

UNIVERSITY SENATE

Proposed: February 26, 1999

Adopted: February 26, 1999

RESOLUTION TO ESTABLISH A MASTER OF SCIENCE DEGREE IN FINANCIAL
ENGINEERING

WHEREAS, the design and development of financial products and the evaluation and management of financial risks has become increasingly dependent on the use of basic engineering tools such as stochastic calculus, diffusion equations, and finite-difference and Monte Carlos techniques, and

WHEREAS, the Education Committee has favorably reviewed a proposal from the IEOR Department and SEAS to establish a program whose graduates will earn a Master of Science degree in the engineering of financial instruments and the management of financial risks, and

WHEREAS, the Committee is satisfied that the proposal has been approved by the Committee on Instruction of SEAS and the faculty of the IEOR Department and of the Graduate Business School, the Registrar, the University Librarian, and the Provost,

THEREFORE BE IT RESOLVED, that the University Senate establish a Master of Science program in Financial Engineering, with the proviso that the Education Committee will review the program in five years;

BE IT FURTHER RESOLVED, that this resolution be forwarded to the Trustees for appropriate action.

Proponent:
Education Committee

Proposal for a New Degree Program: M.S. in Financial Engineering

IEOR Department, SEAS, Columbia University

December 3, 1998

Executive Summary

Recent years have witnessed the increasing usage of basic engineering tools in the design and development of financial products, and in the evaluation and management of financial risks. For example, the pricing of derivative securities has become critically dependent on such fundamental engineering methodologies as stochastic calculus, diffusion (heat transfer) equations, and finite-difference and Monte Carlo techniques. Another example is the central role played by mathematical programming in portfolio optimization and management.

In a global business environment, firms in both the manufacturing and service sectors are experiencing an increasing need for skilled professionals that are well versed in advanced financial instruments and risk management techniques, and adept in using these technologies to hedge against risks throughout the production, logistics, and supply chains of the enterprise.

A very high percentage (close to 80%) of recent IEOR B.S. graduates have been employed in the financial, and management consulting sector. Many of these alumni and their non-Columbia colleagues, have expressed an interest in obtaining a graduate degree that is focused on the engineering and technical aspects of financial management.

To address this need, the Department of Industrial Engineering and Operations Research started in Fall 1997 a new concentration in *Financial Engineering* (FE) within its current M.S. programs (M.S. in Industrial Engineering and M.S. in Operations Research). This new concentration has become very popular - there are 34 students currently enrolled in the FE concentration - and the comments we have received from both participating

students and applicants have overwhelmingly pointed to the need for upgrading this concentration to a separate M.S. degree program in Financial Engineering.

Students pursuing this new degree program will be provided with rigorous training in stochastic modeling, optimization, computation (including numerical and simulation techniques), as well as a basic coverage of financial markets and applications, and the basic operations/logistics management of firms. It is expected that graduates from this program will be able to assume positions as analysts in corporate treasury and finance departments of general manufacturing and service firms, in financial and management consulting firms, as well as in the securities and banking industries.

The proposed program will require a total of ten three-credit courses, which can be taken in two semesters of full-time studies. As is already the case in existing IEOR M.S. programs, every effort is made to schedule courses after 4:00PM to accommodate part-time students. Moreover, many of the required courses are now offered on Columbia Video Network (CVN) through SEAS, making it easier for students to take these courses if they work in industry. Admissions and degree requirements will be similar to other existing IEOR M.S. programs.

IEOR faculty, Professors D. Bienstock, G. Gallego, G. Iyengar, S. Kou, P. Shahabuddin, K. Sigman, and D. Yao (Program Director) will be primarily responsible for overseeing the program, including supervising the curriculum and advising students. They will be assisted in these tasks by Professor M. Broadie and P. Glasserman of the Graduate School of Business, both of whom are nonbudgetary members of the IEOR Department. Enrollment in the program is expected to remain at about 30-40 students per year. No startup funds for either faculty, staff or laboratory space/equipment are required. All required courses listed in the curriculum are already offered. Major adjustments to current teaching assignments are not needed.