Introduction to Stochastic Calculus
Instructor: Professor Christopher Janjigian
Course Number: MA 49500BM
Credits: Three
Time: 12:30–1:20 PM   MWF

Description

An introductory course on Brownian motion and Brownian stochastic calculus. Topics will include basic properties of Gaussian random variables, basic path properties of Brownian motion, basic properties of martingales, basic properties of Ito stochastic integrals and stochastic differential equations, the (strong) Markov property, connections to partial differential equations including the Kolmogorov and Fokker-Planck equations, and the Cameron-Martin and Girsanov theorems. Further topics may include some applications to mathematical finance, stochastic control, or stochastic filtering.

Textbook:
A First Course in Stochastic Calculus by Arguin. ISBN: 978-1-4704-6488-2

Prerequisites: (Required)
Basic probability at the level of MATH/STAT 416 or 519
Ordinary differential equations at the level of MATH 266

(Recommended):
Some exposure to stochastic processes at the level of 432/532.

Introduction to Number Theory
Instructor: Professors Trevor D. Wooley
Course Number: MA 49500N
Credits: Three
Time: 4:30–5:45 PM TTh

Description

Prerequisites: This course is intended for third- or fourth-year undergraduate students or beginning graduate students who have taken and obtained a grade of B- or better in MA 35301 (Linear Algebra II). Students should have basic competence in mathematical proof.

Number Theory studies the properties of integers, and includes the theory of prime numbers, the arithmetic structures that underlie cryptosystems such as RSA, Diophantine equations (polynomial equations to be solved in integers, including the topic of Fermat's Last Theorem), and rational approximations that distinguish algebraic and transcendental numbers. Although a topic studied for more than two millenia, it is the subject of intense active current research, and connects with many other areas of Mathematics.

This course serves as an introductory exploration of Number Theory, without an abstract algebra prerequisite, so that final year students without a pure mathematics background will find this accessible. Connections with abstract algebra will, however, be noted for interested students, and the material should provide reinforcement and preparation for abstract algebra for those with ambitions in this direction.

Content: We begin with a reasonably brisk discussion of the basic notions: the Euclidean algorithm, primes and unique factorisation, congruences, Chinese Remainder Theorem (Public Key Cryptosystems), primitive roots, quadratic reciprocity, arithmetic and multiplicative functions. The second part of the course is devoted to topics: binary quadratic forms, Diophantine approximation and transcendence, continued fractions, Pell's equation and other Diophantine equations, and quadratic fields (subject to time constraints).

Companion Text: An Introduction to the Theory of Numbers (Niven, Zuckerman and Montgomery, 5th edition, Wiley, 1991.)

The course will be based on the instructor's comprehensive web-page hosted LaTeXed notes.

Assessment: Course credit will be based on weekly homeworks – the top 10 scores are totalled; two mid-terms and final exam.