STT 315. Introduction to Probability and Statistics
Spring. 3(3-0) P: MTH 120 or MTH 132 or MTH 152H or LBS 118. R: Open only to students with credit in STT 200 or STT 315 or STT 421. A first course in probability and statistics primarily for business majors. Not open to students with credit in STT 234. Probability models and random variables, estimation, tests of hypotheses, confidence intervals, and elementary tests of hypotheses. Linear models, multiple regression, ANOVA. R: Open only to business majors.

SA: STT 331

316. Introduction to Probability and Statistics for Business
Fall, Spring, Summer. 3(3-0) P: MTH 120 or MTH 132. Not open to students with credit in STT 315. A first course in probability and statistics primarily for business majors. Data analysis, probability models, random variables, confidence intervals, and tests of hypotheses with business applications.

SA: STT 331

317. Quantitative Business Research Methods
Fall, Spring, Summer. 3(3-1) Interdepartmental with Marketing and Supply Chain Management. Administered by Marketing and Supply Chain Management. P: STT 315. R: Open only to juniors or seniors. Application of statistical techniques, including forecasting, to business decision making. Includes applications of linear regression and correlation, analysis of variance, selected non-parametric tests, time series, and index numbers. SA: ML 317, MTA 317
465. Statistical Methods for Biologists II
Spring. 3(3-0) Interdepartmental with Animal Science; and Crop and Soil Sciences. P: STT 464.
Concepts of reducing experimental error: covariance, complete and incomplete block designs, Latin squares, split plots, repeated-measures designs, regression applications, and response surface designs.

471. Statistics for Quality and Productivity
Fall of even years. 3(3-0) P: STT 351 or STT 422 or STT 442. Scientific context of quality: Box, Deming, Taguchi. Graphical techniques, control charts. Design of experiments: factorials and fractional factorials, confounding and aliasing. Engineering parameter design through experimentation.

481. Issues in Statistical Practice
Spring. (1-0) R: Open only to seniors in Statistics. Completion of Tier I writing requirement. Selected readings and projects illustrating special problems encountered by professional statisticians in their roles as consultants, educators, and analysts.

490. Directed Study of Statistical Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course. R: Open only to juniors and seniors in Mathematics or Statistics. Approval of department.
Individualized study of selected topics.

801. Design of Experiments
Fall of odd years. 3(3-0) P: STT 422 or STT 442 or STT 453 or STT 471. Blocking and randomization. Split-plot, Latin square and factorial designs. Fractional factorial designs, aliasing and confounding of effects. Mixture and central composite designs and response surface exploration. Clinical trials.

820. Econometrics I
Spring. 3(3-0) Interdepartmental with Economics; and Agricultural Economics. Administered by Economics; P: EC 501, STT 430. The single equation regression model. Properties of least-squares estimators under various specifications. Multicollinearity, generalized least-squares, errors in variables, seemingly unrelated regressions. Identification and estimation in simultaneous equations models.

821. Econometrics II
Fall. 3(3-0) Interdepartmental with Economics; and Agricultural Economics. Administered by Economics; P: EC 820, STT 442. Estimation and hypothesis testing. Asymptotic properties of optimization estimators. Analysis of cross-sectional economic data. Qualitative and limited dependent variables. Probit, logit, tobit, and sample selectivity. Duration models. Count data.

822. Econometrics III
Spring. 3(3-0) Interdepartmental with Economics; and Agricultural Economics. Administered by Economics; P: EC 820, STT 442. Dynamic models and time series data. ARMA models, ARCH models. Unit roots, cointegration and error correction. Rational expectations models.

825. Sample Surveys
Fall. 3(3-0) P: STT 422 or STT 442 or STT 862. Application of statistical sampling theory to survey designs. Simple random, stratified, and systematic samples. Sub-sampling, double sampling. Ratio and regression estimators.

826. Nonparametric Statistics
Fall. 3(3-0) P: STT 442 or STT 862. Statistical methods based on counts, ranks, order statistics and permutations of observations. Point and interval estimates, tolerance sets, and tests valid under broad distributional assumptions. Applications to social and natural sciences.

841. Linear Statistical Models
Fall. 3(3-0) P: STT 442 or STT 862. Theory and applications of statistical models with linear parameters. Curve fitting, simple and multiple regression, multiple and partial correlation. Analysis of variance, simultaneous inference, experimental design.

