Statistics

The Department of Statistics offers the Master of Arts (MA) and Doctor of Philosophy (PhD) degrees.

Master of Arts (MA)

The program is designed to prepare students for careers in industries that require statistical skills. The focus is on tackling statistical challenges encountered by industry rather than preparing for a PhD. The program is for full-time students and is designed to be completed in two semesters (fall and spring).

For students in the MA program, there is no transfer arrangement into the PhD program. To gain acceptance into the PhD program, you must apply along with all other applicants, and you will be considered in the same way as other applicants. Students should know that admission to the UC Berkeley Statistics PhD program is highly competitive.

Doctor of Philosophy (PhD)

The Statistics PhD program is rigorous, yet welcoming to students with interdisciplinary interests and different levels of preparation. The standard PhD program in statistics provides a broad background in probability theory and in applied and theoretical statistics.

Additionally, building on the interdisciplinary strengths of the department, there are three specialized "Designated Emphasis" (DE) tracks available to students in this program: Computational Science and Engineering (http://citris-uc.org/initiatives/decse) ; Computational and Genomic Biology (http://qb3.berkeley.edu/ccb/research-education/decgb) ; and Communication, Computation, and Statistics (http://www.eecs.berkeley.edu/CCS) .

Admission to the University

Uniform minimum requirements for admission

The following minimum requirements apply to all programs and will be verified by the Graduate Division:

1. A bachelor's degree or recognized equivalent from an accredited institution;
2. A minimum grade-point average of B or better (3.0);
3. If the applicant comes from a country or political entity (e.g. Quebec) where English is not the official language, adequate proficiency in English to do graduate work, as evidenced by a TOEFL score of at least 570 on the paper-and-pencil test, 230 on the computer-based test, 90 on the iBT test, or an IELTS Band score of at least 7 (note that individual programs may set higher levels for any of these); and
4. Enough undergraduate training to do graduate work in the given field.

Applicants who already hold a graduate degree

The Graduate Council views academic degrees as evidence of broad research training, not as vocational training certificates; therefore, applicants who already have academic graduate degrees should be able to take up new subject matter on a serious level without undertaking a graduate program, unless the fields are completely dissimilar.

Programs may consider students for an additional academic master's or professional master's degree if the additional degree is in a distinctly different field.

Applicants admitted to a doctoral program that requires a master's degree to be earned at Berkeley as a prerequisite (even though the applicant already has a master's degree from another institution in the same or a closely allied field of study) will be permitted to undertake the second master's degree, despite the overlap in field.

The Graduate Division will admit students for a second doctoral degree only if they meet the following guidelines:

1. Applicants with doctoral degrees may be admitted for an additional doctoral degree only if that degree program is in a general area of knowledge distinctly different from the field in which they earned their original degree. For example, a physics PhD could be admitted to a doctoral degree program in music or history; however, a student with a doctoral degree in mathematics would not be permitted to add a PhD in statistics.
2. Applicants who hold the PhD degree may be admitted to a professional doctorate or professional master's degree program if there is no duplication of training involved.

Applicants may only apply to one single degree program or one concurrent degree program per admission cycle.

Any applicant who was previously registered at Berkeley as a graduate student, no matter how briefly, must apply for readmission, not admission, even if the new application is to a different program.

Required documents for admissions applications

1. **Transcripts:** Upload unofficial transcripts with the application for the departmental initial review. Official transcripts of all college-level work will be required **if admitted**. Official transcripts must be in sealed envelopes as issued by the school(s) you have attended. Request a current transcript from every post-secondary school that you have attended, including community colleges, summer sessions, and extension programs.
   If you have attended Berkeley, upload unofficial transcript with the application for the departmental initial review. Official transcript with evidence of degree conferral ***will not*** be required if admitted.
2. **Letters of recommendation:** Applicants can request online letters of recommendation through the online application system. Hard copies of recommendation letters must be sent directly to the program, not the Graduate Division.
3. **Evidence of English language proficiency:** All applicants from countries in which the official language is not English are required to submit official evidence of English language proficiency. This requirement applies to applicants from Bangladesh, Burma, Nepal, India, Pakistan, Latin America, the Middle East, the People's Republic of China, Taiwan, Japan, Korea, Southeast Asia, and most European countries. However, applicants who, at the time of application, have already completed at least one year of full-time academic course work with grades of B or better at a U.S. university may submit an official transcript from the U.S. university to fulfill this requirement. The following courses will not fulfill this requirement: 1) courses in English as a Second Language, 2) courses conducted in a language other than English, 3) courses that will be completed after the application is submitted, and 4) courses of a non-academic nature. If applicants have previously been denied admission to Berkeley on the basis of their English language proficiency, they

