**STATISTICS (STAT)**

**STAT 301 — INTRODUCTION TO STATISTICAL METHODS**
3 credits.

Distributions, measures of central tendency, dispersion and shape, the normal distribution; experiments to compare means, standard errors, confidence intervals; effects of departure from assumption; method of least squares, regression, correlation, assumptions and limitations; basic ideas of experimental design. Enroll Info: None
Requisites: Satisfied Quantitative Reasoning (QR) A requirement. Not open to students who have completed STAT 201, 224, 324, or 371
Course Designation: Gen Ed - Quantitative Reasoning Part B
Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

**STAT 302 — ACCELERATED INTRODUCTION TO STATISTICAL METHODS**
3 credits.

Graphical and numerical exploration of data; standard errors; distributions for statistical models including binomial, Poisson, normal; estimation; hypothesis testing; randomization tests; basic principles of experimental design; regression; ANOVA; categorical data analysis; goodness of fit; application. (intended for students wishing to take additional statistics courses). Enroll Info: Satisfied Quantitative Reasoning (QR) A requirement and MATH 221 or equivalent
Requisites: MATH 217, MATH 221, or MATH 275
Course Designation: Gen Ed - Quantitative Reasoning Part B
Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

**STAT 303 — R FOR STATISTICS I**
1 credit.

An understanding of the commonly used statistical language R. Topics will include using R to manipulate data and perform exploratory data analysis. Enroll Info: None
Requisites: STAT 224, 301, 302, 312, 324, 371, MATH/STAT 310, ECON 310, GEN BUS 303, 304, PSYCH 210, or SOC/C&E SOC 360
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No

**STAT 304 — R FOR STATISTICS II**
1 credit.

Provides an understanding of the commonly used statistical language R. Topics will include writing conditional expressions, loops, and functions; manipulating data matrices and arrays; extracting data from text; and making high level visualizations of data. Enroll Info: None
Requisites: STAT 303
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No

**STAT 305 — R FOR STATISTICS III**
1 credit.

Provides an understanding of the commonly used statistical language R. Students will learn to combine R with high performance computing tools to do scientific computing. Enroll Info: None
Requisites: STAT 304
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No

**STAT/MATH 309 — INTRODUCTION TO PROBABILITY AND MATHEMATICAL STATISTICS I**
3 credits.

Probability and combinatorial methods, discrete and continuous, univariate and multivariate distributions, expected values, moments, normal distribution and derived distributions, estimation. Enroll Info: None
Requisites: MATH 234 or concurrent enrollment; not open to students with credit for STAT/MATH 431 or STAT 311
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

**STAT/MATH 310 — INTRODUCTION TO PROBABILITY AND MATHEMATICAL STATISTICS II**
3 credits.

Mathematical statistical inference aims at providing an understanding of likelihood's central role to statistical inference, using the language of mathematical statistics to analyze statistical procedures, and using the computer as a tool for understanding statistics. Specific topics include: samples and populations, estimation, hypothesis testing, and theoretical properties of statistical inference. Enroll Info: None
Requisites: (STAT/MATH 309, STAT 311, or STAT/MATH 431) and (STAT 224, STAT 301, STAT 302, STAT 324, STAT 371, or ECON 310); or graduate/professional standing
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019
STAT 311 — INTRODUCTION TO THEORY AND METHODS OF MATHEMATICAL STATISTICS I
3 credits.

Elements of probability, important discrete distributions, acceptance sampling by attributes, sample characteristics, probability distributions and population characteristics, the normal distribution, acceptance sampling plans based on sample means and variances, sampling from the normal, the central limit theorem, point and interval estimation. Enroll Info: None

Requisites: MATH 234 or concurrent enrollment; not open to students who have taken STAT/MATH 309 or STAT/MATH 431
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 312 — INTRODUCTION TO THEORY AND METHODS OF MATHEMATICAL STATISTICS II
3 credits.

Unbiased estimation, maximum likelihood estimation, confidence intervals, tests of hypotheses, Neyman-Pearson lemma, likelihood ratio test, regression, analysis of variance with applications. Enroll Info: None

Requisites: STAT/MATH 309, STAT 311, STAT/MATH 431, or graduate standing
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 324 — INTRODUCTORY APPLIED STATISTICS FOR ENGINEERS
3 credits.

