STATISTICS (STA)

STA 108 Elementary Introduction to Probability and Statistics 3
Survey of statistics intended for undergraduates in any discipline. Graphical displays, numerical measures, relationships between variables, elements of good data collection. Basic probability, introduction to inferential techniques including confidence intervals and significance testing. Emphasis on statistical literacy.

GE Core: GMT

Notes: May not be taken for credit by students who have received credit for ECO 250 or ECO 350 or who are concurrently enrolled in ECO 250. Students may not earn credit for both RCO 114 and STA 108.

STA 271 Fundamental Concepts of Statistics 3
Survey of basic descriptive and inferential statistics. Graphs and descriptive measures, simple linear regression and correlation, data collection, basic probability and probability models, interval estimation and significance testing, analysis of variance, use of statistical software. An appropriate preparation for more advanced statistics courses in any discipline.

Prerequisites: Minimum grade of C in MAT 115 or MAT 150 or MAT 151 or MAT 190 or MAT 191 or STA 108. or permission of department.

STA 290 Introduction to Probability and Statistical Inference 3
Introduction to probability models and statistical inference. Descriptive statistics, basic probability laws, discrete and continuous probability models, sampling distributions, central limit theorem, estimation, hypothesis testing, simple regression, and correlation.

Prerequisites: Minimum grade of C (2.0) or concurrent registration in MAT 292. or permission of instructor.

STA 301 Statistical Methods 3
Two-group comparisons, simple and multiple regression, one and two factor ANOVA, categorical data analysis, nonparametric methods.

Prerequisites: Minimum grade of C (2.0) in either STA 271 or STA 290. or permission of instructor.

STA 352 Statistical Inference 3
Descriptive and inferential statistics. Emphasis on sampling distributions; theory of estimation and tests of hypotheses, linear hypothesis theory, regression, correlation and analysis of variance.

Prerequisites: Grade of at least C in STA 290 or permission of instructor.

STA 382 Introduction to Sampling Methods 3
Designing survey instruments; estimation of population mean, total, and proportion using simple random, stratified, systematic, and cluster sampling; other sampling techniques such as pps sampling and randomized response methods.

Prerequisites: Minimum grade of C (2.0) in STA 301. or permission of instructor.

STA 475 Ex Cr: Experimental Design 3
STA 481 Introduction to Design of Experiments 3
Planning and analysis of experimental and observational studies. Completely randomized, blocked, split-plot, and repeated measures designs. Factorial arrangements and interaction. Power and sample size calculation.

Prerequisites: Minimum grade of C (2.0) in STA 301. or permission of instructor.

STA 482 Introduction to Time Series Models 3
Estimation/removal of trend and seasonality, introduction to stationary stochastic processes, fitting ARMA/ARIMA models, forecasting techniques, miscellaneous topics, and introduction to a time series modeling software package.

Prerequisites: STA 352 or permission of instructor.

STA 511 Introduction to Probability 3
Events and probabilities (sample spaces), dependent and independent events, random variables and probability distribution, expectation, moment generating functions, multivariate normal distribution, sampling distributions.

Prerequisites: Grade of at least C in STA 290 and MAT 293 or permission of instructor.

STA 552 Introduction to Mathematical Statistics 3
Point estimation, hypothesis testing, confidence intervals, correlation and regression, small sample distributions.

Prerequisites: Grade of at least C in STA 551 or permission of instructor.

STA 562 Statistical Computing 3
Statistical methods requiring significant computing or specialized software. Simulation, randomization, bootstrap, Monte Carlo techniques; numerical optimization. Extensive computer programming involved. This course does not cover the use of statistical software packages.

Prerequisites: Minimum grade of C (2.0) in STA 301. knowledge of a scientific programming language.

STA 565 Analysis of Survival Data 3
Methods for comparing time-to-event data, including parametric and nonparametric procedures for censored or truncated data, regression model diagnostics, group comparisons, and the use of relevant statistical computing packages.

Prerequisites: STA 301 or STA 352. or permission of instructor.

STA 571 Statistical Methods for Research I 3
Introduction to statistical concepts. Basic probability, random variables, the binomial, normal and student's t distributions, hypothesis tests, confidence intervals, chi-square tests, introduction to regression, and analysis of variance.

Notes: Hours do not count toward degree requirements for a mathematics major.