must submit new test scores that meet the current minimum from one of the standardized tests.

Admission to the Program

In addition to the minimum requirements listed above, the following materials are required for admission:

1. The Online Graduate Application for Admissions and Fellowships (http://grad.berkeley.edu/admissions/apply) :

We require applicants submit both the statement of purpose (http://grad.berkeley.edu/admissions/state_purpose.shtml) AND personal history statement (http://www.grad.berkeley.edu/admissions/personal_statement.shtml) .

4. **GRE General Test Scores:** The GRE is required of all applications. The test is composed of three sections. Please send your scores electronically to Institution Code 4833. To be valid, the GRE must have been taken within the past 5 years.

5. **Descriptive List of Upper Division/Graduate Statistics and Math Coursework: Include the department, course number, title, instructor, grade, school, texts used and subject matter covered for all upper division and graduate level statistics and math courses you have taken.**

The application process is entirely online. All supplemental materials such as transcripts and the descriptive list of courses must be uploaded as PDF files via the online application by the application deadline. Please do not mail copies of your transcripts, statement of purpose, letters of recommendations, GRE and TOEFL scores, resumes, or any other documents as they will not be included with your application.

For more information about graduate programs in statistics, including admissions information, please visit our graduate programs page (http://statistics.berkeley.edu/programs/graduate) .

Normative Time Requirements

Normative Time to Advancement

In the first year students must perform satisfactorily in preliminary course work. In the summer, students are required to embark on a short-term research project, internship, graduate student instructorship, reading course, or on another research activity.

In the second and third years, students continue to take courses, serve as a Graduate Student Instructor, find an area for the oral qualifying exam, a potential thesis adviser and pass the oral qualifying exam in the spring semester of second year or in the fall semester of third year. With successful passing of the exam, students then advance to candidacy.

Normative Time tin Candidacy

In the third and fourth years, students finalize a thesis topic, continue to conduct research and make satisfactory progress.

By the end of the fifth year students are expected to finish their thesis and give a lecture based on their work in a department seminar.

Total Normative Time

Total Normative Time is five years.

Time in Advancement

Curriculum

All students are required to take a minimum of 24 semester units of courses in the department numbered 204-272 inclusive for a letter grade. During their first year, students are normally expected to take four semester long graduate level courses. At least three of these should be from the following seven core PhD courses in Probability, Theoretical Statistics, and Applied Statistics:

Courses Required		
STAT C205A	Probability Theory	4
STAT C205B	Probability Theory	4
STAT 204	Probability for Applications	4
STAT 210A/210B	Theoretical Statistics	4
STAT 215A/215B	Statistical Models: Theory and Application	4
STAT Electives from 204-272 (5 courses) - one may be upper division		20
STAT 375	Professional Preparation: Teaching of Probability and Statistics	2-4

A member of the PhD Program Committee Adviser (in consultation with the Faculty mentor) may consent to substitute courses at a comparable level in other disciplines for some of these departmental graduate courses. These requirements can be altered by the PhD Program Committee (in consultation with the faculty mentor) in the following cases:

For students with strong interests in another discipline, when the faculty mentor recommends delaying one core PhD course to the second year and substituting a relevant graduate course from another department.

For students who need additional mathematical preparation, they could take MATH 105 (and MATH 104, if needed) in the first year, and only take two of the core PhD courses during that year, thus delaying one or two core PhD courses to the second year.

Students arriving with advanced standing, having done successful graduate course work at another institution prior to joining the program.

