STATISTICS

The mission of the Department of Statistics is to provide students with a quality education in statistics, in which they acquire fundamental statistical skills and develop a sense of statistics as a profession. In addition, graduates will be prepared for advanced studies in statistics and related disciplines (such as data science and analytics) and for the diverse uses of statistics in business, industry, government, scientific research, and society. The University of Akron's graduate statistics program focuses on applied statistics, and the master's degree is in high demand with expected increase in demand over the next decade.

Visit the Department of Statistics website to learn more about its faculty and facilities.

- Statistical Data Science, Certificate (https://bulletin.uakron.edu/graduate/colleges-programs/arts-sciences/statistics/statistical-data-science-certificate/)
- Statistics, MS (https://bulletin.uakron.edu/graduate/colleges-programs/arts-sciences/statistics/statistics-ms/)

Statistics (STAT)

STAT 550 Probability (3 Units)
Prerequisite: Appropriate background is one semester of calculus or equivalent. Introduction to probability, random variables and probability distributions, expected value, sums of random variables, Markov processes. May not be used to meet graduate major requirements in statistics. (Formerly 3470:550)

STAT 551 Theoretical Statistics I (3 Units)
Prerequisite: Three semesters of calculus or equivalent. Sequential (part 1 of 2). Elementary combinatorial probability theory, probability distributions (discrete and continuous), expectation and variance, moments and moment generating functions, bivariate and multivariate probability distributions, conditional distributions and independence, distributions of functions of random variables (univariate and bivariate), order statistics and their distributions (Formerly 3470:551)

STAT 552 Theoretical Statistics II (3 Units)
Prerequisite: Three semesters of calculus or equivalent. Sequential (2nd of 2 parts). Sampling distributions, point estimation and properties of point estimators, sufficiency, Rao-Blackwell method and MVUE, methods of obtaining point estimators, interval estimation, hypothesis testing, power and sample size calculation, Neyman-Pearson theory of optimal tests (Formerly 3470:552)

STAT 553 Theoretical Statistics I Supplement (1 Unit)
Prerequisite: Appropriate background is at least one semester of calculus-based probability theory and mathematical statistics at the STAT 451 level. This course goes more in-depth on some of the material covered in STAT 451 but not emphasized. For ready reference, the topics covered in STAT 451 are elementary combinatorial probability theory, probability distributions (discrete and continuous), expectation and variance, bivariate and multivariate distributions and distributions of functions of random variables. Some study material and problems from outside the book will be included. (Formerly 3470:553)

STAT 554 Theoretical Statistics II Supplement (1 Unit)
Prerequisite: STAT 553 or permission. Topics in theoretical statistics that are a sequel to the coverage of STAT 451 and STAT 551 but are still not covered in STAT 452 (including a proof of the central limit theorem, large-sample properties of maximum likelihood estimators, convergence in probability and convergence in distribution, completeness and ancillarity). Some study material and problems from outside the book will be included. (Formerly 3470:554)

STAT 561 Applied Statistics (4 Units)
Prerequisite: Appropriate background is two semesters of calculus or equivalent. Applications of statistical theory to natural and physical sciences and engineering, including probability distributions, interval estimation, hypotheses testing (parametric and nonparametric), and simple linear regression and correlation. May not be used to meet graduate major requirements in statistics. (Formerly 3470:561)

STAT 562 Applied Regression and ANOVA (4 Units)
Prerequisite: Appropriate background is one semester of applied statistics or equivalent. Applications of the techniques of regression and multifactor analysis of variance. May not be used to meet graduate major requirements in statistics. (Formerly 3470:562)

STAT 565 Design of Sample Surveys (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Design and analysis of frequently used sample survey techniques. (Formerly 3470:565)

STAT 569 Reliability Models (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Selected topics in reliability modeling including parametric and nonparametric models, competing modes of failure, censored data and accelerated life models. (Formerly 3470:569)

STAT 570 Biostatistics and Epidemiology (3 Units)
Prerequisite: Appropriate background is one semester of applied statistics (STAT 461 or STAT 561) or equivalent. Biostatistics and Epidemiological methods for biological and medical studies, including ANOVA, analysis of repeated measures, disease-related measures, log-linear models, and clinical trials. (Formerly 3470:570)

STAT 571 Introduction to Actuarial Science (3 Units)
(Appropriate background is two semesters of calculus). Interest theory and financial mathematics used in actuarial science. Topics include time value of money, annuities, loans, bonds, cash flows and immunizations, interest rate swaps. (Formerly 3470:571)

STAT 572 Actuarial Models (3 Units)
(Appropriate background is a course in theoretical statistics) Study of severity, frequency and aggregate models used in actuarial applications. Calibration and evaluation, credibility procedures, fundamental principles of pricing in short-term insurance coverage. (Formerly 3470:572)

STAT 573 Survival Analysis (3 Units)
Prerequisite: Applied Statistics (STAT 461 or STAT 561) or equivalent. Basic concepts in survival analysis, censoring and data truncation, estimation of survival models, nonparametric hazard and survival function estimation, comparing survival times between groups (Formerly 3470:573)

