STAT - Statistics

STATISTICS Courses

STAT 130M. Elementary Statistics. 3 Credits.
Topics include: data description, elementary probability, binomial and normal distributions, interval estimation, hypothesis testing, and correlation. The role of probability in inference is emphasized. Prerequisites: qualifying score on a placement test administered by the University Testing Center, qualifying SAT or ACT score, a C or better in MATH 101M, or a higher level math course.

STAT 306. Introductory Statistics. 3 Credits.
A general probability and statistics course designed specifically to accommodate the needs of school teachers and health professionals. Topics include: descriptive statistics, basic probability, discrete random variables, continuous random variables, interval estimation, regression and correlation, hypothesis testing, and applications. (May not be used to satisfy the upper-division elective requirement of the math major program.) Prerequisites: A grade of C or better in MATH 102M or MATH 162M.

STAT 310. Introductory Data Analysis. 3 Credits.
Topics include measures of location, dispersion, and strength of relationship; parametric and nonparametric tests of location; one-way analysis of variance; complete block designs; simple and multiple regression; correlation; measures of association for categorical data. Microsoft EXCEL will be used extensively as an aid in data analysis. Written interpretation of results will be a routine component of daily assignments. Prerequisites: A grade of C or better in STAT 130M or MATH 211.

STAT 330. An Introduction to Probability and Statistics. 3 Credits.
Topics include: descriptive statistics, probability theory and probability distributions, mathematical expectation and its role in decision making, hypothesis testing, point and interval estimation, numerous applications. (Not open to students with credit in STAT 331.) Prerequisites: A grade of C or better in MATH 211.

STAT 331. Theory of Probability. 3 Credits.
An introduction to probability theory including probability functions, continuous and discrete random variables, combinatorics, special probability distributions, moment generating functions, and limit laws. Prerequisites: A grade of C or better in MATH 211.

STAT 405/505. Introduction to Data Handling. 3 Credits.
Use of SAS and R to handle data sets. Topics for SAS include data input, creating permanent data sets, merging data sets, creating new variables, sorting, printing, charting, formatting, IML programming, macro programming, and an overview of proc SQL and other statistical procedures. Topics for R include data structure, control structure, writing functions, and graphics. Prerequisites: grade of C or better in STAT 130M or equivalent and a grade of C or better in MATH 316 or equivalent or permission of instructor.

STAT 431/531. Theory of Statistics. 3 Credits.
Topics include point and interval estimation, tests of hypotheses, introduction to linear models, likelihood techniques, and regression and correlation analysis. Prerequisites: A grade of C or better in STAT 331 or departmental permission.

STAT 432/532. Sampling Theory. 3 Credits.
Sampling from finite populations is discussed. Topics such as simple random sampling, stratified random sampling and ratio and regression estimation are included. Also discussed are aspects of systematic sampling, cluster sampling, and multi-stage sampling. Prerequisites: A grade of C or better in STAT 431/STAT 531.

STAT 435/535. Design and Analysis of Experiments. 3 Credits.
Topics include analysis of variance with one or more factors, multiple comparisons, randomized blocks, Latin squares and related designs: multifactor factorial experiments; blocking and confounding in the 2^(k) factorial design; two-level fractional factorial designs. Statistical software will be used to analyze real life data. Prerequisites: A grade of C or better in STAT 405 or STAT 505 and STAT 437 or STAT 537.

STAT 437/537. Applied Regression and Time Series Analysis. 3 Credits.
Topics include theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 330 or STAT 310 or STAT 431/STAT 531. Pre- or corequisites: STAT 405/STAT 505.

STAT 440/540. Clinical Trials. 3 Credits.
An introduction to statistical methods used in the design, conduct, and analysis of clinical trials. Topics include: study designs, treatment allocation, sample size and power, clinical life tables, log rank test, cross-over designs, and sequential methods of monitoring clinical trials. Prerequisites: A grade of C or better in STAT 431/STAT 531.

STAT 442/542. Environmental Statistics. 3 Credits.
Topics include nonlinear and generalized linear models, quantitative risk assessment, analysis of stimulus-response and spatially correlated data, methods of combining data from several independent studies. Regression settings are emphasized where one or more predictor variables are used to make inferences on an outcome variable of interest. Applications include modeling growth inhibition of organisms exposed to environmental toxins, spatial associations of like species, risk estimation, and spatial prediction. SAS is used extensively in the course. Prerequisites: A grade of C or better in STAT 431/STAT 531 or permission of the instructor; STAT 437 or STAT 537 recommended.

STAT 447/547. Analysis of Longitudinal Data. 3 Credits.
Topics include general linear models, weighted least squares (WLS), maximum likelihood (ML), restricted maximum likelihood (REML) methods of estimation, analysis of continuous response repeated measures data, parametric models for covariance structure, generalized estimating equations (GEE) and quasi least squares (QLS), models for discrete longitudinal data: marginal, random effects, and transition models. Limitations of existing approaches will be discussed. Emphasis will be on the application of these tools to data related to the biological and health sciences. Methods will be implemented using statistical software. Prerequisites: A grade of C or better in STAT 431/STAT 531. Pre- or corequisite: STAT 405/STAT 505.

