

MATH 294: MATHEMATICS OF FINANCE (WINTER 2012)

Professor: R. J. Williams, AP&M 6121. **Office hours:** To be announced.

Class Time: M 4-5.30pm, W 4-5 pm. **Class Meeting Place:** AP&M B412.

Web page: <http://math.ucsd.edu/~williams/courses/math294.html>

DESCRIPTION: This course is an introduction to the mathematics of financial models at the graduate level. The aim is to provide students with an introduction to some basic models of finance and the associated mathematical machinery. The course will begin with the development of the basic ideas of hedging and pricing by arbitrage in the discrete time setting of binomial tree models. Key probabilistic concepts of conditional expectation, martingale, change of measure, and martingale representation, will all be introduced first in this simple framework as a bridge to the continuous model setting. Mathematical fundamentals for the development and analysis of continuous time models will then be reviewed, including Brownian motion, stochastic calculus, change of measure, martingale representation theorem (a more extensive treatment of these foundational topics, including proofs, is given in Math 286: Stochastic Differential Equations). These tools will then be combined to develop the Black-Scholes option pricing formula. Pricing and hedging for European and American call options will be discussed. As time allows, additional topics will be discussed, possibly including models of the interest rate market.

TEXT: Introduction to the Mathematics of Finance, R. J. Williams, AMS, 2006.

PREREQUISITES: A course in probability or consent of instructor. A possible probability course is Math 280AB (Graduate Probability). However, other probability courses may be used in place of this with the consent of the instructor. For those seeking extra reading on probabilistic background, the book by Billingsley (Probability and Measure) is a good resource. The course Math 286 (Stochastic Differential Equations) is a very useful complement to Math 294 and students may find it helpful to take Math 286 before or after Math 294.

HOMEWORK: Doing problems is one of the best ways to internalize the theoretical concepts that will be presented in this course. Homework is an essential part of the course and you should attempt as many of the assigned problems as possible.

ENROLLMENT: Students wishing to attend this course are encouraged to enroll (at least on a S/U basis).

ASSESSMENT: For enrolled students (whether enrolled for a grade or S/U): a student's grade will be based on homework turned in by the student. Problems should be turned in throughout the quarter and by the designated due date for each homework assignment.

ACADEMIC INTEGRITY: Any work submitted by a student for assessment must be the student's own work. (While talking with fellow classmates about the course material or problems is allowed, students must write up their own solutions to problems.) *Copying of solutions of another student is expressly forbidden.*