STATISTICS

Courses

STAT 506 - Introduction to Experimental Design (3 Credits)
Techniques of experimentation based on statistical principles with application to quality improvement and other fields. Full and fractional factorial designs for factors at two levels; dispersion effects; related topics.
Prerequisites: C or higher in MATH 122 or MATH 141; or both MATH 111 or higher and any statistical class.

STAT 509 - Statistics for Engineers (3 Credits)
Basic probability and statistics with applications and examples in engineering. Elementary probability, random variables and their distribution, random processes, statistical inference, linear regression, correlation and basic design of experiments with application to quality assurance, reliability, and life testing. May not be taken concurrently with or after STAT 513, STAT 515, or STAT 516. Not for C.A.S., M.A.S., or Ph.D credit in Statistics.
Prerequisites: MATH 142 or equivalent.

STAT 511 - Probability (3 Credits)
Probability and independence; discrete and continuous random variables; joint, marginal, and conditional densities; moment generating functions; laws of large numbers; binomial, Poisson, gamma, univariate and bivariate normal distributions.
Prerequisites: C or better in MATH 241.

Corequisite: MATH 241.

Cross-listed course: MATH 511

STAT 512 - Mathematical Statistics (3 Credits)
Functions of random variables, order statistics, sampling distributions, central limit theorem, quality of estimators, interval estimation, sufficient statistics, minimum-variance unbiased estimator, maximum likelihood, large-sample theory, introduction to hypothesis testing.
Prerequisites: C or better in STAT 511 or MATH 511.

STAT 513 - Theory of Statistical Inference (3 Credits)
Hypothesis testing, Neyman-Pearson lemma, likelihood ratio tests, power, the theory of linear models including multiple linear regression and ANOVA, the Chi-square goodness-of-fit test, Chi-square inference for contingency tables, Bayesian inference, and advanced topics including survival analysis (only if time permits).
Prerequisites: C or better in STAT 512.

STAT 515 - Statistical Methods I (3 Credits)
Applications and principles of elementary probability, essential discrete and continuous probability distributions, sampling distributions, estimation, and hypothesis testing. Inference for means, variances, proportions, one-way ANOVA, simple linear regression, and contingency tables. Statistical packages such as SAS or R. May not be taken concurrently with or after STAT 509, STAT 513, or STAT 516. Not for CAS, MAS, MS, or PhD credit in Statistics.
Prerequisites: C or higher in MATH 122 or MATH 141; or both MATH 111 or higher and any statistics class.

STAT 516 - Statistical Methods II (3 Credits)
Applications and principles of linear models. Simple and multiple linear regression, analysis of variance for basic designs, multiple comparisons, random effects, and analysis of covariance. Statistical packages such as SAS. Not for CAS, MAS, MS, or PhD credit in Statistics.
Prerequisites: C or higher in STAT 515, STAT 509, STAT 512, or equivalent.

STAT 517 - Advanced Statistical Models (3 Credits)
Theory and applications of advanced statistical models. Includes implementation and assessment of generalized linear, nonlinear and nonparametric regression, mixed effect, repeated measures, multivariate regression, and spatial models.
Prerequisites: STAT 512 or STAT 516 or equivalent.

STAT 518 - Nonparametric Statistical Methods (3 Credits)
Applications and principles of nonparametric statistics. Classical rank-based methods, and selected categorical data analysis and modern nonparametric methods. Statistical packages such as R.

STAT 519 - Sampling (3 Credits)
Techniques of statistical sampling in finite populations with applications in the analysis of sample survey data. Topics include simple random sampling for means and proportions, stratified sampling, cluster sampling, ratio estimates, and two-stage sampling.
Prerequisites: C or higher in STAT 515, STAT 509, STAT 512, or equivalent.

STAT 520 - Forecasting and Time Series (3 Credits)
Time series analysis and forecasting using the multiple regression and Box-Jenkins approaches.
Prerequisites: STAT 516 or MGSC 391.

Cross-listed course: MGSC 520

STAT 521 - Applied Stochastic Processes (3 Credits)
An introduction to stochastic processes, including conditional probability, Markov chains, Poisson processes, and Brownian motion. Incorporates simulation and applications to actuarial science.
Prerequisites: C or higher in STAT 511.

STAT 522 - Financial Mathematics I (3 Credits)
Probability spaces. Random variables. Mean and variance. Geometric Brownian Motion and stock price dynamics. Interest rates and present value analysis. Pricing via arbitrage arguments. Options pricing and the Black-Scholes formula.
Prerequisites: C or better in MATH 241.