842. Categorical Data Analysis
Spring of odd years. 3(3-0) P: STT 442 or STT 862. Analysis of categorical and ordinal data: contingency tables; chi square tests; exact tests; log-linear models; measures of association; logistic regression; generalized linear models.

843. Multivariate Analysis
Spring of even years. 3(3-0) P: STT 442 or STT 862. Multivariate normal distribution, tests of hypotheses on means, multivariate analysis of variance. Discriminant analysis. Principal components. Factor analysis. Analysis of frequency data.

844. Time Series Analysis

852. Stochastic Methods in Operations Research
Spring of even years. 3(3-0) P: STT 441 or STT 861. Optimization techniques related to queuing, inventory, and Markov decision models. Simulation, reliability, and decision analysis.

861. Theory of Probability and Statistics I
Fall. 3(3-0) P: MTH 320 or concurrently. Discrete and continuous random variables and vectors. Important probability models. Inequalities and limit laws. Sampling distributions and functions of random vectors. Statistical inference.

862. Theory of Probability and Statistics II
Spring. 3(3-0) P: MTH 314, MTH 421 or concurrently; STT 861. Statistical inference: sufficiency, likelihood estimation, and tests of hypotheses in parametric and nonparametric cases. Linear models, goodness of fit, and other topics.

871. Theory of Statistics I
Fall. 3(3-0) P: MTH 320 or concurrently, STT 881 or concurrently. Empirical distributions, quantiles, Glivenko-Cantelli Theorem. Important distributions and families. Convergences, Slutsky Theorem, asymptotics of differentiable functions. Basic concepts of decision theory. Confidence sets. Some basic statistical methods.

872. Theory of Statistics II
Spring. 3(3-0) P: STT 871; STT 882 or concurrently. Theory of Neyman Pearson tests and extensions. Convex loss estimation, best unbiased estimates, sufficient statistics, information lower bounds. Extensive application to linear models. LAN families and applications to estimation and tests.

881. Theory of Probability I

882. Theory of Probability II
Spring. 3(3-0) P: STT 441 or STT 861. Conditional expectation, martingales, stationary processes. Brownian motion, convergence in distribution, and the invariance principle.

886. Stochastic Processes and Applications
Fall. 3(3-0) P: STT 441 or STT 861. Finite and countable state Markov chains. Classification of states. Recurrence, branching, birth-death, Poisson and continuous time Markov processes.

887. Applications of Probability
Spring. 3(3-0) P: STT 441. Introduction to Markov chains, renewal theorem and queuing theory. Brownian motion, stochastic integrals and Itô's lemma. Applications to finance, computer science, engineering and economics.

890. Statistical Problems
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Approval of department. Individualized study on selected problems.

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Approval of department.

951. Sequential Analysis and Renewal Theory
Fall of even years. 3(3-0) P: STT 872. Sequential estimation, testing and design. Optimal stopping. Linear and nonlinear renewal theory.

952. Topics in Advanced Inference
Spring of odd years. 3(3-0) P: STT 872. Topics selected from: decision theory; James-Stein, shrinkage, Bayes, and empirical Bayes estimation; invariance; bootstrap methodology; inference on stochastic processes; stochastic approximation; survival analysis and reliability.
953. Asymptotic Theory  
Fall of odd years. 3(3-0) P: STT 872.  
Large sample behavior of likelihood function.  
Local Asymptotic Normality models. Contiguity.  
Bahadur and Pitman efficiency of statistical procedures.

954. Semi-Nonparametric Inference  
Spring of even years. 3(3-0) P: STT 872.  

956. Convergence of Measures and Stochastic Processes  
Fall of even years. 3(3-0) P: STT 882.  

960. Stationary and Second Order Processes  
Spring of odd years. 3(3-0) P: STT 882.  
Stationary, second order, and Gaussian processes. Sample path properties. Linear and nonlinear prediction and estimation. Applications.

963. Martingales  
Fall of odd years. 3(3-0) P: STT 882.  
Discrete and continuous time martingales, convergence theorems, Doob-Meyer decomposition. Applications.

964. Stochastic Analysis  
Spring of even years. 3(3-0) P: STT 882.  

990. Problems in Statistics and Probability  
Fall, Spring. Summer. 1 to 3 credits.  
A student may earn a maximum of 6 credits in all enrollments for this course. P: STT 872. R: Approval of department.  
Individual study on an advanced topic in statistics or probability.

