STATISTICS (STA)

Statistics (STA) Courses

STA 5093. Introduction to Statistical Inference. (3-0) 3 Credit Hours.
Prerequisite: Admission to the Master's program or consent of instructor. Introduction to experiments and sampling; probability, random variables, and distributions; standard discrete and continuous models; sampling distributions; maximum likelihood and moment estimation; confidence intervals and hypothesis tests for one- and two-sample means, proportions, and variances; large sample and bootstrap methods; goodness-of-fit and nonparametric tests. Use of R for simulation and inference. Differential Tuition: $387.

STA 5103. Applied Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or consent of instructor. Simple linear regression, correlation, multiple regression, model selection, one-, and two-way analysis of variance, fixed-, random- and mixed-effects models, multiple comparisons, factorial experiments, and logistic regression. Use of statistical packages such as SAS or R for data analysis. (Same as CE 5043. Credit cannot be earned for both STA 5103 and CE 5043.) Differential Tuition: $387.

STA 5313. Theory of Sample Surveys with Applications. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or consent of instructor. Basic sampling techniques and their comparisons for finite populations. Topics include simple random sampling, stratified sampling, ratio and regression estimates, systematic sampling, cluster sampling, multistage and double sampling, and bootstrap and other sampling plans. Differential Tuition: $387.

STA 5503. Mathematical Statistics I. (3-0) 3 Credit Hours.
Prerequisite: Admission to the Statistics graduate program or consent of instructor. Axioms of probability, counting rules, univariate random variables, multivariate random variables, joint, marginal, and conditional probability distributions, mathematical expectation, variable transformation, moment generating function, commonly used probability distributions, sampling distributions, laws of large numbers and the central limit theorem. Differential Tuition: $387.

STA 5513. Mathematical Statistics II. (3-0) 3 Credit Hours.
Prerequisite: STA 5503 or consent of instructor. Data reduction, sufficient and complete statistics, unbiased estimation, maximum likelihood estimation, method of moments, best unbiased estimator, Fisher information, Cramer-Rao lower bound, hypothesis testing, likelihood ratio test, Neyman-Pearson lemma and uniformly most powerful test, and interval estimation. Differential Tuition: $387.

STA 5973. Directed Research. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. Differential Tuition: $387.

STA 6003. Statistical Methods in Research and Practice. (3-0) 3 Credit Hours.
Prerequisite: One semester of calculus and one statistics course, or consent of instructor. The course includes concepts and knowledge in basic probability, common distributions, point and interval statistical estimation, test of hypothesis, simple and multiple linear regression, and analysis of variance. Course emphasis will be placed on understanding the underlying assumptions and limitations of the different techniques. Statistical software will be used for data analysis. Differential Tuition: $387.

STA 6013. Regression Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Multiple regression analysis, including model adequacy checks, transformations, weighted regression, diagnostics, outlier detection, polynomial regression, indicator variables, multicollinearity, remedial measures, variable selection, model validation, autocorrelation; and specialized regressions including robust regression, nonlinear regression, logistic regression, generalized linear models, and penalized regressions. Differential Tuition: $387.

STA 6033. SAS Programming and Data Management. (3-0) 3 Credit Hours.
Prerequisite: An introductory course in computer programming or consent of instructor. Essential SAS programming concepts with a focus on data management and the preparation of data for statistical analysis: reading raw data from different sources, creating data files in various formats, creating and modifying SAS datasets, SAS libraries, formats, character and numeric functions, combining datasets, summarizing and displaying data, arrays and macros. Efficient programming techniques are stressed. Differential Tuition: $387.

STA 6113. Applied Bayesian Statistics. (3-0) 3 Credit Hours.
Prerequisites: STA 5103 and STA 5513, or consent of instructor. Probability and uncertainty, conditional probability and Bayes' Rule, single parameter and multiple parameter Bayesian analysis, posterior analysis for commonly used distributions, prior distribution elicitation, Bayesian methods in linear models, Bayesian computation including Markov chain Monte Carlo (MCMC) simulation, and applications. Differential Tuition: $387.

