STA - Statistics

Statistics: STA

Lower-Division Courses

STA 301. Introduction to Data Science.

Restricted to students in the McCombs School of Business. An introduction to the principles and practice of data science for business applications. Explore tidying, summarizing, and visualizing data; statistical computing in R; linear regression; introduction to predictive modeling and out-of-sample model validation; uncertainty quantification using resampling methods; basic probability models, including the normal and binomial distributions; and statistical hypothesis testing. The equivalent of three lecture hours a week for one semester. Offered on the letter-grade basis only.

STA 301H. Introduction to Data Science: Honors.

Restricted to students in the McCombs School of Business Honors Program. An introduction to the principles and practice of data science for business applications. Explore tidying, summarizing, and visualizing data; statistical computing in R; linear regression; introduction to predictive modeling and out-of-sample model validation; uncertainty quantification using resampling methods; basic probability models, including the normal and binomial distributions; and statistical hypothesis testing. The equivalent of three lecture hours a week for one semester. Offered on the letter-grade basis only.

STA 309. Elementary Business Statistics.

Restricted to students in the McCombs School of Business. Training in the use of data to gain insight into business problems; describing distributions (center, spread, change, and relationships), producing data (experiments and sampling), probability and inference (means, proportions, differences, regression and correlation). Three lecture hours a week for one semester. Only one of the following may be counted: Educational Psychology 308, Statistics 309, 309H or Statistics and Data Sciences 301. Offered on the letter-grade basis only. Prerequisite: Mathematics 408Q or credit or registration for Mathematics 408D, 408L, or 408S.

STA 309H. Elementary Business Statistics: Honors.

Restricted to students admitted to the McCombs School of Business Honors Program. Training in the use of data to gain insight into business problems; describing distributions (center, spread, change, and relationships), producing data (experiments and sampling), probability and inference (means, proportions, differences, regression and correlation). Three lecture hours a week for one semester. Only one of the following may be counted: Educational Psychology 308, Statistics 309, 309H or Statistics and Data Sciences 301. Offered on the letter-grade basis only. Prerequisite: Twenty-four semester hours of college credit, including Mathematics 408Q, 408D, 408L, or 408S.

Upper-Division Courses

STA 235. Data Science for Business Applications.

Restricted to students in the McCombs School of Business. Examine data science for business applications at the intermediate level. Explore building and validating predictive models; advanced regression modeling, including an in-depth treatment of regression; models for binary outcomes; and causal inference. The equivalent of two lecture hours a week for one semester. Statistics 235 and 235H may not both be counted. Offered on the letter-grade basis only. Prerequisite: Statistics 301 or 301H, Mathematics 408Q or credit or registration for Mathematics 408D, 408L, or 408S.

STA 235H. Data Science for Business Applications: Honors.

Restricted to students in the McCombs School of Business Honors Program. Examine data science for business applications at the intermediate level. Explore building and validating predictive models; advanced regression modeling, including an in-depth treatment of regression; models for binary outcomes; and causal inference. The equivalent of two lecture hours a week for one semester. Statistics 235 and 235H may not both be counted. Offered on the letter-grade basis only. Prerequisite: Statistics 301 or 301H, Mathematics 408Q or credit or registration for Mathematics 408D, 408L, or 408S.

STA 140S, 240S, 340S, 440S, 540S, 640S, 740S, 840S, 940S. Topics in Statistics.

This course is used to record credit the student earns while enrolled at another institution in a program administered by the University's Study Abroad Office or the school's BBA Exchange Programs. Credit is recorded as assigned by the study abroad adviser in the Department of Information, Risk, and Operations Management. University credit is awarded for work in an exchange program; it may be counted as coursework taken in residence. May be repeated for credit when the topics vary.

STA 371G. Statistics and Modeling.

Restricted to students in the McCombs School of Business. Focuses on methods used to model and analyze data. Explores multiple regression models and their application in the functional areas of business, time-series models, decision analysis and the value of information, and simulation-based methods. Three lecture hours a week for one semester. Only one of the following may be counted: Statistics 371G, 371H, 375, 375H. Offered on the letter-grade basis only. Prerequisite: Management Information Systems 301, 301H, or 310; Statistics 309 or 309H; and credit or registration for Business Administration 324 or 324H.

STA 371H. Statistics and Modeling: Honors.

Restricted to students admitted to the McCombs School of Business Honors Program. Focuses on methods used to model and analyze data. Explores multiple regression models and their application in the functional areas of business, time-series models, decision analysis and the value of information, and simulation-based methods. Three lecture hours a week for one semester. Only one of the following may be counted: Statistics 371G, 371H, 375, 375H. Offered on the letter-grade basis only. Prerequisite: Management Information Systems 301, 301H, or 310; Mathematics 408D, 408L, 408M or 408S; Statistics 309 or 309H; and credit or registration for Business Administration 324H.