Preliminary Stage

After the first year in the program, the PhD Program committee will decide if the student has passed the preliminary stage of the program or if the decision is reserved until the end of the second year. To continue in the program, students must pass the preliminary stage by the end of their second year.

QE

The qualifying examination is intended to determine whether students are ready to enter the research phase and are on track toward successfully completing the PhD. It consists of a 50-minute lecture by the student on a topic selected jointly by the student and the thesis adviser. The topic usually involves the student’s research.

Time in Candidacy

Advancement

Advancing to candidacy means a student is ready to write a doctoral dissertation. Students must apply for advancement to candidacy once they have successfully passed the qualifying examination.

Dissertation Presentation/Finishing Talk

Prior to filing, the thesis should be presented at an appropriate seminar in the department.

Required Professional Development

All PhD graduate students are required to serve as a Graduate Student Instructor (http://statistics.berkeley.edu/employment/gsi-and-reader) (GSI) for a minimum of 20 hours (equivalent to a 50% GSI appointment) by the end of their third year in the program within the department.

Unit Requirements

In order to obtain the MA in Statistics, admitted MA students must complete a minimum of 24 units of courses and pass a comprehensive examination.

In extremely rare cases, a thesis option may be considered by the MA advisors. Typically, this will be when either the option has been offered to the student at the time of admission, or if the student arrives with substantial progress in research in an area of interest to our faculty. When taking the thesis option, a total of 20 units is need to complete the degree.

Curriculum

Courses Required

STAT 201A	Introduction to Probability at an Advanced Level	4
STAT 201B	Introduction to Statistics at an Advanced Level	4
STAT 243	Introduction to Statistical Computing	4
STAT 230A	Linear Models	4
STAT 222	Masters of Statistics Capstone Project	4
Elective		4

The capstone will consist of a team-based learning experience that will give students the opportunity to work on a real-world problem and carry out a substantial data analysis project. It will culminate with a written report and an oral presentation of findings. The elective will depend on the student's interests and will be decided in consultation with advisers.

Capstone/Thesis (Plan I)

If approved for the thesis option, you must find three faculty to be on your thesis committee. Though not required, it is strongly encouraged that one of the faculty be from outside the Statistics Department. Both you and the thesis committee chair must agree on the topic of your thesis. Further information on how to file a thesis is available on the MA program web page.

Capstone/Comprehensive Exam (Plan II)

On the Saturday before the spring semester begins in January, students will take a comprehensive exam on the theoretical foundations of statistics. There will be a two hour exam on the material of 201A and a two hour exam on the material of 201B. All students taking the exam will receive copies of previous examinations.

Statistics

STAT 200A Introduction to Probability and Statistics at an Advanced Level 4 Units
Probability spaces, random variables, distributions in probability and statistics, central limit theorem, Poisson processes, transformations involving random variables, estimation, confidence intervals, hypothesis testing, linear models, large sample theory, categorical models, decision theory.
Rules & Requirements

Prerequisites: Multivariable calculus and one semester of linear algebra

Credit Restrictions: Students will receive no credit for Statistics 200A after completing Statistics 201A-201B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 200B Introduction to Probability and Statistics at an Advanced Level 4 Units
Probability spaces, random variables, distributions in probability and statistics, central limit theorem, Poisson processes, transformations involving random variables, estimation, confidence intervals, hypothesis testing, linear models, large sample theory, categorical models, decision theory.
Rules & Requirements

Prerequisites: Multivariable calculus and one semester of linear algebra

Credit Restrictions: Students will receive no credit for Statistics 200A-200B after completing Statistics 201A-201B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 201A Introduction to Probability at an Advanced Level 4 Units
Distributions in probability and statistics, central limit theorem, Poisson processes, modes of convergence, transformations involving random variables.
Rules & Requirements

Prerequisites: Multivariable calculus, one semester of linear algebra, and Statistics 134 or consent of instructor

Credit Restrictions: Students will receive no credit for 201A after taking 200A.

Hours & Format

Fall and/or spring: 7 weeks - 6 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 201B Introduction to Statistics at an Advanced Level 4 Units
Estimation, confidence intervals, hypothesis testing, linear models, large sample theory, categorical models, decision theory.
Rules & Requirements

Prerequisites: Statistics 200A, Statistics 201A, or consent of instructor

Credit Restrictions: Students will receive no credit for Statistics 201B after completing Statistics 200B.

