STATISTICS

https://www.uvm.edu/cems/mathstat

OVERVIEW

The Statistics Program offers biostatistics, statistics, data science and probability courses for the entire university community along with traditional degree programs and individually designed degree programs emphasizing statistics applied to other fields. The degree programs are designed primarily for students who plan careers in data science, business, actuarial science, industry, and government or advanced training in disciplines that make extensive use of statistical methods and data science. The program faculty is deeply involved in consulting and collaborative research in a wide variety of fields, including industry, agriculture, and in the basic and clinical medical sciences. These research activities along with the research of other quantitative UVM faculty offer students unique opportunities to apply their classroom training to "real world" problems. Qualified students with the goal of learning statistics to use in a specialized area of application are especially encouraged to take advantage of these cooperative arrangements.

Program faculty have active statistics research efforts in areas such as bioinformatics, statistical genetics, Bayesian models, survival data analysis, discriminant analysis, bootstrap methods, machine learning, predictive modeling, networks, categorical data analysis, measurement error models, and experimental design. Students seeking the traditional graduate degree in statistics (along with course work in mathematics and computer science, if desired) have excellent opportunities to participate in the faculty's research.

DEGREES

Statistics AMP

Statistics M.S.

FACULTY

Buzas, Jeff Sandor; Professor, Department of Mathematics and Statistics; PHD, North Carolina State University Raleigh

Callas, Peter W.; Research Associate Professor, Department of Mathematics and Statistics; PHD, University of Massachusetts Amherst

Crocker, Abigail; Associate Professor, Department of Mathematics and Statistics; PHD, University of Vermont

Cole, Bernard; Professor, Department of Mathematics and Statistics; PHD, Boston University

Edwards, Erika; Research Associate Professor, Department of Mathematics and Statistics; PHD, Boston University School of Public Health

Single, Richard M.; Associate Professor, Department of Mathematics and Statistics; PHD, SUNY Stony Brook

Young, Jean-Gabriel; Assistant Professor, Department of Mathematics and Statistics; PHD, Universite Laval

Courses

STAT 5000. Biostatistics and Epidemiology. 3 Credits.
Introductory design and analysis of medical studies. Epidemiological concepts, case-control and cohort studies. Clinical trials. Students evaluate statistical aspects of published health science studies. Understand the relevance of published public health research to clinical practice. Credit not awarded for both STAT 5000 and STAT 3000. Prerequisite: Graduate student or Instructor permission.

STAT 5020. Applied Statistics I. 3 Credits.
Foundational statistics, conducting data analysis using statistical software, collaborating as part of an interdisciplinary team, and communicating and presenting research findings. Practical issues and meaningful, real-world impacts of data projects with an emphasis on data equity, data processing, visualization, basic statistical procedures and concepts, and interpretation and communication of results. Focuses on the responsible application of basic statistical methods, concentrating on concepts rather than mathematical theory. Background in calculus or linear algebra is not required. Prerequisites: Graduate student or Instructor permission.

STAT 5210. Advanced Stat Methods & Theory. 3 Credits.
Parametric and non-parametric two-sample tests. Multiple regression and correlation. Matrix representations. Basic experimental design. Analysis of variance (fixed, random, and mixed models). Statistical Software usage. Credit not awarded for both STAT 5210 and STAT 3210. Prerequisites: Graduate student or Instructor permission; content knowledge of STAT 2830 assumed.

STAT 5230. Appld Multivariate Analysis. 3 Credits.
Multivariate normal distribution. Inference for mean vectors and covariance matrices. Multivariate analysis of variance (MANOVA), discrimination and classification, principal components, factor and cluster analysis. Prerequisite: STAT 3210, matrix algebra recommended.

STAT 5290. Survivl/Logistic Regression. 3 Credits.
Models and inference for time-to-event and binary data. Censored data, life tables, Kaplan-Meier estimation, logrank tests, proportional hazards models. Logistic regression-interpretation, assessment, model building, special topics. Prerequisite: Graduate student or Instructor permission; content knowledge of STAT 3210 or STAT 5210 assumed.

STAT 5310. Experimental Design. 3 Credits.
Randomization, complete and incomplete blocks, cross-overs, Latin squares, covariance analysis, factorial experiments, confounding, fractional factorials, nesting, split plots, repeated measures, mixed models, response surface optimization. Prerequisites: Graduate student or Instructor permission; content knowledge of STAT 3210 or STAT 5210 assumed; content knowledge of STAT 5010 recommended.