Descriptive statistics, probability concepts and distributions, random variables. Hypothesis tests and confidence intervals for one- and two-sample problems. Linear regression, model checking, and inference. Analysis of variance and basic ideas in experimental design. Enroll Info: None

Requisites: MATH 222 or 276. Not open to students who have completed STAT 224 or 371
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 327 — LEARNING A STATISTICAL LANGUAGE
1 credit.

This modular course is aimed at providing students with an understanding of commonly used statistical languages. (Two such languages commonly used in our Department – and others – are R and SAS.) Modules will be offered at the introductory, intermediate and advanced levels. (Also, students may not receive credit twice for the same language at the same level.) Enroll Info: Any introductory stat course (224, 301, 324, 371) for all modules; additional prerequisites will vary by topic

Requisites: None
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT 333 — APPLIED REGRESSION ANALYSIS
3 credits.

An introduction to regression with emphasis on the practical aspects. Topics include: straight-line model, role of assumptions, residual analysis, transformations, multiple regression (with some use of matrix notation), multicollinearity, subset selection, and a brief introduction to mixed models. Enroll Info: An introductory statistics course (Stat 224 or STAT 301 or STAT 302 or STAT 324 or STAT 371) and STAT 327 (STAT 327 may be taken concurrently)

Requisites: (STAT 224, STAT 301, STAT 302, STAT 312, STAT 324, or STAT 371) and STAT 327 or concurrent enrollment
Course Designation: Gen Ed - Quantitative Reasoning Part B
Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 349 — INTRODUCTION TO TIME SERIES
3 credits.

Autocorrelation; stationarity and non-stationarity; heteroscedasticity; dynamic models; auto-regressive and moving average models; identification and fitting; forecasting; seasonal adjustment; applications for financial time series, social sciences and environmental studies. Enroll Info: None

Requisites: STAT 333
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019
STAT 351 — INTRODUCTORY NONPARAMETRIC STATISTICS
3 credits.
Distribution free statistical procedures or methods valid under nonrestrictive assumptions: basic tools; counting methods; order statistics, ranks, empirical distribution functions; distribution free tests and associated interval and point estimators; sign test; signed rank tests; rank tests; Mann Whitney Wilcoxon procedures; Kolmogorov Smirnov tests; permutation methods; kernel density estimation; kernel and spline regression estimation; computer techniques and programs; discussion and comparison with parametric methods. Enroll Info: None
Requisites: STAT 333
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 360 — TOPICS IN STATISTICS STUDY ABROAD
1-3 credits.
Credit is awarded for students having completed an advanced statistics course in a study abroad program for which there is no direct equivalence to the statistics department course offerings. The study abroad course must be pre-approved by the statistics department. Enroll Info: None
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: Yes, unlimited number of completions

STAT 371 — INTRODUCTORY APPLIED STATISTICS FOR THE LIFE SCIENCES
3 credits.
The course will provide students in the life sciences with an introduction to modern statistical practice. Topics include: exploratory data analysis, probability and random variables; one-sample testing and confidence intervals, role of assumptions, sample size determination, two-sample inference; basic ideas in experimental design, analysis of variance, linear regression, goodness-of-fit; biological applications. Enroll Info: None
Requisites: MATH 112 and 113, 114, or 171. Not open to students who have completed STAT 224 or 324
Course Designation: Gen Ed - Quantitative Reasoning Part B
Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 411 — AN INTRODUCTION TO SAMPLE SURVEY THEORY AND METHODS
3 credits.
An introduction to the methods used to design sample surveys and analyze the results. Topics covered include: basic tools, simple random sampling, ratio and regression estimation, stratification, systematic sampling, cluster (area) sampling, two-stage sampling, unequal probability sampling, non-sampling errors, and missing data. For illustration and clarification, examples are drawn from diverse areas of application. Enroll Info: None
Requisites: STAT 333
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/M E 424 — STATISTICAL EXPERIMENTAL DESIGN
3 credits.
This course provides a systematic introduction to statistical design and analysis of experiments. Topics include: principles of randomization, blocking and replication, randomized blocking designs, Latin square designs, full factorial and fractional factorial designs and response surface methodology. Substantial focus will be devoted to engineering applications. Enroll Info: None
Requisites: STAT 224, STAT 301, STAT 302, STAT 324, or STAT 371
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019
STAT/MATH 431 — INTRODUCTION TO THE THEORY OF PROBABILITY
3 credits.

