NYU TANDON SCHOOL OF ENGINEERING

Finance & Risk Engineering

# FRE-GY 6411,
# Fixed Income Securities
# Fall 2021

## Instructor Information


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## Course Schedule

**Lecture 1: Introduction to Fix Income Securities & US Treasury Debt Instruments. Risk Analysis & Control**

- Discount Rate, Forward rate and Yield to Maturity (YTM)
- Price Value of Basis Point (PVBP)
- Duration, Modified Duration and Bond Yield Elasticity
- Taylor Series Expansion and Convexity
- Risk Analysis of Fix Income Portfolios
- Risk & Factor Control of Fix Income Portfolios

**Lecture 2 : Introduction to Multi-Period and Multi-Factor Economy & Asset Pricing**

- Multi-Factor, Two Period Economy, Consumption & Investment Options
- Introduction to Arrow-Debreu Economy, Optimization, Arrow-Debreu Securities & State Pricing
- Binominal & Trinomial Multi-Period Economy & Asset Price Evolution

**Lecture 3 : Non-Arbitrage Asset Pricing Model**

- Non-Arbitrage Asset Pricing Theory
- Dynamic Programming and Multi-period Replicating Portfolio
- Risk-Adjusted(Neutral) Probability and Expectations
- Complete Market and Derivative Asset Pricing Model

**Lecture 3b : Non-Arbitrage Asset Pricing of Fix Income Securities**

- Swap Rate
- Forwards & Futures Market
- Defaultable Fix Income Securities and Pricing

**Lecture 4a : Governments Bonds Futures Contracts**

- CBOT US Treasuries Contracts Specifications
- Conversion Factor
- Concept of the Cheapest To Deliver Bonds
- Pricing of The Futures Contract with Multiple Delivery Options

**Lecture 4b : Modeling Term-Structure of Assets**

- Introduction to Term-Structure : Commodity, Volatility and Fix-Income
- Futures Price of Asset and Expected Price of Asset in future
- 1st, 2nd and 3rd order Spline Interpolations, and Properties

**Lecture 5 : Central Banks Yield Term-Structure Modeling**

- Constant Maturity Treasury
- Cubic Spline Interpolation
- Nelson-Siegel Interpolation

**Lecture 6 : Continuous Time & Affine Term Structure Model**

- Continuous instantons rate, forward rate, bond pricing
- Local Expectation vs. Expectation Hypothesis
- Introduction to Affine Models
- Affine Term Structure and Duffie & Kan Model
- Non-Arbitrage Term Structure vs. Technical Term Structure

**Lecture 7 : Final Exam**

## Resources

- **Access your course materials**: NYU Classes (nyu.edu/its/classes)
- **Databases, journal articles, and more**: Bern Dibner Library (library.nyu.edu)
  NYU Virtual Business Library (guides.nyu.edu/vbl)
- **Obtain 24/7 technology assistance:** Tandon IT Help Desk (soehelpdesk@nyu.edu, 646.997.3123)
  NYU IT Service Desk (AskIT@nyu.edu, 212-998-3333)

# Policies

## Academic Misconduct

A. Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

B. Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:
    1. Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
    2. Fabrication: including but not limited to, falsifying experimental data and/or citations.
    3. Plagiarism: Intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
    4. Unauthorized collaboration: working together on work that was meant to be done individually.
    5. Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission have been received from the course instructor(s) or research adviser involved.
    6. Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

## Disability Disclosure Statement

Academic accommodations are available for students with disabilities. Please contact the **Moses Center for Students with Disabilities** (212-998-4980 or mosescsd@nyu.edu) for further information. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for assistance.

## Inclusion Statement

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me.