

Special & Advanced Mathematics Courses

Spring 2022

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: Mathematics 263. **Corvino/Jacavage/Zhou**

272. Linear Algebra with Applications

An introductory course in linear algebra emphasizing applications to fields such as economics, natural sciences, computer science, statistics, and engineering. The course covers solutions of systems of equations, matrix algebra, vector spaces, linear transformations, determinants, eigenvalues, and eigenvectors. Corequisite: Mathematics 263 or permission of instructor. **Akinyemi/Reiter**

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 proportionality, curve fitting, elementary linear programming, and simulation. Prerequisite: Mathematics 162. **Storey**

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 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. **Lewis**

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: Mathematics 263 or permission of instructor. **Zulli**

300. Vector Spaces

A first course in theoretical linear algebra, emphasizing the reading and writing of proofs. Topics include systems of linear equations, matrix algebra, vector spaces and linear transformations, eigenvectors and diagonalization, inner product spaces, and the Spectral Theorem. Not open to students with credit for Mathematics 272. Prerequisite: Mathematics 290 or permission of instructor. **Bloom**

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: Mathematics 272 or Mathematics 300 or permission of instructor. **Lu**

310. Ordinary Differential Equations

A course in the theory and applications of ordinary differential equations which emphasizes qualitative aspects of the subject. Topics include analytic and numerical solution techniques for systems of equations, graphical analysis, stability, existence-uniqueness theorems, and applications. Prerequisite: Math 263, and Math 272 or Math 300. **Lewis**

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. **Root**

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. **Xu**

338. Advanced Regression Analysis

Topics include simple linear regression, multiple linear regression, and nonlinear regression. More specifically, the course covers applications of least squared techniques, inference, diagnostics such as residual analysis and the associated remedial measures, and the use of ANOVA in regression. The course uses a matrix-based approach. In addition, this course shows how regression is used in many other fields through practical application of the techniques covered in this class in real-world scenarios. Prerequisite: Math 336 and one of Math 272 or 300. **Xu**

352. Abstract Algebra II

The course covers field extensions and Galois Theory. Additional topics are included at the discretion of the instructor. Prerequisite: Math 351; corequisite: Math 300 or permission of instructor. **McMahon**

356. Intro 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: Mathematics 290. **Mancuso**

400. Senior Seminar

A course in which each student undertakes a thorough and independent study of one or more topics in mathematics. Students are required to make oral presentations on their work and to prepare written reports on their topics. [W] Prerequisite: Senior standing and satisfactory completion of at least two 300-level courses in mathematics. **Gordon**

Recommendation: *AB/BS Math Majors should take Mathematics 290 by the end of the second year to permit the widest possible selection of courses in the third and fourth years.*

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

Some Anticipated Courses for **Fall 2022:**

264 Differential Equations

272 Linear Algebra with Applications

287 Intro to Data Modeling

290 Transition to Theoretical Mathematics

301 Case Studies in Mathematical Modeling

323 Geometry

335 Probability

336 Mathematical Statistics

345 Complex Analysis

347 Financial Mathematics

351 Abstract Algebra I

358 Topology

3XX Special Topics - TBD