Topics covered include axioms of probability, random variables, the most important discrete and continuous probability distributions, expectation and variance, moment generating functions, conditional probability and conditional expectations, multivariate distributions, Markov's and Chebyshev's inequalities, laws of large numbers, and the central limit theorem. Enroll Info: None
Requisites: MATH 234 or 376 or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 441 — INTRODUCTION TO BIOSTATISTICS FOR PHARMACY
3 credits.

Introduction to statistical methods used in pharmaceutical and related biomedical applications. Topics include exploratory data analysis of random samples, theory of probability and population reference distributions, statistical inference and hypothesis testing, regression methods, and survival analysis techniques. Enroll Info: Admission to School of Pharmacy, Pharm.D. pgm
Requisites: Declared in Pharmacy program
Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2011

STAT 456 — APPLIED MULTIVARIATE ANALYSIS
3 credits.

Theory and applications of multivariate statistical methods. Basic concepts and statistical reasoning which underlie the techniques of multivariate analysis. Ideas rather than derivations stressed although basic models discussed to give the student some feeling for their adequacy in particular situations. Acquaintance with and use of existing computer programs in the multivariate analysis area. Enroll Info: STAT 333 and a course in linear algebra (MATH 340 or MATH 341 or MATH 375)
Requisites: STAT 333 and (MATH 340, MATH 341, or MATH 375) or graduate standing
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 461 — FINANCIAL STATISTICS
3 credits.

Stochastic models and statistical methodologies are widely employed in modern finance. The models and their inferences are very important for academic research and financial practices. This course will cover the financial stochastic models and their statistical inferences with applications to volatility analysis and risk management. It will introduce discrete models such as binomial trees and GARCH and stochastic volatility models as well as simple continuous models like the Black-Scholes model. The main focus of the course will be on statistical inference, data analysis and risk management regarding these models. Enroll Info: STAT 333 or ECON 410 and one of STAT/MATH 309 or STAT 311 or MATH/STAT 431
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2017

STAT/COMP SCI 471 — INTRODUCTION TO COMPUTATIONAL STATISTICS
3 credits.

Classical statistical procedures arise where closed-form mathematical expressions are available for various inference summaries (e.g. linear regression, analysis of variance). A major emphasis of modern statistics is the development of inference principles in cases where both more complex data structures are involved and where more elaborate computations are required. Topics from numerical linear algebra, optimization, Monte Carlo (including Markov chain Monte Carlo), and graph theory are developed, especially as they relate to statistical inference (e.g., bootstrapping, permutation, Bayesian inference, EM algorithm, multivariate analysis). Enroll Info: None
Requisites: (STAT/MATH 310 and STAT 333) or graduate/professional standing
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/COMP SCI/MATH 475 — INTRODUCTION TO COMBINATORICS
3 credits.

Requisites: (MATH 320, 340, 341, or 375) or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Spring 2019
STAT 479 — SPECIAL TOPICS IN STATISTICS
1-3 credits.

This course will be used for curricular offerings for topics of interest to undergraduates. It will be offered as the need arises. Enroll Info: None

Requisites: None

Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2019

STAT/B M I 511 — INTRODUCTION TO BIOSTATISTICAL METHODS FOR PUBLIC HEALTH
3 credits.

Provides breadth in biostatistical methods for public health practitioners. Topics will include research design, data collection methods and database management, statistical computing and programming, descriptive statistics in tables and graphics, introductory statistical methods, and survey sampling. Enroll Info: None

Requisites: Declared in the Master of Public Health (MPH) program. Not open to students who have taken STAT/B M I 541 or POP HLTH/ B M I 551

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2018

STAT/COMP SCI/I SY E/MATH 525 — LINEAR PROGRAMMING METHODS
3 credits.

Real linear algebra over polyhedral cones; theorems of the alternative for matrices. Formulation of linear programs. Duality theory and solvability. The simplex method and related methods for efficient computer solution. Perturbation and sensitivity analysis. Applications and extensions, such as game theory, linear economic models, and quadratic programming. Enroll Info: None

Requisites: MATH 320, 340, 341, 375, or 443 or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program

Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Spring 2019

STAT/B M I 541 — INTRODUCTION TO BIOSTATISTICS
3 credits.