STA 172, 272, 372. Topics in Statistics.

Restricted to students in the McCombs School of Business. For each semester hour of credit earned, one lecture hour a week for one semester. May be repeated for credit when the topics vary. Prerequisite: Upper-division standing, and Statistics 301, 301H, 309 or 309H with a grade of at least C-; additional prerequisites vary with the topic.

> **Topic 1: Statistical Computer Packages.**
> **Topic 2: Sampling.**
> **Topic 3: Statistical Decision Making for Business.**
> **Topic 4: Multivariate Statistical Analysis.**
> **Topic 6: Optimization Methods in Finance.** Explores quantitative methods and techniques in optimization and simulation, and their use in financial decision making. Discusses theory and application in portfolio selection, options and other derivative pricing, index tracking, risk measures, volatility estimating. Specific subjects will include linear, quadratic, nonlinear, and integer programming; dynamic programming; robust optimization; Monte Carlo methods and variance reduction techniques. Emphasis will be placed on problem solving with advanced computational programming languages. Only one

of the following may be counted: Finance 372 (Topic: Optimization Method in Finance), 372 (Topic 6), Statistics 372 (Topic 6), Business Analytics 372 (Topic 6), Decision Science 372 (Topic 6).

Topic 7: Computational Finance. A systematic introduction to the analysis and implementation of numerical methods used in finance. Covers numerical techniques used in derivative pricing and optimal asset allocation, such as Monte Carlo and quasi-Monte Carlo simulation, methods for solving partial differential equations, and dynamic programming. Statistics 372 (Topic 7) and Decision Science 372 (Topic 7) may not both be counted.

Topic 8: Time Series Forecasting Models. An applied skills approach to statistical forecasting methods used in business. Topics may include seasonal adjustment of time series; exponential smoothing models; ARCH/GARCH models for varying volatility in financial returns; diffusion models for new product forecasting; Box-Jenkins models; and modeling multiple time series. Each topic is illustrated with real data. Only one of the following may be counted: Statistics 372 (Topic 5), 372 (Topic 8), 372 (Topic 9), Business Analytics 372 (Topic 20), 372 (Topic 21). Additional prerequisite: Statistics 235, 235H, 371G, 371H, 375, or 375H.

Topic 9: Time Series Forecasting. Examine statistical forecasting methods used in business. Discuss Box-Jenkins models; exponential smoothing models; ARCH/GARCH models for varying volatility in financial returns; seasonal adjustment of time series; tests for nonstationarity of time series; and modeling multiple time series. Only one of the following may be counted: Statistics 372 (Topic 5), 372 (Topic 8), 372 (Topic 9), Business Analytics 372 (Topic 20), 372 (Topic 21). Additional prerequisite: Statistics 235, 235H, 371G, 371H or Statistics and Data Sciences 358 or Economics 341K; or other course with basic knowledge about regression.

STA 375. Statistics and Modeling for Finance.

Restricted to students in the McCombs School of Business. Methods used to model and analyze data, especially as applied to problems related to finance. Explores regression models, time-series models, decision analysis and simulation-based methods. Three lecture hours a week for one semester. Only one of the following may be counted: Statistics 371G, 371H, 375, 375H. Prerequisite: Management Information Systems 301, 301H, or 310; Mathematics 408D, 408L, 408M or 408S; Statistics 309 or 309H; and credit or registration for Business Administration 324 or 324H.

STA 375H. Statistics and Modeling for Finance: Honors.

Restricted to students admitted to the McCombs School of Business Honors Program. Methods used to model and analyze data, especially as applied to problems related to finance. Explores regression models, time-series models, decision analysis and simulation-based methods. Three lecture hours a week for one semester. Only one of the following may be counted: Statistics 371G, 371H, 375, 375H. Offered on the letter-grade basis only. Prerequisite: Management Information Systems 301, 301H, or 310; Mathematics 408D, 408L, 408M or 408S; Statistics 309 or 309H; and credit or registration for Business Administration 324H.

STA 376. Intermediate Statistics.

Restricted to students in a business major. Analysis of forecasting techniques and theory; macroeconomic models; long-range and short-term forecasting; forecasting for the firm, using case material. Three lecture hours a week for one semester. Prerequisite: Statistics 301, 301H, 309 or 309H.

Graduate Courses

STA 180, 280, 380. Seminar in Business Statistics.