995. Topics in Statistics and Probability  
Fall, Spring. Summer. 1 to 3 credits.  
A student may earn a maximum of 24 credits in all enrollments for this course. P: STT 882. R: Approval of department.  
Nonparametric statistics, multivariate analysis, time series analysis, Bayesian statistics, reliability theory, stochastic approximation, design of experiments, sets of decision problems, stochastic processes, or sequential analysis.

999. Doctoral Dissertation Research  
Fall, Spring. Summer. 1 to 24 credits.  
A student may earn a maximum of 48 credits in all enrollments for this course. R: Approval of department.

STUDIO ART—Descriptions of Courses

110. Drawing I  
Fall, Spring. 3(0-6) P: STA 110  
Fundamental concepts of drawing. Emphasis on observational, descriptive and analytical drawing. Practice of drawing skills using common drawing media.

111. Drawing II  
Fall, Spring. 3(0-6) P: STA 110  
Development of imagery and expression; abstraction and the use of the human figure as subject matter.

113. Color and Design  
Fall, Spring. 3(0-6) P: STA 110  
Basic elements of two-dimensional design. Principles of organization and the theory and practice of color as a basis for creative solutions for the problems of the artist and designer.

114. Three-Dimensional Form  
Fall, Spring. 3(0-6) P: STA 110  
Formal elements of three-dimensional form. Application of the principles of organization as a means for producing creative solutions for the artist and designer. Related practical experience with a variety of materials and processes.

300. Intermediate Drawing  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Observational and imaginative drawing including the human figure. Non-representational drawing. Contemporary drawing systems, concepts, and processes.

320. Painting I  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Representational painting of landscape, figure, and still life imagery. Painting concepts, materials, and techniques.

325. Painting II  
Fall, Spring. 3(0-6) P: STA 320  
Continuation of representational painting, and introduction to non-representational painting and concepts.

340. Ceramics I  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Ceramic processes including handbuilding, glaze formulation, and kiln firing as a means of cultural expression.

345. Ceramics II  
Fall, Spring. 3(0-6) P: STA 340  
Continued development of ceramic forming and kiln firing techniques including handbuilding, glaze formulation, mold making, casting, and wheel throwing for cultural and artistic expression.

350. Figure Modeling  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Modeling human and natural forms. The figure as a means of artistic and cultural expression.

351. Mixed Media and Installation  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Exploration of artistic expression using mixed media and assemblage techniques. Installation techniques.

354. Casting  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Casting concepts and techniques as a means of artistic and cultural expression.

355. Construction and Fabrication  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Sculptural concepts using methods of construction and fabrication as an approach to artistic and cultural expression.

360. Graphic Design  
Fall, Spring. 3(0-6) P: STA 111 and STA 113 and STA 114  
Graphic signs and symbols used in visual communication. Application of design principles to experimental and practical problem solving.

370. Photography  
Fall, Spring. 4(2-4) P: STA 111 and STA 113 and STA 114  
History and basic technology of black and white photography, integrative camerawork, and darkroom processing. Issues in photographic aesthetics. Students furnish camera and all materials.

400. Advanced Drawing  
Fall, Spring. 4(0-8) P: STA 300  
Drawing with an emphasis on a wide range of current drawing concepts, materials, and techniques. Advanced non-representational drawing. Application to individual thematic development.

420. Painting  
Fall, Spring. 4(0-8) P: STA 300  
A student may earn a maximum of 20 credits in all enrollments for this course. P: STA 325  
Advanced applications of painting concepts, styles and techniques. Consideration of the language of contemporary painting.

430. Relief Printing  
Fall, Spring. 4(0-8) P: STA 300  
History and practice of relief prints including additive methods, linocut and woodcut for artistic and cultural expression.

431. Screen Printing  
Fall, Spring. 4(0-8) P: STA 300  
A student may earn a maximum of 20 credits in all enrollments for this course. P: STA 300 or STA 320  
Screen printing as a fine art print medium. Theory and practice of relief prints including additive methods, linocut and woodcut for artistic and expressive imagery.

432. Lithography  
Fall, Spring. 4(0-8) P: STA 300  
A student may earn a maximum of 20 credits in all enrollments for this course. P: STA 300 or STA 320  
Lithographic process as an artistic medium. Techniques of the medium. Preparing the plate or stone, printing, and using tusche, wash and rubbing as a means to creative imagery.