

491. Special Topics in Spanish

Fall, Spring. 3(3-0)

R: Approval of department.

Special topics supplementing regular course offerings, proposed by faculty on a group study basis.

800. Current Approaches to Spanish Instruction

Fall. 3(3-0)

Theoretical and applied study of methodologies of teaching Spanish.

805. Evolution of the Spanish Language

Spring of odd-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Phonology, morphology and syntax of Spanish from its origins to the present.

806. Topics in Hispanic Linguistics

Spring of even-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Issues in Spanish language treated in light of current linguistic inquiry. Topics vary.

807. Topics in Hispanic Culture

Spring of odd-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Topics such as the Enlightenment, Post-Francoist film, and pre-Columbian cultures.

810. Studies in Medieval Spanish Literature

Spring of even-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Works, genres, and writers of the Spanish Middle Ages. Topics vary.

815. Studies in Golden Age Literature

Fall of even-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Poetry, drama, and prose of 16th and 17th century Spain. Topics vary.

820. Cervantes

Fall of odd-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Critical study of "Don Quijote," "Novelas Ejemplares," or other works.

825. Studies in 18th and 19th Century Spanish Literature

Spring of odd-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Literature from post-Baroque Spain to the Generation of 1898. Topics vary.

830. Studies in 20th-Century Spanish Literature

Fall of odd-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Authors, generations, and tendencies that shape the directions of Spanish literature in the 20th Century. Topics vary.

835. Spanish-American Literature before Modernismo

Spring of even-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Major authors and movements from the colonial period to Modernismo. Topics vary.

840. Contemporary Spanish-American Literature

Fall of even-numbered years. 3(3-0) A student may earn a maximum of 9 credits in all enrollments for this course.

Poetry, drama, prose, fiction, and essay from Modernismo to the present. Topics vary.

890. Independent Study

Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 9 credits in all enrollments for this course.

R: Approval of department.

Special projects, directed reading, and research arranged by an individual graduate student and a faculty member in areas supplementing regular course offerings.

891. Special Topics in Spanish

Fall, Spring, Summer. 3(3-0) A student may earn a maximum of 6 credits in all enrollments for this course.

R: Approval of department.

Special topics supplementing regular course offerings proposed by faculty on a group study basis for graduate students.

999. Doctoral Dissertation Research

Fall, Spring, Summer. 1 to 24 credits. A student may earn a maximum of 24 credits in all enrollments for this course.

R: Approval of department.

STATISTICS AND PROBABILITY

STT

Department of Statistics and Probability
College of Natural Science**200. Statistical Methods**

Fall, Spring, Summer. 3(4-0)

P: MTH 103 or designated score on mathematics placement test. R: Not open to students with credit in STT 201 or STT 315 or STT 421.

Data analysis, probability models, random variables, estimation, tests of hypotheses, confidence intervals, and simple linear regression.

201. Statistical Methods

Fall, Spring, Summer. 4(3-2)

P: MTH 103 or designated score on mathematics placement test. R: Not open to students with credit in STT 200 or STT 315 or STT 421.

Probability and statistics with computer applications. Data analysis, probability models, random variables, tests of hypotheses, confidence intervals, simple linear regression. Weekly lab using statistical software.

231. Statistics for Scientists

Fall, Spring. 3(3-0)

P: MTH 120 or MTH 124 or MTH 132 or MTH 152H or LBS 118. R: Open only to students in College of Natural Science.

Calculus based course in probability and statistics. Probability models, random variables. Estimation, confidence intervals, tests of hypotheses, simple linear regression with applications in sciences.

SA: STT 331

315. Introduction to Probability and Statistics for Business

Fall, Spring, Summer. 3(4-0)

P: MTH 120 or MTH 124 or MTH 132. R: Not open to students with credit in STT 200 or STT 201 or STT 421.

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.

317. Quantitative Business Research Methods

Fall, Spring, Summer. 3(3-1) Interdepartmental with Marketing and Logistics. Administered by Marketing and Logistics.

P: STT 315. R: Open only to juniors and seniors in College of Business.

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.