STAT 575 Foundations of Statistical Quality Control (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Course provides a solid foundation in the theory and applications of statistical techniques widely used in industry. (Formerly 3470:575)

STAT 576 Bayesian Statistics (3 Units)
(Appropriate background is one semester of applied statistics or equivalent). Basic concepts in Bayesian theory, sampling methods, MCMC, hierarchical modeling. Computer applications of Bayesian statistics to natural and physical sciences and engineering. (Formerly 3470:576)

STAT 577 Time Series Analysis (3 Units)
Prerequisite: Appropriate background is one semester of probability, or one semester of theoretical statistics, or one semester of applied statistics or equivalent or permission. Stationarity. ARIMA modeling with seasonality. Parameter estimation, model diagnostics and forecastng. Regression with autocorrelated errors. Cointegration and multivariat ARMA models. Heteroscedasticity and long-memory models. (Formerly 3470:577)

STAT 580 Statistical Data Management (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Students learn data organization and structures, design of statistical databases, statistical software analysis, importing and exporting of data between software, and missing data analysis. (Formerly 3470:580)

STAT 582 Statistical Data Management Supplement (1 Unit)
Prerequisite: Appropriate background is one semester of familiarity with statistical software packages such as MINITAB, SPSS, SAS and R or permission. This course is solely intended to teach Master's students coming from the department's undergraduate curriculum how to manage (edit, search and manipulate with) data on the computer with a number of statistical software packages widely used in the academe and industry (above and beyond what they have learned at the undergraduate level). Homework assignments and data analysis projects are given. (Formerly 3470:582)

STAT 583 Advanced Statistical Computing (3 Units)
Prerequisite: Appropriate background is one semester of applied statistics or equivalent. Topics include data management, random number generation, resampling methods, numerical optimization, Markov Chain Monte Carlo, smoothing methods, data mining: clustering and classification. (Formerly 3470:583)

STAT 584 Introduction to Machine Learning (3 Units)
Prerequisite: Prior course in applied statistics. Methodologies for statistical learning, including generalized logistic regression, ridge regression, neural networks, support vector machines, principal components analysis, and K-means and hierarchical clustering (Formerly 3470:584)

STAT 585 Applied Analytics-Decision Trees (3 Units)
Prerequisite: STAT 561. Selected topics in predictive modeling using CHAID, Classification and Regression Trees, Logistic Regression and Neural Networks. (Formerly 3470:585)

STAT 586 Spatial-temporal Statistics (3 Units)
(Appropriate background is one semester of applied statistics or equivalent). Basic concepts of geostatistic, point pattern, area unit. Spatial-temporal modeling in high dimensional data. Computer applications to natural and physical sciences and engineering. (Formerly 3470:586)

STAT 589 Topics in Statistics (1-3 Units)
(May be repeated for a total of six credits) Prerequisite: permission. Selected topics in advanced statistics, including quality control, reliability, sampling techniques, decision theory, advanced inference, stochastic processes and others. (Formerly 3470:589)

STAT 591 Workshop in Statistics (1-3 Units)
(May be repeated with change of topic) Group studies of special topics in statistics. May not be used to meet undergraduate or graduate major requirements in mathematics and statistics. May be used for elective credit only. (Formerly 3470:591)

STAT 594 High-Dimensional High-Throughput Data Analysis (3 Units)
Prerequisite: Regression and ANOVA and statistical data management, or instructor's permission. This course provides exposure to a variety of advanced statistical methods (beyond the ones taught in our undergraduate curriculum) for handling the challenges of high-dimensional high-throughput data, along with their software implementation and applications. Topics include multiple hypothesis testing and multiplicity adjustment, curse of dimensionality, sparsity, high-dimensional data visualization, dimension reduction methods, model selection and estimator selection, machine learning methods, aggregation of estimators and classifiers, graphical and network models. (Formerly 3470:594)

STAT 595 Statistical Consulting (1-3 Units)
Prerequisite: STAT 580 or permission. Students will be assigned to work with an instructor on current projects in the Center for Statistical Consulting. May be repeated for a total of 4 credits; however, only 2 credits will count toward major requirements. Does not count for elective credit for math science department majors. (Formerly 3470:595)

STAT 596 Advanced Statistical Methods for Modern Data Analysis (3 Units)
Prerequisites: Regression and ANOVA and statistical data management, or instructor's permission. This course provides exposure to a variety of advanced statistical methods (beyond the ones taught in our undergraduate curriculum) for handling the challenges of modern-day data analysis, along with their software implementation and applications. Topics include distribution-free statistical methods, modern regression methods (robust, penalized, nonparametric), generalized linear models, random effects models, generalized linear mixed models, generalized additive models, some machine learning methods, some data mining methods, graphical/network models and an introduction to biostatistics. (Formerly 3470:596)

STAT 650 Advanced Probability & Stochastic Processes (3 Units)
Prerequisite: STAT 651. Random walk, distributions, unlimited sequence of trials, laws of large numbers, convolutions, branching processes, renewal theory, Markov chains, time-dependent stochastic processes. (Formerly 3470:650)

