STATISTICS

In the Department of Mathematics and Statistics

Associate Professors Liam O’Brien and James Scott; Visiting Assistant Professor Costel-Gabriel Bontea

The statistics minor is designed to equip students with the analytical tools and capacities to interact with real-world data in a research environment while also accommodating students who seek a more theoretical foundation in the field. It is designed to pair with majors in which data plays a central role. This minor equips students with the fundamental skills necessary to understand not only how to display and analyze data, but how to design studies and experiments and collect data.

Requirements for the Minor in Statistics

Mathematics 122 or 162, and 253; Statistics 212 and 321; and two more statistics courses numbered 300 or above. (The Psychology 214/215 or Economics 293/393 course sequences may be substituted for Statistics 212.)

A minor in data science is described in the “Data Science” section of the catalogue.

The point scale for retention of the minors applies to all courses in the minors. No requirement for the minors may be taken satisfactory/unsatisfactory.

Course Offerings

[SC110] Statistical Thinking Statistics is the science of learning from data; it provides tools for understanding data and arguments based on data in many diverse fields. Students will learn to describe data in basic terms and to verbalize interpretations of it. Topics include graphical and numerical methods for summarizing data, methods of data collection, basic study design, introductory probability, confidence intervals, and statistical inference. Does not count toward any major or minor. Credit may be received for only one of Mathematics or Statistics 110, 212, or 231. Four credit hours. Q.

SC212fs Introduction to Statistics and Data Science An exploration of statistical methods relevant to a broad array of scientific disciplines. Students will learn to properly collect data through sound experimental design and to present and interpret data in a meaningful way, making use of statistical computing packages. Topics include descriptive statistics, design of experiments, randomization, contingency tables, measures of association for categorical variables, confidence intervals, one- and two-sample tests of hypotheses for means and proportions, analysis of variance, correlation/regression, and nonparametrics. Credit can be received for only one of Mathematics or Statistics 110, 212, or 231. Four credit hours. Q, W2. BONTEA, O’BRIEN, SCOTT, WIECZOREK

SC306s Topics in Epidemiology The purposes of epidemiological research are to discover the causes of disease, to advance and evaluate methods of disease prevention, and to aid in planning and evaluating the effectiveness of public health programs. Students will learn about the historical development of epidemiology, a cornerstone of public health practice. Through the use of statistical methods and software, they will explore the analytic methods commonly used to investigate the occurrence of disease. Topics include descriptive and analytic epidemiology; measures of disease occurrence and association; observational and experimental study designs; and interaction, confounding, and bias. Prerequisite: Mathematics or Statistics 212, 231, 382, or 482. Four credit hours. SCOTT

[SC308] Topics in Psychometrics and Multivariate Statistics Psychometrics is concerned with the development and evaluation of psychological instruments such as tests and questionnaires. Students will learn about the fundamental concepts central to measurements derived from these tools. The establishment and assessment of the validity and reliability of research instruments, as well as the construction of scales and indices, will be discussed. Data reduction techniques and an introduction to testing theory will also be covered. Statistical software will be used throughout. Prerequisite: Statistics 212 and Mathematics 253 (may be taken concurrently). Four credit hours.

SC321fs Statistical Modeling Students will expand on their inferential statistical background and explore methods of modeling data through linear and nonlinear regression analysis. Through the use of statistical software, they will learn how to identify possible models based on data visualization techniques, to validate assumptions required by such models, and to describe their limitations. Topics include multiple linear regression, multicollinearity, logistic regression, models for analyzing temporal data, model-building strategies, transformations, model validation. Prerequisite: Mathematics or Statistics 212, 231, 382, or 482. Four credit hours. O’BRIEN, WIECZOREK

SC381f Probability Listed as Mathematics 381. Four credit hours. GOUVEA

SC398s Applied Longitudinal Analysis Longitudinal data occur when the same response is measured repeatedly through time. Students in this course will learn the fundamental properties of the structure of longitudinal data, as well as standard regression and mixed
modeling strategies to analyze them. The types of estimation, and implications for using them, will also be discussed. Statistical software will be used throughout the course. Prerequisite: Mathematics 253 and Statistics 212. Four credit hours. O'BRIEN

**SC482s  Topics in Statistical Inference** Building on their background in probability theory, students explore inferential methods in statistics and learn how to evaluate different estimation techniques and hypothesis-testing methods. Students learn techniques for modeling the response of a continuous random variable using information from several variables using regression modeling. Topics include method of moments and maximum likelihood estimation, sample properties of estimators, including sufficiency, consistency, and relative efficiency, Rao-Blackwell theorem, tests of hypotheses, confidence intervals, linear models, and analysis of variance. Previously listed as Statistics 382. Prerequisite: Mathematics 381. Four credit hours. O'BRIEN