3470:550 Probability (3 Credits)
Prerequisite: Appropriate background is one semester of calculus or equivalent. Elementary combinatorial probability theory, mathematical expectation, functions of random variables, sampling distributions, and simple linear regression and correlation. May not be used to meet graduate major requirements in statistics.

3470:551 Theoretical Statistics I (3 Credits)
Sequential. Prerequisite: Appropriate background is three semesters of calculus or equivalent. Basic concepts of statistical inference, estimation, hypothesis testing, sequential tests, and experimental designs. May not be used to meet graduate major requirements in statistics.

3470:552 Theoretical Statistics II (3 Credits)
Sequential. Prerequisite: Appropriate background is three semesters of calculus or equivalent. Advanced topics in statistical inference, including nonparametric methods, efficient procedures in estimation, and regression models. May not be used to meet graduate major requirements in statistics.

3470:561 Applied Statistics (4 Credits)
Prerequisite: Appropriate background is two semesters of calculus or equivalent. Application of statistical techniques to the solution of scientific and engineering problems, including probability distributions, confidence intervals, hypothesis testing, and simple linear regression and correlation. May not be used to meet graduate major requirements in statistics.

3470:562 Applied Regression and ANOVA (4 Credits)
Prerequisite: Appropriate background is one semester of applied statistics or equivalent. Applications of the techniques of regression and analysis of variance. May not be used to meet graduate major requirements in statistics.

3470:565 Design of Sample Surveys (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Design and analysis of frequently used sample survey techniques.

3470:569 Reliability Models (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Selected topics in reliability modeling including parametric and nonparametric models, competing models of failure, censored data, and accelerated life models.

3470:570 Biostatistics and Epidemiology (3 Credits)
Prerequisite: Appropriate background in one semester of applied statistics or equivalent. Biostatistics and epidemiological methods for biological and medical studies, including ANOVA, analysis of repeated measures, disease-related measures, log-linear models, and clinical trials.

3470:571 Introduction to Actuarial Science (3 Credits)
(Appropriate background is two semesters of calculus.) Interest theory and financial mathematics used in actuarial science. Topics include the time value of money, annuities, loans, bonds, cash flows and immunizations, and interest rate swaps.

3470:572 Actuarial Models (3 Credits)
(Appropriate background is a course in theoretical statistics) Study of severity, frequency and aggregate models used in actuarial applications. Calibration and evaluation, credibility procedures, fundamental principles of pricing in short-term insurance coverage.

3470:573 Survival Analysis (3 Credits)
Prerequisite: Applied Statistics (3470:461 or 3470:561) or equivalent. Basic concepts in survival analysis, censoring and data truncation, estimation of survival models, nonparametric hazard and survival function estimation, competing survival times between groups.

3470:575 Foundations of Statistical Quality Control (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Course provides a solid foundation in the theory and applications of statistical techniques widely used in industry.

3470:576 Bayesian Statistics (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent). Basic concepts in Bayesian theory, sampling methods, MCMC, hierarchical modeling. Computer applications of Bayesian statistics to natural and physical sciences and engineering.

3470:577 Time Series Analysis (3 Credits)
Prerequisite: Appropriate background is one semester of probability, or one semester of theoretical statistics, or one semester of applied statistics or equivalent or permission. Stationarity. ARIMA modeling with seasonality. Parameter estimation, model, diagnostics and forecasting. Regression with autocorrelated errors. Cointegration and multivariate ARMA models. Heteroscedasticity and long-memory models.

3470:580 Statistical Data Management (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Students learn data organization and structures, design of statistical databases, statistical software analysis, importing and exporting of data between software, and missing data analysis.

3470:583 Advanced Statistical Computing (3 Credits)
Prerequisite: Appropriate background is one semester of applied statistics or equivalent. Topics include data management, random number generation, resampling methods, numerical optimization, Markov Chain Monte Carlo, smoothing methods, data mining: clustering and classification.

3470:584 Introduction to Machine Learning (3 Credits)

3470:585 Applied Analytics-Decision Trees (3 Credits)
Prerequisite: 3470:561. Selected topics in predictive modeling using CHAID, Classification and Regression Trees, Logistic Regression and Neural Networks.

3470:586 Spatial-temporal Statistics (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent). Basic concepts of geostatistics, point pattern, area unit. Spatial-temporal modeling in high dimensional data. Computer applications to natural and physical sciences and engineering.

