STATISTICS

Courses offered by the Department of Statistics are listed under the subject code STATS on the Stanford Bulletin's ExploreCourses web site.

The department's goals are to acquaint students with the role played in science and technology by probabilistic and statistical ideas and methods, to provide instruction in the theory and application of techniques that have been found to be commonly useful, and to train research workers in probability and statistics. There are courses for general students as well as those who plan careers in statistics in business, government, industry, and teaching.

The requirements for a degree in Statistics are flexible, depending on the needs and interests of the students. Some students may be interested in the theory of statistics and/or probability, whereas other students may wish to apply statistical and probabilistic methods to a substantive area. The department has long recognized the relation of statistical theory to applications. It has fostered this by encouraging a liaison with other departments in the form of joint and courtesy faculty appointments: Economics (Anderson, Romano), Education (Olkin, Rogosa), Electrical Engineering (Montanari), Geological and Environmental Sciences (Rajaratnam, Switzer), Health Research and Policy (Efron, Hastie, Johnstone, Lavori, Olshen, Tibshirani, Wong), Mathematics (Candés, Dembo, Diaconis), Political Science (Jackman), and the SLAC National Accelerator Laboratory (Friedman). The research activities of the department reflect an interest in applied and theoretical statistics and probability. There are workshops in biology/medicine and in environmental factors in health.

In addition to courses for Statistics students, the department offers a number of service courses designed for students in other departments. These tend to emphasize the application of statistical techniques rather than their theoretical development.

The department has always drawn visitors from other countries and universities. As a consequence, there is usually a wide range of seminars offered by both the visitors and the department's own faculty.

Undergraduate Programs in Statistics

Majoring in Statistics

Students wishing to build a concentration in probability and statistics are encouraged to consider declaring a major in Mathematical and Computational Science (http://web.stanford.edu/group/mathcompsci). This interdepartmental program is administered in the Department of Statistics and provides core training in computing, mathematics, operations research, and statistics, with opportunities for further elective work and specialization. See the "Mathematical and Computational Science" section of this bulletin.

Graduate Programs in Statistics

University requirements for the M.S. and Ph.D. degrees are discussed in the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees)" section of this bulletin.

Learning Outcomes (Graduate)

The purpose of the master's program is to further develop knowledge and skills in Statistics and to prepare students for a professional career or doctoral studies. This is achieved through completion of courses, in the primary field as well as related areas, and experience with independent work and specialization.

The Ph.D. is conferred upon candidates who have demonstrated substantial scholarship and the ability to conduct independent research and analysis in Statistics. Through completion of advanced course work and rigorous skills training, the doctoral program prepares students to make original contributions to the knowledge of Statistics and to interpret and present the results of such research.

Minor in Statistics

The undergraduate minor in Statistics is designed to complement major degree programs primarily in the social and natural sciences. Students with an undergraduate Statistics minor should find broadened possibilities for employment. The Statistics minor provides valued preparation for professional degree studies in postgraduate academic programs.

The minor consists of a minimum of six courses with a total of at least 20 units. There are two required courses (8 units) and four qualifying or elective courses (12 or more units). All courses for the minor must be taken for a letter grade. An overall 2.75 grade point average (GPA) is required for courses fulfilling the minor.

Required Courses

		Units
STATS 116	Theory of Probability	3-5
STATS 200	Introduction to Statistical Inference	3

Qualifying Courses

At most, one of these two courses may be counted toward the six course requirement for the minor:

		Units
MATH 52	Integral Calculus of Several Variables	5
STATS 191	Introduction to Applied Statistics	3-4

Elective Courses

At least one of the elective courses should be a STATS 200-level course. The remaining two elective courses may also be 200-level courses. Alternatively, one or two elective courses may be approved courses in other departments. Special topics courses and seminars for undergraduates are offered from time to time by the department, and these may be counted toward the course requirement. Students may not count any Statistics courses below the 100 level toward the minor.