Hours & Format

Fall and/or spring: 7 weeks - 6 hours of lecture and 3 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 204 Probability for Applications 4 Units
A treatment of ideas and techniques most commonly found in the applications of probability: Gaussian and Poisson processes, limit theorems, large deviation principles, information, Markov chains and Markov chain Monte Carlo, martingales, Brownian motion and diffusion.
Rules & Requirements

Credit Restrictions: Students will receive no credit for Statistics 204 after completing Statistics 205A-205B.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: Evans

STAT C205A Probability Theory 4 Units
The course is designed as a sequence with Statistics C205B/ Mathematics C218B with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: MATH C218A

STAT C205B Probability Theory 4 Units
The course is designed as a sequence with with Statistics C205A/ Mathematics C218A with the following combined syllabus. Measure theory concepts needed for probability. Expection, distributions. Laws of large numbers and central limit theorems for independent random variables. Characteristic function methods. Conditional expectations, martingales and martingale convergence theorems. Markov chains. Stationary processes. Brownian motion.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: MATH C218B

STAT C206A Advanced Topics in Probability and Stochastic Process 3 Units
The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probability offered according to students demand and faculty availability.
Rules & Requirements

Prerequisites: Statistics C205A-C205B or consent of instructor

Repeat rules: Course may be repeated for credit with a different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: MATH C223A

STAT C206B Advanced Topics in Probability and Stochastic Processes 3 Units
The topics of this course change each semester, and multiple sections may be offered. Advanced topics in probability offered according to students demand and faculty availability.
Rules & Requirements

Repeat rules: Course may be repeated for credit with a different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: MATH C223B

STAT 210A Theoretical Statistics 4 Units
An introduction to mathematical statistics, covering both frequentist and Bayesian aspects of modeling, inference, and decision-making. Topics include statistical decision theory; point estimation; minimax and admissibility; Bayesian methods; exponential families; hypothesis testing; confidence intervals; small and large sample theory; and M-estimation.
Rules & Requirements

Prerequisites: Linear algebra, real analysis, and a year of upper division probability and statistics

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 210B Theoretical Statistics 4 Units
Introduction to modern theory of statistics; empirical processes, influence functions, M-estimation, U and V statistics and associated stochastic decompositions; non-parametric function estimation and associated minimax theory; semiparametric models; Monte Carlo methods and bootstrap methods; distributionfree and equivariant procedures; topics in machine learning. Topics covered may vary with instructor.
Rules & Requirements

Prerequisites: Statistics 210A and a graduate level probability course; a good understanding of various notions of stochastic convergence

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 212A Topics in Theoretical Statistics 3 Units
This course introduces the student to topics of current research interest in theoretical statistics. Recent topics include information theory, multivariate analysis and random matrix theory, high-dimensional inference. Typical topics have been model selection; empirical and point processes; the bootstrap, stochastic search, and Monte Carlo integration; information theory and statistics; semi- and non-parametric modeling; time series and survival analysis.
Rules & Requirements

Prerequisites: 210 or 205 and 215

Repeat rules: Course may be repeated for credit with different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Formerly known as: 216A-216B and 217A-217B

STAT 212B Topics in Theoretical Statistics 3 Units
This course introduces the student to topics of current research interest in theoretical statistics. Recent topics include information theory, multivariate analysis and random matrix theory, high-dimensional inference. Typical topics have been model selection; empirical and point processes; the bootstrap, stochastic search, and Monte Carlo integration; information theory and statistics; semi- and non-parametric modeling; time series and survival analysis.
Rules & Requirements

Prerequisites: 210 or 205 and 215

Repeat rules: Course may be repeated for credit with different instructor. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Formerly known as: 216A-216B and 217A-217B