STAT 5350. Categorical Data Analysis. 3 Credits.
Measures of association and inference for categorical and ordinal data in multiway contingency tables. Log linear and logistic regression models. Prerequisite: Graduate student or Instructor permission; content knowledge of STAT 3210 or STAT 5210 assumed.

STAT 5510. Probability Theory. 3 Credits.
Distributions of random variables and functions of random variables. Expectations, stochastic independence, sampling and limiting distributions (central limit theorems). Concepts of random number generation. Prerequisites: Graduate student or Instructor permission; content knowledge of MATH 2248, STAT 2510 assumed.

STAT 5530. Appl Time Series&Forecastng. 3 Credits.
Autoregressive moving average (Box-Jenkins) models, autocorrelation, partial correlation, differencing for nonstationarity, computer modeling. Forecasting, seasonal or cyclic variation, transfer function and intervention analysis, spectral analysis.

STAT 5870. Data Science I - Experience. 3 Credits.
Data harvesting, cleaning, and summarizing; working with non-traditional, non-numeric data (social network, natural language textual data, etc.); scientific visualization; advanced data pipelines with a practical focus on real datasets and developing good habits for rigorous and reproducible computational science; Project-based. Credit not awarded for both STAT 5870 and STAT 3870. Prerequisites: Knowledge of CS 1210 and either STAT 1410 or STAT 2430 required; knowledge of CS 2100 and MATH 2522 or MATH 2544 recommended; Graduate student or Instructor permission. Cross-listed with: CSYS 5870, CS 5870.

STAT 5990. Special Topics. 1-18 Credits.
See Schedule of Courses for specific titles.

STAT 6020. Applied Statistics II. 3 Credits.
Expands on foundational knowledge of statistics by teaching advanced methods and approaches, including conducting analyses using statistical software, collaborating as part of an interdisciplinary team, communicating and presenting research findings. Addresses practical issues and meaningful, real-world impacts with an emphasis on data equity and interpretation and communication of results. Focuses on the responsible application of advanced statistical methods, concentrating on concepts rather than mathematical theory. Background in calculus or linear algebra is not required. Prerequisites: STAT 5020; Graduate student or Instructor permission.

STAT 6300. Bayesian Statistics. 3 Credits.
Introduction to Bayesian inference. Posterior inference, predictive distributions, prior distribution selection. MCMC algorithms. Hierarchical models. Model checking and selection. Use of computer software. Prerequisite: Content knowledge of STAT 5510 assumed.

STAT 6391. Master's Thesis Research. 1-18 Credits.
Research for the Master's Thesis.

STAT 6810. Statistical Research. 1-3 Credits.
Methodologic or data analytic research culminating in oral and written reports to the faculty. Prerequisite: Instructor permission.

STAT 6850. Consulting Practicum. 1-3 Credits.
Supervised field work in statistical consulting. Experiences may include advising UVM faculty and students or clients in applied settings such as industry and government agencies. Prerequisites: Second year Graduate student in Statistics or Biostatistics; permission of Statistics Program Director.

STAT 6870. Data Science II. 3 Credits.
Advanced data analysis, collection, and filtering; statistical modeling, monte carlo statistical methods, and in particular Bayesian data analysis, including necessary probabilistic background material; a practical focus on real datasets and developing good habits for rigorous and reproducible computational science. Prerequisites: STAT 5870, CS 5870, CSYS 5870, or Instructor permission. Cross-listed with: CS 6870, CSYS 6870.

STAT 6990. Special Topics. 1-18 Credits.
Lectures or directed readings on advanced and contemporary topics not presently included in other statistics courses. Prerequisites: As listed in schedule of courses.

STAT 6993. Independent Study. 1-18 Credits.
A course which is tailored to fit the interests of a specific student, which occurs outside the traditional classroom/laboratory setting under the supervision of a faculty member, for which credit is awarded. Offered at department discretion.

STAT 7980. Applied Geostatistics. 3 Credits.
Introduction to the theory of regionalized variables, geostatistics (kriging techniques): special topics in multivariate analysis; Applications to real data subject to spatial variation are emphasized. Prerequisites: Programming skills (such as in Python or Matlab) and content knowledge of multivariate statistics (such as STAT 5230) are assumed. Cross-listed with: CEE 7980, CSYS 7980.