Examples of elective course sequences are:

		Units
Data Analysis and Applied Statistics		
STATS 202	Data Mining and Analysis	3
STATS 203	Introduction to Regression Models and Analysis of Variance	3
Statistical Methodology		
STATS 205	Introduction to Nonparametric Statistics	3
STATS 206	Applied Multivariate Analysis	3
STATS 207	Introduction to Time Series Analysis	3
Economic Optimization		
STATS 206	Applied Multivariate Analysis	3
ECON 160	Game Theory and Economic Applications	5
Psychology Modeling and Experiments		
STATS 206	Applied Multivariate Analysis	3
Signal Processing		
STATS 207	Introduction to Time Series Analysis	3
EE 264	Digital Signal Processing	3
EE 279	Introduction to Digital Communication	3
Genetic and Ecologic Modeling		
STATS 217	Introduction to Stochastic Processes	3

BIO 283	Theoretical Population Genetics	3
Probability and Applications		
STATS 217	Introduction to Stochastic Processes	3
STATS 218	Introduction to Stochastic Processes	3
Mathematical Finances		
STATS 240	Statistical Methods in Finance	3-4
STATS 243	Financial Models and Statistical Methods in Active Risk Management	3-4
STATS 250	Mathematical Finance	3

Master of Science in Statistics

The department requires that a master's student take 45 units of work from offerings in the Department of Statistics (http://explorecourses.stanford.edu/search?view=catalog&filter-coursestatus-Active=on&page=0&catalog=&academicYear=&q=STATS&collapse=) or from authorized courses in other departments. With the advice of the master's program advisers, each student selects his or her own set of electives.

All requirements for the Statistics master's degree, including the coterminal master's degree, must be completed within three years of their first quarter of graduate standing. Ordinarily, four or five quarters are needed to complete all requirements. Honors Cooperative students must finish within five years.

Units for a given course may not be counted to meet the requirements of more than one degree, with the exception that up to 45 units of a Stanford M.A. or M.S. degree may be applied to the residency requirement for the Ph.D., D.M.A. or Engineer degrees. (GAP 3.2 (http://gap.stanford.edu/3-2.html))

University Coterminal Requirements

Coterminal master's degree candidates are expected to complete all master's degree requirements as described in this bulletin. University requirements for the coterminal master's degree are described in the "Coterminal Master's Program (http://exploredegrees.stanford.edu/cotermdegrees)" section. University requirements for the master's degree are described in the "Graduate Degrees (http://exploredegrees.stanford.edu/graduatedegrees/#masterstext)" section of this bulletin.

After accepting admission to this coterminal master's degree program, students may request transfer of courses from the undergraduate to the graduate career to satisfy requirements for the master's degree. Transfer of courses to the graduate career requires review and approval of both the undergraduate and graduate programs on a case by case basis.

In this master's program, courses taken three quarters prior to the first graduate quarter, or later, are eligible for consideration for transfer to the graduate career. No courses taken prior to the first quarter of the sophomore year may be used to meet master's degree requirements.

Course transfers are not possible after the bachelor's degree has been conferred.

The University requires that the graduate adviser be assigned in the student's first graduate quarter even though the undergraduate career may still be open. The University also requires that the Master's Degree Program Proposal be completed by the student and approved by the department by the end of the student's first graduate quarter.

Students must submit a completed Coterminal Course Approval Form (https://stanford.box.com/Coterm-Course-Approval) with their Application for Admission to Coterminal Master's Program (https://stanford.box.com/CotermApplic) indicating which courses must be transferred from the student's undergraduate to graduate career

For further information about the Statistics master's degree program requirements, see the department web site (https://statistics.stanford.edu/academics/ms-statistics). (https://statistics.stanford.edu/masters-program-proposal-form)

Students must earn a 3.0 GPA in the following M.S. degree requirements:

1. Statistics core courses (must complete all four courses):

		Units
STATS 116	Theory of Probability	3-5
STATS 191	Introduction to Applied Statistics	3-4
STATS 200	Introduction to Statistical Inference	3
STATS 217	Introduction to Stochastic Processes	2-3

All must be taken for a letter grade. Students with prior background may replace each course with a more advanced course from the same area. Courses previously taken may be waived by the adviser, in which case they must be replaced by other graduate courses offered by the department.

2. Linear Algebra Mathematics requirement:

		Units
Select one of the following:		
MATH 104	Applied Matrix Theory	3
MATH 113	Linear Algebra and Matrix Theory	3
MATH 115	Functions of a Real Variable	3
MATH 171	Fundamental Concepts of Analysis	3

All must be taken for a letter grade. Substitution of other courses in Mathematics and Computer Science may be made with consent of the adviser.