351. Probability and Statistics for Engineers

Fall, Spring, Summer. 3(3-0)

P: MTH 234. R: Open only to juniors and seniors. No open to students with credit in STT 430.

Calculus based course in probability and statistics for engineers. Probability models and random variables. Estimation, confidence intervals, tests of hypotheses simple linear regression. Other topics with applications to engineering.

421. Statistics I

Fall, Spring, Summer. 3(3-0)

P: MTH 103 or MTH 110 or MTH 116. R: Not open to students with credit in STT 200 or STT 201 or STT 315

Basic probability, random variables, and common distributions. Estimation and tests for one-, two-, and paired sample problems. Introduction to simple linear regression and correlation, 1-way ANOVA.

422. Statistics II

Fall, Spring, Summer. 3(3-0)

P: STT 421. R: Not open to students with credit in STT 464.

Goodness of fit and other non-parametric methods. Linear models including multiple regression and ANOVA for simple experimental designs.

430. Introduction to Probability and Statistics

Fall. 3(3-0)

P: MTH 126 or MTH 133. R: Open only to Economics and Agricultural Economics majors. Not open to students with credit in STT 351.

Calculus based probability and statistics with applications. Discrete and continuous random variables and their expectations. Point and interval estimation, tests of hypotheses, simple linear regression.

441. Probability and Statistics I: Probability

Fall, Spring, Summer. 3(3-0)

P: MTH 235 or concurrently.

Probability models and basic statistics at an intermediate mathematical level. Discrete, continuous, univariate, and multivariate distributions. Random variables. Normal approximation. Sampling distributions, parameter estimation, and elementary tests of hypotheses.

442. Probability and Statistics II: Statistics

Fall, Spring. 3(3-0)

P: STT 441, MTH 314.

Estimation, tests of hypotheses, confidence intervals. Goodness of fit, non-parametric methods. Linear models, multiple regression, ANOVA.

461. Computations in Probability and Statistics

Spring. 3(3-0)

P: CPS 131 or CPS 230; MTH 314, STT 441.

Computer algorithms for evaluation, simulation and visualization. Sampling and prescribed distributions. Robustness and error analysis of procedures used by statistical packages. Graphics for data display, computation of probabilities and percentiles.

**Descriptions — Statistics and Probability
of
Courses**

464. Statistical Methods for Biologists I
Fall. 3(3-0) Interdepartmental with Animal
Science, and Crop and Soil Sciences.
P: STT 421.

Biological random variables. Estimation of population parameters. Testing hypotheses. Linear correlation and regression (prediction). Analyses of counted and measured data to compare several biological groups (contingency tables and analysis of variance).

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. 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(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.

820. Econometrics I
Spring. 3(3-0) Interdepartmental with Eco-
nomics and Agricultural Economics. Administered by
Economics.
P: EC 801, 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 Econo-
mics and Agricultural Economics. Administered by Eco-
nomics.
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 Eco-
nomics 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.

843. Multivariate Analysis
Spring of odd-numbered 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
Spring. 3(3-0)

P: STT 442 or STT 862.
Stationary time series. Autocorrelation and spectrum. ARMA and ARIMA processes: estimation and forecasting. Seasonal ARIMA models. Identification and diagnostic techniques. Multivariate time series. Time series software.

**852. Stochastic Methods in Operations
Research**
Spring. 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 non-parametric cases. Linear models, goodness of fit, and other topics.

871. Theory of Statistics I
Fall. 3(3-0)

P: MTH 828 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
Fall. 3(3-0)

P: MTH 828 or concurrently.
Measures and their extensions, integration, and convergence theorems. Product measures, Lebesgue decomposition, transition probabilities, Kolmogorov consistency theorem. Independence. Classical limit theorems for partial sums.

882. Theory of Probability II
Spring. 3(3-0)

P: STT 881.
Conditional expectation, martingales, stationary processes. Brownian motion, convergence in distribution, and the invariance principle.

886. Stochastic Processes and Applications I
Fall. 3(3-0)

P: STT 441 or STT 861.
Finite and countable state Markov chains. Classification of states. Recurrence, branching, birth-death, Poisson renewal counting, and continuous time Markov processes.

