

# STATISTICAL SCIENCES (STA)

## STA 107. Explorations in Statistics. (3 h)

Introduction to statistical literacy and the role of statistics in settings such as elections, medicine, sports, and the sciences. Topics vary by instructor. (D, QR)

## STA 111. Elementary Probability and Statistics. (4 h)

Data collection and visualization, exploratory analysis, introductory probability, inference techniques for one variable, and statistical literacy. Lab. (D, QR, QDA)

## STA 112. Introduction to Regression and Data Science. (3 h)

A foundational course in regression and data science. The course introduces data analysis through statistical computing in R, least-squares and logistic regression, model selection, and data visualization. P-STA 111, a score of 4 or 5 on the AP Statistics exam, or prerequisite override required. (D, QR, QDA)

## STA 175. Competitions. (1-3 h)

Seminar designed for students who wish to participate in statistics and/or data analysis competitions. Not to be counted toward any major or minor offered by the department. May be repeated for credit. Pass/Fail only.

## STA 214. Applied Generalized Linear Models. (3 h)

A course in statistical models, emphasizing models for count and categorical data, an exploration of likelihood-based modeling, and an introduction to mixed effects models. These models are applied using R. P-STA 112 and MTH 111. (QR, D)

## STA 247. Design and Sampling. (3 h)

Experimental designs, observational studies, survey design and estimation with stratified, cluster, and other sampling schemes. P-STA 112 or prerequisite override required. (D)

## STA 279. Topics in Statistics. (1-3 h)

Topics in statistics not considered in regular courses, or which continue study begun in regular courses. May be repeated for credit if the topic varies. Content and prerequisites vary.

## STA 310. 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. Credit not allowed for both STA 310 and MTH 357. P-MTH 112 or prerequisite override required. (D)

## STA 311. Statistical Inference. (3 h)

Derivation of point estimators, hypothesis testing, and confidence intervals, using both frequentist and Bayesian approaches. P-STA 310 or MTH 357 or prerequisite override required. (D)

## STA 312. 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 hypotheses, model selection, and applications. P-MTH 121 or 205, and STA 310 or MTH 357. (D)

## STA 352. 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. Also listed as MTH 359. P-MTH 117 or MTH 121 or MTH 205, and one course in STA at the 200 level or above.

## STA 362. Multivariate Statistics. (3 h)

Multivariate and linear methods for classification, visualization, discrimination, and analysis of high dimensional data. P-STA 112 and MTH 121 or MTH 205, or prerequisite override required. (D)

## STA 363. 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. P-STA 112 and MTH 121 or 205, or prerequisite override required, experience with statistical computing. (D)

## STA 364. Computational and Nonparametric Statistics. (3 h)

Computational and Nonparametric Statistics (3 h). Computationally intensive statistical methods. Topics may include simulation, Monte Carlo integration and Markov Chain Monte Carlo, sub-sampling, non-parametric estimation and regression. Students will make extensive use of statistical software throughout the course. P-STA 112, and either STA 310 or MTH 357, or prerequisite override required. (D)

## STA 365. 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 112 and STA 310. (QR, D)

## STA 368. 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 112, and either STA 310 or MTH 357, or prerequisite override required. (D)

## STA 379. Advanced Topics in Statistics. (1-3 h)

Topics in statistics not considered in regular courses or which continue study begun in regular courses. May be repeated for credit if the topic varies. Content and prerequisites vary.

## STA 381. Applied Statistics Capstone. (2 h)

Students integrate knowledge acquired throughout their degree program. Topics include developing a research plan, statistical writing, data visualization, and data ethics. Students will communicate statistical results to both technical and non-technical audiences through written reports and oral presentations. Offered fall semester. P-senior STA major.

## STA 382. Applied Statistics Capstone. (1.5 h)

A capstone course for students in the B.S. in Applied Statistics. Topics include developing a project plan, team work skills, statistical writing, data visualization, and data ethics. Students will communicate statistical results to both technical and non-technical audiences through written reports and oral presentations. P-STA 363 and junior or senior B.S. in Applied Statistics major. Students in the B.S. in Statistics may request entry into this course by contacting the professor, and may be admitted if there is space available.

## STA 383. Individual Study. (1-3 h)

A course of independent study directed by a faculty advisor. By prearrangement. May be repeated for credit. P-Prerequisite override required.

## STA 384. Internship in Statistics. (1-3 h)

Individual external internship in a professional setting, completed under the supervision of a faculty member. The student is responsible for identifying and obtaining the internship. May be repeated for credit. Pass/Fail only. P - Prerequisite override required.

## STA 391. Honors Research I. (1 h)

Independent study or research directed by a faculty advisor by prearrangement with the advisor. P-Prerequisite override required.

**STA 392. Honors Research II. (1 h)**

Preparation of a paper, followed by an oral presentation based upon work completed in STA 391.