Introduction to Financial Engineering  
ISyE 6227—Spring 2006  

Syllabus  

Instructor  
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Course Description and Objectives  

- Students learn the core concepts and advanced techniques for economic  
decision analysis of capital investment and for managing and valuing  
project risk.  
- Students also learn the basic terminology, concepts and issues relevant  
to financial engineering and management.  

Course Materials  

- The required text is *Investment Science* by Luenberger, Oxford Uni-  
- Supplemental notes, handouts and exercises will be posted regularly  
and represent an integral part of the course. Check the web site  

Course Organization  

- Class time will be used to motivate, explain, illustrate and expand on  
the concepts and techniques discussed in the book and in the handouts.  
- Quite frequently you will be requested to read a handout or certain  
parts of the book or solve an in-class assignment and be prepared to  
discuss during class.
• If you must miss class it is your responsibility to catch up.

• It is your responsibility for obtaining class materials before each class.

Grading

• Your grade will be based on 3 closed-book exams, scheduled as follows:
  – Exam I: Thursday, Feb. 24 (30%)
  – Exam II: Thursday, April 7 (30%)
  – Final Exam [currently Friday, May 6, 11:30am] (40%)

Exams will be based on all assigned homework.

• “No” regrading.

• You must receive my prior permission to miss an exam (in case of an emergency). In such a case I will decide whether
  – you take the same exam (at a different time or day);
  – you take an alternative exam (to be scheduled); or
  – your grade will be pro-rated based on the other exams.

Homework

• Some problems will be straightforward; others quite challenging.

• You are encouraged to work together.

• Detailed solutions to most homework problems will be provided.

• Doing the homework yourself is essential to learning this material.
Projected Topical Outline

NOTE: The homework problems listed below refer to those in the assigned text. Additional homework problems may be assigned.

Overview

• Handouts.
  – Financial Market Overview
  – Sports Park Business Case Study
  – Consumption, Investment and the Fisher Separation Principle

Basic Theory of Interest

• Text Assignment. Chapter 2.1-2.6.
• Homework Problems. Chapter 2: 1, 3, 5, 7, 8, 9, 11, 15.
• Handouts.
  – Fixed Rate Mortgage and Refinancing Spreadsheet Example
  – Fixed Rate Mortgages
  – After-Tax Cash Flow Examples
  – Depreciation
  – Equipment Selection
  – Sensitivity Analysis
  – Project Evaluation Criteria for Mutually Exclusive Projects

Fixed-Income Securities

• Text Assignment. Chapter 3.1-3.6.
• Homework Problems. Chapter 3: 1, 3, 5, 6, 7, 9, 12.
The Term Structure of Interest Rates

- **Text Assignment.** Chapter 4.1-4.9.
- **Homework Problems.** Chapter 4: 1, 2, 3, 5, 6, 7, 11, 13.
- **Handouts.**
  - Term Structure Estimation
  - Immunizing Against Interest Rate Risk

Dynamic Cash Flow Analysis

- **Text Assignment.** Chapter 5.1-5.4, 5.6.
- **Homework Problems.** Chapter 5: 1, 3, 7, 8, 9.
- **Handouts.**
  - Estimating Firm Value

Mean-Variance Portfolio Theory

- **Text Assignment.** Chapter 6.1-6.10.
- **Homework Problems.** Chapter 6: 3, 5, 7, 9.
- **Handouts.**
  - Mean-Variance Risk Analysis Motivating Example
  - Mean-Variance Efficient Frontier
  - Mean-Variance Efficient Frontier Homework

The Capital Asset Pricing Model

- **Text Assignment.** Chapter 7.1-7.5, 7.7.
- **Homework Problems.** Chapter 7: 1, 2, 3, 6, 8.
Utility Theory

• *Text Assignment.* Chapter 9.1-9.4.

• *Homework Problems.* Chapter 9: 1, 2, 11, 14.

• *Handouts.*
  – Utility Homework Problems

Basic Options Theory

• *Text Assignment.* Chapter 12.1-12.7.

• *Homework Problems.* Chapter 12: 4, 9, 10, 13.

• *Handouts.*
  – Fair Pricing Example
  – Option Examples
  – Four Period Call Option Example
  – An Exotic Option
  – An Exotic Option (Solution)
  – Options Concept Homework

Real Options

• *Text Assignment.* Chapter 12.1-12.7.

• *Homework Problems.* Chapter 12: 8, 14, 16(b).

• *Handouts.*
  – Simplico Real Options Calculations
  – Classic Real Option Problems
  – Classic Real Option Problem Worksheets
  – Classic Real Option Problems with Solutions
  – Growth Option
  – Real Estate Option
Stock Price Dynamics

- *Homework Problems.* Chapter 11: 1, 3, 6, 8. Chapter 13: 1, 2, 5, 6, 7.
- *Handouts.*
  - Stock Price Dynamics

Additional Topics

- Forwards, Futures and Swaps (Chapter 10)
- Interest Rate Derivatives (Chapter 14)