3. Programming requirement:

		Units
Select one of the following:		
CS 106A	Programming Methodology	3
CS 106B	Programming Abstractions	3
CS 106X	Programming Abstractions (Accelerated)	3
CME 108	Introduction to Scientific Computing	3

All must be taken for a letter grade. Substitution of other courses in Mathematics and Computer Science may be made with consent of the adviser.

4. Additional Statistics Courses

At least four additional Statistics courses must be taken from graduate offerings in the department (STATS 202 through 390). All must be taken for a letter grade, if offered. Students cannot count more than a total 6 units of the following toward the master's degree requirements:

		Units
STATS 260A	Workshop in Biostatistics	1-2
STATS 260B	Workshop in Biostatistics	1-2
STATS 260C	Workshop in Biostatistics	1-2
STATS 298	Industrial Research for Statisticians	1
STATS 299	Independent Study	1-10
STATS 390	Consulting Workshop	1

5. Elective Courses

Additional elective units to complete the requirements may be chosen from the list available from the department web site (https://statistics.stanford.edu/academics/ms-statistics-elective-courses). Other graduate courses (200 or above) may be authorized by the adviser if they provide skills relevant to statistics or deal primarily with an application of statistics or probability and do not overlap courses in the student's

program. There is sufficient flexibility to accommodate students with interests in applications to business, computing, economics, engineering, health, operations research, and biological and social sciences.

Courses below 200 level are not acceptable, with the following exceptions:

		Units
STATS 116	Theory of Probability	3-5
STATS 191	Introduction to Applied Statistics	3-4
MATH 104	Applied Matrix Theory	3
MATH 113	Linear Algebra and Matrix Theory	3
MATH 115	Functions of a Real Variable	3
MATH 171	Fundamental Concepts of Analysis	3
MATH 180	Introduction to Financial Mathematics	3
CS 106A	Programming Methodology	3-5
CS 106B	Programming Abstractions	3-5
CS 106X	Programming Abstractions (Accelerated)	3-5
CS 140	Operating Systems and Systems Programming	3-4
CS 142	Web Applications	3
CS 143	Compilers	3-4
CS 144	Introduction to Computer Networking	3-4
CS 145	Introduction to Databases	3-4
CS 147	Introduction to Human-Computer Interaction Design	3-5
CS 148	Introduction to Computer Graphics and Imaging	3-4
CS 149		
CS 154	Introduction to Automata and Complexity Theory	3-4
CS 155	Computer and Network Security	3
CS 157	Logic and Automated Reasoning	3
CS 161	Design and Analysis of Algorithms	3-5
CS 170	Stanford Laptop Orchestra: Composition, Coding, and Performance	1-5
CS 181	Computers, Ethics, and Public Policy	4

At most, one of these courses may be counted:

		Units
MATH 104	Applied Matrix Theory	3
MATH 113	Linear Algebra and Matrix Theory	3
MATH 151	Introduction to Probability Theory	3
STATS 116	Theory of Probability	3-5

6. Master's Degree Program Proposal Form (degree milestone)
This form (https://statistics.stanford.edu/masters-program-proposal-form) is to be submitted by the student to the major department's student services administrator prior to the end of the first quarter of enrollment in the program. A revised program proposal must be submitted if your degree plans change.

There is no thesis requirement.

Students with a strong mathematical background who may wish to go on to a Ph.D. in Statistics should consider applying to the Ph.D. program.

Master of Science in Statistics: Data Science (subplan)

The Department of Statistics and ICME have collaborated on a new specialization/subplan for the Master in Science degree focusing on big data in engineering and applied sciences. Students in the program will develop strong mathematical, statistical, computational, and programming skills through the ICME M.S. requirements and will gain a fundamental data science education by focusing 18 units of elective courses in the area of data science and related courses. Upon completion of the M.S. in Statistics with a specialization/subplan in Data Science, students will be prepared to continue on to their Ph.D. in Computer Science, ICME, or as a data science professional in industry.

