

347. Financial Mathematics

A wide range of topics in mathematical finance are covered, including: continuous time models such as the Brownian motion model for stock prices, the Black-Scholes model for options prices, the Ho-Lee, Vasicek and other models for interest rates, also different hedging strategies and numerical approaches for derivative pricing such as binomial trees, Monte-Carlo simulation and finite difference methods, and price models for credit derivatives such as asset swaps, credit default swaps and collateralized debt obligations. Prerequisite: Econ 101 and Math 335. **Lu**

356. Introduction to Real Analysis

A rigorous development of the calculus of functions of one real variable including the topology of the real line, limits, uniform convergence, continuity, differentiation and integration. Prerequisite: Math 263 and Math 290. **Abedin**

384. Moral Machine Learning

Modern practicing statisticians confront moral considerations from multiple sources – algorithmic bias, data privacy, and mythological transparency – to name three. Like any profession facing such normative concerns, there should be a professional ethic among practicing statisticians. This course lays the mathematical foundation for carefully considering the underlying causes of the above moral concerns and provides several potential perspectives for grounding a statistician's professional ethic. Prerequisite: Math 336. **Ackerman**

386. Reflection Groups and Symmetry

We see repeated patterns everywhere—in nature, in floor tiles, in wallpaper, in the work of M.C. Escher—but what does it mean for two patterns to have the same kind of symmetry? Can the various kinds of symmetry be organized and

classified somehow? The mathematical study of this idea takes place via the study of reflection groups, which lie at the intersection of abstract algebra and geometry. In this class we will study these fascinating examples of infinite groups, learn how to classify them, and explore the geometric pictures associated to them. Prerequisite: Math 351. **Dougherty**

Courses for Fall 2027:

264 Differential Equations

272 Linear Algebra with Applications

282 Techniques of Math Modeling

290 Transition to Theoretical Mathematics

301 Case Studies in Math Modeling

325 Combinatorics

335 Probability

336 Mathematical Statistics

337 Stochastic Processes

338 Advanced Regression Analysis

343 Advanced Multivariable Calculus

349 Numerical Analysis

351 Abstract Algebra I

357 Real Analysis II

Visit <http://math.lafayette.edu/> for updates on these and other courses anticipated for next academic year.

$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$

y

x

Special and Advanced Mathematics Courses

$a^2 + b^2 = c^2$

$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$

$\nabla^2 \phi = 0$

$A = \begin{bmatrix} 2 & -1 & 0 \\ 1 & 3 & -2 \\ 0 & -1 & 4 \end{bmatrix}$

$e^{ix} = \cos x + i \sin x$

Math Builds Tomorrow ∞

We recommend that students who wish to major in mathematics take Math 272 during the first two years to ensure the widest possible selection of electives in the third and fourth years. More track-specific recommendations can be found at math.lafayette.edu.

264. Differential Equations

An introductory course in ordinary differential equations including techniques of elementary linear algebra. Emphasis is on first-order equations, and higher-order linear equations and systems of equations. Topics include qualitative analysis of differential equations, analytical and numerical solutions, Laplace transforms, existence and uniqueness of solutions, and elemental models in science and engineering.

Prerequisite: Math 263. **Halmrast/Miller-Brown/Corvino**

272. Linear Algebra with Applications

An introduction to linear algebra and some of its many applications. Topics include systems of linear equations, matrix algebra, Euclidean spaces and linear transformations between them, the rank-nullity theorem, eigenvalues, diagonalization, orthogonality and least squares approximation. Corequisite: Math 162. **Turek/Zhou**

282. Techniques of Mathematical Modeling

A course that introduces students to the fundamentals of mathematical modeling through the formulation, analysis, and testing of mathematical models in a variety of areas. Modeling techniques covered include curve fitting, difference and differential equations, simulation and an introduction to computer programming. Prerequisite: Math 162. **Carr**

286. Intro to Probability & Mathematical Statistics

This course will serve as a one-semester introduction to probability and mathematical statistics, with roughly half of the semester devoted to each. After learning the basics of set theory and axiomatic probability, we review random variables, probability mass/density functions, expected value (including covariance

and correlation), and expected value and variance of linear combinations. Then we begin inferential statistics (confidence intervals and hypothesis tests), correlation and simple linear regression, and, time permitting, one-way analysis of variance and/or chi-squared tests. Prerequisite: Math 263. **Liebner**

290. Transition to Theoretical Math

An introduction to the concepts and techniques that permeate advanced mathematics. Topics include set theory, propositional logic, proof techniques, relations, and functions. Special emphasis on developing students' facility for reading and writing mathematical proofs. Examples and additional topics are included from various branches of mathematics, at the discretion of the instructor. Corequisite: Math 272 or permission of instructor. **Saia**

300. Vector Spaces

A course in theoretical linear algebra, emphasizing the reading and writing of proofs. Topics include vector spaces and linear transformations between them, coordinatization of vectors and matrix representation of linear transformations, the rank-nullity theorem, diagonalization, inner product spaces and orthogonality, the spectral theorem for Hermitian operators, matrix decompositions, and bilinear and quadratic forms. Prerequisite: MATH 272 and MATH 290, or permission of instructor. **Smith**

306. Operations Research

A study of some mathematical methods of decision making. Topics include: linear programming (maximizing linear functions subject to linear constraints), the simplex algorithm for solving linear programming problems, sensitivity analysis, networks and inventory problems and applications.

Prerequisite: Math 272 or Math 300 or permission of instructor. **Lewis**

312. Partial Differential Equations An introduction to partial differential equations and their applications. Formulation of initial and boundary value problems for these equations and methods for their solution are emphasized. Separation of variables and Fourier analysis are developed. The course includes interpretation of classical equations and their solutions in terms of applications. Prerequisite: Math 263. **Corvino**

328. Number Theory

An introduction to the theory of the integers and techniques for their study and application. Topics include primality, modular arithmetic, arithmetic functions, quadratic residues, and diophantine equations. Prerequisite: MATH 263 or permission of instructor; reading and writing proofs will be a significant part of the course, so MATH 290 could be useful, though it is not a prerequisite. **Roy**

335. Probability

A development of basic probability theory including the axioms, random variables, expected value, the law of large numbers, and the central limit theorem. Additional topics include distribution functions and generating functions. Prerequisite: Math 263. **Lau**

336. Mathematical Statistics

A mathematical development of fundamental results and techniques in statistics. Topics include estimation, sampling distributions, hypothesis testing, correlation and regression. Prerequisite: Math 335. **Gaugler**