IE 444 Operations Research in Finance

Synopsis. This course aims to introduce industrial engineering students to mainstream optimization tools and models used in modern finance. The course will open with a review of pertinent optimization technology, and develop from scratch the basic financial optimization models. We will use the GAMS and XPRESS-MP modeling systems accessible in the university computer systems. The essential prerequisite for the course is IE 202, or equivalent. A previous course in Engineering Economics or Finance is a plus, but is not a rigid requirement.

The course will be conducted using a set of lecture notes that will be made available by the instructor.

Grading will be based on homework (20%), a midterm examination (30%) and final (50%).

Tentative Syllabus

Weekly Topics

WEEK(1): Cash flow streams, present value, and fixed income instruments

WEEK(2): Introduction to linear programming

WEEK(3): LP models in finance I: Cash flow matching, dedication and immunization

WEEK(4): LP models in finance II: Fundamental theorem of asset pricing

WEEK(5): LP models in finance III: Risk-neutral probabilities and arbitrage detection

WEEK(6): Introduction to quadratic programming

WEEK(7): Mean-variance Markowitz portfolio model

WEEK(8): More on portfolio optimization

WEEK(9): Integer programming in finance: Constructing an index fund

WEEK(10): Dynamic programming in finance: structuring CMO's

WEEK(11): Robust optimization in finance: dynamic portfolio optimization QP

WEEK(12): Stochastic programming and optimal control models in finance

Mustafa C. Pinar.