



Course IME 611, Even (Spring) 2021

Discussion hours: Th 10:35-11:50

**Course:** IME 611, Financial Engineering

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**Zoom link:** Use your IITK email to join in to zoom and for class discussions  
Join Zoom Meeting

<https://zoom.us/j/97543954984?pwd=QjdJQ3JDUWY0U1pPYXp3cGorQTZMdz09>

Meeting ID: 975 4395 4984

Passcode: ime611

### Course Description and Objectives

**Basic Elements of Financial Systems** and Financial Management, Fundamentals of Financial Systems and Domain Knowledge of Financial Management

Fixed Income Securities: Bonds, The basic theory of interest, The term structure of interest rates.

Portfolio Theory: Mean-variance portfolio theory, the capital asset pricing model, issues related to statistical estimation.

**Introduction to Stochastic Calculus:** Wiener processes and Ito's lemma, Stochastic Differential Equations, Binomial trees, Monte Carlo simulation.

**Options and Futures:** Forward and futures contracts, Differences between Forwards & Futures, Futures & Forwards on Commodities & Currencies, Pricing of Stock Options on Stock Indices, Currencies, and Futures, Valuation of Futures, Interest Rate Futures, Applications to Hedging & Speculation, Delta Hedging, Greek letters

### Student Learning Outcomes:

- An ability to analyze risk-return relationship
- An ability to value and analyze bonds, stocks and derivatives
- An ability to apply portfolio theory to a portfolio of different financial securities
- An ability to program computational models

### Prerequisite

An intermediate level knowledge of the field of finance, Engineering mathematics including probability and statistics.

### Course Materials, Text etc.

**Course Material:** Power point slides and recorded videos used for lectures will be provided to students.

Text/Reading Materials:

1. *Investment Science*, 2nd Edition, David G. Luenberger; ISBN 978-0-19-974008-6
2. *An Elementary Introduction to Mathematical Finance*, 3rd Edition, Sheldon M. Ross; ISBN 978-1-10-873011-2
3. *Statistics and Finance*, An Introduction, David Ruppert; ISBN 978-1-4939-7079-7

**Teaching method and course emphasis:** The course will be mostly based on lectures and presentations. Apart from in class learning, away from class learning will be encouraged through assignments. The course emphasizes the application of the learned techniques to equity, fixed income portfolio management, and derivative pricing.

EXCEL - Excel add-ins SOLVER and ANALYSIS TOOLPAK will be used.

Other material/readings will be handed out from time to time.

### Course Policies

**All home assignments are with fixed deadlines:** These assignments are designed to provide you with a chance to put the concepts introduced in the class into practice.

**Class attendance and participation policy:** It will be monitored regularly through a combination of: (a) analytics of whether the lecture and discussions have been attended, (b) in-video questions, and (c) online viva-voce.

### Course Grade Determination

**Evaluation Components:** Take home assignments (3×15), in-video quizzes and class participation 15, Final quiz 20, course project 20.

Grading policy
Total points (TP) $\geq 90$ : A
$90 > \text{TP} \geq 75$ : B
$75 > \text{TP} \geq 55$ : C
$55 > \text{TP} \geq 45$ : D
$45 > \text{TP} \geq 35$ : E

### Resource Guide

#### Official Class Cancellation

If a class is canceled due to some unforeseen reasons, the class activity (homework, test, etc.) scheduled for the canceled date is automatically rescheduled for the next date that class is officially in session.

## Honor System: Plagiarism and Academic Integrity

The honor system assumes the responsibilities of students and faculty in upholding academic integrity, while at the same time respecting the rights of individuals to the due process offered by administrative hearings and appeals. Accordingly, “members of this academic course are required to conduct themselves in accordance with the highest standards of academic honesty and integrity.” In addition, all members are required to:

- Agree to be bound by the Honor System and its procedures;
- Report suspicion or knowledge of possible violations of the Honor System;
- Support an environment that reflects a commitment to academic integrity;
- Answer truthfully when called upon to do so regarding Honor System cases, and,
- Maintain confidentiality regarding specific information in Honor System cases.

Most importantly, “All students are presumed upon enrollment to have acquainted themselves with and have an understanding of the Honor System”.

In this class, because coursework may be collaborative at times, particular issues of integrity arise. You should not copy or print another student’s work without permission. Any material (this includes IDEAS and LANGUAGE) from another source must be credited, whether that material is quoted directly, summarized, or paraphrased.

## Copyright Information

*“The instructor of this course owns the copyright of all the course materials. This lecture material was distributed only to the students attending the course IME611A/FINANCIAL ENGINEERING of IIT Kanpur and should not be distributed in print or through electronic media without the consent of the instructor. Students can make their own copies of the course materials for their use.”*

## Student with Disabilities

If you have a physical or mental impairment that requires an academic adjustment or accommodation, then bring it to the notice of instructors at your earliest convenience.

**Student Conduct during Online Sessions** During online discussions, students are expected to conduct themselves in an orderly and cooperative manner so that the faculty member can proceed with the customary instruction.

**Email Policy** e-mail is the most convenient way to contact the instructors.

## Important Dates During the Current Semester

[https://www.iitk.ac.in/doaa/data/Calendar-2020-21-II\\_&\\_Summer-2021.pdf](https://www.iitk.ac.in/doaa/data/Calendar-2020-21-II_&_Summer-2021.pdf)

## Tentative Schedule

**Outline of Topics and Course Schedule** Because of unforeseen circumstances and responsibilities it is possible that the instructor will not be able to meet the scheduled class discussion. In case this event occurs, barring an emergency, the class will be notified, and the class discussion will be rescheduled. So, be advised that the following class schedule is *tentative* and subject to alteration as dictated by the pace, ability, and interest of the students. Online discussions, material difficulty and external forces may also dictate alterations.

Class 1	Discussion of syllabus, A brief overview of course
Class 2-4	Financial instruments and their salient characteristics, Cashflows: Deterministic and Random, Time Value of Money
Class 5-10	Analytics of Fixed Income Markets, Valuation and pricing of Bonds, Bond Portfolio Management, Term Structure of Interest rates, Interest Rate Models
Class 11-16	Analytics of Equity Markets, Valuation of Stocks, Equity Portfolio Management: Mean-variance portfolio theory, Pricing Models of Stocks: CAPM, APT, Factor Models
(Mid-semester recess)	
Class 17-21	Valuation and Pricing of Forwards, Futures, Swaps
Class 22-26	Models of Asset Dynamics, Basics of Options Pricing, Computational Methods