Course designed for the biomedical researcher. Topics include: descriptive statistics, hypothesis testing, estimation, confidence intervals, t-tests, chi-squared tests, analysis of variance, linear regression, correlation, nonparametric tests, survival analysis and odds ratio. Biomedical applications used for each topic. Enroll Info: Graduate standing. Students may not enroll if they have completed BMI 511 or BMI 551.

Requisites: None

Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2018

STAT/B M I 542 — INTRODUCTION TO CLINICAL TRIALS I
3 credits.

Intended for biomedical researchers interested in the design and analysis of clinical trials. Topics include definition of hypotheses, measures of effectiveness, sample size, randomization, data collection and monitoring, and issues in statistical analysis. Statistics graduate students should take STAT/B M I 641. Enroll Info: STAT/B M I 541 or equiv or cons inst

Requisites: None

Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2019

STAT/B M I 546 — PRACTICUM IN CLINICAL TRIAL DATA ANALYSIS AND INTERPRETATION
3 credits.

Provides practice in analysis and interpretation of existing datasets from national and international clinical trials in a variety of diseases. Students will develop a research question, review clinical protocols, and analyze available data to prepare a report. Enroll Info: STAT/B M I 541 or 572 STAT/B M I 542 or 641

Requisites: None

Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Summer 2015

STAT/F&W ECOL/HORT 571 — STATISTICAL METHODS FOR BIOSCIENCE I
4 credits.

Descriptive statistics, distributions, one- and two-sample normal inference, power, one-way ANOVA, simple linear regression, categorical data, non-parametric methods; underlying assumptions and diagnostic work. Enroll Info: None

Requisites: Graduate/professional standing

Course Designation: Gen Ed - Quantitative Reasoning Part B
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2018

STAT/F&W ECOL/HORT 572 — STATISTICAL METHODS FOR BIOSCIENCE II
4 credits.

Polynomial regression, multiple regression, two-way ANOVA with and without interaction, split-plot design, subsampling, analysis of covariance, elementary sampling, introduction to bioassay. Enroll Info: Continuation of FSTAT 571

Requisites: STAT/F&W ECOL/HORT 571 or graduate/professional standing

Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2019
STAT 575 — STATISTICAL METHODS FOR SPATIAL DATA
3 credits.

Detecting and quantifying spatial patterns and modeling in the presence of such patterns. Spatial Point Patterns: testing nonrandomness, simulating and characterizing patterns. Lattice Data: spatial autocorrelation and regression. Geostatistics: variograms, ordinary and universal kriging, inference, assessing assumptions, and extensions. Enroll Info: STAT 333 424; or HORT/F&W ECOL/STAT 572; or cons inst
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2015

STAT 601 — STATISTICAL METHODS I
4 credits.

Together with STAT 602, this course is to provide graduate students in statistics and related quantitative fields with a thorough grounding in modern statistical methods. The specific learning outcomes for the course are to understand data collection in context (how/why data were collected, key questions under study); explore data by effective graphical and numerical summaries; understand probability concepts and models as tools for studying random phenomena and for statistical inference; analyze data using appropriate, modern statistical models, methods, and software; understand the statistical concepts underlying methods; develop the ability to interpret results and critically evaluate the methods used; communicate data analysis and key findings in context. Enroll Info: None
Requisites: Graduate standing
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 602 — STATISTICAL METHODS II
4 credits.

Together with STAT 601, this course is to provide graduate students in statistics and related quantitative fields with a thorough grounding in modern statistical methods. The specific learning outcomes for the course are to understand data collection in context (how/why data were collected, key questions under study); explore data by effective graphical and numerical summaries; understand probability concepts and models as tools for studying random phenomena and for statistical inference; analyze data using appropriate, modern statistical models, methods, and software; understand the statistical concepts underlying methods; develop the ability to interpret results and critically evaluate the methods used; communicate data analysis and key findings in context. Enroll Info: STAT 601
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 609 — MATHEMATICAL STATISTICS I
3 credits.

Review of probability, random variables and vectors and their distributions, moments and inequalities, generating functions, transformations of random variables, sampling and distribution theory, convergence concepts for sequences of random variables, laws of large numbers, central limit and other limit theorems. Enroll Info: STAT/ MATH 309 or 431, MATH 340, MATH 521, or equiv or cons inst
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2018

STAT 610 — INTRODUCTION TO STATISTICAL INERENCE
4 credits.

