

## Statistics (962)

**472 Regression Analysis (3)** Linear regression and correlation, multiple regression, polynomial regression, selection of variables, use of dummy variables, analysis of residuals. Logistic regression and its applications. Matrix formulation of model. Use of standard computer packages. Major writing requirement.

*(DE) Prerequisite(s): 320.*

**473 Experimental Design and Analysis (3)** Design and analysis of single factor and many-factor studies. Residual analysis and checking assumptions. Transformations. Sample size determination and power analysis. Analysis of variance for complex experiments. Fractional factorial and incomplete block designs. Use of standard computing packages. Major writing requirement.

*(DE) Prerequisite(s): 330.*

### **500 Thesis (1-15)**

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

**502 Registration for Use of Facilities (1-15)** Required for the student not otherwise registered during any semester when student uses university facilities and/or faculty time before degree is completed.

*Grading Restriction: Satisfactory/No Credit grading only.*

*Repeatability: May be repeated.*

*Credit Restriction: May not be used toward degree requirements.*

**531 Survey of Statistical Methods I (3)** Univariate and bivariate data collection and organization, statistical estimation and hypothesis testing; analysis of relationships for categorical and numerical data, including Chi-square tests and simple linear and quadratic regression. Use of computing facilities required.

*Credit Restriction(s): Students may not receive credit for both 531 and 537.*

*(DE) Prerequisite(s): 1 year of college mathematics.*

**532 Survey of Statistical Methods II (3)** Multiple linear regression, including use of dummy variables; single and multiple factor analysis of variance and covariance; issues in experimental design and analysis.

Use of computing facilities required.

*(DE) Prerequisite(s): 531.*

**537 Statistics for Research I (3)** Principles and application of statistical methodology, integrated with considerable use of major statistical computing system. Probability and probability distributions, forming and testing hypotheses using parametric and nonparametric inference methods. Matrix-based simple linear regression and correlation.

*Credit Restriction(s): Students may not receive credit for both 537 and 531.*

*(DE) Prerequisite(s): 1 year of undergraduate mathematics and 1 undergraduate statistics course.*

**538 Statistics for Research II (3)** General linear model as applied to multiple regression and analysis of variance. Diagnostic and influence techniques. One-way, factorial, blocking, and nested designs, preplanned versus post-hoc contrasts. Random factors and repeated measures.  
*(DE) Prerequisite(s): 537 or 532.*

**561 Introduction to Computing for Data Management and Analysis (1)** The University of Tennessee, Knoxville, computing environment for beginning statistics graduate students. Use of operating system commands, system editor, utility programs and SAS statistical package for data entry and editing, file management and statistical analysis. Use of UTCC computing facilities required.  
*(DE) Prerequisite(s): 531 and 537 or 571 or consent of instructor.*

**563 Introduction to Mathematical Statistics (3)** Basic probability models and theory of distributions of random variables.  
*(DE) Prerequisite(s): Mathematics 241.*

**564 Theory of Statistical Inference (3)** Introductory theory underlying common statistical procedures of hypothesis testing and estimation.  
*(DE) Prerequisite(s): 563.*

**566 Statistical Techniques in Industrial Processes (3)** Applications of control charts and other statistical techniques in industrial setting. Attributes and variables control charts, process capability analysis, aspects of sampling, statistical tolerancing, estimation of variance components, problems of measurement, special industrial applications.  
*(DE) Prerequisite(s): 571 or equivalent.*

**567 Analysis of Lifetime Data (3)** Statistical analysis of life data. Methods of analysis for complete and censored data. Life data regression. Analysis of accelerated life tests.  
*(DE) Prerequisite(s): 563 or Mathematics 425.*

**571 Statistical Methods (3)** Data collection strategies. Descriptive statistics. Probability distributions, simulation of random variables, sampling distributions. Estimation and hypothesis testing, regression, Chi-Square test for categorical data, simple design of experiments, nonparametric methods. Use of statistical software.  
*(DE) Prerequisite(s): 1 year of calculus and a statistics course.*

