

STATISTICAL SCIENCE

Degrees in Statistical Science are intended to provide the students with the necessary background into both the theory and application of statistics as it is used in today's society. The major is intended for those students who either want to seek employment with a B.S. degree or continue towards their advanced degrees. The minor will most likely be taken by students who intend to enter graduate school in an area other than statistics.

- Statistics, B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/statistics-bs/>)
- Statistics (Actuarial Science), B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/statistics-actuarial-science-concentration-bs/>)
- Statistics (Sports Analytics), B.S. (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/statistics-sports-analytics-concentration-bs/>)
- Statistics - Secondary Major (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/statistics-secondary-major/>)
- Statistics Minor (<https://catalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/statistics-minor/>)
- Accelerated Bachelor of Science/Master of Science in Statistics (<https://nextcatalog.baylor.edu/undergraduate/college-arts-sciences/academic-departments/statistical-science/joint-statistics-bs-ms/>)

Statistics (STA)

STA 1301 Statistical Reasoning: A Guide to the Unknown (3)

Pre-requisite(s): Freshman standing and consent of statistics undergraduate faculty advisor

Philosophical, ethical, and sociological issues related to statistical uncertainty and randomness.

STA 1380 Elementary Statistics (3)

Introduction to traditional statistical concepts including descriptive statistics, binomial and normal probability models, tests of hypotheses, linear correlation and regression, two-way contingency tables, and one-way analysis of variance. Credit may not be obtained after receiving credit in STA 2381 or 3381.

STA 1V9R Research (3)

Pre-requisite(s): Consent of the instructor

Undergraduate research undertaken with the supervision of a faculty member. May be taken for a maximum of 6 hours.

STA 2300 Introduction to Data Science (3)

Cross-listed as CSI 2300

Principles of data science, including problem workflow, variable types, visualization, modeling, programming, data management and cleaning, reproducibility, and big data.

STA 2381 Introductory Statistical Methods (3)

Pre-requisite(s): A grade of C or above in MTH 1321

Parametric statistical methods. Topics range from descriptive statistics through regression and one-way analysis of variance. Applications are typically from biology and medicine. Computer data analysis is required.

STA 2450 Introduction to Computing for the Mathematical and Statistical Sciences (4)

Computer programming for mathematical scientists with emphasis on designing algorithms, problem solving, and coding practices. Topics include development of programs from specifications; appropriate use of data types; functions; modular program organization; documentation and style; and version control and collaborative programming.

STA 2V9R Research (3)

Pre-requisite(s): Consent of the instructor

Undergraduate research undertaken with the supervision of a faculty member. May be taken for a maximum of 6 hours.

STA 3300 History of Statistics: English Origins (3)

Pre-requisite(s): STA 1380 or STA 2381 or STA 3381 or QBA 2302

Examines historical beginnings of the statistics discipline in England. Considers philosophical tenets from the Bayesian and frequentist perspectives as well as the debates between Fisher and Pearson. Emphasizes significance of such sites as Rothamsted Research Station, Bletchley Park, and the University of Cambridge, all linked to the birthplace of modern statistics.

STA 3310 Sports Analytics I (3)

Pre-requisite(s): STA 3381

Combines classical statistical methods with cutting-edge data science tools to communicate findings and wield influence over decisions within sports organizations. Fosters critical thinking, equipping students with statistical techniques for data analytics, and mastering data visualization to facilitate data-driven choices in sports.

STA 3311 Sports Analytics II (3)

Pre-requisite(s): STA 3310

Delves deeper into sports analytics, emphasizing sophisticated statistical models and data manipulation techniques to refine predictions and strategies in sports settings.

STA 3375 Technologies for Sports Analytics (3)

Pre-requisite(s): STA 2300 and STA 2450

Concepts in big data analytics primarily applied to topics in sports focusing on graphical methods through dashboards and inferential methods.

STA 3381 Probability and Statistics (3)

Pre-requisite(s): A grade of C or above in MTH 1322

Introduction to the fundamentals of probability, random variables, discrete and continuous probability distributions, expectations, sampling distributions, topics of statistical inference such as confidence intervals, tests of hypotheses, and regression.

STA 3386 Regression Analysis (3)

Pre-requisite(s): MTH 2311, MTH 2321, and STA 3381 A development of regression techniques including simple linear regression, multiple regression, logistic regression and Poisson regression with emphasis on model assumptions, parameter estimation, variable selection and diagnostics

STA 3V90 Undergraduate Research in Statistics (1-3)

Pre-requisite(s): Consent of instructor

Independent study or research in topics not available in other courses. Maximum of four hours will count toward the degree.

STA 3V9R Research (3)

Pre-requisite(s): Consent of the instructor

Undergraduate research undertaken with the supervision of a faculty member. May be taken for a maximum of 6 hours.

