The course is designed to give a broad overview of modern financial theory. We start from revisiting Brownian motions, stochastic calculus, and their applications to Black-Scholes-Merton's theory. Then markets and models of several risk sectors related to credit, insurance, weather, energy, volatility, interest rates, etc. are introduced. We also discuss risk measures and the management of risks by trading derivative contracts. Students are required to do course projects in addition to exams.

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Prerequisities:

STAT 387500 (basic knowledge of probability and statistics.)
MATH 2030 (Advanced Calculus)

Textbook: John Hull, "Options, Futures, and Other Derivatives," 7th Edition, Prentice Hall, 2009. (ISBN: 0-13-500994-4)

References:
   (1)   Alison Etheridge, "A Course in Financial Calculus," Cambridge University Press, (1st edition) 2002.
   (2)   P. Jackel, "Monte Carlo Methods in Finance," John Wiley & Sons Ltd. 2002.

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Grading:

Assignments 30%, Exams(midterm and final) 50%, Biweekly Report 10%, Course Project 10%.

Course Contents:
1. Review Binomial Tree Models with Pricing Derivatives
2. Basic Stochastic Calculus in Finance
3. Basic Numerical Procedures
4. Value at Risk
5. Estimating Voaltilities and Correlations for Risk Management
6. Credit Risk
7. Credit Derivatives
8. Exotic Options
9. Insurance, Weather, and Energy Derivatives
10. More of Models and Numerical Procedures
11. Martingales and Measures
12. Interest Rate Derivatives: The Standard Market Models
13. Convexity, Timing, and Quanto Adjustments