Conditioning, distribution theory, approximation to distributions, modes of convergence, limit theorems, statistical models, parameter estimation, comparison of estimators, confidence sets, theory of hypothesis tests, introduction to Bayesian inference and nonparametric estimation. Enroll Info: STAT/MATH 309 or STAT/MATH 431, MATH 521, MATH 340 or equiv or cons inst
Requisites: None
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 627 — PROFESSIONAL SKILLS IN DATA SCIENCE
1-3 credits.

This topics course is aimed at providing statistics graduate students with an understanding of and experience with important aspects of professional development in statistics, including skills with internet tools, sophisticated use of statistical languages (such as R) and other emerging topics. Enroll Info: Graduate student in Statistics
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019
STAT 628 — DATA SCIENCE PRACTICUM
1-3 credits.

This course is aimed at providing graduate students with an understanding of and experience with turning statistics concepts into practice through data science practicums inspired by realistic projects. Students will combine theory and methods expertise with communications skills to translate from a vaguely stated project description and complex data set into a concisely summarized analysis, including both written and graphical interpretation that can be used by decision makers in an organization. Enroll Info: Graduate student in Statistics
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT/I SY/E/MATH/OTM 632 — INTRODUCTION TO STOCHASTIC PROCESSES
3 credits.

Topics include discrete-time Markov chains, Poisson point processes, continuous-time Markov chains, and renewal processes. Applications to queueing, branching, and other models in science, engineering and business. Enroll Info: None
Requisites: (STAT/MATH 431, 309, STAT 311 or MATH 531) and (MATH 320, 340, 341, 375, 421 or 531) or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Breadth - Natural Science
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/B M I 641 — STATISTICAL METHODS FOR CLINICAL TRIALS
3 credits.

Statistical issues in the design of clinical trials, basic survival analysis, data collection and sequential monitoring. Intended for statistics graduate students; those with medical backgrounds should take STAT/B M I 542. Enroll Info: STAT/MATH 310 or equiv or cons inst
Requisites: None
Course Designation: Breadth - Natural Science
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/B M I 642 — STATISTICAL METHODS FOR EPIDEMIOLOGY
3 credits.

Methods for analysis of case-control, cross sectional, and cohort studies. Covers epidemiologic study design, measures of association, rates, classical contingency table methods, and logistic and Poisson regression. Enroll Info: Statistics 310 or equivalent or consent of instructor
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 679 — SPECIAL TOPICS IN STATISTICS
1-3 credits.

Special topics in statistics at the master's level. Subject matter varies. Enroll Info: None
Requisites: None
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT 681 — SENIOR HONORS THESIS
3 credits.

Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Honors - Honors Only Courses (H)
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 682 — SENIOR HONORS THESIS
3 credits.

Enroll Info: None
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Honors - Honors Only Courses (H)
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 698 — DIRECTED STUDY
1-6 credits.

Enroll Info: Graded on a N basis; requires cons inst
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2018
STAT 699 — DIRECTED STUDY
1-6 credits.
Enroll Info: Graded on a lettered basis; requires cons inst
Requisites: Consent of instructor
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT 701 — APPLIED TIME SERIES ANALYSIS, FORECASTING AND CONTROL I
3 credits.
Theory and application of discrete time series models illustrated with forecasting problems. Principles of iterative model building. Representation of dynamic relations by difference equations. Autoregressive integrated Moving Average models. Identification, fitting, diagnostic checking of models. Seasonal model application to forecasting in business, economics, ecology, and engineering used at each stage, which the student analyzes using computer programs which have been specially written and extensively tested. Enroll Info: STAT/MATH 709, 731, or 831 or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT/MATH 709 — MATHEMATICAL STATISTICS
4 credits.
Introduction to measure theoretic probability; derivation and transformation of probability distributions; generating functions and characteristic functions; conditional expectation, sufficiency, and unbiased estimation; methods of large sample theory including laws of large numbers and central limit theorems; order statistics. Enroll Info: None
Requisites: Consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT/MATH 710 — MATHEMATICAL STATISTICS
4 credits.
Estimation, efficiency, Neyman-Pearson theory of hypothesis testing, confidence regions, decision theory, analysis of variance, and distribution of quadratic forms. Enroll Info: None
Requisites: STAT/MATH 709
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/MATH 726 — NONLINEAR OPTIMIZATION I
3 credits.
Theory and algorithms for nonlinear optimization, focusing on unconstrained optimization. Line-search and trust-region methods; quasi-Newton methods; conjugate-gradient and limited-memory methods for large-scale problems; derivative-free optimization; algorithms for least-squares problems and nonlinear equations; gradient projection algorithms for bound-constrained problems; and simple penalty methods for nonlinearly constrained optimization. Enroll Info: Students are strongly encouraged to have knowledge of linear algebra and familiarity with basic mathematical analysis.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 732 — LARGE SAMPLE THEORY OF STATISTICAL INFERENCE
3 credits.
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