STA 6133. Simulation and Statistical Computing. (3-0) 3 Credit Hours.
Prerequisite: STA 5513 or consent of instructor. Random variable generation, accept-reject methods, simulation from multivariate distributions, Markov chain Monte Carlo simulation, numerical quadrature, Monte Carlo integration, importance sampling, Laplace approximation, methods for variance reduction, bootstrap and jackknife, deterministic methods for function optimization, and EM algorithm. Differential Tuition: $387.

STA 6233. R Programming for Data Science. (3-0) 3 Credit Hours.
This course is designed to introduce students to the statistical program R for data analysis and manipulation. Topics include preprocessing/manipulating/combining datasets, summarizing and visualizing data techniques, writing functions, object oriented programming, data simulation and resampling methods, and interfacing R with other programming languages such as SQL, Python, C++, and Hadoop. Techniques for efficient programming will be stressed. The concept of high-performance computing (multi-core/parallel-processing) is also demonstrated. Differential Tuition: $387.

STA 6253. Time Series Analysis and Applications. (3-0) 3 Credit Hours.
Prerequisite: STA 5513 or consent of instructor. Examples and goals of time series analysis, autocovariance function, stationarity, linear processes, autoregressive and moving average (ARMA) processes, spectral analysis, the periodogram, linear filters, regression models with ARMA errors, forecasting in times series models, estimation by maximum likelihood and least squares, diagnostics, model selection, autoregressive integrated moving average (ARIMA) and other nonstationary processes. (Formerly STA 5253. Credit cannot be earned for both STA 6253 and STA 5253.) Differential Tuition: $387.

STA 6413. Nonparametric Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or consent of instructor. Order statistics, test of goodness of fit, rank-order statistics, linear rank statistics for problems involving location and scale, association in multiple classifications, and asymptotic relative efficiency. (Formerly STA 5413. Credit cannot be earned for both STA 5413 and STA 6413.) Differential Tuition: $387.

STA 6443. Statistical Modeling. (3-0) 3 Credit Hours.
Prerequisite: Basic statistics or equivalent. Introduction of basic statistical methods, with specific emphasis on inferential statistics and predictive modeling algorithms . Topics include (i) exploratory data analysis; data visualization, graphical methods, extracting important variables and detecting outliers, (ii) linear models; analysis of variance (ANOVA), linear regression models, and logistic regression models. Students will be provided the opportunity to gain an understanding of when to apply and how to select various predictive modeling algorithms for various types of problems, as well as data assumptions and requirements for algorithm use, proper parameter setting, and interpreting results. Differential Tuition: $387.

STA 6543. Predictive Modeling. (3-0) 3 Credit Hours.
This course presents students with basic understanding of predictive modeling techniques and predictive analytics tools, with specific emphasis on problem-solving with real data using R programming. Topics include data preprocessing, over-fitting and model tuning, supervised learning methods, including linear regression and classification, nonlinear regression and classification models, resampling methods, model regularization, tree and rule-based methods, and support vector machines. Unsupervised learning methods include principal component analysis, clustering methods, and outlier detection. Students will learn how to select various predictive modeling algorithms for a wide variety of applications and how to code the programs in R, as well as assumptions and requirements of predictive modelling, optimal tuning parameter setting, and how to interpret and report the results. Differential Tuition: $387.

STA 6713. Linear Models. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Multivariate normal distribution; distribution of quadratic forms; Gauss Markov Theorem; theory for the full rank and less than full rank models; generalized least squares; estimability and testable hypotheses; general linear hypothesis; linear mixed models and variance components; generalized linear models. (Formerly STA 5713. Credit can be earned for only one of the following: STA 5713, STA 6713, or STA 7723.) Differential Tuition: $387.

STA 6813. Multivariate Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Multivariate normal distribution; estimation of mean vector and covariance matrix; Hotelling's T-squared statistic; principal components, factor analysis, MANOVA, multivariate regression; cluster analysis, discriminant analysis; Wishart distribution; and tests concerning covariance matrices. Use of statistical software such as SAS or R for data analysis. Differential Tuition: $387.

