Tom Balmat

Graduate level course descriptions (from NCSU course catalog and course web pages)

MA 518 - Calculus on Manifolds (currently MA 555, Manifold Theory)

Manifolds are non-linear smooth geometric shapes, which locally look like open subsets of Euclidean space. Manifolds appear in various branches of mathematics, physics, and engineering. We will rigorously define manifolds, examine properties of smooth maps between them, and introduce basic tools needed to perform differential and integral calculus on manifolds.

http://www4.ncsu.edu/~iakogan/wwwTeaching/555/555-S15/555syll-S15.pdf

MA 505 - Linear Programming

The course is a unique blend of the theory of linear programming, exciting applications of linear programming to real world problems, and algorithms and associated software for solving large scale linear programs. The theoretical aspect of the course will focus on complexity, geometry, optimality conditions, and duality in linear programming. The application aspect of the course will help students in recognizing and developing linear programming models for problems in science and engineering. The algorithmic aspect of the course will develop simplex and interior point methodologies and expose students to associated state of the art computer software for reliably and efficiently solving large scale linear programs. We will also look at recent extensions to linear conic programming especially semidefinite programming.

http://www4.ncsu.edu/~kksivara/ma505fall2006/ma505outline.html

ST 507 - Statistics for the Behavioral Sciences I

A general introduction to the use of descriptive and inferential statistics in behavioral science research. Methods for describing and summarizing data presented, followed by procedures for estimating population parameters and testing hypotheses concerning summarized data.

http://www2.acs.ncsu.edu/reg_records/crs_cat/ST.html

ST 511 - Experimental Statistics for the Biological Sciences I

Preq: ST 311 or graduate standing. Basic concepts of statistical models and use of samples; variation, statistical measures, distributions, tests of significance, analysis of variance, regression and correlation, chi-square. Students will learn methods for summarizing and describing data, and techniques for using sample data to make inferences about a larger population.

http://www.stat.ncsu.edu/people/jeng/courses/st511/syllabus.pdf

ST 517 - Applied Least Squares

(ST 517 is no longer in the course catalog, but description of ST 708 looks identical)

Least squares estimation and hypothesis testing procedures for linear models. Consideration of regression, analysis of variance, and analysis of covariance in a unified manner. Emphasis on use of the computer, with investigation of assumptions, diagnostics, and model selection. Students will gain considerable experience diagnosing and remedying problems encountered during regression analysis. Experience will also be gained regarding variable and model selection. Students will use SAS to do most homework assignments.

http://www.stat.ncsu.edu/people/hughes-oliver/courses/ST708/syllabus.html

ST 512 - Experimental Statistics for the Biological Sciences

The goal of this course is to introduce statistical methods and concepts that are fundamental to analyzing data that arise in the biological sciences. The pedagogy of the course is based on the view that a practical knowledge of statistics requires mastery of three separate types of understanding. They are:

- Logical understanding. Ultimately, statistics does not exist for its own sake. Instead, statisticsprovides a tool for using data to evaluate and illuminate scientific ideas. The logical connections between statistical methods and scientific thinking are a fundamental component of contemporary scientific discourse. Understanding this logic is central to intelligent data analysis.
- Mathematical understanding. Statistical methods are rooted in mathematics. Although it is conceivable to take a 'black box' approach to statistics, such an approach has serious drawbacks. At the least, treating statistical methods as a black box results in fragmented understanding that hides the common theory underlying the methods. Understanding the mathematical theory behind statistical methods illuminates the deep connections among the methods, which in turn provides a more enduring understanding. In addition, understanding mathematics makes the assumptions and limitations of statistical methods clear, as they arise as a logical consequence of the mathematics.
- Computational understanding: In today's world, nearly everyone analyzes data with statistical software very few do statistical calculations by hand. Although practical constrains limit the number of software packages that we can examine in class, most software packages share several common denominators. We will gain exposure to two contemporary statistical software packages, R and SAS.
- Most disciplines within the biological sciences have specific methods that are commonly used or favored. We will not cover these discipline specific methods. Instead, the goal of an applied statistics class with a diverse clientele is to teach the fundamental statistical concepts and models from which more specialized methods are derived. An understanding of these basic models empowers students to master the specialized techniques that are specific to their own research fields.

http://www.stat.ncsu.edu/courses/syllabus/2013/FA/ST_512_003-Gross.pdf

ISE 748 - Quality Engineering

Introduction to basic concepts of quality engineering. Statistical process control (SPC) methods, acceptance sampling techniques, concept of parameter design and statistical as well as analytical techniques for its implementation, tolerance analysis and design, components of cost of poor quality and an introduction to quality management.

http://www2.acs.ncsu.edu/reg_records/crs_cat/ISE.html

ISE 747 - Reliability Engineering

Introduction to basic concepts of reliability engineering. Application of probability and statistics to estimate reliability of industrial systems; development of reliability measures; analysis of static and dynamic reliability models; development and analysis of fault trees; analysis of Markovian and non-Markovian models; and optimization of reliability models.

http://www2.acs.ncsu.edu/reg_records/crs_cat/ISE.html

ISE 589 - Stochastic Modeling

This course will introduce mathematical modeling, analysis, and solution procedures applicable to uncertain (stochastic) production and service systems. Methodologies covered include probability theory and stochastic processes including discrete and continuous Markov processes. Applications relate to design and analysis of problems, capacity planning, inventory control, waiting lines, and system reliability and maintainability. This course will be taught at the Masters' level.

http://engineeringonline.ncsu.edu/onlinecourses/coursehomepages/FALL-2012/ISE589.html

ECE 514 - Random Processes

Probabilistic descriptions of signals and noise, including joint, marginal and conditional densities, autocorrelation, cross-correlation and power spectral density. Linear and nonlinear transformations. Linear least-squares estimation. Signal detection.

http://www2.acs.ncsu.edu/reg_records/crs_cat/ECE.html#ECE%20514