STAT/MATH 733 — THEORY OF PROBABILITY I
3 credits.
An introduction to measure theoretic probability and stochastic processes. Topics include foundations, independence, zero-one laws, laws of large numbers, convergence in distribution, characteristic functions, central limit theorems, random walks, conditional expectations. Enroll Info: Familiarity with basic measure theory (e.g. MATH 629 or 721) or concurrent registration in MATH 721 is strongly recommended.
Requisites: Graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2018

STAT/MATH 734 — THEORY OF PROBABILITY II
3 credits.
Continuation of MATH/STAT 733. Possible topics include martingales, weak convergence of measures, introduction to Brownian motion. Enroll Info: None
Requisites: Graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019
STAT/B M I 741 — SURVIVAL ANALYSIS THEORY AND METHODS
3 credits.

Theory and practice of analytic methods for censored survival data, including nonparametric and parametric methods, the proportional hazards regression model, and a review of current topics in survival analysis. Enroll Info: STAT 610 or 710 or equivalent or consent of instructor

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 760 — MULTIVARIATE ANALYSIS I
3 credits.

Multivariate normal distribution, estimation of mean and covariance matrix; Wishart distribution; distribution of partial and multiple correlation coefficients; Hotelling’s T-squared, principal components. Enroll Info: Cons inst or STAT/MATH 710

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2017

STAT 761 — DECISION TREES FOR MULTIVARIATE ANALYSIS
3 credits.

Tree construction, including finding splits, tree-pruning and error estimation. Categorical predictor variables, missing or censored data, prior class-probabilities, and unequal misclassification costs. Selection bias. Comparison with other statistics and machine-learning methods. Extensions to piecewise linear and non-least squares regression models. Enroll Info: None

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT/B M I 768 — STATISTICAL METHODS FOR MEDICAL IMAGE ANALYSIS
3 credits.

Introduce key statistical methods and concepts for analyzing various medical images. Analyze publicly available and student/instructor supplied imaging data using the most up-to-date methods and tools. Aimed at graduate student and researchers with strong quantitative background. Enroll Info: Two semesters of statistics courses (STAT/MATH 309-310), or the consent of instructor. The course is self-contained. The knowledge of calculus and linear algebra is needed

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 771 — STATISTICAL COMPUTING
3 credits.

The design of statistical software including special techniques for probability distributions, methods of simulation of random processes, numerical methods for linear models and multivariate analysis, and methods for nonlinear models. Enroll Info: STAT 333 or equiv or cons inst

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT/ECON/GEN BUS 775 — INTRODUCTION TO BAYESIAN DECISION AND CONTROL I
3 credits.

Common sampling models in business and economic problems, information from data, likelihood function of parameters, choices of models, Bayes’ Theorem, subjective basis for probability, sequential nature of Bayesian inference, prior and posterior distributions of parameters in binomial, poisson, exponential and normal populations, comparison of two normal distributions, predictive distributions, decision theory, utility, risk aversion, extensive form of analysis, two-action problems, point estimation, best population problems, economics of sampling. Enroll Info: None

Requisites: STAT 609 or STAT/MATH 709
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

STAT 801 — ADVANCED FINANCIAL STATISTICS
3 credits.

Statistical theory and methodology for modern financial data. Topics include financial stochastic models based on time series and stochastic calculus, modern statistical inference, and statistical learning for financial data as well as their applications to financial problems. Enroll Info: None

Requisites: STAT 701
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

STAT/MATH 803 — EXPERIMENTAL DESIGN I
3 credits.