3470:589 Topics in Statistics (1-3 Credits)
(May be repeated for a total of six credits) Prerequisite: permission. Selected topics in advanced statistics, including quality control, reliability, sampling techniques, decision theory, advanced inference, stochastic processes and others.
3470:591 Workshop in Statistics (1-3 Credits)
(May be repeated with change of topic) Group studies of special topics in statistics. May not be used to meet undergraduate or graduate major requirements in mathematics and statistics. May be used for elective credit only.

3470:595 Statistical Consulting (1-3 Credits)
Prerequisite: 3470:580 or permission. Students will be assigned to work with an instructor on current projects in the Center for Statistical Consulting. May be repeated for a total of 4 credits; however, only 2 credits will count toward major requirements. Does not count for elective credit for math science department majors.

3470:550 Advanced Probability & Stochastic Processes (3 Credits)
Prerequisite: 3470:651. Random walk, distributions, unlimited sequence of trials, laws of large numbers, convolutions, branching processes, renewal theory, Markov chains, time-dependent stochastic processes.

3470:551 Probability & Statistics (4 Credits)
(Appropriate background is three semesters of Calculus or equivalent.) Probability, random variables, moments and generating functions, random vectors, special distributions, limit theorems, sampling, point estimation, hypothesis testing, confidence estimation.

3470:552 Advanced Mathematical Statistics (3 Credits)
Prerequisite: 3470:651. Convergence of random variables, the Central Limit Theorem; theory of estimation; theory of hypothesis testing; the multivariate normal density; introduction to linear models; Bayesian statistics.

3470:555 Linear Models (3 Credits)
(Appropriate background is Linear Algebra or 3470:651 or equivalent.) General linear model in matrix notation, general linear hypothesis, regression models, experimental design models, analysis of variance and covariance, variance components.

3470:561 Statistics for the Life Sciences (3 Credits)
Prerequisite: college level algebra or equivalent. Data description and presentation, probability applications in the life sciences (including sensitivity, specificity, relative risk), principles and application of statistical inference, ANOVA, correlation and regression. May not be used to meet graduate major requirements in statistics.

3470:563 Experimental Design (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Selected topics in experimental design including random and fixed effects, nested designs, split plot designs, confounding, fractional factorials, Latin squares, and analysis of covariance.

3470:565 Regression (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Correlation, simple and multiple linear regression: least squares, matrix notation, model building and checking estimation, hypothesis testing, outliers, influence, multicollinearity, transformations, categorical regressors; logistic regression.

3470:566 Nonparametric Statistics - Methods (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Theory and practice using techniques requiring less restrictive assumptions. Nonparametric analogues to t- and F-tests, ANOVA, regression and correlation. Computer applications.

3470:567 Factor Analysis (3 Credits)
(Appropriate background is one semester of applied statistics or equivalent.) Theory and techniques for identifying variables through use of principal components and factor analysis. Identification of groups using cluster analysis. Computer applications.

3470:655 Linear Models (3 Credits)
(Appropriate background is 3470:651 or equivalent.) Limit Theorem; theory of estimation; theory of hypothesis testing; the multivariate normal density; introduction to linear models; Bayesian statistics.

3470:652 Advanced Mathematical Statistics (3 Credits)
Prerequisite: 3470:651. Random walk, distributions, unlimited sequence of trials, laws of large numbers, convolutions, branching processes, renewal theory, Markov chains, time-dependent stochastic processes.

3470:651 Probability & Statistics (4 Credits)
(Appropriate background is three semesters of Calculus or equivalent.) Probability, random variables, moments and generating functions, random vectors, special distributions, limit theorems, sampling, point estimation, hypothesis testing, confidence estimation.

3470:650 Advanced Probability & Stochastic Processes (3 Credits)
Prerequisite: 3470:651. Random walk, distributions, unlimited sequence of trials, laws of large numbers, convolutions, branching processes, renewal theory, Markov chains, time-dependent stochastic processes.

3470:654 Advanced Linear Models (3 Credits)
(Appropriate background is Linear Algebra or 3470:651 or equivalent.) General linear model in matrix notation, general linear hypothesis, regression models, experimental design models, analysis of variance and covariance, variance components.

3470:657 Nonparametric Statistics - Theory (3 Credits)
Selected topics in statistics including concepts in order, statistics, sensitivity, specificity, relative risk), principles and application of statistical inference, ANOVA, correlation and regression. May not be used to meet graduate major requirements in statistics.

3470:658 Multivariate Statistical Methods (3 Credits)
(Appropriate background is two semesters of applied statistics or equivalent.) Multivariate techniques including distance concept, Hotelling T2, multivariate ANOVA, regression and correlation, linear contrasts, factorial experiments, nested and repeat measure designs, Bonferroni X2 tests, linear discrimination analysis, canonical correlations, application.

