Statistics

**STAT 5191** Statistical Computing Packages (1 semester hour) Introduction to use of major statistical packages such as SAS, BMD, and Minitab. Based primarily on self-study materials. No credit allowed to mathematical sciences majors. Prerequisite: One semester of statistics. (1-0) S

**STAT 5351** Probability and Statistics I (3 semester hours) A mathematical treatment of probability theory. Random variables, distributions, conditioning, expectations, special distributions and the central limit theorem. The theory is illustrated by numerous examples. This is a basic course in probability and uses calculus extensively. Prerequisite: Multivariable calculus (MATH 2451). (3-0) T

**STAT 5352** Probability and Statistics II (3 semester hours) Theory and methods of statistical inference. Sampling, estimation, confidence intervals, hypothesis testing, analysis of variance, and regression with applications. Prerequisite: **STAT 5351**. (3-0) T

**STAT 5390** Topics in Statistics - Level 5 (3 semester hours) May be repeated for credit as topics vary (9 hours maximum). (3-0) R

**STAT 6326** Sampling Theory (3 semester hours) Introduction to survey sampling theory and methods. Topics include simple random, stratified, systematic, cluster, unequal probability, multistage, spatial sampling designs. Estimation of means, proportions, variances, ratios, and other parameters for a finite population, optimal allocation, detectability, multiplicity. Prerequisite: **STAT 5351**. (3-0) T

**STAT 6329** Applied Probability and Stochastic Processes (3 semester hours) Basic random processes used in stochastic modeling, including Poisson, Gaussian, and Markov processes with an introduction to renewal processes and queuing theory. Measure theory not required. Prerequisite: **STAT 5351**. (3-0) T

**STAT 6331** Statistical Inference I (3 semester hours) Introduction to fundamental concepts and methods of statistical modeling and decision making. Basic distribution theory. Decision theory. Exponential families of models. Sufficiency. Estimation and hypothesis testing. Likelihood methods and optimality. Large sample approximations. Prerequisites: **STAT 5352** or equivalent and **MATH 5302** or equivalent. (3-0) Y

**STAT 6332** Statistical Inference II (3 semester hours) Elementary and advanced asymptotic methods, treating sample quantiles, U-statistics, differentiable statistical functions, and influence curves, the MLE, L-statistics, M-statistics, and the bootstrap. Advanced aspects of statistical inference, likelihood-based inference, robust statistics. General forms of Neyman-Pearson Lemma. Metrics on spaces of probability distributions. Prerequisites: **STAT 6331**. Pre-/Co-Requirement: **STAT 6344**. (3-0) T

**STAT 6337** Advanced Statistical Methods I (3 semester hours) Statistical methods most often used in the analysis of data. Study of statistical models, including multiple regression, nonlinear regression, stepwise regression, regression diagnostics, balanced and unbalanced analysis of variance, analysis of covariance and log-linear analysis of multiway contingency tables. Prerequisites: **MATH 2418** and **STAT 5352** or **STAT 6331**. (3-0) T

**STAT 6338** Advanced Statistical Methods II (3 semester hours) This course continues **STAT 6337**. Topics include one way and multiway analysis of variance, fixed, random, and mixed effects models, nested
designs, repeated measures designs, fractional designs, Latin squares, diagnostics, and implementation of statistical methods in SAS. Prerequisite: STAT 6337. (3-0) T

**STAT 6339** Linear Statistical Models (3 semester hours) Vectors of random variables, multivariate normal distribution, quadratic forms. Theoretical treatment of general linear models, including the Gauss-Markov theorem, estimation, hypotheses testing, and polynomial regression. Introduction to the analysis of variance and analysis of covariance. Prerequisites: STAT 6331 and MATH 2418 or equivalent. (3-0) T

**STAT 6341** Numerical Linear Algebra and Statistical Computing (3 semester hours) A study of computational methods used in statistics. Topics to be covered include the simulation of stochastic processes, numerical linear algebra, QR decomposition and least squares regression, SV decomposition and multivariate data, statistical programming languages, and graphical methods. Prerequisite: STAT 5352 or STAT 6337. (3-0) T

**STAT 6343** Experimental Design (3 semester hours) This course focuses on the planning, development, implementation and analysis of data collected under controlled experimental conditions. Repeated measures designs, Graeco-Latin square designs, randomized block designs, balanced incomplete block designs, partially balanced incomplete block designs, fractional replication and confounding. The course requires substantial use of computer facilities. Prerequisite: STAT 6338 or equivalent knowledge of fixed and random effects crossed ANOVA designs. (3-0) T