STA 6833. Design and Analysis of Experiments. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Introduction to experimental design and applied data analysis as used in business, technological, and scientific settings. Topics include one-factor and two-factor experiments, randomized block designs, two-level and three-level factorial and fractional factorial designs, nested and split-plot designs, and optimal designs. Use is made of statistical software such as SAS and JMP for data analysis. Differential Tuition: $387.

STA 6843. Computer Aided Optimal Design. (3-0) 3 Credit Hours.
Prerequisite: STA 6833 or equivalent, or consent of instructor. Introduction to obtaining experimental designs and statistical methods for fitting response surfaces, and how to computer-generate the designs and use them in applied settings. Topics discussed include generating designs for obtaining process improvements with steepest ascents and for fitting response surfaces of different shapes, and use of the resultant model diagnostics to find optimum operating conditions. Use is made of JMP and SAS for design generation. Differential Tuition: $387.

STA 6853. Categorical Data Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Types of categorical data, analysis of cross-classified tables, test of independence, measures of association, logit models and analogies with regression, multinomial logit models, log-linear models for two- and multi-dimensional tables, specialized methods for ordinal data, and models for matched pairs data, delta method and large sample tests. Use of statistical packages such as SAS or R for data analysis. Differential Tuition: $387.

STA 6863. Spatial Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or consent of instructor. Problems dealing with spatial statistics, random fields, Gaussian random fields, covariograms and variograms, stationarity and isotropy, covariogram/variogram estimation, spatial prediction (kriging), statistical properties of kriging predictors, cross validation, simulation of random fields, models for lattice/areal data. Differential Tuition: $387.

STA 6903. Survival Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or consent of instructor. This course introduces both parametric and nonparametric methods for analyzing survival data. Topics include Kaplan-Meier estimator, inference based on standard lifetime distributions, regression approach to survival analysis including the Cox proportional hazards model. Emphasis on application and data analysis using SAS or R. (Formerly STA 5903. Credit cannot be earned for both STA 6903 and STA 5903.) Differential Tuition: $387.

STA 6923. Introduction to Statistical Learning. (3-0) 3 Credit Hours.
Prerequisite: One year of calculus and STA 4713, or STA 5103, or consent of instructor. This course provides an introduction to statistical learning and data mining tools in analyzing the vast amounts of data found in business, informatics, cyber security and other industries. The course mostly covers supervised and unsupervised learnings. The topics include concepts in statistical and machine learnings, variance-bias tradeoff, linear regressions with model assessment and regularization, model averaging, resampling tools, tree regressions and classification, discriminant analysis, nearest-neighbor classification, principal components and cluster analysis. Software such as R or Python may be used for data analysis. Differential Tuition: $387.

STA 6933. Advanced Topics in Statistical Learning. (3-0) 3 Credit Hours.
Prerequisite: STA 6013 and STA 6923, or consent of instructor. This course provides deeper understanding in selected statistical learning concepts and tools with mathematical justifications. The topics include linear and nonlinear methods in regression and classification with regularization, additive models with bagging and boosting, random forest, support vector machines, and neural networks. Software such as R or Python may be used for data analysis. Differential Tuition: $387.

STA 6943. Statistics Internship. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing, 15 semester credit hours of graduate work, and consent of instructor. Internship must be approved in advance by the Internship Coordinator and the student's Graduate Advisor of Record. Supervised full- or part-time off-campus work experience and training in statistics. Individual conferences and written reports required. Differential Tuition: $387.

STA 6953. Independent Study. (0-0) 3 Credit Hours.
Prerequisites: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the degree. Differential Tuition: $387.

STA 6961. Comprehensive Examination. (0-0) 1 Credit Hour.
Prerequisite: Approval of the appropriate Graduate Program Committee to take the Comprehensive Examination. Independent study course for the purpose of taking the Comprehensive Examination. May be repeated as many times as approved by the Graduate Program Committee. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). Differential Tuition: $129.

STA 6973. Special Problems. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Problems courses may be repeated for credit when topics vary, but not more than 6 hours, regardless of discipline, will apply to the degree. Differential Tuition: $387.