STA 572 Statistical Methods for Research II 3
Statistical methodology in research and use of statistical software. Regression, confidence intervals, hypothesis testing, design and analysis of experiments, one-and two-factor analysis of variance, multiple comparisons, hypothesis tests.

Prerequisites: STA 571 or permission of instructor.

STA 573 Theory of Linear Regression 3
Linear regression, least squares, inference, hypothesis testing, matrix approach to multiple regression. Estimation, Gauss-Markov Theorem, confidence bounds, model testing, analysis of residuals, polynomial regression, indicator variables.

Prerequisites: Grade of at least C in STA 352 and MAT 310, or STA 662, or permission of instructor.

STA 574 Theory of the Analysis of Variance 3
Multivariate normal distribution, one-way analysis of variance, balanced and unbalanced two-way analysis of variance, empty cells, multiple comparisons, special designs, selected topics from random effects models.

Prerequisites: Grade of at least C in STA 573 or permission of instructor.
STA 575 Nonparametric Statistics 3
Introduction to nonparametric statistical methods for the analysis of qualitative and rank data. Binomial test, sign test, tests based on ranks, nonparametric analysis of variance, nonparametric correlation and measures of association.
**Prerequisites:** Grade of at least C in STA 352 or STA 662. or permission of instructor.

STA 580 Biostatistical Methods 3
Statistical methods for biological research including: descriptive statistics; probability distributions; parametric and nonparametric tests; ANOVA; regression; correlation; contingency table analysis.
**Prerequisites:** Grade of at least C in STA 271 or STA 290 or permission of instructor.

STA 581 SAS System for Statistical Analysis 1
Creating, importing, and working with SAS data sets. Using SAS procedures for elementary statistical analysis, graphical displays, and report generation.
**Prerequisites:** STA 271 or STA 290 or similar introductory statistics course.

STA 589 Experimental Course 3
This number reserved for experimental courses. Refer to the Course Schedule for current offerings.

STA 591 Actuarial Exam Preparation Seminar 1
Topics vary according to interest and demand. Intended to help prepare for the P/1, FM/2, or MLC exam.
**Prerequisites:** STA 551 or STA 687 or permission of instructor.
**Notes:** One credit maximum. May be repeated; Grade: Pass/Not Pass (P/ NP).

STA 593 Directed Study in Statistics 1-3

STA 594 Directed Study in Statistics 1-3

STA 651 Mathematical Statistics 3
**Prerequisites:** STA 352 and either MAT 394 or MAT 395 or MAT 595.

STA 652 Mathematical Statistics 3
**Prerequisites:** STA 352 and either MAT 394 or MAT 395 or MAT 595.

STA 655 Applied Probability Models 3
An introduction to Markov chains, Poisson processes, renewal processes, Brownian motion, and survival models. Examples drawn from applied field such as engineering, management, finance, and sciences.
**Prerequisites:** STA 551, or permission of instructor.

STA 661 Advanced Statistics in the Behavioral and Biological Sciences I 3
Statistical techniques and design considerations for controlled experiments and observational studies. Exploratory data analysis, elementary probability theory, principles of statistical inference, contingency tables, one-way ANOVA, bivariate regression and correlation.
**Prerequisites:** STA 271 or an equivalent introductory statistics course.

STA 661L Adv Stat Lab I Beh-Bio Sci 1

STA 662 Advanced Statistics in the Behavioral and Biological Sciences II 3
Continuation of STA 661. Multiple regression and correlation, analysis of covariance, factorial ANOVAs, randomized block designs, multiple comparisons, split-plot designs, repeated measures.
**Prerequisites:** STA 661 or permission of instructor.

STA 662L Adv Stat Lab II Beh-Bio Sci 1

STA 667 Statistical Consulting 1
Statistical consultation on a doctoral or master's research. Access to the Statistical Consulting Center. Students are required to attend the initial class meeting during the beginning of the semester.
**Prerequisites:** Permission of instructor.
**Notes:** Credit is not applicable to a graduate plan of study. Grade: Satisfactory/Unsatisfactory (S/U).

STA 668 Consulting Experience 1
Development of consulting skills through reading and discussion of literature on statistical consulting and participation in statistical consulting sessions.
**Prerequisites:** STA 662 or permission of instructor.
**Notes:** Grade: Satisfactory/Unsatisfactory (S/U).

