

## ISYE 4311 CAPITAL INVESTMENT ANALYSIS

**Required depth course for Economic and Financial Systems concentration**

**Credit:** 3-0-3

**Prepared** Prof Shijie Deng and Laura Ying Li, 2025

**Prerequisite(s):** ISyE 3025, ISyE 3133 and ISyE3232

### **Reference Text and Course Handout**

*Corporate Finance, 2<sup>nd</sup> edition* by J. Berk and P. DMarzo. Pearson, 2011.

*Capital Investment Analysis* by S.T. Hackman, 2013.

### **Catalog Description**

Students learn core concepts and techniques for economic decision analysis of complex capital investment problems that involve dimensions of time, uncertainty and strategy.

### **Course Description**

Students learn core concepts and techniques for capital investment analysis, as well as the basic terminology, fundamental economic ideas and practical issues relevant to corporate finance, financial management and financial engineering.

### **Topical Outline**

| Topics  | Weeks |
|---|-------|
| Basic Valuation: Cash Flow Equivalence. Perpetuities and Annuities. Interest Rates. Fixed Rate Loans. Project Cash Flow Analysis. Equipment Analysis. Project Cash Flow Estimation.     | 5     |
| Capital Investment Under Uncertainty: Strategy, Options and Information. Discounted Cash Flow Analysis. Analysis of Project Options. Value of Information. Capital Investment Planning. | 4     |
| Risk vs Return: CAPM, Cost of Capital and Project Valuation. Optimal Portfolio Choice and CAPM. Arbitrage and the Law of One Price. Cost of Capital and Project Valuation.              | 4     |
| Capital Investment Under Uncertainty: Valuation via Contingent Claims. Asset Price Dynamics. Financial Options Analysis. Real Options Analysis.   | 2     |

### **Course Outcomes and their relationships to ISyE Program Outcomes**

At the end of this course, students will be able to:

- Value a fixed rate loan and pension plan.
- Prepare a capital investment cash flow projection.
- Select equipment alternative.
- Estimate cost of capital for project valuation.
- Recognize, analyze and value embedded project options.
- Value information.
- Value financial and real options using risk-neutral valuation.

| <b>Course outcome /<br/>Program Outcomes</b>                      |  | 1. identify, formulate solve engg prob by engg, sci & Math   |  |  |  |  |
|---|--|--|--|--|--|--|
| 1. Value a fixed rate loan and pension plan.                      |  | 2. produce solutions consider public health, safety, welfare, global, cultural, social, environ & economic.  |  |  |  |  |
| 2. Prepare a capital investment cash flow projection.             |  | 3 communicate with a range of audience   |  |  |  |  |
| 3. Select equipment alternative.                                  |  | 4 recognize ethical & professional responsibilities, make informed judgement consider resolutions in global, economic, environ and societal context. |  |  |  |  |
| 4. Estimate cost of capital for project valuation.                |  | 5. effective on a team provide leadership, collaborative and inclusive envirn, plan tasks & meet objectives  |  |  |  |  |
| 5. Recognize, analyze and value embedded project options.         |  | 6. develop and conduct experiment, analyze and interpret data & use engineering judgement to draw conclusions.                                       |  |  |  |  |
| 6. Value information.   |  | 7. acquire and apply new knowledge using appropriate learning strategies   |  |  |  |  |
| 7. Value financial and real options using risk-neutral valuation. |  |  |  |  |  |  |

### **Evaluation of the important course outcomes**

The course outcomes 4 and 5 will be assessed by direct questions on final exam.