STAT 215A Statistical Models: Theory and Application 4 Units
Applied statistics with a focus on critical thinking, reasoning skills, and techniques. Hands-on-experience with solving real data problems with high-level programming languages such as R. Emphasis on examining the assumptions behind standard statistical models and methods. Exploratory data analysis (e.g., graphical data summaries, PCAs, clustering analysis). Model formulation, fitting, and validation and testing. Linear regression and generalizations (e.g., GLMs, ridge regression, lasso).
Rules & Requirements

Prerequisites: Linear algebra, calculus, upper division probability and statistics, and familiarity with high-level programming languages. Statistics 133, 134, and 135 recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 215B Statistical Models: Theory and Application 4 Units
Course builds on 215A in developing critical thinking skills and the techniques of advanced applied statistics. Particular topics vary with instructor. Examples of possible topics include planning and design of experiments, ANOVA and random effects models, splines, classification, spatial statistics, categorical data analysis, survival analysis, and multivariate analysis.
Rules & Requirements

Prerequisites: Statistics 215A or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 222 Masters of Statistics Capstone Project 4 Units
The capstone project is part of the masters degree program in statistics. Students engage in professionally-oriented group research under the supervision of a research advisor. The research synthesizes the statistical, computational, economic, and social issues involved in solving complex real-world problems.
Rules & Requirements

Prerequisites: Statistics 201A-201B, 243. Restricted to students who have been admitted to the one-year Masters Program in Statistics beginning fall 2012 or later

Hours & Format

Fall and/or spring: 15 weeks - 4 hours of seminar per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 230A Linear Models 4 Units
Theory of least squares estimation, interval estimation, and tests under the general linear fixed effects model with normally distributed errors. Large sample theory for non-normal linear models. Two and higher way layouts, residual analysis. Effects of departures from the underlying assumptions. Robust alternatives to least squares.
Rules & Requirements

Prerequisites: Matrix algebra, a year of calculus, two semesters of upper division or graduate probability and statistics

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 232 Experimental Design 4 Units
Randomization, blocking, factorial design, confounding, fractional replication, response surface methodology, optimal design. Applications.
Rules & Requirements

Prerequisites: 200B or equivalent

Repeat rules: Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 239A The Statistics of Causal Inference in the Social Science 4 Units
Approaches to causal inference using the potential outcomes framework. Covers observational studies with and without ignorable treatment assignment, randomized experiments with and without noncompliance, instrumental variables, regression discontinuity, sensitivity analysis and randomization inference. Applications are drawn from a variety of fields including political science, economics, sociology, public health and medicine.
Rules & Requirements

Prerequisites: At least one graduate matrix based multivariate regression course in addition to introductory statistics and probability

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 1-2 hours of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade. This is part one of a year long series course. A provisional grade of IP (in progress) will be applied and later replaced with the final grade after completing part two of the series.

Instructor: Sekhon

STAT 239B Quantitative Methodology in the Social Sciences Seminar 4 Units
A seminar on successful research designs and a forum for students to discuss the research methods needed in their own work, supplemented by lectures on relevant statistical and computational topics such as matching methods, instrumental variables, regression discontinuity, and Bayesian, maximum likelihood and robust estimation. Applications are drawn from political science, economics, sociology, and public health. Experience with R is assumed.
Rules & Requirements

Prerequisites: Statistics 239A or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3-3 hours of lecture and 1-2 hours of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade. This is part two of a year long series course. Upon completion, the final grade will be applied to both parts of the series.

STAT C239A The Statistics of Causal Inference in the Social Science 4 Units
Approaches to causal inference using the potential outcomes framework. Covers observational studies with and without ignorable treatment assignment, randomized experiments with and without noncompliance, instrumental variables, regression discontinuity, sensitivity analysis and randomization inference. Applications are drawn from a variety of fields including political science, economics, sociology, public health and medicine.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: POL SCI C236A

STAT 240 Nonparametric and Robust Methods 4 Units
Standard nonparametric tests and confidence intervals for continuous and categorical data; nonparametric estimation of quantiles; robust estimation of location and scale parameters. Efficiency comparison with the classical procedures.
Rules & Requirements

