MATH 485 - Introduction to Mathematical Finance
TTh 6:40 - 8:00 PM, Room: HILL 124
Course website

Instructor: Triet Pham, Office: Hill 207, Email: triet.pham@rutgers.edu
Office Hours: TTh 5:00-6:30 pm and by appointment.

Grader: Michael Jang, Email: mjang714@gmail.com

Textbook: Mathematics of Finance by Stampfli and Goodman.
Reference:

1. Mathematics for Finance by Capinski and Zastawniak.
2. An Elementary Introduction to Mathematical Finance by Sheldon Ross.
(Capinski and Zastawniak is available at Rutgers library in electronic copy)

Course Objectives: In this course we will study the mathematical theory and financial concepts used to model and analyze financial derivatives. Topics that we will go over include binomial tree, continuous time stock and interest rate models, option pricing, Black-Scholes formula and hedging. We will also go over the mathematical concepts of martingales and Brownian motion, which are fundamental in understanding these financial models.

Course Outline:

Please note that this is a tentative outline. As the course progesses, we may adjust the pace and / or the material if necessary. It may be that we do not cover the last few topics. There will also be additional notes posted on the course website.

WEEK 1: Introduction to financial markets and derivatives. Ideas of replication and no arbitrage pricing for forward contracts and the one-period model. Probability review. Text: Sections 1.2, 1.3, 2.1.

WEEK 2: Risk neutral measure, pricing and the fundamental theorem of asset pricing for the one period model. Text: Sections 2.2–2.4.

WEEK 3: Multi-period, binomial tree models, I: Pricing European options by backward induction. Text: Sections 3.1, 3.2. See also 4.1, 4.2 for your information.

WEEK 4: Multi-period binomial tree models, II; pricing American options and exotic options. Text: Sections 3.2, 3.3. See also 4.3 for your information.

WEEK 5: Martingales in discrete time. Text: Class notes.

WEEK 6: Hedging and arbitrage. Sections 2.5, 2.6, 3.7. Also revisit 1.2 and 1.3 for your information.

WEEK 7: Continuous time models: Central limit theorem and limit of binomial trees. Brownian motion and geometric Brownian motion. Text: Class notes. Sections 5.1 and 5.2.

WEEK 8: The Black-Scholes model and the Black-Scholes pricing formula. Text: Sections 5.4 and 5.5.

WEEK 9: Analytic approach to Black-Scholes: Stochastic differentials, Ito's rule, continuous time martingales. Text: Class notes, Sections 6.1—6.4.

WEEK 10: The partial differential equation approach to pricing. Application to other options. Text: Sections 6.5 and 6.6.

WEEK 11: Review of the continuous time models, Brownian motion, Ito's formula, Black-Scholes model, Black-Scholes PDE.

WEEK 12: Hedging: delta and other greeks. Text: Chapter 7.

WEEK 13: Interest rates, forward rates, zero-coupon bonds, swaps. Text: Sections 8.1 – 8.3.

WEEK 14: Interest rate models and pricing. Text: Sections 8.4, 8.5.

Grade Breakdown:

Homework: 15 %
Midterm 1: 25 %
Midterm 2: 25 %
Final: 35 %

Calculator policy: Scientific calculators are permitted (and probably needed) in the exams.

Academic Honesty: As a Rutgers University student, you have agreed to abide by the Universitys academic honesty policy, as stated in http://academicintegrity.rutgers.edu. Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

Extra help: All students are strongly encouraged to come to my office hours to discuss homework problems or any aspect of the course. I am also available by appointments if the office hours do not fit into your schedule. Sending me emails regarding your questions is also an excellent way to get a prompt response.

University Attendance Policy: Students are expected to attend classes regularly, according to what is stated in http://sasundergrad.rutgers.edu/academics/courses/registration-and-course-policies/attendance-and-cancellation-of-class

Important Dates:

First midterm ..... Oct 13, 2015
Second midterm ..... Nov 17, 2015
Final Exam ..... Tuesday December 15, 8pm - 11pm
You can also check the final exam schedule here