**887. Stochastic Processes and Applications
II**
Spring. 3(3-0)

P: STT 886.
Random processes in continuous time. Analysis of Markov and queueing processes with applications. Brownian motion, martingales, and stochastic calculus.

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-numbered 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-numbered 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-numbered 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-numbered years. 3(3-0)

P: STT 872.
Small and large sample properties of distribution-free tests. Adaptive and robust procedures. Nonparametric ANOVA. Estimation of regression and density functions.

- 961. Convergence of Measures and Stochastic Processes**
Fall of even-numbered years. 3(3-0)
P: STT 882.
Convergence of measures on metric spaces. Prohorov's theorem. Function spaces with the uniform and Skorohod metric. Empirical processes. Applications.
- 962. Stationary and Second Order Processes**
Spring of odd-numbered 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-numbered years. 3(3-0)
P: STT 882.
Discrete and continuous time martingales, convergence theorems, Doob-Meyer decomposition. Applications.
- 964. Stochastic Analysis**
Spring of even-numbered years. 3(3-0)
P: STT 882.
Stochastic integrals and semi-martingales, Ito formula, stochastic differential equations. Applications.
- 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.
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.
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

STA

Department of Art College of Arts and Letters

- 110. Drawing I**
Fall, Spring. 3(0-6)
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.
Emphasis on development of personal imagery and expression. Introduction of the means of abstraction and of the use of the human figure as subject matter.
- 113. Color and Design**
Fall, Spring. 3(0-6)
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)
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, STA 113, STA 114.
Observational and imaginative drawing including the human figure. Non-representational drawing. Contemporary drawing systems, concepts, and process.
- 302. Time-Space-Motion-Sound**
Spring. 3(0-6)
P: STA 300. R: Not open to freshmen and sophomores.
Multi-dimensional forms of artistic expression and their interrelationships. Theory and exploration.
- 320. Painting I**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, 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, STA 113, STA 114.
Ceramic processes including handbuilding, glaze formulation, and kiln firing.
- 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.
- 350. Figure Modeling**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, STA 114.
Modeling human and natural forms.
- 351. Collage, Mixed Media, Assemblage**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, STA 114.
Exploration of artistic expression using collage, mixed media, and assemblage techniques.
- 354. Casting**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, STA 114.
Casting concepts and techniques as a means of artistic expression.
- 355. Construction and Fabrication**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, STA 114.
Sculptural concepts using methods of construction and fabrication as an approach to artistic expression.
- 360. Graphic Design**
Fall, Spring. 3(0-6)
P: STA 111, STA 113, 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, STA 113, 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.
- 380. Art for Early Childhood and Elementary Education**
Fall, Spring. 3(1-4)
R: Not open to freshmen and sophomores. Not open to students in the Department of Art.
Creative art experience and its application for children. Children's growth and development in art. Studio activities, readings, and discussion.
- 381. Learning Strategies, Concepts, Resources and Materials for Art Education**
Spring. 4(0-8)
R: Not open to freshmen and sophomores. Open only to majors in the Department of Art with a teacher certification option.
Children's growth and development in art. Concepts, processes, and materials applied to art teaching. Writing assignments and field trips required.
- 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.
- 405. Metalsmithing**
Fall of even-numbered years. 4(0-8)
P: STA 111, STA 113, STA 114.
Forming, joining, finishing and embellishing processes for metals to create small sculpture or jewelry.
- 407. Art in London**
Summer. 3(0-6)
P: STA 111, STA 113, STA 114.
Study in London, England, of a variety of art disciplines. Visits to museums, galleries, monuments and other relevant sites, with some field trips away from the city. Meetings with artists.
- 420. Painting**
Fall, Spring. 4(0-8) 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) A student may earn a maximum of 20 credits in all enrollments for this course.
P: STA 300 or STA 320.
Theory and practice of relief prints including additive methods, linocut and woodcut.
- 431. Screen Printing**
Fall, Spring. 4(0-8) 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 techniques as a means to creative and expressive imagery.
- 432. Lithography**
Fall, Spring. 4(0-8) 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.