**572 Applied Regression Analysis (3)** Simple linear regression. Matrix approach to multiple linear regression. Partial and sequential sums of squares, interaction and confounding, use of dummy variables, model selection. Leverage, influence and collinearity. Autocorrelated errors. Generalized linear models, maximum likelihood estimation, logistic regression, analysis of deviance. Nonlinear models, inference, ill-conditioning. Robust regression, M-estimators, iteratively reweighted least squares. Nonparametric regression, kernel, splines, testing lack of fit.  
*(DE) Prerequisite(s): 571 and matrix algebra.*

**573 Design of Experiments (3)** One-factor and factorial experiments with quantitative and qualitative factors. Checking assumptions. Emphasis on design principles of randomization, replication, and blocking. Analysis of covariance. Fractional factorials and response surface designs. Nested and split plot designs. Optimal design. Industrial applications emphasized.

*(DE) Corequisite: 572.*

**574 Data Mining Methods and Applications (3)** Understanding and application of data mining methods. Data preparation; exploratory data analysis and visualization; cluster analysis; logistic regression; decision trees; neural networks; association rules; model assessment; and other topics. Applications to real world data. Use of standard computer packages.

*(DE) Prerequisite(s): 532 or 538 or 571 or consent of instructor.*

**575 Applied Time Series (3)** Fundamental concepts of time series analysis: Box-Jenkins approach, stationary and nonstationary models, forecasting model identification, seasonal models, transfer function models, and spectral theory.

*(DE) Prerequisite(s): 538 or 572 or consent of instructor.*

**578 Categorical Data Analysis (3)** Log-linear analysis of multidimensional contingency tables. Logistic regression. Theory, applications, and use of statistical software.

*(DE) Prerequisite(s): 1 year of graduate-level statistics and regression analysis and analysis of variance or consent of instructor.*

**579 Applied Multivariate Methods (3)** Multivariate techniques: Hotellings T-sq. MANOVA, discriminant analysis, canonical correlation, principal component analysis, and factor analysis. Computer oriented approach: analysis and interpretation. Knowledge of basic matrices and SAS essential.

*(DE) Prerequisite(s): 538 or knowledge of regression and analysis of variance.*

**583 Special Topics in Applied Statistics (1-3)**

*Repeatability: May be repeated. Maximum 9 hours.*

**585 Principles of Statistical Process Management (1-3)** Statistical and other techniques applied to management of organizational processes.

*Repeatability: Not repeatable. May be taken once for 1-3 hours.*

*Registration Permission: Consent of department head.*

**587 Graduate Seminar (1)** Directed readings and active participation in colloquium program of Department of Statistics and of student's minor program.

*Grading Restriction: Satisfactory/No Credit grading only.*

*Repeatability: May be repeated. Maximum 2 hours.*

*Registration Permission: Consent of departmental director of graduate studies.*

**592 Internship (1-6)** Supervised off-campus experience in application of statistical principles and methods in business, industry, or government. Written and oral report required.

*Grading Restriction: Satisfactory/No Credit grading only.*

*Repeatability: May be repeated. Maximum 6 hours.*

*(DE) Prerequisite(s): 4 courses in graduate-level statistics or consent of departmental director of graduate studies.*

**593 Independent Study (2-6)** Faculty directed readings and investigation of specified topic in probability or statistics. Written report and oral presentation required.

*Grading: Satisfactory/No Credit or letter grade.*

*Repeatability: May be repeated. Maximum 6 hours.*

*(DE) Prerequisite(s): 2 courses in statistics.*

*Registration Permission: Consent of the departmental director of graduate studies.*

**595 Statistical Consulting Practicum (1-6)** Supervised experience helping on-campus researchers plan, manage data, and develop and perform analyses specific to designs and hypotheses. Discussion of activities in regular seminar meetings. Final written reports and/or detailed diaries required.

