STA: STATISTICS

Courses

STA 501. Methodologies in Applied Statistics. 3 Credits.
This course will teach the commonly used statistical techniques that are most likely to be encountered in graduate research. Topics will include t-tests, multiple linear regression, ANOVA, chi-squared tests and power/sample size calculations.
Distance education offering may be available.

STA 502. Introduction to Python for Statistics and Data Science. 1 Credit.
In this course, students will learn to install Python and Jupyter Notebook, basic syntax, data input/output, control flows, data visualization and manipulation, along with basic descriptive statistics and statistical tests. They will also learn how to use some common libraries such as NumPy, Pandas and Maplotlib. This course will focus more on using Python as a tool for Statistics and Data Science rather than the intricacies of using an object-oriented programming language.
Distance education offering may be available.

STA 503. Introduction to R. 1 Credit.
This is an introductory course in R programming. The major topics include setting up Rstudio, R data objects, data input/output, built-in and user-defined R functions, control statement and looping, basic R plot functions, commonly used R libraries, and R markdown.
Distance education offering may be available.

STA 504. Mathematical Statistics I with Calculus Review. 4 Credits.
A rigorous treatment of probability spaces and an introduction to the estimation of parameters. This course will also review relevant calculus topics.
Distance education offering may be available.

STA 505. Mathematical Statistics I. 3 Credits.
A rigorous treatment of probability spaces and an introduction to the estimation of parameters.
Distance education offering may be available.

STA 506. Mathematical Statistics II. 3 Credits.
Continuation of STA 505. Correlation, sampling, tests of significance, analysis of variance, and other topics.
STA 506 Prerequisite: Successful completion of STA 504 or STA 505, with minimum grades of C-.
Distance education offering may be available.

STA 507. Introduction to Categorical Data Analysis. 3 Credits.
Data-driven introduction to statistical techniques for analysis of data arising from medical and public health studies. Contingency tables, logistic regression survival models, non parametric methods and other topics.
STA 507 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C-, or permission of instructor.
Distance education offering may be available.

STA 511. Intro Stat Computing & Data Management. 3 Credits.
This course will give students the ability to effectively manage and manipulate data, conduct statistical analysis and generate reports and graphics, primarily using the SAS Statistical Software package.
Distance education offering may be available.

STA 512. Principles of Experimental Analysis. 4 Credits.
Course provides technology-driven introduction to regression and other common statistical multivariable modeling techniques. Emphasis on interdisciplinary actions.
STA 512 Prerequisite: Successful completion of STA 511, with a minimum grade of C-, or permission of instructor.
Distance education offering may be available.

STA 513. Intermediate Linear Models. 4 Credits.
Rigorous mathematical and computational treatment of linear models.
STA 513 Prerequisite: Successful completion of STA 504 or STA 505; STA 506, STA 511, and STA 512, with minimum grades of C-, or permission of instructor.
Distance education offering may be available.

STA 514. Modern Experimental Design. 3 Credits.
Focusing on recent journal articles, this course will investigate issues associated with design of various studies and experiments. Pharmaceutical clinical trials, case-controlled studies, cohort studies, survey design, bias, causality and other topics.
STA 514 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C-, or permission of instructor.
Distance education offering may be available.

STA 531. Topics In Applied Statistics. 3 Credits.
Contact department for more information about this course.
Repeatable for credit.

STA 532. Survival Analysis. 3 Credits.
This course will provide students with the knowledge and tools to conduct a complete statistical analysis of time to event data. Students will get experience using common methods for survival analysis, including Kaplan-Meier Methods, Life Table Analysis, parametric regression methods, and Cox proportional Hazard Regression. Additional topics include discrete time data, competing risks, and sensitivity analysis.

STA 533. Longitudinal Data Analysis. 3 Credits.
Introduction to the application and theory of models for clustered and longitudinal data. Course will address the analysis for both continous and categorical response data. Course will be held in the statistics lab and use the statistical software package SAS. Other software such as R, HLM, SPSS, MIXORMIXREG may be introduced.
STA 533 Prerequisite: Successful completion of STA 507, STA 511, STA 512, and STA 513, with minimum grades of C-.

