legal concepts of regulation, forensics, compliance, and fraud.
2. Discuss rogue trading, insider trading, front running, collusion, and other abuses.
3. Survey several regulatory systems, including: OATS and Blue Sheets (FINRA); Market Reply (Nasdaq); MIDAS (SEC).
4. Survey some actual law cases using financial forensic methods and with respect to the Daubert standard for expert witnesses.
5. Learn about the financial technologies underlying the new and proposed systems such as big data and legal Entity Identifiers.

Course Structure

Classes consist of lectures, discussion of financial technology news, readings, team presentations, and case studies. Each student will be a member of a team. Individual and team assignments will be given. The final team project provides a way for students to present independent research (a review of a financial technology, system, or a case study). Teams will propose a topic, get feedback, and approval, and complete a professional report and formal presentation.

Readings

The reference text for the course is: *Introduction to Financial Technology* by Roy S. Freedman, Academic Press, 2006, ISBN: 0123704782.

Other material consisting of papers, case studies, and selected news articles are available at the course website:
http://inductive.net/fe/7211/7211.htm (password provided in class).

Course Requirements
Students must submit all of the following deliverables to be eligible for an A:
1) At least one* optional discussion question assignment *per week* (assigned during class). This is due at the next class meeting.
2) Your *individual* performance on a surprise quiz.
3) Your participation in the team assignments (1 or 2).
4) Your team's project proposal – due at least 2 weeks before your presentation at the final meeting (the Class Seminar).
5) Your team's project Report – due at the Class Seminar.
6) Your team's project Presentation the Class Seminar
7) Your participation at the Class Seminar

Rules for submission
- Email all deliverables to roy.freedman@nyu.edu .
- Put the text "FRE 7211" in the Email subject line, Email text body, and all attachments so your email will be correctly indexed.
- Insert a <space> between FRE and the course number.
- Identify yourself by name and student number in the email subject line. The email text body, and all email attachments must include the names and student numbers of everyone (such as your team members) who helped you work on the assignment. Identify the assignment name as well.

If these rules are not followed there will be a delay in your grade.

Collaboration is encouraged and required. The class will be broken up into teams. Elect a Team Leader who will be responsible for submitting all team work. Identify the contributors and contributions and the name of the team in the email subject line. As long as all collaborators are listed, only one email need be submitted. Identify all collaborators by name and student number. If these rules are not followed there will be a delay in your grade.

Your expected course participation includes reading the assigned material from the textbook or course website before class. Class participation – questions, comments, observations, and feedback – is highly encouraged. Attendance will be taken.

First Team Assignment
Name of Assignment: FINRA and OPRA Systems
Approximate Date: Meeting 4
Description: Student teams will answer some of the following questions.

What is FINRA and who do they regulate? What are FINRA's "Blue Sheets?" What data do they contain? What are they used for? What is the FINRA system called OATS? What data does it contain? What is it used for? [Order Audit Trail System]. What is OPRA and who do they regulate?

Market Data Express (owned by the CBOE) is an OPRA approved vendor. They sell OPRA tick data: what data is contained in OPRA tick data? What are the sizes of OPRA tick data files? How much does it cost? What is the SEC system called COATS? What data does it contain? What is it used for? [Consolidated Order Audit Trail System]?

Homeworks and team assignments count for 60% of the grade. The Team Project, consisting of a proposal, report, and presentation, counts for 40% of the grade.

Proposal for Team Project
Name of Project Proposal: Chosen by Team.
Approximate Date: Meeting 7
Percentage of final grade: 10%
Description: The goal of the proposal is to prove that your team can do independent research, and present your results in a professional context. You are free to study any topic of interest to you that is related to the class topics. You can do a book report, an article review, a case study, a detailed description of a financial organization, system, or technology, method, or product. There are many papers you can review that are cited in class ("news") or cited by the text or that are posted on the course web site. Your work can be a review or a case study of someone else's work – as long as this is unambiguously identified in your title and your references. For example, "A Review of …. Authored by …"

I will give you feedback on your proposal and help refine the scope of your study. Your proposal must be approved at least two weeks before presentation. Your proposal must include a set of references you will study.

Presentation and Report for Course Seminar
Name of Project: Chosen by Team – same as Team Proposal (see above).
Date: Last Class Meeting
Percentage of final grade: 30%
Description: The report should be something you can be proud to cite on your resume and bring to interviews. The report should be at least 6 pages, written professionally, delivered in Word or PDF. It should be a professional review of your study. Make sure that you know the meaning of every word and define every acronym or abbreviation before use. Include page numbers. Formally identify the source of all diagrams, pictures, and quotes. Include a list of references. Include page numbers. Most (at least ¾) of your references should be primary sources – not encyclopedias like Wikipedia (note this). When researching material on the web, use https://scholar.google.com/ for academic papers and legal cases.

The presentation should be something you can be proud to bring to interviews. You should be able to talk about your work for 10-12 minutes. A shorter presentation that covers the major points is better than a longer presentation. *Do not read your report* during the presentation. Most professionals use PowerPoint (a good guideline is 1 minute per PowerPoint slide), but be careful! Read Edward Tufte's caveats on using PowerPoint.

For more information:
Consult points 6-10 on http://inductive.net/fe/news/FAQ.htm .

Weekly Assigned Discussion Questions
Approximate Date: Week after assigned in class
Percentage of final grade: 20%

Schedule

1. Introduction: Regulation, forensics, compliance, and fraud
   Problems in financial systems of systems
2. Rogue trading; insider trading; front running; collusion, and other market abuses from the 19th to 21st Centuries
   From Blanc Brothers to high speed trading arbitrage
3. Legal Entity Identifiers: money laundering, fraud, and other crimes
   forensics in wagering systems
4. Data intensive regulatory systems and markets subject to NMS and Dodd-Frank regulation
   Case Studies of regulatory systems: OATS, Blue Sheets (FINRA); Market Reply (Nasdaq); MIDAS (SEC)
5. New systems and big data technologies: the Consolidated Audit Trail (SEC)
6. AI and expert system approaches: Rule-Based systems and Rules with Uncertainty
7. Seminar: Final Presentations and Reports

Standards and Plagiarism
You are not allowed to present other people's work as your own. Summarize in your own words ("paraphrase"), quote, cite, and provide a professionally formatted reference.

Copying violates professional standards. Review the NYU Code of Conduct at

- https://engineering.nyu.edu/sites/default/files/2018-06/code-conduct2-2-16.pdf
- http://www.nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/educational-and-research-uses-of-copyrighted-materials-policy-st.html

For more information:
Consult point 5 on http://inductive.net/fe/news/FAQ.htm .

Moses Center Statement of Disability

If you are student with a disability who is requesting accommodations, please contact New York University's Moses Center for Students with Disabilities at 212-998-4980 or mosescsd@nyu.edu. You must be registered with CSD to receive accommodations. Information about the Moses Center can be found at www.nyu.edu/csd. The Moses Center is located at 726 Broadway on the 2nd floor.