*Repeatability: May be repeated. Maximum 6 hours.*

*(DE) Prerequisite(s): 572 or 538.*

**600 Doctoral Research and Dissertation (3-15)**

*Grading Restriction: P/NP only.*

*Repeatability: May be repeated.*

**662 Computational Methods in Statistics (3)** Up-to-date computational methods in statistics: open architecture interactive computational languages supplemented by other statistical packages with graphical capabilities. Statistical computing, numerical methods for linear models and generalized linear models, nonlinear statistical methods, matrix computations and special matrices, essentials of Monte Carlo simulation, and resampling techniques.

*(DE) Prerequisite(s): Knowledge of programming language and 572 or consent of instructor.*

**663 Advanced Statistics Theory I (3)** Univariate models and theory of distributions, general theory of estimation and method of maximum likelihood, sufficient statistics, small and large sample efficiency of estimators, and confidence and tolerance intervals. Context of series of significant problems in applied statistics.

*(DE) Prerequisite(s): 564 and Mathematics 445.*

**664 Advanced Statistics Theory II (3)** Testing statistical hypotheses, Bayesian methods and estimation, linear model theory and model selection.

*(DE) Prerequisite(s): 663.*

**666 Advanced Statistical Process Control (3)** Development of advanced SPC concepts: theory governing properties of Shewhart-type control charts. Comparisons with competing methodologies. Readings and discussion based on current literature.

*(DE) Prerequisite(s): 564 and 566.*

**673 Advanced Topics in Design of Experiments and Linear Models**

**(3)** Experimentation for product and process improvement: response surface methodology and robust design methods; mixture experiments; optimal design topics; distribution theory and inference for linear models.

*(DE) Prerequisite(s): 573 or consent of instructor.*

**674 Advanced Data Mining (3)** Interacting roles of statistical learning and data mining. Statistical data structures, measurement, visualization and exploration. Multidimensional scaling, classification methods, decision trees, neural networks, association rules and market basket analysis. Cluster analysis. Bayesian clustering, evaluation and selection of models and information criterion. Boosting and bagging. Support vector machines, optimization, search methods, and algorithms.

*(DE) Prerequisite(s): 564, 579 and knowledge of programming language or consent of instructor.*

**677 Statistical Modeling (3)** Modern techniques of statistical modeling: predictive, likelihood, Bayesian, and information-based model selection and evaluation paradigms. Application of techniques in various types of models for both continuous and discrete data modeling problems. Interactive computational tools.

*(DE) Prerequisite(s): 564 and 572 or 538 or consent of instructor.*

**679 Multivariate Statistical Modeling (3)** Modern information based techniques and model selection in multivariate analysis, informational tests of significance with multivariate data, multivariate analysis of variance, multivariate regression and variable selection, multisample cluster analysis, common principal component model, factor analysis model, covariance structural models with latent variables, mixture-model cluster analysis.

*(DE) Prerequisite(s): Matrix algebra and 564 or matrix-based linear models with experience in interactive computing or consent of instructor.*

**683 Special Topics in Statistics (1-3)** Presentation of specialized topics in statistics.

*Repeatability: May be repeated. Maximum 6 hours.*

**691 Graduate Seminar in Applied Statistics (3)** Reading of literature and discussion of open problems of importance to industry: design of experiments, modeling, process control, regression, and reliability.

*Grading Restriction: Satisfactory/No Credit or letter grade.*

*Registration Permission: Consent of instructor.*

**693 Independent Study (1-6)** Directed research on subject of mutual interest to student and faculty member.

*Repeatability: May be repeated. Maximum 6 hours.*

**English 462 Writing for Publication (3)** Principles and practices of writing for publication. Dissertations, theses, articles, and reports in science and technology.

*(DE) Prerequisite(s): 360 or consent of instructor.*