Selected topics in the applications of statistical methods to business problems. For each semester hour of credit earned, one lecture hour a week for one semester. May be repeated for credit when the topics vary.

Prerequisite: Graduate standing; additional prerequisites vary with the topic.

Topic 1: Correlation and Regression Analysis.

Topic 2: Design of Experiments.

Topic 3: Statistical Computing with SAS.

Topic 4: Nonparametric Methods.

Topic 5: Statistical Consulting. Additional prerequisite: Coursework in mathematical statistics and regression.

Topic 6: Survey Research Methods.

Topic 7: Forecasting. Development of forecasting techniques for use in business applications. Additional prerequisite: Business Administration 386T or the equivalent.

Topic 8: Cybernetics and the Law: Societal, Economic, and Other Problems.

Topic 9: Applied Linear Models. Theory and application of linear models in empirically oriented research in business. Additional prerequisite: Business Administration 386T or the equivalent.

Topic 10: Mathematical Statistics for Applications. Applications-oriented treatment of mathematical statistics for graduate students who plan to use statistical methods in their research but do not need a highly mathematical development of the subject. Major focus on regression models and related methods. Extensive use of statistical software for data analysis and modeling. Emphasis on understanding how the mathematics of probability and statistics both enables and limits the data analysis that can be done. Additional prerequisite: Differential and integral calculus; familiarity with basic statistics through linear regression.

Topic 11: Analysis of Variance. Additional prerequisite: Business Administration 386T or the equivalent.

Topic 12: Applied Multivariate Methods. Additional prerequisite: Business Administration 386T or the equivalent, and familiarity with statistical software.

Topic 13: Statistical Decision Theory. Development of the mathematical basis of statistical decision theory from both the Bayesian and the frequentist point of view. Additional prerequisite: A calculus-level course in statistics.

Topic 14: Risk Analysis and Management. The quantification and analysis of risk, considered from several perspectives: financial risk measures, strategic risk measures, stochastic dominance rules, chance constrained programming, and safety-first approaches.

Topic 15: Research on Probabilistic Judgment. Research training and experience for graduate students and advanced Canfield Business Honors Program undergraduate students who are interested in probabilistic judgment. Additional prerequisite: Statistics 309H or the equivalent and consent of instructor.

Topic 16: Probability and Science in the Courtroom. The role of probability and scientific reasoning in legal judgments: differences between probability evidence and other types of evidence; legal and psychological implications of these differences; the role of statistics, formal analyses, and expert opinions in legal decisions; their impact on judges and jurors. Management Science 380 (Topic 20) and Statistics 380 (Topic 16) may not both be counted.

Topic 17: Predictive Modeling. Introduction to statistical methods for prediction including regression analysis, logistic and multinominal regression, classification and regression trees, bias-variance trade-off, cross validation, variable selection, principal component regression and partial least squares regression. Additional prerequisite: Consent of instructor.

Topic 18: Learning Structures and Time Series. Introduction to exploring data analysis, clustering, dimension reduction, networks, text timing, and time series. Additional prerequisite: Consent of instructor.

STA 280N. Topics in Statistics.

Two lecture hours a week for one semester. May be repeated for credit when the topics vary. Offered on the letter-grade basis only. Prerequisite: Graduate standing.

> **Topic 1: Advanced Statistics and Econometrics with R.** Statistics 280N (Topic 1) and 284N (Topic: Advanced Statistics And Econom) may not both be counted. Offered on the letter-grade basis only.

STA 381. Sampling.

Theory of sampling; sample design, including stratified, systematic, and multistage sampling; nonsampling errors. Three lecture hours a week for one semester. Prerequisite: Graduate standing and Business Administration 386T.

STA 184N, 284N, 384N. Topics in Business Analytics.

Restricted to students admitted to Master's of Science in Information, Risk, and Operations Management program. Selected topics in business analytics. May be repeated for credit when the topics vary. Prerequisite: Graduate standing.

STA 287, 387. Business Analytics and Decision Modeling.

Introduction to some of the basic concepts in quantitative business analysis that are used to support organizational decision making over various time frames. Explores methods that apply to all areas of an organization, with emphasis on financial decision making. For 287, four lecture hours a week for a half a semester; for 387, three lecture hours a week for one semester. Prerequisite: Graduate standing and admission to the McCombs School of Business.

STA 287C. Business Analytics and Decision Modelling for Executives.

Restricted to students in the Executive MBA Program. Examine risky decision-making with an emphasis on case studies that show how Excel models can be used to improve decision-making. Two lecture hours a week for one semester. Offered on the letter-grade basis only. Prerequisite: Graduate standing.

Professional Courses