Cross-listed course: MATH 514

STAT 523 - Financial Mathematics II (3 Credits)
Convex sets. Separating Hyperplane Theorem. Fundamental Theorem of Asset Pricing. Risk and expected return. Minimum variance portfolios. Capital Asset Pricing Model. Martingales and options pricing. Optimization models and dynamic programming.
Prerequisites: C or better in MATH 514 or STAT 522.

Cross-listed course: MATH 515

STAT 525 - Statistical Quality Control (3 Credits)
Statistical procedures for process control including CUSUM and Shewhart Control Charts, and lot-acceptance sampling.
Prerequisites: STAT 509 or STAT 515 or MGSC 391.

Cross-listed course: MGSC 525

STAT 528 - Environmental Statistics (3 Credits)
Statistical analysis of environmental data. Review of multiple regression and ANOVA, nonlinear regression models and generalized linear models, analyses for temporally and spatially correlated data, and methods of environmental sampling.
Prerequisites: STAT 516.

STAT 530 - Applied Multivariate Statistics and Data Mining (3 Credits)
Introduction to fundamentals of multivariate statistics and data mining. Principal components and factor analysis; multidimensional scaling and cluster analysis; MANOVA and discriminant analysis; decision trees; and support vector machines. Use of appropriate software.
Prerequisites: C or higher in STAT 515, STAT 205, STAT 509, STAT 512, ECON 436, MGSC 391, PSYC 228, or equivalent.

STAT 535 - Introduction to Bayesian Data Analysis (3 Credits)
Principles of Bayesian statistics, including: one- and multi-sample analyses; Bayesian linear models; Monte Carlo approaches; prior elicitation; hypothesis testing and model selection; hierarchical models; selected advanced models; statistical packages such as WinBUGS and R.
Prerequisites: C or higher in STAT 512; or CSCE 582 [=STAT 582]; or both STAT 511 and either STAT 509 or STAT 515; or equivalent.

STAT 540 - Computing in Statistics (3 Credits)
An introduction to statistical packages such as R and SAS with special focus on data management and computing procedures such as Monte Carlo simulation.
Prerequisites: C or higher in STAT 515, STAT 509, STAT 512, or equivalent.

STAT 541 - Advanced SAS Programming (3 Credits)
Advanced programming techniques in SAS, including database management, macro language, and efficient programming practices.
Prerequisites: STAT 540.

STAT 582 - Bayesian Networks and Decision Graphs (3 Credits)
Normative approaches to uncertainty in artificial intelligence. Probabilistic and causal modeling with Bayesian networks and influence diagrams. Applications in decision analysis and support. Algorithms for probability update in graphical models.
Prerequisites: CSCE 350, STAT 509, or STAT 515.

Cross-listed course: CSCE 582

STAT 587 - Big Data Analytics (3 Credits)
Foundational techniques and tools required for data science and big data analytics. Concepts, principles, and techniques applicable to any technology or industry for establishing a baseline that can be enhanced by future study.
Prerequisites: STAT 509, STAT 513, or STAT 515.

Cross-listed course: CSCE 587

STAT 588 - Genomic Data Science (3 Credits)
This course focuses on quantitative knowledge for interdisciplinary applications in genetics as well as hands-on experience in analyzing genetic data. In this course, students will have programming exercises in using analysis tools to conduct genome-wide analysis, annotation, and interpretation of genetic data using R/Bioconductor packages.
Prerequisites: C or better in STAT 201 or higher.

Cross-listed course: BIOL 588

STAT 591 - Data Analysis for Teachers (3 Credits)
Introduction to statistics for elementary, middle, and high school teachers. The fundamentals of data collection, descriptive statistics, probability, and inference with special focus on methods of teaching statistical reasoning. For M.A.T. (excluding mathematics) / M.Ed. / M.T. and nondegree credit only.
Cross-listed course: SMED 591

STAT 599 - Topics in Statistics (1-3 Credits)
Course content varies and will be announced in the schedule of courses by title.

STAT 600 - Statistics for Applied Management (3 Credits)
Introduction to data collection, descriptive statistics, and statistical inference with examples from hospitality, retail, sport, and entertainment management. Focus on selecting, implementing, and interpreting the appropriate statistical methods using software such as Excel and SPSS. Not for minor or degree credit in Mathematics or Statistics. Does not prepare students for STAT 516, STAT 518, STAT 519 or STAT 525.

STAT 650 - AP Statistics for Teachers (3 Credits)
A thorough study of the topics covered on the AP Statistics Examination. A non-calculus-based introduction, including descriptive and inferential one- and two-variable statistics, and emphasizing activities illustrating statistical thinking. Current secondary high school teacher certification in mathematics. For I.M.A./M.A.T. (excluding mathematics)/M.Ed./M.T. and nondegree credit only. Restricted to graduate students.