The M.S. in Data Science specialization/subplan is overseen by a steering committee comprised of ICME and Statistics faculty members. Current members are Professors Guenther Walther, Trevor Hastie, Emmanuel Candes, and Margot Gerritsen.

Applicants will apply to the M.S. program in Statistics and declare their preference for the Data Science subplan within the application ("Department Specialization" option). Selection of the students is made by the Statistics admission committee, which has representation from the Data Science steering committee.

A Master's degree program proposal (https://statistics.stanford.edu/stats-ds-program-proposa-form-pdf), is to be submitted by the student to the major department's student services administrator prior to the end of the first quarter of enrollment in the program. A revised program proposal must be submitted if your degree plans change.

(Subplans are printed on the transcript and diploma.)

Curriculum and Degree Requirements

The course work follows the requirements of the traditional ICME M.S. degree with additional restrictions placed on the general and focused electives. As defined in the general graduate student requirements, students must maintain a grade point average (GPA) of 3.0 or better and classes must be taken at the 200 level or higher. Students must complete 45 units of required coursework in Data Science.

Students must demonstrate breadth of knowledge in the field by completing the following core courses. Courses in this area must be taken for letter grade.

		Units
CME 302	Numerical Linear Algebra	3
CME 304	Numerical Optimization	3
CME 305	Discrete Mathematics and Algorithms	3

In addition to the three core courses, the students are required to take a course in Stochastics. They can take either CME 308 Stochastic Methods in Engineering or an equivalent course approved by the steering committee. Must be taken for a letter grade.

Requirement 2: Advanced Scientific Programming and High Performance Computing Core (6 units)
To ensure that students have a strong foundation in programming, all students will be required to take 6 units of advanced programming, with at least 3 units in parallel computing. Courses in this area must be taken for letter grade.

		Units
Approved Advanced Programming courses: (3 units)		
CME 212	Advanced Programming for Scientists and Engineers	3
CME 214	Software Design in Modern Fortran for Scientists and Engineers	3
CS 107	Computer Organization and Systems	3-5
CS 249B	Large-scale Software Development	3
Approved Parallel Computing/HCP courses: (3 units)		
CME 213	Introduction to parallel computing using MPI, openMP, and CUDA	3
CME 342	Parallel Methods in Numerical Analysis	3
CS 149		3-4
CS 315A	Parallel Computer Architecture and Programming	3
CS 316	Advanced Multi-Core Systems	3

Students who do not start the program with a strong computational and/or programming background will take an extra 3 units to prepare themselves by, for example, taking CME 211 Software Development for Scientists and Engineers or an equivalent course, such as CS106A/B/X. For Data Science track students, the 1-unit course in MapReduce offered by ICME annually is also highly recommended.

Requirement 3: Statistics Core (12 units)
Courses in this area must be taken for letter grade.

The curriculum for the Data Science track requires 12 units of focused coursework in Statistics consisting of the following courses:

		Units
STATS 200	Introduction to Statistical Inference	3
STATS 203	Introduction to Regression Models and Analysis of Variance	3
or		
STATS 305	Introduction to Statistical Modeling	3
STATS 315A	Modern Applied Statistics: Learning	2-3
STATS 315B	Modern Applied Statistics: Data Mining	2-3

or equivalent courses as approved by the steering committee.

Of the following 15 units in Requirements **Four** and **Five** combined, 6 units must be taken for a letter grade.

Requirement 4: Domain Specialization or preparatory courses (9 units)
Three courses in specialized areas. One or two of these courses may be used by the students that enter the program with insufficient linear algebra or programming experience to prepare for the core requirements in the MS track.

