



## **FINANCIAL ENGINEERING**

A Joint Program of the School of  
Mathematical Sciences and the  
Peter F. Drucker and Masatoshi Ito  
Graduate School of Management

# **Financial Engineering Program**

## **Managing risk for strategic purposes**

Financial Engineering is the applied science of risk. It employs advanced statistical and theoretical methods to structure, evaluate, and manage price exposure to risk. The domain of financial engineering is not limited to risk associated with complex financial instruments; it also deals with risks inherent in real asset investment decisions, organizational and product-market choices. Accordingly, we define Financial Engineering as the art and science of managing risk exposure for the purpose of creating value in organizations.

Many universities can and do teach the technical aspects of financial engineering. However few, if any, are able to achieve the balance we offer at Claremont Graduate University. Our Financial Engineering Program combines a flexible, non-departmentalized management program with a mathematics program that emphasizes applications. With this unique structure and resources of the University, we can deliver a focused, yet practical multi-disciplinary education in financial engineering that is both critically important to management and hard to duplicate by other universities.

The Financial Engineering Program is a multi-faceted endeavor that includes both degree-based and non-degree-based education and outreach. The core of the program is the Master of Science in Financial Engineering (MSFE) degree. The Financial Engineering Program is built around a highly focused curriculum that incorporates essential ideas from mathematics, finance, and management. To ensure the practical relevance of the Financial Engineering program, we have continued to enhance the program by the development of:

- A Financial Engineering Program Advisory Board
- The Financial Engineering Program Distinguished Speaker Series
- The Financial Engineering Internship Program

The Peter F. Drucker and Masatoshi Ito Graduate School of Management and the School of Mathematical Sciences of Claremont Graduate University have developed two innovative programs: the Master of Science in Financial Engineering (MSFE) and the Ph.D. in Financial Engineering. These intensive and highly focused programs prepare graduates for careers in a broad range of specialties including investment banking, corporate finance, and consulting.

## Financial Engineering: A Unique Degree Program

The Financial Engineering Program has a dual focus. First, it develops technical competencies students need to understand and evaluate or design complex financial products, and to make complex investment decisions with embedded real options. Second, it challenges students to develop the managerial vision needed for understanding and communicating the responsible strategic use of such products for value creation. The close integration of management and mathematics, which is the hallmark of this degree program, is not available at any other university.

As a joint management and mathematics program, the MSFE degree provides an integrated managerial and technical advantage. The mathematics component develops skills such as analytical and simulation techniques that students need to analyze and evaluate financial products and other risk exposures. The management component, including case studies and field-based internships, develops the methods and insights students must have to interpret organizational needs and goals in the design of appropriate exposure to financial, organizational, and product-market risks.

### Curriculum

Students in the Financial Engineering Program are required to take twelve courses totaling 48 credit units. Eight of the twelve courses are required of all students, and four are customized “electives” that are selected in consultation with the program and academic advisor, and are intended to address the specific needs of the student. The program is completed in three semesters of very intensive full-time course work. Students also have the option of completing the program in 8 semesters on a part-time basis.

#### Required Courses (32 units)

<b>Mathematics Courses</b>	<b>Management Courses</b>
Probability	Financial Accounting
Statistics	Corporate Finance
Stochastic Processes	Asset Management Practicum
Mathematical Finance	Financial Derivatives and Risk Management

Mathematical Finance, Financial Derivatives and Risk Management are capstone courses. In Financial Derivatives, they are required to complete a project that is related to management of complex risk in an organization.

Typically, a student will take two additional courses in mathematics and two in management. Electives are selected, however, to meet the specific needs of the student. Mathematics electives include courses in Numerical Analysis, Partial Differential Equations, Advanced Statistical Methods, Simulation, Numerical Methods for Finance, Scientific Computing, Time Series Analysis, Advanced Mathematical Finance, and Econometrics. Management electives include courses in Financial Policy and Strategy, Fixed-Income Management, Strategy, and Strategic Risk Management in an Emerging Economy. The Financial Engineering internship (optional) can apply toward the management elective requirement.

### Students

The program is intended for students with strong technical backgrounds and aptitudes. Applicants to the Financial Engineering Program should have strong records of achievement in quantitatively oriented undergraduate disciplines and have demonstrated competency in multivariable calculus and linear algebra coursework, or the equivalent. Current and past students range from mid-career “rocket scientists” to recent graduates in engineering and the physical sciences. We have experienced unanticipated interest from economics Ph.D. students, and certain Executive MBA students who wish to pursue a dual degree option.

## **MBA and Executive Management Program Impact**

The Financial Engineering Program, which begins in September, accepts up to 30 new students each year. In part, this structure is intended to enable us to combine Financial Engineering Program students with MBA students in some of their coursework and extracurricular activities. The presence of Financial Engineering students in MBA courses contributes to overall student demand for academic rigor that is a hallmark of the Financial Engineering program. Integrating Financial Engineering students with MBA students also encourages the Financial Engineering students to develop teamwork and organizational capabilities.

## **Relevance**

### **Financial Engineering Program Advisory Board**

A Financial Engineering Program advisory board was created for the program to ensure continued relevance. The board meets annually to review all aspects of the program. Board members are individuals who are actively involved in financial engineering and risk management at high levels in their organizations. They also help us maintain focus and provide support to the internship program (discussed below). Occasionally, Board members are available as speakers and actively consider our students for long-term employment.

### **Financial Engineering Internships**

An integral component of the Financial Engineering Program is an internship opportunity that allows students to examine specific applications of derivative instruments or risk management in a business environment. Internships are full or part time. Full-time internships typically involve a commitment of 40 hours per week for at least 10 weeks during the summer following completion of the first year of the program; part-time internships typically involve a commitment of at least 16 hours per week for at least 25 weeks.