Prerequisites: A year of upper division probability and statistics

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT C241A Statistical Learning Theory 3 Units
Classification regression, clustering, dimensionality, reduction, and density estimation. Mixture models, hierarchical models, factorial models, hidden Markov, and state space models, Markov properties, and recursive algorithms for general probabilistic inference nonparametric methods including decision trees, kernal methods, neural networks, and wavelets. Ensemble methods.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructors: Bartlett, Jordan, Wainwright

Also listed as: COMPSCI C281A

STAT C241B Advanced Topics in Learning and Decision Making 3 Units
Recent topics include: Graphical models and approximate inference algorithms. Markov chain Monte Carlo, mean field and probability propagation methods. Model selection and stochastic realization. Bayesian information theoretic and structural risk minimization approaches. Markov decision processes and partially observable Markov decision processes. Reinforcement learning.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructors: Bartlett, Jordan, Wainwright

Also listed as: COMPSCI C281B

STAT 243 Introduction to Statistical Computing 4 Units
Concepts in statistical programming and statistical computation, including programming principles, data and text manipulation, parallel processing, simulation, numerical linear algebra, and optimization.
Objectives & Outcomes

Student Learning Outcomes: Become familiar with concepts and tools for reproducible research and good scientific computing practices.
Operate effectively in a UNIX environment and on remote servers.
Program effectively in languages including R and Python with an advanced knowledge of language functionality and an understanding of general programming concepts.
Understand in depth and make use of principles of numerical linear algebra, optimization, and simulation for statistics-related research.

Rules & Requirements

Prerequisites: Graduate standing

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 244 Statistical Computing 4 Units
Algorithms in statistical computing: random number generation, generating other distributions, random sampling and permutations. Matrix computations in linear models. Non-linear optimization with applications to statistical procedures. Other topics of current interest, such as issues of efficiency, and use of graphics.
Rules & Requirements

Prerequisites: Knowledge of a higher level programming language

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT C245A Introduction to Modern Biostatistical Theory and Practice 4 Units
Course covers major topics in general statistical theory, with a focus on statistical methods in epidemiology. The course provides a broad theoretical framework for understanding the properties of commonly-used and more advanced methods. Emphasis is on estimation in nonparametric models in the context of contingency tables, regression (e.g., linear, logistic), density estimation and more. Topics include maximum likelihood and loss-based estimation, asymptotic linearity/ normality, the delta method, bootstrapping, machine learning, targeted maximum likelihood estimation. Comprehension of broad concepts is the main goal, but practical implementation in R is also emphasized. Basic knowledge of probability/statistics and calculus are assume
Rules & Requirements

Prerequisites: Statistics 200A (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: Hubbard

Also listed as: PB HLTH C240A

STAT C245B Biostatistical Methods: Survival Analysis and Causality 4 Units
Analysis of survival time data using parametric and non-parametric models, hypothesis testing, and methods for analyzing censored (partially observed) data with covariates. Topics include marginal estimation of a survival function, estimation of a generalized multivariate linear regression model (allowing missing covariates and/or outcomes), estimation of a multiplicative intensity model (such as Cox proportional hazards model) and estimation of causal parameters assuming marginal structural models. General theory for developing locally efficient estimators of the parameters of interest in censored data models. Computing techniques, numerical methods, simulation and general implementation of biostatistical analysis techniques with emphasis on data applications.
Rules & Requirements

Prerequisites: Statistics 200B (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: van der Laan

Also listed as: PB HLTH C240B

STAT C245C Biostatistical Methods: Computational Statistics with Applications in Biology and Medicine 4 Units
This course provides an introduction to computational statistics, with emphasis on statistical methods and software for addressing high-dimensional inference problems in biology and medicine. Topics include numerical and graphical data summaries, loss-based estimation (regression, classification, density estimation), smoothing, EM algorithm, Markov chain Monte-Carlo, clustering, multiple testing, resampling, hidden Markov models, in silico experiments.
Rules & Requirements

Prerequisites: Statistics 200A or equivalent (may be taken concurrently)