STAT 700 - Applied Statistics I (3 Credits)
Introduction to probability and the concepts of estimation and hypothesis testing for use in experimental, social, and professional sciences. One and two-sample analyses, nonparametric tests, contingency tables, sample surveys, simple linear regression, various statistical packages. Not to be used for M.S. or Ph.D. credit in statistics or mathematics. Not to be used for M.S. or Ph.D. credit in statistics or mathematics.

STAT 701 - Applied Statistics II (3 Credits)
Continuation of STAT 700. Simple linear regression, correlation, multiple regression, fixed and random effects analysis of variance, analysis of covariance, experimental designs, some multivariate methods, various statistical packages. Not to be used for M.S. or Ph.D. credit in statistics or mathematics.
Prerequisites: STAT 700 or the equivalent.

STAT 702 - Introduction to Statistical Theory I (3 Credits)
Fundamental theory of statistics and how it applies to industrial problems. Topics include probability, random variables and vectors and their distributions, sampling theory, point and interval estimators, and application to the theory of reliability, regression, process control and quality issues. Not to be used for M.S. or Ph.D. credit in statistics.
Prerequisites: MATH 142.

STAT 703 - Introduction to Statistical Theory II (3 Credits)
Continuation of STAT 702. Topics include discussion of theoretical properties of point estimators and tests of hypotheses, elements of statistical tests, the Neyman-Pearson Lemma, UMP tests, likelihood ratio and other types of tests, and Bayes procedures in the decision process. Not to be used for M.S. or Ph.D. credit in statistics.
Prerequisites: STAT 702.

STAT 704 - Data Analysis I (3 Credits)
Primarily for graduate students in statistics and the mathematical sciences. Probability concepts, inferences for normal parameters, regression, correlation, use of computer statistical packages.
Prerequisite or Corequisite: STAT 712.

STAT 705 - Data Analysis II (3 Credits)
Continuation of STAT 704. Analysis of variance (fixed and random effects), analysis of covariance, experimental design, model building, other applied topics, and use of computer statistical packages.
Prerequisites: STAT 704 and STAT 712.

STAT 706 - Experimental Design (3 Credits)
Specialized experimental design: 2n and 3n factorials; fractional replication; confounding; incomplete block designs, including split-plot, split-block, and Latin square designs; general principles of design.
Prerequisites: STAT 701 or STAT 705.

STAT 708 - Environmetrics (3 Credits)
Statistical methods for environmental and ecological sciences, including nonlinear regression, generalized linear models, spatial analyses/kriging, temporal analyses, meta-analysis, quantitative risk assessment.
Prerequisites: STAT 701 or STAT 705 or BIOS 757.

STAT 709 - Environmetrics II (3 Credits)
Theoretical underpinnings of environmetrics. Spatial statistics, temporal and longitudinal analysis, hierarchical modeling, and Bayesian inferences for environmental data.
Prerequisites: STAT 708 or BIOS 808; STAT 714.

STAT 712 - Mathematical Statistics I (3 Credits)
Sample spaces, probability and conditional probability, independence, random variables, expectation, distribution theory, sampling distributions, laws of large numbers and asymptotic theory, order statistics, and estimation.
Prerequisites: advanced calculus.

STAT 713 - Mathematical Statistics II (3 Credits)
Further development of estimation theory and tests of hypotheses, including an introduction to Bayes estimation, sufficiency, minimum variance principles, uniformly most powerful and likelihood ratio tests, and sequential probability ratio tests.
Prerequisites: STAT 712.

STAT 714 - Linear Statistical Models (3 Credits)
A study of the general linear statistical model and the linear hypothesis. Topics include the multivariate normal distribution, distributions of quadratic forms, and parameter estimation and hypothesis testing for full-rank models, regression models, and less than full-rank models.
Prerequisites: STAT 513 and MATH 544 or STAT 712 or equivalent.

STAT 715 - Nonlinear Statistical Models (3 Credits)
Inference for general nonlinear parametric statistical models for univariate and multivariate response; linear and quadratic estimating equations; models for covariance structure; effects of model misspecification and robustness.
Prerequisites: STAT 713, STAT 714.

STAT 716 - Selected Topics in Probability (1-3 Credits)
Special topics in probability theory and stochastic processes not offered in other courses.

STAT 718 - Selected Topics in Statistics (1-3 Credits)
Special topics in statistics not offered in other courses.

STAT 720 - Times Series Analysis (3 Credits)
Stochastic properties, identification, estimation, and forecasting methods for stationary and nonstationary time series models.
Prerequisites: STAT 704 and STAT 512.