STA 4301 Introduction to Experimental Design (3)

Examines a variety of complex experimental designs that are available to researchers including split-plot factorial designs, confounded factorial designs, fractional factorial designs, incomplete block designs, and analysis of covariance. The designs are examined within the framework of the general linear model. Extensive use is made of computer software.

STA 4330 SAS Programming for Statistical Science (3)

Pre-requisite(s): STA 2381 or 3381

Concepts in SAS programming including methods to establish and transform SAS data sets, perform statistical analyses, and create general customized reports. Methods from both BASE SAS and SAS SQL will be considered.

STA 4350 Statistical Machine Learning (3)

Pre-requisite(s): STA 3386 Fundamental topics of machine learning including supervised/unsupervised learning, cost function optimization, feature selection and engineering, and bias/variance tradeoff. Learning algorithms including classification methods, support vector machines, decision trees, neural networks, and deep learning are included.

STA 4360 Bayesian Data Analysis (3)

Pre-requisite(s): STA 3381

An introduction to Bayesian inference emphasizing prior and posterior distributions, estimation, prediction, hierarchical Bayesian analysis, and applications with computer implemented data analysis. An introduction to Bayesian inference emphasizing prior and posterior distributions, estimation, prediction, hierarchical Bayesian analysis, and applications with computer implemented data analysis.

STA 4362 Applied Time Series Analysis (3)

Pre-requisite(s): STA 3386

Statistical methods of analyzing time series. Model identification, estimation, forecasting, and spectral analysis will be discussed. Applications in a variety of areas including economics and environmental science will be considered.

STA 4370 Sampling Techniques (3)

Pre-requisite(s): Three hours of statistical methods

Planning, execution, and analysis of sampling from finite populations. Simple random, stratified random, ratio, systematic, cluster, sub sampling, regression estimates, and multi-frame techniques are covered.

STA 4371 Data Management and Mining (3)

Pre-requisite(s): STA 3381

Terminology, techniques, and management of Data Mining for biostatisticians.

STA 4372 Introduction to Biostatistics (3)

Pre-requisite(s): STA 2381 or STA 3381 or consent of the instructor. Data Analysis for biostatisticians in the biomedical and pharmaceutical fields.

STA 4373 Computational Methods in Statistics (3)

Pre-requisite(s): STA 2381 or STA 3381 or consent of the instructor. Computational methods using statistical packages and programming.

STA 4374 Statistical Process Control (3)

Pre-requisite(s): STA 3381 or equivalent

Development of statistical concepts and theory underlying procedures used in statistical process control applications and reliability.

STA 4382 Intermediate Statistical Methods (3)

Pre-requisite(s): A minimum grade of C in either STA 2381 or STA 3381; or consent of instructor

Development and application of two-sample inferences, analysis of variance, multiple comparison procedures, and nonparametric methods.

STA 4384 Applied Multivariate Methods (3)

Pre-requisite(s): STA 3386

Numerical and graphical descriptive statistics for multivariate data, principal components and factor analysis, canonical correlation, discriminant analysis, multivariate analysis of variance, multidimensional contingency tables, and cluster analysis.

STA 4385 Mathematical Statistics I (3)

Pre-requisite(s): MTH 2321 with minimum grade of C

Introductions to the fundamentals of probability theory, random variables and their distributions, expectations, transformations of random variables, moment generating functions, special discrete and continuous distributions, multivariate distributions, order statistics, and sampling distributions.

STA 4386 Mathematical Statistics II (3)

Pre-requisite(s): STA 4385 with minimum grade of C

Theory of statistical estimation and hypothesis testing. Topics include point and interval estimation, properties of estimators, properties of test of hypotheses including most powerful and likelihood ratios tests, and decision theory including Bayes and minimax criteria.

STA 4387 Introduction to Probability Models (3)

Pre-requisite(s): STA 4385 with minimum grade of C

Applications of probability theory to the study of phenomena in such fields as engineering, management science, social and physical sciences, and operations research. Topics include Markov chains, branching processes, Poisson processes, exponential models, and continuous-time Markov chains with applications to queuing systems. Other topics introduced are renewal theory and estimation procedures.

STA 43C8 Capstone in Sports Analytics (3)

Pre-requisite(s): Senior standing and consent of the instructor

Applying statistics data science methodology to research problems in sports analytics.

STA 43C9 Capstone Statistics Course (3)

Pre-requisite(s): Approval of the statistics undergraduate faculty advisor. Statistical concepts applied to written and oral reports for consulting. For students majoring in statistics.

STA 4V90 Special Topics in Statistics (1-3)

Pre-requisite(s): STA 2381 or STA 3381

Topics in probability and/or statistics not covered in other courses. May be repeated for a maximum of 6 hours if the content is different.

STA 4V9R Research (3)

Pre-requisite(s): Consent of the instructor

Undergraduate research undertaken with the supervision of a faculty member. May be taken for a maximum of 6 hours.