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: Dudoit

Also listed as: PB HLTH C240C

STAT C245D Biostatistical Methods: Computational Statistics with Applications in Biology and Medicine II 4 Units
This course and Pb Hlth C240C/STAT C245C provide an introduction to computational statistics with emphasis on statistical methods and software for addressing high-dimensional inference problems that arise in current biological and medical research. The courses also discusses statistical computing resources, with emphasis on the R language and environment (www.r-project.org). Programming topics to be discussed include: data structures, functions, statistical models, graphical procedures, designing an R package, object-oriented programming, inter-system interfaces. The statistical and computational methods are motivated by and illustrated on data structures that arise in current high-dimensional inference problems in biology and medicine.
Rules & Requirements

Prerequisites: Statistics 200A-200B or Statistics 201A-201B (may be taken concurrently) or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: Dudoit

Also listed as: PB HLTH C240D

STAT C245E Statistical Genomics 4 Units
Genomics is one of the fundamental areas of research in the biological sciences and is rapidly becoming one of the most important application areas in statistics. This is the first course of a two-semester sequence, which provides an introduction to statistical and computational methods for the analysis of meiosis, population genetics, and genetic mapping. The second course is Statistics C245F/Public Health C240F. The courses are primarily intended for graduate students and advanced undergraduate students from the mathematical sciences.
Rules & Requirements

Prerequisites: Statistics 200A and 200B or equivalent (may be taken concurrently). A course in algorithms and knowledge of at least one computing language (e.g., R, matlab) is recommended

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructors: Dudoit, Huang, Nielsen, Song

Also listed as: PB HLTH C240E

STAT C245F Statistical Genomics 4 Units
Genomics is one of the fundamental areas of research in the biological sciences and is rapidly becoming one of the most important application areas in statistics. The first course in this two-semester sequence is Public Health C240E/Statistics C245E. This is the second course, which focuses on sequence analysis, phylogenetics, and high-throughput microarray and sequencing gene expression experiments. The courses are primarily intended for graduate students and advanced undergraduate students from the mathematical sciences.
Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 1 hour of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructors: Dudoit, Huang, Nielsen, Song

Also listed as: PB HLTH C240F

STAT C247C Longitudinal Data Analysis 4 Units
The course covers the statistical issues surrounding estimation of effects using data on subjects followed through time. The course emphasizes a regression model approach and discusses disease incidence modeling and both continuous outcome data/linear models and longitudinal extensions to nonlinear models (e.g., logistic and Poisson). The primary focus is from the analysis side, but mathematical intuition behind the procedures will also be discussed. The statistical/mathematical material includes some survival analysis, linear models, logistic and Poisson regression, and matrix algebra for statistics. The course will conclude with an introduction to recently developed causal regression techniques (e.g., marginal structural models). Time permitting, serially correlated data on ecological units will also be discussed.
Rules & Requirements

Prerequisites: 142, 145, 241 or equivalent courses in basic statistics, linear and logistic regression

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of discussion per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructors: Hubbard, Jewell

Also listed as: PB HLTH C242C

STAT 248 Analysis of Time Series 4 Units
Frequency-based techniques of time series analysis, spectral theory, linear filters, estimation of spectra, estimation of transfer functions, design, system identification, vector-valued stationary processes, model building.
Rules & Requirements

Prerequisites: 102 or equivalent

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT C249A Censored Longitudinal Data and Causality 4 Units
This course examines optimal robust methods for statistical inference regarding causal and non-causal parameters based on longitudinal data in the presence of informative censoring and informative confounding of treatment. Models presented include multivariate regression models, multiplicative intensity models for counting processes, and causal models such as marginal structural models and structural nested models. Methods will be illustrated with data sets of practical interest and analyzed in the laboratory section. This course, appropriate for advanced masters and Ph.D. students, provides exposure to a number of ongoing research topics.
Rules & Requirements

Prerequisites: 240B, Statistics 200A-200B or consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Instructor: van der Laan

Also listed as: PB HLTH C246A

STAT 259 Reproducible and Collaborative Statistical Data Science 4 Units
A project-based introduction to statistical data analysis. Through case studies, computer laboratories, and a term project, students will learn practical techniques and tools for producing statistically sound and appropriate, reproducible, and verifiable computational answers to scientific questions. Course emphasizes version control, testing, process automation, code review, and collaborative programming. Software tools may include Bash, Git, Python, and LaTeX.
Rules & Requirements