STAT 721 - Stochastic Processes (3 Credits)
Theory of stochastic processes, including branching processes, discrete and continuous time Markov chains, renewal theory, point processes, and Brownian motion.
Prerequisites: STAT 711 or STAT 712.

STAT 730 - Multivariate Analysis (3 Credits)
A survey of the theory and applications of the fundamental techniques for analyzing multivariate data.
Prerequisites: STAT 713.

STAT 740 - Statistical Computing (3 Credits)
A survey of current algorithms and software for solving fundamental problems of statistical computing with emphasis on computer generation of random variates.
Prerequisites: STAT 713 and knowledge of a computer programming language.

STAT 750 - Response Surface Methodology (3 Credits)
Methods for fitting (regression) response surfaces and interpreting them subject to random error. Includes designs and industrial process optimization methods.
Prerequisites: STAT 701 or STAT 705.

STAT 761 - Reliability and Life Testing (3 Credits)
The various statistical and probability models in reliability and life testing and inference procedures for such models, including life distributions, parametric and nonparametric inference methods, hazard and failure rate functions, plotting methods, analysis of mixtures, censoring.
Prerequisites: STAT 703 or STAT 713.

STAT 770 - Categorical Data Analysis (3 Credits)
Advanced methods for analysis of discrete data. Higher-order contingency tables, log-linear and other generalized linear models. Multivariate methods for matched pairs and longitudinal data.
Prerequisites: STAT 704 or BIOS 759.

STAT 771 - Applied Longitudinal Data Analysis (3 Credits)
Modern methods for the analysis of repeated measures, correlated outcomes, and longitudinal data, including repeated measures ANOVA, generalized linear models, random effects, and generalized estimating equations.
Prerequisites: BIOS 757 or BIOS 758 or STAT 701 or STAT 705.

Cross-listed course: BIOS 770

STAT 775 - Generalized Linear Models (3 Credits)
Statistical theory and applications extending regression and analysis of variance to non-normal data. Encompasses logistic and other binary regressions, log-linear models, and gamma regression models.
Prerequisites: STAT 713 or STAT 513, and STAT 705 or BIOS 757.

Cross-listed course: BIOS 815

STAT 778 - Item Response Theory (3 Credits)
Statistical models for item response theory, Rasch and other models for binary and polytomous data, and applications. Use of statistical software.
Prerequisites: EDRM 711 or PSYC 710 or STAT 701 or STAT 704.

Cross-listed course: EDRM 828

STAT 790 - Seminar in Statistical Consulting (1 Credit)
An exposure to the techniques of statistical consulting through discussion and analysis of actual statistical problems which occur in fields of application.
Prerequisites: STAT 700 or equivalent.

STAT 791 - Practicum in Statistical Consulting (1 Credit)
Experiences in actual statistical consulting settings; participation and critiques.
Prerequisites: STAT 790.

STAT 798 - Independent Study (1-6 Credits)

STAT 799 - Thesis Preparation (1-9 Credits)
CL: 2020.

STAT 810 - Probability Theory I (3 Credits)
Probability spaces, random variables and distributions, expectations, characteristic functions, laws of large numbers, and the central limit theorem.
Prerequisites: STAT 511, STAT 512, or MATH 703.

Cross-listed course: MATH 710

STAT 811 - Probability Theory II (3 Credits)
More about distributions, limit theorems, Poisson approximations, conditioning, martingales, and random walks.
Cross-listed course: MATH 711

STAT 822 - Advanced Statistical Inference (3 Credits)
The advanced theory of statistical inference, including the general decision problem; Neyman-Pearson theory of testing hypotheses; the monotone likelihood ratio property; unbiasedness, efficiency, and other small sample properties of estimators; asymptotic properties of estimators, especially maximum likelihood estimators; and general sequential procedures.
Prerequisites: STAT 713.

STAT 823 - Large Sample Theory (3 Credits)
Modes of convergence, limit theorems, and the asymptopic properties of estimators and tests.
Prerequisites: STAT 713.

STAT 824 - Nonparametric Inference (3 Credits)
The general theory of nonparametric statistics, including order statistic theory, theory of ranks, U-statistics in nonparametric estimation and testing, linear rank statistics and their application to location and scale problems, goodness-of-fit, and other distribution-free procedures.
Prerequisites: STAT 713.

STAT 890 - Doctoral Seminar (3 Credits)
For doctoral candidates.

STAT 898 - Directed Readings and Research (1-12 Credits)
CL: 2020.

STAT 899 - Dissertation Preparation (1-12 Credits)
For doctoral candidates.