STA 534. Time Series. 3 Credits.
Time series analysis deals with the statistical study of random events ordered through time. This class will focus on the characteristics inherent in such processes such as repetitive cycles and deteriorating dependence. Course topics will include seasonal decomposition, exponential smoothing, and ARIMA models. Emphasis will be placed on real life data analysis and statistical communication. Data analysis will be done with a variety of programs such as SAS, R, and Excel.
STA 534 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C-.

STA 535. Multivariate Data Analysis. 3 Credits.
Multivariate data typically consist of many records, each with readings on two or more variables, with or without an "outcome" variable of interest. Procedures covered in this course include multivariate analysis of variance (MANOVA), principal component analysis, factor analysis and classification techniques.

STA 536. Data Mining. 3 Credits.
The purpose of this course is to give you an introduction to many of the modern techniques that are used to analyze a wide array of data sets. We will be applying these methods using the statistical programming language R.

STA 537. Advanced Statistical Programming Using SAS. 3 Credits.
This course will focus on skills and techniques considered essential to advanced SAS programming. The primary topics covered will be SAS SQL and SAS Macro Programming. Other advanced topics such as indices, efficient programming techniques, memory usage,graphics, and using best programming practices will also be covered.
STA 537 Prerequisite: Successful completion of STA 511, with a minimum grade of C-.
Distance education offering may be available.

STA 538. Statistical Programming Using R. 3 Credits.
The statistical programming language R is one of the most popular tools for data analysis. It is freely available to most common operating systems and also an extremely powerful and customizable programming language. This course will focus on performing many rigorous statistical analyses and simulating data in R. Some of the topics include: verifying concepts of statistical inference using simulations, fitting linear models, performing various statistical tests, along with advanced graphics and visualization.

STA 539. Applied Bayesian Methods. 3 Credits.
Review of conditional probability and Bayes' Theorem, conditional distributions and conditional expectations, and likelihood functions; prior and posterior distributions; conjugate priors; credible intervals; Bayes' factors; Bayesian estimation in linear models; predictive analysis; Markov Chain Monte Carlo methods. Use of appropriate technology.
STA 539 Prerequisite: Successful completion of STA 506 and STA 511, with minimum grades of C-.

STA 540. Statistical Consulting. 3 Credits.
This course will discuss the skills needed to be successful in different consulting environments. It will provide detailed instruction on use of communication skills and consulting strategies. Several interactive case studies will be presented. Then, students will be required to work as part of a team on a real consulting project. Students will be involved in a consulting session with clients, research and carry out the data analysis, and present the final results in another consulting meeting. Statistical methods from previous courses may be applied to the data for the projects. In addition, new statistical techniques may be taught as part of the class if the projects require statistical methodologies not introduced in previous classes.
STA 540 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C-.

STA 541. Categorical Data Analysis II. 3 Credits.
This course will extend the information presented in the STA 507 course. We will cover statistical methods for producing Receiver Operating Characteristic Curves and the Optimal operating point from logistic regression. Goodness-of-link and complex modeling issues for count data such as overdispersion and underdispersion will be presented. Students will be exposed to discussion of techniques for both cross-sectional and longitudinal count data. Techniques to assess goodness of fit for count data will be introduced. Students will be exposed to various programming techniques to fit such data within the SAS software using procedures such as PROC GENMOD, PROC COUNTREG, PROC FMM, PROC GLIMMIX, and PROC NLMIXED. Upon completion of this second part of Categorical Data Analysis, students will be comfortable with the analytical techniques for a variety of count outcomes in the real world setting. Proper communication and interpretation of these models is an essential component of the course.
STA 541 Prerequisite: Successful completion of STA 507, with a minimum grades of C-.

STA 542. Statistical Methods for Observational Studies. 3 Credits.
In the assessment of the association between a predictor and a response confounding by another factor might yield wrong answers. One standard technique to protect against confounding is randomization, which is the standard for conducting randomized clinical trials (RCT). In the setting where randomization cannot be applied, such as cohort or case-control studies, the potential for confounding exists; therefore, analytical techniques must be developed to address this potential confounding. These studies where the respective predictor is observed (i.e. gender, case versus control, etc...) rather than randomized (i.e. drug versus placebo, Treatment 1 versus Treatment 2, etc...) are referred to as observational studies. This course will cover statistical methods for the design and analysis of observational studies. Students will be exposed to discussion of differences between experimental, observational, and quasi-experimental studies. Techniques to assess statistical effects while addressing confounding (both measured and unmeasured) and selection bias will be introduced. Various techniques introduced are: propensity scores, inverse probability weighting, instrumental variables, Marginal Structural Models, Structural Nested Mean Models. Students additionally will be introduced to the Rubin Causal Model framework in the assessment of Causal effects.
STA 542 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C-.