STA 670 Categorical Data Analysis 3
Methods for analyzing dichotomous, multinomial and ordinal responses. Measures of association; inference for proportions and contingency tables; generalized linear models including logistic regression and loglinear models.
**Prerequisites:** STA 662 or permission of instructor.

STA 671 Multivariate Analysis 3
Multivariate normal distribution. Cluster analysis, discriminant analysis, canonical correlation, principal component analysis, factor analysis, multivariate analysis of variance. Use and interpretation of relevant statistical software.
**Prerequisites:** STA 573 or STA 662 or permission of instructor.

STA 672 Applied Statistical Computing 3
Limitations and advantages of statistical packages (SAS, SPSSX, BMDP Minitab). Evaluation in terms of statistical methods, utility, availability, sophistication, data base manipulation, and programming capabilities. Applications from various disciplines.
**Prerequisites:** STA 572 or STA 662.

STA 673 Statistical Linear Models I 3
Abstract vector spaces, inner product spaces, projections, the Spectral Theorem, least squares, multiple regression, ANOVA, multiple comparisons, data analysis.
**Prerequisites:** STA 352 and MAT 310 or permission of instructor.

STA 674 Statistical Linear Models II 3
Abstract vector spaces, inner product spaces, projections, the Spectral Theorem, least squares, multiple regression, ANOVA, multiple comparisons, data analysis.
**Prerequisites:** STA 352 and MAT 310 or permission of instructor.

STA 675 Advanced Experimental Design 3
Topics include factorials and fractional factorials, incomplete block designs, split-plot and repeated measures, random and mixed effects models, crossover designs, response surface designs, power analysis.
**Prerequisites:** STA 662 or permission of instructor.
STA 676 Sample Survey Methods 3
Survey methods for students from any discipline. Random, stratified, cluster, multi-stage and other sampling schemes. Estimation of population means, variances, and proportions. Questionnaire design and analysis.
Prerequisites: STA 352 or STA 572 or STA 662 or permission of instructor.

STA 677 Advanced Topics in Data Analysis and Quantitative Methods 3
Topics vary according to interest and demand. Quantitative methods not normally covered in detail in other statistics courses. Topics may be selected from psychometrics, econometrics, biometrics, sociometrics, quantitative epidemiology.
Prerequisites: STA 662.

STA 678 Theory of Time Series 3
Examples of time series; objectives in time series modeling; theory and applications of linear and non-linear time series models; ARMA/ARIMA/ARCH/GARCH models; time series modeling using computer packages.
Prerequisites: STA 551 or STA 651, or permission of instructor.

STA 682 Actuarial Models I 3
Actuarial models for life contingencies; single and multiple lives models, present values, premium, reserves, pension plans, and retirement benefits. Intended for the MLC actuarial exam.
Prerequisites: STA 551 and MAT 586, or consent of instructor.

STA 683 Actuarial Models II 3
Actuarial models for life contingencies; single and multiple lives models, present values, premium, reserves, pension plans and retirement benefits. Intended for the MLC actuarial exam.
Prerequisites: STA 686, or consent of instructor.

STA 690 Graduate Seminar 1
Development of presentation skills through reading, discussions, and presentation of current research topics in applied statistics.
Prerequisites: STA 662 or permission of instructor.
Notes: Grade: Satisfactory/Unsatisfactory (S/U).

STA 698 Project in Statistics 3
Directed research project in statistics.
Prerequisites: Permission of instructor.
Notes: Grade: Satisfactory/Unsatisfactory (S/U).

STA 699 Thesis 1-6

STA 701 Seminar in Computational Statistics 3
Readings from the literature in Computational Statistics.
Prerequisites: Either STA 651, and STA 652, or STA 676; or permission of instructor;
Notes: May be repeated up to 9 hours as topics vary.

STA 703 Topics in High Dimensional Data Analysis 3
Advanced study in special topics in statistical data analysis with large scale data sets. The course may be repeated up to 9 hours as topics vary.
Prerequisites: STA 562, STA 673, or permission of instructor.
Corequisites: STA 674.

STA 709 Topics in Computational Statistics 3
Advanced study in special topics in Computational Statistics.
Prerequisites: STA 552 or STA 652 or permission of instructor.
Notes: May be repeated for credit.

STA 801 Thesis Extension 1-3

STA 803 Research Extension 1-3