Specialized courses include courses that further deepen the data science core. Some possibilities include:

		Units
CS 347	Parallel and Distributed Data Management	3
CS 448	Topics in Computer Graphics	3-4
CS 224W	Social Information and Network Analysis	3-4
STATS 366	Modern Statistics for Modern Biology	3
BIOS 221	Modern Statistics for Modern Biology	
PSYCH 204A	Human Neuroimaging Methods	3
PSYCH 303	Human and Machine Hearing	3
OIT 367	Business Intelligence from Big Data	4
BIOMEDIN 215	Data Driven Medicine	3
ENERGY 240	Geostatistics	2-3
BIOE 214	Representations and Algorithms for Computational Molecular Biology	3-4

Requirement 5: Practical component (6 units)
The students need 6 units of practical component that may include any combination of:

- Capstone project, supervised by a faculty member and approved by the steering committee: the capstone project should be computational in nature; students should submit a one-page proposal, supported by the faculty member, to the steering committee (gwalther@stanford.edu) for approval.
- Clinics, such as the Stanford Data Science Challenge Lab ENGR 250 Data Challenge Laboratory and Data Science Impact Lab ENGR 350 Data Impact Laboratory
- Other courses that have a strong hands-on and practical component, such as STATS 390 Statistical Consulting (up to 3 units).

Doctor of Philosophy in Statistics

The department looks for students who wish to prepare for research careers in statistics or probability, either applied or theoretical. Advanced undergraduate or master's level work in mathematics and statistics provides a good background for the doctoral program. Quantitatively oriented students with degrees in other scientific fields are also encouraged to apply for admission. The program normally takes five years to complete.

Program Summary

		Units
First-year core program		
STATS 300	Advanced Topics in Statistics: Stochastic Block Models and Latent Variable Models (offered Summer Quarter)	2-3
STATS 300A	Theory of Statistics	2-3
STATS 300B	Theory of Statistics	2-4
STATS 300C	Theory of Statistics	2-4
STATS 305	Introduction to Statistical Modeling	3
STATS 306A	Methods for Applied Statistics	3
STATS 306B	Methods for Applied Statistics: Empirical Bayes Methods	2-3
STATS 310A	Theory of Probability	2-4
STATS 310B	Theory of Probability	2-3
STATS 310C	Theory of Probability	2-4

- Pass two of three parts of the qualifying examinations (end of first year); breadth requirement (second and third year); successfully complete the thesis proposal meeting (before end of third year); pass the University oral examination (fourth or fifth year); dissertation (fifth year).
- In addition, students are required to take nine units of advanced topics courses offered by the department. Recommended courses include the following:

		Units
STATS 314A	Advanced Statistical Theory	3
STATS 314B	Topics in Minimax Inference of Nonparametric Functionals	3
STATS 315A	Modern Applied Statistics: Learning	2-3
STATS 315B	Modern Applied Statistics: Data Mining	2-3
STATS 317	Stochastic Processes	3
STATS 318	Modern Markov Chains	3
STATS 330	An Introduction to Compressed Sensing	3
STATS 370	Bayesian Statistics I	3
STATS 376A	Information Theory	3
STATS 376B	Network Information Theory	3
EE 364A	Convex Optimization I	3

- Complete a minimum of three units of STATS 390 Consulting Workshop, taking it at least twice.
- Take STATS 319 Literature of Statistics once per year after passing the Qualifying Exam until the year after passing the dissertation proposal meeting.

First-Year Core Courses

- STATS 300 Advanced Topics in Statistics: Stochastic Block Models and Latent Variable Models systematically surveys the ideas of estimation and of hypothesis testing for parametric and nonparametric models involving small and large samples.

- STATS 305 Introduction to Statistical Modeling is concerned with linear regression and the analysis of variance.
- STATS 306A Methods for Applied Statistics and STATS 306B Methods for Applied Statistics: Empirical Bayes Methods survey a large number of modeling techniques, related to but going beyond the linear models of STATS 305 Introduction to Statistical Modeling.
- STATS 310A Theory of Probability, STATS 310B Theory of Probability, and STATS 310C Theory of Probability are measure-theoretic courses in probability theory, beginning with basic concepts of the law of large numbers and martingale theory.
  - Students who do not have enough mathematics background can take STATS 310A,B,C after their first year but need to have their first-year program approved by the Ph.D. program adviser.

Qualifying Examinations

These are intended to test the student's level of knowledge when the first-year program, common to all students, has been completed. There are separate examinations in the three core subjects of statistical theory and methods, applied statistics, and probability theory, and all are typically taken during the summer between the student's first and second years. Students are expected to show acceptable performance in two examinations. Letter grades are not given. After passing the qualifying exams, students will file for Ph.D. candidacy, a University milestone.