3470:670 Advanced Biostatistics (3 Credits)
Prerequisite: 3470:570. Statistical issues and methods for biological, medical and health sciences including: clinical trials, sample size, power, log-linear models, survival analysis, and bioassay. Computer applications.

3470:675 Response Surface Methodology (3 Credits)
(3470:670 Advanced Biostatistics is a prerequisite.) First and second order response designs, efficient experimental plans, methods for the analysis, and optimization of response functions.

3470:676 Survey Sampling (3 Credits)
Selected topics in sampling techniques, estimation, variance components.

3470:679 Regression (3 Credits)
Prerequisite: 3470:651. Simple and multiple linear regression; least squares, matrix notation, model building and checking estimation, hypothesis testing, outliers, influence, multicollinearity, transformations, categorical regressors; logistic regression.

3470:681 Analysis of Variance (3 Credits)
Prerequisite: 3470:651. Random walk, distributions, unlimited sequence of trials, laws of large numbers, convolutions, branching processes, renewal theory, Markov chains, time-dependent stochastic processes.

3470:682 Regression Analysis (3 Credits)
Prerequisite: 3470:651. Simple and multiple linear regression; least squares, matrix notation, model building and checking estimation, hypothesis testing, outliers, influence, multicollinearity, transformations, categorical regressors; logistic regression.

3470:683 Multivariate Analysis (3 Credits)
Selected topics in statistics including concepts in order, statistics, sensitivity, specificity, relative risk), principles and application of statistical inference, ANOVA, correlation and regression. May not be used to meet graduate major requirements in statistics.

3470:684 Advanced Biostatistics (3 Credits)
Prerequisite: 3470:570. Statistical issues and methods for biological, medical and health sciences including: clinical trials, sample size, power, log-linear models, survival analysis, and bioassay. Computer applications.

3470:685 Advanced Topics in Statistics (1-3 Credits)
(May be repeated for a total of six credits) Prerequisite: 3470:651. Selected topics in statistics including concepts in order, statistics, advanced inference, sequential analysis, stochastic processes, reliability theory, Bayesian statistics and regression.

3470:686 Statistical Consulting (1-3 Credits)
Prerequisite: 3470:580 or permission. Students will be assigned to work with an instructor on current projects in the Center for Statistical Consulting. May be repeated for a total of 4 credits; however, only 2 credits will count toward major requirements. Does not count for elective credit for math science department majors.

3470:687 Individual Reading: Statistics (1-3 Credits)
Prerequisite: permission of the academic adviser and the department chair. Directed studies in statistics. May not be used to meet graduate major requirements. Credit/non-credit.

3470:688 Multivariate Statistical Methods (3 Credits)
(Appropriate background is two semesters of applied statistics or equivalent.) Multivariate techniques including distance concept, Hotelling T2, multivariate ANOVA, regression and correlation, linear contrasts, factorial experiments, nested and repeat measure designs, Bonferroni X2 tests, linear discrimination analysis, canonical correlations, application.

3470:689 Advanced Topics in Statistics (1-3 Credits)
(May be repeated for a total of six credits) Prerequisite: 3470:651. Selected topics in statistics including concepts in order, statistics, advanced inference, sequential analysis, stochastic processes, reliability theory, Bayesian statistics and regression.

3470:692 Statistics Masters Paper (1-3 Credits)
Prerequisite: permission of advisor. Supervised writing of paper for Masters of Science in Statistics Nonthesis Option. No more than 2 credits apply to major requirements.

3470:695 Practicum in Statistics & Mathematics (1-3 Credits)
Prerequisite: graduate teaching assistant or permission. Training and experience in college teaching of statistics. May not be used to meet degree requirements. Credit/non-credit.

3470:696 Master's Research (1-6 Credits)
(May be repeated) Prerequisite: permission of advisor. Research in suitable topics in statistics culminating in a research paper. No more than 2 credits applicable to major requirements.

3470:697 Individual Reading: Statistics (1-3 Credits)
Prerequisites: graduate standing and permission of the graduate academic adviser and the department chair. Directed studies in statistics under the guidance of a selected faculty member. (May be repeated for a total of four credits)

3470:698 Master's Thesis (1-6 Credits)
(May be repeated) Prerequisite: permission of advisor. Research in suitable topics in statistics culminating in a research paper. No more than 2 credits applicable to major requirements.

3470:699 Master's Thesis (2 Credits)
(May be repeated for a total of 4 credits) Prerequisite: Permission. Properly qualified candidates for master's degree may obtain 2-4 credits for research experience which culminates in presentation of Ph.D. supervised thesis.