STATISTICS (STA)

Statistics (STA)
Master of Science

Overview

The Department of Statistical Sciences offers the degree of M.S. in Statistics. The program is designed to accommodate both students seeking a terminal degree for work in industry as well as those seeking preparation for Ph.D. in Statistics or Biostatistics at another institution. The degree requirements are flexible and permit both thesis and coursework programs of study, with opportunities to engage in research as well as data analysis competitions.

Programs

- Statistics, MS (https://bulletin.wfu.edu/graduate/programs/degree-programs/statistics/statistics-ms/)
- Data Science, Certificate (https://bulletin.wfu.edu/graduate/programs/certificates/data-science-certificate/)

Courses

STA 610. Probability. (3 h)
Distributions of discrete and continuous random variables, sampling distributions. Covers much of the material on the syllabus for the first actuarial exam. This course is cross-listed as MTH 657.

STA 611. Statistical Inference. (3 h)
Derivation of point estimators, hypothesis testing, and confidence intervals, using both frequentist and Bayesian approaches. P-STA 610 or MTH 657 or POI.

STA 612. Linear Models. (3 h)
Theory of estimation and testing in linear models. Topics include least squares and the normal equations, the Gauss-Markov Theorem, testing general linear hypothesis, model selection, and applications. P-STA 610 or MTH 657, or POI.

STA 652. Networks: Models and Analysis. (3 h)
A course in fundamental network theory concepts, including measures of network structure, community detection, clustering, and network modelling and inference. Topics also draw from recent advances in the analysis of networks and network data, as well as applications in economics, sociology, biology, computer science, and other areas.

STA 662. Multivariate Statistics. (3 h)
Multivariate and generalized linear methods for classification, visualization, discrimination, and analysis.

STA 663. Introduction to Statistical Learning. (3 h)
An introduction to supervised learning. Topics may include lasso and ridge regression, splines, generalized additive models, random forests, and support vector machines. Requires prior experience with R programming.

STA 664. Computational and Nonparametric Statistics. (3 h)
Computationally intensive methods to fit statistical models to data. Topics include simulation, Monte Carlo integration and Markov Chain Monte Carlo, sub-sampling, and nonparametric estimation and regression. P-MTH 657 or POI.

STA 665. Applied Bayesian Statistics. (3 h)
An introduction to Bayesian statistics and computational methods for performing Bayesian data analysis. Topics may include conjugate distributions, objective prior distributions, Bayesian inference, hierarchical models, and Markov chain Monte Carlo methods. P - STA 610 and a previous course in regression.

STA 668. Time Series and Forecasting. (3 h)
Methods and models for time series processes and autocorrelated data. Topics include model diagnostics, ARMA models, spectral methods, computational considerations, and forecasting error. P-STA 610 or MTH 657, or POI.

STA 679. Advanced Topics in Statistics. (1-3 h)
Topics in statistics not considered in regular courses or which continue study begun in regular courses. Content varies.

STA 682. Readings in Statistics. (1-3 h)
Reading in statistical topics to provide a foundational basis for more advanced study in a particular area. May not be used to satisfy any requirement in the MA degree with thesis. No more than three hours may be applied to the requirements for the MA degree without thesis. May be repeated for credit for a total of 3 hours.

STA 683. Individual Study. (1-3 h)
A course of independent study directed by a faculty adviser. By prearrangement.

STA 710. Stochastic Processes and Applications. (3 h)
This course includes the axiomatic foundations of probability theory and an introduction to stochastic processes. Applications may include Markov chains, Markov Chain Monte Carlo with Metropolis-Hastings, Gibbs sampling, Brownian motion, and related topics, with an emphasis on modern developments. This course is cross-listed as MTH 757. P-STA 610 or MTH 657 and MTH 611 or POI.

STA 711. Advanced Statistical Inference. (3 h)
Advanced mathematical treatment of point estimators, hypothesis testings, and confidence intervals, using both frequentist and Bayesian approaches. P-STA 610 or MTH 657, or POI.

STA 712. Generalized Linear Models. (3 h)
Extensions of the classical linear model to cover models for binary and count data, ordinal and nominal categorical data, and time-to-event data, along with numerical maximization techniques needed to fit such models. Additional topics may include longitudinal data, the Expectation-Maximization algorithm, non-linear models, or related topics. P-STA 612 or POI.

STA 720. Bayesian Analysis. (3 h)
Fundamental concepts, theory, and computational methods for Bayesian inference. Topics may include decision theory, evaluating Bayesian estimators, Bayesian testing and credible intervals, Markov chain Monte Carlo methods, and hierarchical models. P-STA 610 or MTH 657, or POI.

STA 779. Topics in Statistics. (3 h)
Topics vary by instructor. May be repeated for credit.

STA 791. Thesis Research. (1-9 h)
May be repeated for credit. Satisfactory/Unsatisfactory. P-POI.

STA 792. Thesis Research. (1-9 h)
May be repeated for credit. Satisfactory/Unsatisfactory. P-POI.

Faculty

Program Director Daniel Beavers
Chair Robert Erhardt
Professors Kenneth Berenhaut, Robert Erhardt

Associate Professors Dan Beavers, Staci Hepler
Assistant Professors Leonardo Cella, Ciaran Evans, Emily Huang, Sneha Jadhay, Sarah Lotspeich, Lucy D'Agostino McGowan