Summary of matrix algebra required, theory of estimable functions, incomplete blocks, balanced incomplete block designs, partially balanced incomplete block designs. Enroll Info: None

Requisites: Graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2017
STAT 809 — NON PARAMETRIC STATISTICS
3 credits.
Statistical procedures valid under unrestrictive assumptions; sign test; confidence intervals; efficiency comparisons; signed rank procedures; Walsh sums; point estimators; two sample rank tests; zeros, ties, and other problems of discrete data; order statistics; Winsorized and truncated point estimators and connection with gross error models; permutation procedures; combinatorial problems, and computer applications. Enroll Info: STAT/MATH 710 or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 811 — SAMPLE SURVEY THEORY AND METHOD
3 credits.
Simple random sampling; systematic sampling; probability sampling; stratified sampling; subsampling with units of equal and unequal size; double sampling; multi-stage and multi-phase sampling; ratio and regression estimates; model-based and model-assisted approaches; variance estimation; non-response. Enroll Info: Stats 610 or 710 or equiv
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2017

STAT/MATH 833 — TOPICS IN THE THEORY OF PROBABILITY
3 credits.
Advanced topics in probability and stochastic processes. Enroll Info: None
Requisites: Graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT 834 — EMPRICAL PROCESSES AND SEMIPARAMETRIC INFERENCE
1-3 credits.
Empirical process methods in statistics; semiparametric models; stochastic convergence in metric spaces; Glivenko-Cantelli and Donsker theorems; entropy calculations; bootstrapped empirical processes; functional delta method; Z-estimators; M-estimators; rates of convergence; semiparametric efficiency; semiparametric estimating equations; nonparametric maximum likelihood. Enroll Info: STAT/MATH 710 or Stat 832 or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 840 — STATISTICAL MODEL BUILDING AND LEARNING
3 credits.
Theory of reproducing kernel Hilbert spaces in statistical model building; bounded linear functionals and representer theory; smoothing splines; ANOVA spines; degrees of freedom for signal and the bias-variance tradeoff; Bayesian confidence intervals; model selection. Enroll Info: STAT/MATH 710 or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2015

STAT 841 — NONPARAMETRIC STATISTICS AND MACHINE LEARNING METHODS
3 credits.
Statistical function estimation and classification; reproducing kernel machines, support vector machines; high dimensional model selection and estimation; Bayesian, empirical Bayesian interpretation of nonparametric learning methods; log density ANOVA and graphical models; tree ensemble methods including bagging, boosting, and random forest. Enroll Info: STAT 840
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2015

STAT 849 — THEORY AND APPLICATION OF REGRESSION AND ANALYSIS OF VARIANCE I
3 credits.
Theory and applications of the general linear model; graphical methods; simultaneous inference; regression diagnostics; analysis of variance of fixed, random and mixed effects models; ANCOVA: violations of assumptions. Enroll Info: STAT/MATH 310, 312 or 314
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

STAT 850 — THEORY AND APPLICATION OF REGRESSION AND ANALYSIS OF VARIANCE II
3 credits.
Theory and applications of the general linear model; graphical methods; simultaneous inference; regression diagnostics; analysis of variance of fixed, random and mixed effects models; ANCOVA: violations of assumptions. Enroll Info: STAT 849
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
STAT 860 — ESTIMATION OF FUNCTIONS FROM DATA
3 credits.

Statistical and approximation theoretic methods of estimating functions and values of functionals from experimental data; experimental design and data analysis problems that arise as problems in approximation theory; convergence theorems; ill-posed inverse problems; Banach and Hilbert space penalty functionals. Enroll Info: STAT/MATH 710 or cons inst

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2016

STAT/COMP SCI/E C E 861 — THEORETICAL FOUNDATIONS OF MACHINE LEARNING
3 credits.


Requisites: E C E/COMP SCI 761 or E C E 830
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT/B M I 877 — STATISTICAL METHODS FOR MOLECULAR BIOLOGY
3 credits.

Develop statistical problems in gene mapping, high throughput omic data analysis, phylogenetics and sequence analysis. Introduce ideas of key methods using published data. Statisticians learn statistical basis for research methodology. Collaboration among students and with biologists is encouraged through projects. Enroll Info: STAT/MATH 309-310 or 609-610 or 709-710 or equiv, or cons inst. GENETICS 466 or equiv strongly recommended

Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

STAT 990 — RESEARCH
1-12 credits.

Content varies. Enroll Info: None

Requisites: Consent of instructor

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

STAT 992 — SEMINAR
1-3 credits.

Content varies. Enroll Info: None

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2019

STAT 998 — STATISTICAL CONSULTING
3 credits.

Consulting apprenticeship. Enroll Info: 9 cr in statistics and cons inst

Requisites: Graduate/professional standing

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Spring 2019