**STAT 6344** Probability Theory I (3 semester hours) Measure theoretic coverage of probability theory. Topics include: Axioms of probability, Integration; Distributions and moments; Probability Inequalities; Convergence of probability measures; Laws of large numbers; Central limit theorem; Three-series theorem; Zero-one laws; Glivenko-Cantelli theorem; Law of iterated logarithm; Conditional probability and expectation; Introduction to martingales. Prerequisite: MATH 5302 or equivalent. (3-0) T

**STAT 6347** Applied Time Series Analysis (3 semester hours) Methods and theory for the analysis of data collected over time. The course covers techniques commonly used in both the frequency domain (harmonic analysis) and the time domain (autoregressive, moving average models). Prerequisite: STAT 6337 or equivalent. (3-0) T

**STAT 6348** Applied Multivariate Analysis (3 semester hours) Currently used techniques of multivariate analysis. Topics include Hotelling’s T test, the multivariate linear model, principal components analysis, factor analysis, cluster analysis, classification problems, graphics and visualization tools. Emphasis on computations with R or other software. Additional topics may be covered based on current research of the instructor. Prerequisite: STAT 5352 or STAT 6331. (3-0) T

**STAT 6365** Statistical Quality and Process Control (3 semester hours) Statistical methodology of monitoring, testing, and improving the quality of goods and services is developed at the intermediate level. Topics include control charts for variables and attributes, assessment of process stability and capability, construction and interpretation of CUSUM, moving average charts and V-masks, optimal sampling techniques, and evaluation of operating-characteristic curves and average time to detection. Prerequisite: STAT 5351 or equivalent. (3-0) T

**STAT 6390** Topics in Statistics - Level 6 (3 semester hours) May be repeated for credit as topics vary (9 hours maximum). Topics selected from but not limited to choices such as spatial statics, nonparametric curve estimation, functional data analysis, statistical learning and data mining, actuarial science, sampling
theory, statistical quality and process control, sequential analysis, survival analysis, longitudinal data analysis, categorical data analysis, and clinical trials, for example. (3-0) R

**STAT 6v99** Statistical Consulting (1-3 semester hours) Practical experience in collaboration with individuals who are working on problems which are amenable to statistical analysis. Problem formulation, statistical abstraction of the problem, and analysis of the data. Course may be repeated but a maximum of three hours may be counted toward the requirements for the master's degree. Prerequisite: Consent of instructor. ([1-3]-0) T

**STAT 7330** Decision Theory and Bayesian Inference (3 semester hours) Statistical decision theory and Bayesian inference are developed at an intermediate mathematical level. Prerequisites: MATH 5302 or equivalent and **STAT 6331**. (3-0) T

**STAT 7331** Multivariate Analysis (3 semester hours) Vector space foundations and geometric considerations. The multivariate normal distribution: properties, estimation, and hypothesis testing. Multivariate t-test. Classification problems. The Wishart distribution. General linear hypothesis and MANOVA. Principal components, canonical correlations, factor analysis. Multivariate nonparametric and robust methods. Prerequisite: **STAT 6331** or equivalent. (3-0) T


**STAT 7338** Time Series Modeling and Filtering (3 semester hours) Theory of correlated observations observed sequentially in time. Stationary processes, Autocovariance function. ARMA models. Optimal forecasting in time domain and in frequency domain. Spectral representation. Estimation and model selection. Nonstationary time series models. Prerequisite: **STAT 6331**. (3-0) T

**STAT 7345** Advanced Probability and Stochastic Processes (3 semester hours) Taught as a continuation of **STAT 6344**. Martingales, Kolmogorov's existence theorem, random walk, Markov chains, the Poisson process, the general birth and death process, other Markov processes, renewal processes, Brownian motion and diffusion, stationary processes, and the empirical process. Prerequisite: **STAT 6344**. (3-0) T

**STAT 7390** Topics in Statistics - Level 7 (3 semester hours) May be repeated for credit as topics vary (9 hours maximum). Topics selected from but not limited to choices such as spatial statistics, nonparametric curve estimation, functional data analysis, statistical learning and data mining, actuarial science, sampling theory, statistical quality and process control, sequential analysis, survival analysis, longitudinal data analysis, categorical data analysis, and clinical trials, for example. (3-0) R

**STAT 8v02** Individual Instruction in Statistics (1-6 semester hours) May be repeated for credit. ([1-6]-0) S

**STAT 8v03** Advanced Topics in Statistics (1-6 semester hours) May be repeated for credit. ([1-6]-0) R

**STAT 8v07** Research in Statistics (1-9 semester hours) Open to students with advanced standing, subject to approval of the graduate adviser. May be repeated for credit. ([1-9]-0) S
**STAT 8v98** Thesis (3-9 semester hours) May be repeated for credit. ([3-9]-0) S

**STAT 8v99** Dissertation (1-9 semester hours) May be repeated for credit. ([1-9]-0) S