STATISTICS (ST) (ST)

ST 150 Contemporary Math-Stat Seminar 1 cr
This course gives an overview of modern mathematics and statistics from the point of view of the practitioners. The course is designed for majors in mathematics and statistics at all levels as well as those students who are considering mathematics and statistics as a major or minor area of study. Topics usually included are elements of geometry , algebra, analysis, methods of statistical inference, the role of the computer in the analytical sciences; these topics vary from semester to semester. This course cannot be taken for credit simultaneously with MA 150, but may be repeated in different semesters. NOTE: May be offered for Honors Credit.
Cross-Listed: MA 150

ST 210 Stat Reason and Application 3 cr
An introduction to modern statistics designed to provide the student with a solid foundation in statistical concepts, reasoning and applications. Emphasis given to problem identification, methodology selection and interpretation of results. Analysis of data accomplished by extensive use of statistical computer software, thereby minimizing manual computation. Coverage includes descriptive statistics, probability models, estimation, and hypothesis testing. High School level algebra is recommended. Computer Lab fee. NOTE: ST 210 is intended for students in all disciplines except Engineering and Computer Science. Credit for both ST 210 and ST 315 not allowed. May be offered for Honors Credit.

ST 305 Applied Stat Health Sciences 3 cr
An introduction to statistical reasoning and data analysis for the health sciences. Coverage includes descriptive statistics, methods of data collection, estimation, hypothesis testing, non-parametric statistics, ANOVA, repeated measures, correlation and other measures of association, modeling data with linear and logistic regression. Critique of selected research articles and case studies incorporating research and evidence-based practice will be adopted to connect statistics to daily work in healthcare field. Statistical computer software (e.g. Minitab) will be extensively used for data analysis. Computer Lab fee. Note: This course is offered only as a fully online course and only for health sciences students.
Prerequisite: MA 110 Minimum Grade of C or MA 112 Minimum Grade of C

ST 310 Stat Research Techniques 3 cr
This course is a continuation of ST 210. Coverage includes analysis of experimental designs such as completely randomized design, randomized block design, and factorial design using analysis of variance (ANOVA), correlation, simple and multiple regression analysis, model building, nonparametric techniques, contingency table analysis, sampling and survey methods. Time permitting topics such as time series analysis and statistical simulations will be covered. Statistical computer software will be extensively used for data analysis. Computer Lab fee. NOTE: Credit for only ONE course from ST 310, ST 315 and ST 320 is allowed.
Prerequisite: ST 210 Minimum Grade of C

ST 315 Applied Probability-Statistics 3 cr
Concepts of probability theory, discrete and continuous probability distributions including gamma, beta, exponential and Weibull, descriptive statistics, sampling, estimation, confidence intervals, testing of hypothesis, ANOVA and multiple comparisons, linear and multiple regression, correlation, nonparametric analysis, contingency table analysis, computer-assisted data analysis using appropriate statistical software. Computer Lab fee.
Prerequisite: MA 125 Minimum Grade of C

ST 320 Applied Stat Analysis 3 cr
Descriptive statistics, probability distributions, sampling, estimation, confidence intervals and hypothesis testing, experimental designs, ANOVA and multiple comparisons, linear and multiple regression, correlation, nonparametric analysis, goodness of fit, contingency table analysis, quality control, acceptance sampling, computer-assisted data analysis using appropriate statistical software. Computer Lab fee. NOTE: ST 315 and ST 320 are intended for students in Engineering, Computer Science, and Mathematics. ST 315 covers additional probability distributions while ST 320 additionally covers concepts of quality control and acceptance sampling. Students in these disciplines should consult with their academic advisor for appropriate choice between ST 315 and ST 320. Computer Lab fee. NOTE: Credit for only ONE course from ST 310, ST 315, and ST 320 is allowed.
Prerequisite: MA 125 Minimum Grade of D

ST 335 Applied Regression Analysis 3 cr
Simple, polynomial and multiple linear regression; residual and lack-of-fit analysis; simple, multiple, partial and multiple-partial correlation analysis; model building algorithms; dummy variables; analysis of covariance; model comparisons; analysis of experimental designs including messy data; nonlinear regression models; computer-assisted data analysis using appropriate statistical software. Computer Lab fee. NOTE: Satisfies the Technology Proficiency Requirement for Math/Stat majors.
Prerequisite: ST 210 Minimum Grade of C or ST 315 Minimum Grade of C or ST 320 Minimum Grade of C

ST 340 Design-Analysis of Experiments 3 cr
Principles, constructions, and analysis of experimental designs to include completely randomized, randomized complete block, Latin square and split plot designs, factorial experiments, designs with nested and/or crossed factors, multifactor experiments with randomization restrictions, transformations, incomplete block designs, multiple comparisons including contrasts, confounding, fractional replication, computer-assisted data analysis. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of C or ST 310 Minimum Grade of C or ST 315 Minimum Grade of C or ST 320 Minimum Grade of C