STAT 651 Probability & Statistics (4 Units)
(Appropriate background is three semesters of Calculus or equivalent.) Probability, random variables, moments and generating functions, random vectors, special distributions, limit theorems, sampling, point estimation, hypothesis testing, confidence estimation. (Formerly 3470:651)

STAT 652 Advanced Mathematical Statistics (3 Units)
Prerequisite: STAT 651. Convergence of random variables, the Central Limit Theorem; theory of estimation; theory of hypothesis testing; the multivariate normal density; introduction to linear models; Bayesian statistics. (Formerly 3470:652)

STAT 655 Linear Models (3 Units)
(Appropriate background is Linear Algebra or STAT 651 or equivalent.) General linear model in matrix notation, general linear hypothesis, regression models, experimental design models, analysis of variance and covariance, variance components. (Formerly 3470:655)

STAT 661 Statistics for the Life Sciences (3 Units)
Prerequisite: college level algebra or equivalent. Data description and presentation, probability applications in the life sciences (including sensitivity, specificity, relative risk), principles and application of statistical inference, ANOVA, correlation and regression. May not be used to meet graduate major requirements in statistics. (Formerly 3470:661)

STAT 663 Experimental Design (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Selected topics in experimental design including random and fixed effects, nested designs, split plot designs, confounding, fractional factorials, Latin squares, and analysis of covariance. (Formerly 3470:663)

STAT 665 Regression (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Correlation, simple and multiple linear regression: least squares, matrix notation, model building and checking estimation, hypothesis testing, outliers, influence, multicollinearity, transformations, categorical regressors; logistic regression. (Formerly 3470:665)

STAT 666 Nonparametric Statistics - Methods (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Theory and practice using techniques requiring less restrictive assumptions. Nonparametric analogues to t- and F-tests, ANOVA, regression and correlation. Computer applications. (Formerly 3470:666)

STAT 667 Factor Analysis (3 Units)
(Appropriate background is one semester of applied statistics or equivalent.) Theory and techniques for identifying variables through use of principal components and factor analysis. Identification of groups using cluster analysis. Computer applications. (Formerly 3470:667)

STAT 668 Multivariate Statistical Methods (3 Units)
(Appropriate background is two semesters of applied statistics or equivalent.) Multivariate techniques including distance concept, Hotelling T^2, multivariate ANOVA, regression and correlation, linear contrasts, factorial experiments, nested and repeat measure designs, Bonferroni X^2 tests, linear discrimination analysis, canonical correlations, application. (Formerly 3470:668)

STAT 669 Regression Encore (1 Unit)
Prerequisite: STAT 462 or STAT 562. Some advanced topics in regression analysis (beyond those covered in STAT 462 and STAT 562) that are usually included in the graduate-level regression analysis course. (Formerly 3470:669)

STAT 670 Advanced Biostatistics (3 Units)
Prerequisite: STAT 570. Statistical issues and methods for biological, medical and health sciences including: clinical trials, sample size, power, log-linear models, survival analysis, and bioassay. Computer applications. (Formerly 3470:670)

STAT 675 Response Surface Methodology (3 Units)
(Appropriate background is two semesters of applied statistics or equivalent.) First and second order response designs, efficient experimental plans, methods for the analysis, and optimization of response functions. (Formerly 3470:675)

STAT 689 Advanced Topics in Statistics (1-3 Units)
(May be repeated for a total of six credits) Prerequisite: STAT 651. Selected topics in statistics including concepts in order, statistics, advanced inference, sequential analysis, stochastic processes, reliability theory, Bayesian statistics and regression. (Formerly 3470:689)

STAT 692 Statistics Masters Paper (2-3 Units)
Prerequisite: permission of advisor. Supervised writing of paper based on a terminal project and its presentation in front of an audience. For Masters of Science in Statistics (Non-thesis Option). A minimum of 2 credit-hours and a maximum of 3 credit-hours. (Formerly 3470:692)

STAT 695 Practicum in Statistics & Mathematics (1-3 Units)
Prerequisite: graduate teaching assistant or permission. Training and experience in college teaching of statistics. May not be used to meet degree requirements. Credit/non-credit. (Formerly 3470:695)

STAT 697 Individual Reading: Statistics (1-3 Units)
Prerequisites: graduate standing and permission of the graduate academic adviser and the department chair. Directed studies in statistics under the guidance of a selected faculty member. (May be repeated for a total of four credits) (Formerly 3470:697)

STAT 698 Master's Research (1-6 Units)
(May be repeated) Prerequisite: permission of advisor. Research in suitable topics in statistics culminating in a research paper. No more than 2 credits applicable to major requirements. (Formerly 3470:698)

STAT 699 Master's Thesis (2 Units)
Prerequisite: Permission. (May be repeated for a total of 4 credits) Properly qualified candidates for master's degree may obtain 2-4 credits for research experience which culminates in the presentation of faculty-supervised thesis. (Formerly 3470:699)