STA 543. Statistical Methods in Business and Finance. 3 Credits.
This course will cover the application of statistics to modeling, estimation, inference and forecasting in the business and financial world through real world problems with an emphasis on critical evaluation. It will cover selected topics from econometrics, decision theory, and financial modeling, as well as business optimization and simulation.
STA 543 Prerequisite: Successful completion of STA 504 or STA 505; STA 511, and STA 512, with minimum grades of C-.

STA 544. Applied Marketing Analytics. 3 Credits.
In this course we will learn how to provide in-depth insights about core big data assets commonly used in business analytics, as well as research in pharmaceutical, package goods, and financial industries. Additional topics will include national and customer level data assets, projection methodologies, business analytics techniques, and specific applications of statistical and analytic techniques to the marketing industry.

STA 545. Statistical Design and Analysis of Clinical Trials. 3 Credits.
This course in the statistical design and analysis of clinical trials will focus on the scientific questions each phase of clinical trials (Phase I, Phase II, and Phase III) addresses. For oncology trials, various Phase I designs will be explored, noting the strengths and weaknesses of each design. Group Sequential procedures that specify how interim analyses will be performed in Phase III trials will be explored, together with graphical methods associated with each procedure.
STA 545 Prerequisite: Successful completion of STA 511 and STA 512, with minimum grades of C.

STA 546. Foundations of Bioinformatics. 3 Credits.
Bioinformatics is an interdisciplinary field involving molecular biology, computer science, mathematics, and statistics. Most data sets are very large and so require computationally intensive algorithms. This course intends to introduce students to many areas of biological data, along with algorithms and software to help model biological processes.
STA 546 Prerequisite: Successful completion of STA 512, with a minimum grade of C.

STA 551. Foundations of Data Science. 3 Credits.
This is a data science survey course. The first part of this course will be dedicated to data science foundations. Topics include statistical models, machine learning algorithms, model performance metrics, and major resampling algorithms. The second part will focus on data science processes. Topics include data science project life cycle, model selection, validation, performance evaluation, and data science ethics. The last part of the course will discuss data science infrastructure and pipelines.
STA 551 Prerequisite: Successful completion of STA 503 and STA 506, with minimum grades of C.

STA 552. Applied Statistical Machine Learning. 3 Credits.
This course introduces commonly used models and algorithms in data science fields. Both supervised and unsupervised machine learning algorithms will be discussed. Specific topics will be selected from supervised learning (probabilistic and linear classification, neural networks, tree-based models), unsupervised learning (clustering and feature extraction), and semi-supervised learning algorithms. This course will introduce both theories and applications.
STA 552 Prerequisite: Successful completion of STA 503 and STA 506, with minimum grades of C.

STA 553. Data Visualization. 3 Credits.
This course focuses on the principles of data visualization and addresses questions about what, why, and how to visualize. Topics include visualization design elements such as colors, shapes, and movements, etc.; data exploratory visualization; statistical graphics and model visualization; process visualization; dashboard design; and the ethics of data visualization. The course will also introduce some commonly used visualization tools.
STA 553 Prerequisite: Successful completion of STA 503, with a minimum grade of C.

STA 598. Statistics Transfer Credits (Graduate). 3-9 Credits.
Transfer Credits
Repeatable for credit.

STA 599. Independent Study. 1-3 Credits.
Individual exploration of a topic in statistics.
Repeatable for credit.

STA 601. Internship In Applied Statistics. 1-6 Credits.
In cooperation with a regional industrial company student will perform an internship in applied statistics.
Repeatable for credit.

STA 609. Thesis I. 3-6 Credits.
Preliminary research under the guidance of a mathematics faculty member. Students must present oral preliminary findings before proceeding to STA 610
Repeatable for credit.

STA 610. Thesis II. 3-6 Credits.
Research project under the guidance of the mathematics faculty.
STA 610 Prerequisite: Successful completion of STA 609, with a minimum grade of C-.
Repeatable for credit.