ST 345 Sampling-Survey Techniques 3 cr
Sampling concepts and designs for survey investigations; sampling methodologies including applications of simple random, stratified, one-and-two stage cluster, and systematic sampling; sample size determination; ratio and regression estimation; population size estimation; random response modeling; acceptance sampling including applications of single and multiple 2-class attribute sampling plans; computer-assisted data analysis using appropriate statistical software. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of C or ST 310 Minimum Grade of C or ST 315 Minimum Grade of C or ST 320 Minimum Grade of C

ST 350 Applied Time Series Analysis 3 cr
Fundamental concepts; classical regression models as forecasting models, exponential smoothings, stationary and nonstationary models, additive and multiplicative decompositions, moving average, autoregressive, ARMA and ARIMA processes, estimation in MA, AR ARMA, and ARIMA processes. Box-Jenkins methodology, computer aided modeling, applications. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of D or ST 315 Minimum Grade of D or ST 320 Minimum Grade of D or ST 335 Minimum Grade of D

ST 355 Nonparametric Stat Methods 3 cr
Distribution-free analysis of location and scale measures, nonparametric treatment of fundamental statistical designs, nonparametric comparison procedures, association and contingency table analysis, nonparametric goodness-of fit procedures, and tests for randomness, nonparametric regression and other measures of association, computer intensive statistical methods. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of D or ST 315 Minimum Grade of D or ST 320 Minimum Grade of D

ST 415 Stat Qual Control Reliability 3 cr
Probability distributions in quality control, inferences about process quality, control charts for attributes and variables, process capability analysis, economic design of control charts, custom charts, acceptance sampling by attributes and variables, six sigma concepts, reliability concepts, censoring, definitions and properties of survival distributions, methods of estimating and comparing reliability distributions, Kaplan-Meier estimation, burn-in models with a major emphasis on computer-assisted data analysis. Computer Lab fee.

ST 425 Applied Linear Models 3 cr
Some results of matrix algebra, multivariate normal distributions, distributions of quadratic forms, general linear models, design models with one factor and two factors including interaction, component-of-variance models, and computing techniques. Computer Lab fee.
Prerequisite: MA 237 Minimum Grade of D and ST 335 Minimum Grade of D or ST 340 Minimum Grade of D

ST 450 Categorical Data Analysis 3 cr
Analysis of two-way, three-way and higher dimension contingency tables using log-linear models, measures of association for nominal and ordinal tables, multiple-factor models, multiple response models, logistic regression, and weighted least squares. Computer Lab fee.

ST 460 Multivariate Stat Analysis 3 cr
Multivariate normal distribution, sampling distribution, hypothesis testing, principal components and introduction to factor analysis, canonical correlation analysis, discriminant and classification analysis, and MANOVA. Computer Lab fee.

ST 470 Theory of Statistics 3 cr
A comprehensive introduction to the mathematical foundations of statistics. Sufficient statistics and information. Parameter estimation, maximum likelihood and moment estimation, optimality properties of estimators and confidence intervals. Hypothesis testing, likelihood ratio tests and power functions. Credit for both ST 470 and MA 551 is not allowed.
Prerequisite: MA 451 Minimum Grade of D or MA 550 Minimum Grade of D

ST 475 Stat Computing and Graphics 3 cr
Introduction to computer-assisted data analysis with statistical computer software, including SAS, R/S-Plus. Coverage includes basics of SAS, common SAS statistical procedures, high-dimensional data visualization, some elements of statistical computing such as numerical computation, semi-numerical computation, symbolic and graphical computation, and special topics selected by instructor. (Credit for ST 475 and ST 575 is not allowed. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of C or ST 315 Minimum Grade of C or ST 540 Minimum Grade of C
Cross-Listed: ST 575

ST 478 Stat Learning Tech in Data Sci 3 cr
Statistical learning refers to a set of tools for modeling and understanding complex datasets. It is a recently developed area in statistics and blends with parallel developments in computer science and, in particular, machine learning. The purpose of this course is to provide the student with a foundation in modern (non-traditional) statistical learning techniques to deal with small to large complex datasets. Analysis of data is accomplished by extensive use of statistical software thereby minimizing manual computation. Coverage includes introduction to statistical learning, classification or supervised learning methods, resampling methods, linear and non-linear model selection techniques, support vector machines and tree-based methods. Credit for both ST 478 and ST 580 not allowed.
Prerequisite: ST 335 (may be taken concurrently) Minimum Grade of C and CSC 121 (may be taken concurrently) Minimum Grade of C

ST 480 Statistical Practicum - W 1 cr
Relates to the student's classroom studies with actual statistical problems encountered in practice. Working with the departmental statistical consultant, the student will participate in providing statistical assistance to research faculty in applied fields. Computer Lab fee.
Prerequisite: ST 335 Minimum Grade of C and ST 340 Minimum Grade of C)

ST 490 Special Topics 1-3 cr
Selected topics in advanced undergraduate applied statistics This course may be repeated for a maximum of six credits.

ST 494 Directed Studies 1-3 cr
Directed Study. May be repeated for a maximum of six credits.
Prerequisite: Permission of Department Chair.