STAT 449/549. Nonparametric Statistics. 3 Credits.
Topics include the theory and applications of binomial tests and rank tests, including the tests of McNemar, Mann-Whitney, Friedman, Kruskal-Wallis, and Smirnov. Prerequisites: A grade of C or better in STAT 330 or STAT 331 or departmental permission.

STAT 450/550. Categorical Data Analysis. 3 Credits.
Topics include relative risk and odds ratio measures for 2 x 2 tables, the chi-square and Mantel-Haenszel tests, Fisher's exact test, analysis of sets of 2 x 2 tables using Cochran-Mantel-Haenszel methodology, analysis of I x J and sets of I x J tables for both nominal and ordinal data, logistic regression including the logit and probit models, and building and applying loglinear models. Emphasis will be on the application of these statistical tools to data related to the health and social sciences. Interpretation of computer output will be stressed. Prerequisites: A grade of C or better in STAT 431/STAT 531. Pre- or corequisite: STAT 405/STAT 505.

STAT 460/560. Statistical Simulation/Programming Using Statistical Software Packages. 3 Credits.
This course is a data-based tour of advanced statistical techniques using software packages, exploring a catalog of data sets (simulated or otherwise) spanning a variety of fields and applications, including data suitable for regression, ANOVA, time series modeling, longitudinal data analysis, and multivariate techniques. Approaches will include parametric, nonparametric, simulation, and bootstrapping. SAS and R (S-plus) will be used extensively, with some other specialized products. For writing actual (not packaged) code, PROC IML and R will be used. This is a finishing course for applied statisticians, highly recommended for students planning a career in statistical programming and simulation. Prerequisites: A grade of C or better in STAT 405/505 and two of STAT 435/STAT 535, STAT 457/STAT 537, STAT 447/STAT 547 and STAT 450/STAT 550.
Prerequisites: A grade of C or better in STAT 431 or STAT 531. Pre- or corequisite: STAT 405 or STAT 505. Methods will be implemented using statistical software. Limitations of existing approaches will be discussed. Emphasis will be on the application of these statistical tools to data related to the health and social sciences. Interpretation of computer output will be stressed. Prerequisites: A grade of C or better in STAT 431 or STAT 531.

Statistical Simulation/Programming Using Statistical Software Packages, 3 Credits.
This course is a data-based tour of advanced statistical techniques using software packages, exploring a catalog of data sets (simulated or otherwise) spanning a variety of fields and applications, including data suitable for regression, ANOVA, time series modeling, longitudinal data analysis and multivariate techniques. Approaches will include parametric, nonparametric, simulation, and bootstrapping. SAS and R (S-plus) will be used extensively, with some other specialized products. For writing actual (not packaged) code, PROC IML and R will be used. This is a finishing course for applied statisticians, highly recommended for students planning a career in statistical programming and simulation. Prerequisites: A grade of C or better in STAT 505 and two of STAT 535, STAT 547 and STAT 550.

Topics in Statistics, 1-3 Credits.
The advanced study of selected topics. Prerequisites: permission of the instructor.

Linear Statistical Models, 3 Credits.
Topics include linear models, likelihood techniques, and regression and correlation analysis. Prerequisites: A grade of C or better in STAT 331 or permission of the instructor.

Environmental Statistics, 3 Credits.
Topics include linear models, likelihood techniques, and regression and correlation analysis. Prerequisites: A grade of C or better in STAT 331 or permission of the instructor.

Applied Regression and Time Series Analysis, 3 Credits.
Topics include least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505 and STAT 437 or STAT 537.

Categorical Data Analysis, 3 Credits.
Topics include the multivariate normal distribution, distributions of quadratic forms, the general linear model, estimability, the Gauss-Markov theorem and general linear hypotheses, analysis of variance (ANOVA) and covariance (ANCOVA) with special attention to unbalanced data, and analysis of mixed effects and variance components models including the logit and probit models, and building and applying loglinear models. Emphasis will be on the application of these statistical tools to data related to the health and social sciences. Interpretation of computer output will be stressed. Prerequisites: A grade of C or better in STAT 431 or STAT 531.

SAS/IML Programming, 3 Credits.
Prerequisites: Permission of the instructor. Topics include the use of the SAS/IML system for mathematical computations and statistical analysis, including the logit and probit models, and building and applying loglinear models. Emphasis will be on the application of these statistical tools to data related to the health and social sciences. Interpretation of computer output will be stressed. Prerequisites: A grade of C or better in STAT 431 or STAT 531.

Topics include the theory and applications of binomial tests and rank tests, including the tests of McNemar, Mann-Whitney, Friedman, Kruskal-Wallis, and Smirnov. Prerequisites: A grade of C or better in STAT 330 or STAT 331 or departmental permission.