Prerequisites: Statistics 133, Statistics 134, and Statistics 135 (or equivalent)

Credit Restrictions: Students will receive no credit for Statistics 259 after taking Statistics 159.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture and 2 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 260 Topics in Probability and Statistics 3 Units
Special topics in probability and statistics offered according to student demand and faculty availability.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT C261 Quantitative/Statistical Research Methods in Social Sciences 3 Units
Selected topics in quantitative/statistical methods of research in the social sciences and particularly in sociology. Possible topics include: analysis of qualitative/categorical data; loglinear models and latent-structure analysis; the analysis of cross-classified data having ordered and unordered categories; measure, models, and graphical displays in the analysis of cross-classified data; correspondence analysis, association analysis, and related methods of data analysis.
Rules & Requirements

Prerequisites: Consent of instructor

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

Also listed as: SOCIOL C271D

STAT 272 Statistical Consulting 3 Units
To be taken concurrently with service as a consultant in the department's drop-in consulting service. Participants will work on problems arising in the service and will discuss general ways of handling such problems. There will be working sessions with researchers in substantive fields and occasional lectures on consulting.
Rules & Requirements

Prerequisites: Some course work in applied statistics and permission of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of session per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

STAT 278B Statistics Research Seminar 1 - 4 Units
Special topics, by means of lectures and informational conferences.
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of seminar per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Offered for satisfactory/unsatisfactory grade only.

STAT 298 Directed Study for Graduate Students 1 - 12 Units
Special tutorial or seminar on selected topics.
Rules & Requirements

Prerequisites: Consent of instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-16 hours of independent study per week
8 weeks - 1-12 hours of independent study per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 299 Individual Study Leading to Higher Degrees 1 - 12 Units
Individual study
Rules & Requirements

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 3-36 hours of independent study per week

Summer:
6 weeks - 7.5-45 hours of independent study per week
8 weeks - 6-36 hours of independent study per week
10 weeks - 4.5-27 hours of independent study per week

Additional Details

Subject/Course Level: Statistics/Graduate

Grading: Letter grade.

STAT 375 Professional Preparation: Teaching of Probability and Statistics 2 - 4 Units
Discussion, problem review and development, guidance of laboratory classes, course development, supervised practice teaching.
Rules & Requirements

Prerequisites: Graduate standing and appointment as a graduate student instructor

Repeat rules: Course may be repeated for credit. Course may be repeated for credit when topic changes.

Hours & Format

Fall and/or spring: 15 weeks - 2 hours of lecture and 4 hours of laboratory per week

Additional Details

Subject/Course Level: Statistics/Professional course for teachers or prospective teachers

Grading: Offered for satisfactory/unsatisfactory grade only.

Formerly known as: Statistics 300

STAT 601 Individual Study for Master's Candidates 1 - 8 Units
Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for the master's comprehensive examinations. Units may not be used to meet either unit or residence requirements for a master's degree.
Rules & Requirements

Repeat rules: Course may be repeated for a maximum of 16 units.Course may be repeated for a maximum of 16 units.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-10 hours of independent study per week
8 weeks - 1-8 hours of independent study per week

Additional Details

Subject/Course Level: Statistics/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.

STAT 602 Individual Study for Doctoral Candidates 1 - 8 Units
Individual study in consultation with the graduate adviser, intended to provide an opportunity for qualified students to prepare themselves for certain examinations required of candidates for the Ph.D. degree.
Rules & Requirements

Prerequisites: One year of full-time graduate study and permission of the graduate adviser

Credit Restrictions: Course does not satisfy unit or residence requirements for doctoral degree.

Repeat rules: Course may be repeated for a maximum of 16 units.Course may be repeated for a maximum of 16 units.

Hours & Format

Fall and/or spring: 15 weeks - 0 hours of independent study per week

Summer:
6 weeks - 1-10 hours of independent study per week
8 weeks - 1-8 hours of independent study per week

Additional Details

Subject/Course Level: Statistics/Graduate examination preparation

Grading: Offered for satisfactory/unsatisfactory grade only.