ST 499 Honor Senior Project - H 3-6 cr
With the guidance and advice of a faculty mentor, Honors Students will identify, and carry out a research project in Statistics. The outcome of the research project will include a formal presentation at the annual Honors Student Colloquium. The senior project will be judged and graded by three members of the faculty, chaired by the faculty mentor.

ST 525 Appl Stat for Clinical Trials 3 cr
This course introduces the fundamental concepts of clinical trials and statistical methods in clinical trials with examples. Topics include clinical trial design and development, randomization, blindness, sample size and power calculation, data collection and management, missing data, survival analysis, association and reproducibility, crossover trials, Bayesian adaptive methods, and others. Most of the statistical methods will be implemented using R. Procedures or subroutines from other statistical software packages, such as SAS and SPSS, will also be introduced as needed.
Prerequisite: ST 210 Minimum Grade of C or ST 305 Minimum Grade of C or ST 315 Minimum Grade of C or ST 540 Minimum Grade of C

ST 540 Stat in Research I 3 cr
A service course for graduate students in disciplines other than mathematics and statistics. A non-calculus exposition in support of application. Coverage includes descriptive statistics, probability and probability distributions, sampling, estimation, tests of significance, analysis of variance, correlation, linear, polynomial, and multiple linear regression including residual and lack of fit analysis, nonparametric procedures, contingency table analysis, and computer-assisted data analysis using appropriate computer software. Computer Lab fee.

ST 545 Stat in Research II 3 cr
Continuation of ST 540. Coverage includes regression analysis through matrices, multiple, partial and multiple-partial correlation analysis, model building algorithms, non-linear regression, analysis of covariance, completely randomized, randomized complete block, and factorial experimentation for equal and unequal cell replication, logistic regression, resampling, basic multivariate techniques, and computer-assisted data analysis. Computer Lab fee.
Prerequisite: ST 540 Minimum Grade of C

ST 550 Environmental Statistics 3 cr
Sampling environmental populations; parametric and nonparametric and estimation; applications of lognormal, Weibull, gamma and beta distributions; locating hot spots; censored data; outlier detection; trend analysis, seasonality; estimation of animal abundance. Computer Lab fee.
Prerequisite: ST 210 Minimum Grade of C or ST 315 Minimum Grade of C or ST 540 Minimum Grade of C

ST 555 Categorical Data 3 cr
Introduction to categorical response data, probability distributions for categorical data, statistical inference for proportions, contingency tables and measures of association, logistic regression, log-linear models for contingency tables, multi-category response models, models for matched pairs categorical response variables. Credit for both ST 450 and ST 555 is not allowed.
Prerequisite: ST 540 Minimum Grade of C or ST 315 Minimum Grade of C or ST 335 Minimum Grade of C
Cross-Listed: ST 450

ST 560 Appl Desgn & Analysis of Exper 3 cr
A software aided introduction to the design and analysis of experiments for univariate and multivariate data. The coverage includes designs such as block designs, factorial designs, repeated measurement designs, hierarchical designs, response surface methods, and Taguchi methods along with various ANOVA techniques for univariate data, ANCOVA for the correlated data, and MANOVA for multivariate data. Analysis of data will be accomplished by extensive use of statistical software. Computer lab fee.
Prerequisite: ST 540 Minimum Grade of B

ST 575 Stat Computing and Graphics 3 cr
Introduction to computer assisted data analysis with statistical computer software, including SAS, R/S-Plus. Coverage includes basics of SAS, common SAS statistical procedures, high-dimensional data visualization, some elements of statistical computing such as numerical computation, semi-numerical computation, symbolic and graphical computation, and special topics selected by instructor. (Credit for both ST 475 and ST 575 is not allowed. Computer Lab fee.
Prerequisite: (ST 540 Minimum Grade of C or ST 315 Minimum Grade of C or ST 210 Minimum Grade of C)
Cross-Listed: ST 475

ST 580 Stat Learning Tech in Data Sc 3 cr
Statistical learning refers to a set of tools for modeling and understanding complex datasets. It is a recently developed area in statistics and blends with parallel developments in computer science and, in particular, machine learning. The purpose of this course is to provide the student with a foundation in modern (non-traditional) statistical learning techniques to deal with small to large complex datasets. Analysis of data is accomplished by extensive use of statistical software thereby minimizing manual computation. Coverage includes introduction to statistical learning, classification or supervised learning methods, resampling methods, linear and non-linear model selection techniques, support vector machines and tree-based methods.
Prerequisite: ST 540 Minimum Grade of C

ST 585 Nonparametric Modeling 3 cr
This course is designed to introduce an alternative set of methodologies to existing and non-existing statistical methods with emphasis on distribution-free and robust procedures. The coverage includes distribution-free analysis of location and scale measures. Nonparametric treatment of fundamental statistical designs, nonparametric multiple comparison procedures, association and contingency table analysis, goodness-of-fit procedures. Nonparametric regression and other measures of association and computer intensive methods. Statistical computer software is intended to enhance the facility with applications of various techniques covered in this course.
Prerequisite: ST 335 Minimum Grade of C and ST 540 Minimum Grade of C

ST 590 Sp Topic: 1-3 cr
Selected topics in advanced applied statistics. This course may be repeated for a maximum of six credits.