STA 6983. Master's Thesis. (0-0) 3 Credit Hours.
Prerequisites: Permission from the Graduate Advisor of Record and thesis director. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. Differential Tuition: $387.

STA 6993. Statistical Consulting. (3-0) 3 Credit Hours.
Prerequisites: STA 6033, STA 6233 or equivalents, and background in regression analysis and experimental design. Restricted to students who have completed two semesters in the Master's or Doctoral programs. The principles dealing with the basic art and concepts of consulting in statistics. This course discusses the roles and responsibilities of applied statisticians, relationship between clients and consultants, effective information gathering and report writing. Each student is assigned at least one consulting problem and is required to submit a comprehensive final report. Differential Tuition: $387.

STA 7003. Advanced Statistical Methods. (3-0) 3 Credit Hours.
Prerequisite: One semester of calculus and one statistics course, or consent of instructor. The course provides basic statistical methods to non-Statistics major business doctoral students. The course includes concepts and knowledge in basic probability, common distributions, point and interval statistical estimation, test of hypothesis, simple and multiple linear regression, and analysis of variance. Course emphasis will be placed on understanding the underlying assumptions and limitations of the different techniques. Statistical software will be used for data analysis. Differential Tuition: $387.

STA 7023. Applied Linear Statistical Models. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An in-depth study of regression and analysis of variance models. Topics include multiple regression and model building, multiple and partial correlation, analysis of residuals, analysis of variance, multivariate analysis of variance, analysis of variance as regression analysis, generalized linear model, and applications of statistical models to problems in business. Computer software packages such as SAS or SPSS will be used for data analysis. This course is designed for doctoral students in Business and cannot be applied to a Master of Science degree in Applied Statistics without consent of the instructor and prior approval from the Graduate Advisor of Record. Differential Tuition: $387.

STA 7033. Multivariate Statistical Analysis. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An advanced treatment of multivariate statistical techniques. Topics include multivariate normal distribution, multivariate tests of hypotheses, confidence regions, principal component analysis, factor analysis, discrimination and classification analysis, and clustering. Computer software packages such as SAS or SPSS will be used for data analysis. This course is designed for doctoral students in Business and cannot be applied to a Master of Science degree in Applied Statistics without consent of the instructor and prior approval from the Graduate Advisor of Record. Differential Tuition: $387.

STA 7211. Doctoral Research. (0-0) 1 Credit Hour.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $129.

STA 7212. Doctoral Research. (0-0) 2 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $258.

STA 7213. Doctoral Research. (0-0) 3 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $387.

STA 7214. Doctoral Research. (0-0) 4 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $516.

STA 7216. Doctoral Research. (0-0) 6 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $774.

STA 7311. Doctoral Dissertation. (0-0) 1 Credit Hour.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $129.

STA 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $387.

STA 7314. Doctoral Dissertation. (0-0) 4 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $516.

STA 7316. Doctoral Dissertation. (0-0) 6 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. Differential Tuition: $774.

STA 7503. Advanced Inference I. (3-0) 3 Credit Hours.
Prerequisites: STA 5503 and STA 5513 or equivalent and Doctoral standing. Brief introduction to measure and Lebesgue integration, location-scale families of distributions, exponential families of distributions, sufficiency, completeness, ancillarity, Fisher information, model identifiability, principles of estimation, best unbiased estimation, variance lower bounds, maximum likelihood estimation, and small sample properties of estimators. Differential Tuition: $387.

STA 7513. Advanced Inference II. (3-0) 3 Credit Hours.
Prerequisite: STA 7503. Different forms of stochastic convergence, laws of large numbers, central limit theorems, multivariate delta method, asymptotic properties of maximum likelihood estimators, tests of hypotheses, Neyman-Pearson theory, uniformly most powerful tests, unbiased tests, monotone likelihood ratio families, likelihood ratio tests, Wald and Rao/Score tests, asymptotic properties of tests, tests of linear hypothesis, Bonferroni and Scheffe multiple tests, confidence regions, duality between confidence regions and tests of hypotheses. Differential Tuition: $387.