Statistical Simulation/Programming Using Statistical Software Packages, 3 Credits.
This course is a data-based tour of advanced statistical techniques using software packages, exploring a catalog of data sets (simulated or otherwise) spanning a variety of fields and applications, including data suitable for regression, ANOVA, time series modeling, longitudinal data analysis and multivariate techniques. Approaches will include parametric, nonparametric, simulation, and bootstrapping. SAS and R (S-plus) will be used extensively, with some other specialized products. For writing actual (not packaged) code, PROC IML and R will be used. This is a finishing course for applied statisticians, highly recommended for students planning a career in statistical programming and simulation. Prerequisites: A grade of C or better in STAT 505 and two of STAT 535, STAT 547 and STAT 550.

STAT 130M - Theory of Statistics
3 Credits
An introduction to the statistical methods used in the design, conduct, and analysis of clinical trials. Topics include: study designs, treatment allocation, sample size and power, clinical life tables, log rank test, cross-over designs, and sequential methods of monitoring clinical trials. Prerequisites: A grade of C or better in STAT 431 or STAT 531.

STAT 131M - Environmental Statistics
3 Credits
Topics include nonlinear and generalized linear models, quantitative risk assessment, analysis of stimulus-response and spatially correlated data, methods of combining data from several independent studies. Regression settings are emphasized where one or more predictor variables are used to make inferences on an outcome variable of interest. Applications include modeling growth inhibition of organisms exposed to environmental toxins, regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 211M - Applied Regression and Time Series Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 212M - Applied Regression and Time Series Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 213M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 214M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 215M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 216M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 217M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 218M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 219M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 220M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 221M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 222M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 223M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 224M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.

STAT 225M - Categorical Data Analysis
3 Credits
Topics include the theory of least squares, simple linear regression, multiple regression and residual analysis. Multicollinearity issues, regression on dummy variables, extensions to dependent errors and introduction to elementary time series, including auto-regressive and moving-average models will also be discussed. Fitting and interpreting the models using SAS and R software for real data is emphasized. Prerequisites: A grade of C or better in STAT 405 or STAT 505.
STAT 628. Applied Multivariate Analysis. 3 Credits.
Topics include the multivariate normal distribution, graphical display of multivariate data and tests for normality, Hotelling’s T2, multivariate analysis of variance (MANOVA) and regression, profile analysis, growth curve models, canonical correlation analysis, principal components, factor models, clustering, and discriminant analysis. All methods are implemented using the SAS statistical software. Prerequisites: STAT 537 or STAT 627 or permission of the instructor.

STAT 630. Time Series Models. 3 Credits.
This course examines the principles and concepts of time series and forecasting. Study includes theory, methods, and model parameter estimation taking into account correlation and autocorrelation structures with data applications from pollution, economics, seasonal trends, and the stock market. Notions of autoregressive, moving, average, stationary and nonstationary ARIMA models will be discussed. The multivariate version and state-space models will also be introduced. Simulation of time series data will be discussed in depth. Prerequisites: STAT 626, STAT 505, and STAT 537.

STAT 632. Master’s Project. 3 Credits.
Under the guidance of a faculty member in the Department of Mathematics and Statistics, the student will undertake a significant data analysis project in a scientific setting outside the department. A written report and/or public presentation of results will be required. Prerequisites: permission of graduate program director.

STAT 635. Statistical Consulting. 3 Credits.
This course is intended to teach statistical consulting techniques to graduate students in statistics. Students are expected to work on statistical consulting problems brought by faculty and graduate students in various fields. Prerequisites: STAT 626.

STAT 640. Survival Analysis. 3 Credits.
Survival time models, clinical life tables, nonparametric methods for estimating survival functions, Cox regression, survival distributions, mathematical and graphical methods for goodness of fit, proportional hazards models, comparison of treatment groups, regression models. Prerequisite: STAT 626.

STAT 667. Cooperative Education. 1-3 Credits.
1-3 credits. Student participation for credit based on academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and the cooperative education program prior to the semester in which the work experience is to take place.

STAT 697. Topics in Statistics. 1-3 Credits.
Advanced study of selected topics. Prerequisites: permission of the instructor.

STAT 727. Advanced Statistical Inference I. 3 Credits.
Topics to be covered include introduction to measure theoretic probability, properties of group and exponential families, sufficiency, unbiasedness, equivariance, properties of estimators, large sample theory, maximum likelihood estimation, EM algorithm, information inequality, asymptotic optimality. Prerequisites: A grade of C+ or higher in MATH 517 and STAT 626.

STAT 728. Advanced Statistical Inference II. 3 Credits.
Topics to be covered include convergence concepts, limit theorems, large sample theory, asymptotic distributions, decision theory, minimax, admissibility, Bayes estimates, generalized Neyman-Pearson Lemma, uniformly most powerful tests, unbiased tests, invariant tests, and Bayesian tests. Prerequisites: A grade of C+ or higher in STAT 727 or STAT 827.

STAT 795. Seminar in Statistics. 1-3 Credits.
1-3 credits. Prerequisite: permission of the instructor.

STAT 797. Topics in Statistics. 1-3 Credits.
Advanced study of selected topics. Prerequisites: Permission of the instructor.