MATH 844 - Design of Experiments II

Credits: 3

Second course in design of experiments, with applications in quality improvement and industrial manufacturing, engineering research and development, research in physical and biological sciences. Covers experimental design strategies and issues that are often encountered in practice complete and incomplete blocking, partially balanced incomplete blocking (PBIB), partial confounding, intra and inter block information, split plotting and strip plotting, repeated measures, crossover designs, Latin squares and rectangles, Youden squares, crossed and nested treatment structures, variance components, mixed effects models, analysis of covariance, optimizations, space filling designs, and modern screening design strategies.

Prerequisite(s): MATH 840 with a minimum grade of B-.

Grade Mode: Letter Grading

MATH 845 - Foundations of Applied Mathematics I

Credits: 3

An introduction to Partial Differential Equations (PDEs) and associated mathematical methods and the analytical foundation for applied mathematics. Topics include: PDE classification, superposition, separation of variables, orthonormal functions, completeness, convergence, Fourier Series, Sturm-Liouville eigenvalue problems, and eigenfunctions. Methods are introduced for the analysis and solution of boundary value problems, in particular, the Heat, Wave, and Laplace equations. Students are required to have a mastery of differential equations and ordinary differential equations.

Grade Mode: Letter Grading

MATH 846 - Foundations of Applied Mathematics II

Credits: 3

An introduction to special functions, asymptotic analysis, and transform methods applied to partial differential equations. Topics include: Boundary value problems in cylindrical coordinates, the Bessel equation and Bessel functions, Fourier-Bessel expansions in cylindrically symmetric spatial domains, the Fourier Transform, the Hilbert Transform, Cosine and Sine Transforms, problems on semi-infinite intervals, and Asymptotic Analysis. Students are required to have a mastery of differential equations and ordinary differential equations.

Grade Mode: Letter Grading

MATH 847 - Introduction to Nonlinear Dynamics and Chaos

Credits: 3

An introduction to the mathematics of chaos and nonlinear dynamics. Topics include: linear and nonlinear systems of ordinary differential equations; discrete maps; chaos; phase plane analysis; bifurcations; and computer simulations. Prereq: elementary differential equations; linear algebra; and multidimensional calculus. (Not offered every year.)

Grade Mode: Letter Grading

MATH 853 - Introduction to Numerical Methods

Credits: 3

Introduction to mathematical algorithms and methods of approximation. A wide survey of approximation methods are examined including, but not limited to, polynomial interpolation, root finding, numerical integration, approximation of differential equations, and techniques used in conjunction with linear systems. Included in each case is a study of the accuracy and stability of a given technique, as well as its efficiency and complexity. It is assumed that the student is familiar and comfortable with programming a high-level computer language. (Also offered as CS 853.)

Equivalent(s): CS 853

Grade Mode: Letter Grading

MATH 855 - Probability with Applications

Credits: 3

Introduces the theory, methods, and applications of randomness and random processes. Probability concepts, random variable, expectation, discrete and continuous probability distributions, joint distributions, conditional distributions; moment-generating functions, convergence of random variables.

Grade Mode: Letter Grading

MATH 856 - Principles of Statistical Inference

Credits: 3

Introduces the basic principles and methods of statistical estimation and model fitting. One- and two-sample procedures, consistency and efficiency, likelihood methods, confidence regions, significance testing, Bayesian inference, nonparametric and re-sampling methods, decision theory.

Prerequisite(s): MATH 855 with a minimum grade of B-.

Grade Mode: Letter Grading

MATH 857 - Mathematical Optimization for Applications

Credits: 3

This course introduces the foundations of mathematical optimization and reinforces them via applications. The content includes convex optimization, first and second-order methods, constrained problems, duality, linear and quadratic programming, as well as discrete and non-convex optimization. Applications will focus on machine learning methods but also include problems from engineering and operations research. Students are required to have a mastery of Calculus II and programming proficiency in MATLAB, R, Java, C, Python, or equivalent.

Equivalent(s): CS 857

Grade Mode: Letter Grading

MATH 861 - Abstract Algebra

Credits: 3

This course establishes the axiomatic framework that underlies number systems and similar mathematical structures, investigating basic properties of groups, rings, fields and their homomorphisms.

Grade Mode: Letter Grading

MATH 863 - Abstract Algebra II