STATISTICS (STA)

College of the Sciences and Mathematics

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.

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. Typically offered in Fall.

STA 505. Mathematical Statistics I. 3 Credits.
A rigorous treatment of probability spaces and an introduction to the estimation of parameters. Typically offered in Fall.

STA 506. Mathematical Statistics II. 3 Credits.
Continuation of STA 505. Correlation, sampling, tests of significance, analysis of variance, and other topics. Pre / Co requisites: STA 506 requires a prerequisite of STA 505 or STA 504. Typically offered in Fall.

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. Pre / Co requisites: STA 507 requires prerequisites of STA 511 and STA 512 or permission of instructor.

STA 510. Statistical Methods for Research. 3 Credits.
This course will provide the tools and methods for designing a research project, conducting the research, managing and manipulating a dataset, and finally analyzing data. This course is for students not enrolled in the Applied Statistics Graduate Degree Program. It requires no prior course in statistics or computer science. Topics covered will include: 1. Research Design 2. Basic Statistics 3. Introductory statistical programming using SAS and Excel 4. Statistical Analysis (including t-tests, linear regression, ANOVA, and chi-squared tests) 5. Writing a final report, including graphics, summarizing the results.

STA 511. Intro Stat Computing & Data Management. 3 Credits.
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. Typically offered in Fall.

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. Pre / Co requisites: STA 512 requires prerequisite: STA 511 or permission of instructor. Typically offered in Spring.

STA 513. Intermediate Linear Models. 4 Credits.
Rigorous mathematical and computational treatment of linear models. Pre / Co requisites: STA 513 requires prerequisites of STA 505 or STA 504, STA 506, STA 511, and STA 512 or permission of instructor.

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. Pre / Co requisites: STA 514 requires prerequisites of STA 511 and STA 512 or consent of instructor.

STA 521. Statistics I. 3 Credits.
For nonmathematics majors. Emphasis on applications to education, psychology, and the sciences. Distributions, measures of central tendency and variability, correlation, regression and hypothesis testing, and other topics.

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 continuous 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. Pre / Co requisites: STA 533 requires prerequisites: STA 511, STA 512, STA 507 and STA 513 or permission of Director of M.S. Applied Statistics.

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 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. Pre / Co requisites: STA 535 requires prerequisite: STA 505, STA 506, STA 511, STA 512.

STA 536. Data Mining. 3 Credits.
LEC (0), LAB (0)
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. Pre / Co requisites: STA 537 requires a prerequisite of STA 511.

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. Typically offered in Fall, Spring & Summer.

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. Pre / Co requisites: STA 539 requires prerequisites of STA 506 and STA 511. Typically offered in Fall, Spring & Summer.

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. Pre / Co requisites: STA 540 requires prerequisites of STA 511 and STA 512. Typically offered in Fall, Spring & Summer.
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.
Pre / Co requisites: STA 541 requires a prerequisite of STA 507.
Typically offered in Fall, Spring & Summer.

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.
Pre / Co requisites: STA 542 requires prerequisites of STA 511 and STA 512.
Typically offered in Fall, Spring & Summer.

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.
Pre / Co requisites: STA 543 requires prerequisites of STA 505 or STA 504; STA 511; STA 512.
Typically offered in Fall, Spring & Summer.

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.
Typically offered in Fall, Spring & Summer.

STA 599. Independent Study. 1-3 Credits.
Individual exploration of a topic in statistics.
Typically offered in Fall, Spring & Summer.
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.
Typically offered in Fall, Spring & Summer.
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.
Typically offered in Fall, Spring & Summer.
Repeatable for Credit.