Breadth Requirement

Students are required to take 15 units of coursework outside of the department and are advised to choose an area of concentration in a specific scientific field of statistical applications approved by the Ph.D. program adviser.

Popular areas with suggested course options include:

Computational Biology and Statistical Genomics

Students are expected to take 9 units of graduate courses in genetics or neurosciences (imaging), such as GENE 203/BIO 203 (Advanced Genetics), as well as 9 units of classes in Statistical Genetics or Bioinformatics:

		Units
Courses can be chosen from the following list: [1]		
STATS 345	Statistical and Machine Learning Methods for Genomics	3
STATS 366	Modern Statistics for Modern Biology	3
STATS 367	Statistical Models in Genetics	3

[1] The following courses are not offered this year but may be used by students who completed them in fulfillment of this requirement: STATS 345, STATS 367.

Machine Learning

		Units
Courses can be chosen from the following list:		
Statistical Learning		
STATS 315A	Modern Applied Statistics: Learning	2-3
STATS 315B	Modern Applied Statistics: Data Mining	2-3
Data Bases		
CS 245	Database Systems Principles	3
CS 346	Database System Implementation	3-5
CS 347	Parallel and Distributed Data Management	3
Probabilistic Methods in AI		
CS 221	Artificial Intelligence: Principles and Techniques	3-4
CS 354	Topics in Circuit Complexity	3
Statistical Learning Theory and Pattern Classification		
CS 229	Machine Learning	3-4

Applied Probability

Students are expected to take 15 units of graduate courses in some of the following areas:

		Units
Control and Stochastic Calculus		
MSE 322	Stochastic Calculus and Control	3
MSE 351	Dynamic Programming and Stochastic Control	3
MATH 237	Default and Systemic Risk	3
Finance		
STATS 250	Mathematical Finance	3
FINANCE 622	Dynamic Asset Pricing Theory	4
MATH 236	Introduction to Stochastic Differential Equations	3
Information Theory		
EE 376A	Information Theory	3
EE 376B	Network Information Theory	3
Monte Carlo [1]		
STATS 318	Modern Markov Chains	3
STATS 345	Statistical and Machine Learning Methods for Genomics	3
STATS 362	Topic: Monte Carlo	3
Queuing Theory		
MSE 335	Queueing and Scheduling in Processing Networks	3
Stochastic Processes		
STATS 317	Stochastic Processes	3
MATH 234	Large Deviations Theory	3

[1] The following courses are not offered this year but may be used by students who completed them in fulfillment of this requirement: STATS 318, STATS 345, STATS 362.

Earth Science Statistics

Students are expected to take:

		Units
STATS 313	Introduction to Graphical Models	3
STATS 317	Stochastic Processes	3
STATS 318	Modern Markov Chains	3
In addition, students are expected to take three courses from the GS or Geophysics departments, such as GEOPHYS 210.		

Social and Behavioral Sciences

Students are expected to take three advanced courses from the department with an applied orientation such as:

		Units
Courses can be chosen from the following list: [1]		
STATS 261/262	Intermediate Biostatistics: Analysis of Discrete Data	3
STATS 324	Multivariate Analysis	2-3

[1] The following courses are not offered this year but may be used by students who completed them in fulfillment of this requirement: STATS 343, 354.

In addition, students must complete at least three advanced quantitative courses from departments such as Anthropology, Economics, Political Science, Psychology, and Sociology, and the schools of Education, Business, or Medicine.

Dissertation Reading Committee, Dissertation Proposal Meeting and University Oral Examinations

The dissertation reading committee consists of the student's adviser plus two faculty readers, all of whom are responsible for reading and approving the full dissertation.

The dissertation proposal meeting is intended to demonstrate students' depth in some areas of statistics, and to examine the general plan for their research. It also confirms that students have chosen a Ph.D. faculty adviser and have started to work with that adviser on a research topic. In the meeting, they will give a short presentation and discuss their ideas for completing a Ph.D. thesis, with a committee consisting of the dissertation reading committee plus a fourth member. The meeting must be successfully completed before the end of their third year. "Successful completion" means that the general research plan is sound and has a reasonable chance of success. If they do not successfully complete the meeting to the satisfaction of the committee, then the meeting must be repeated. Repeated failure can lead to a loss of financial support.

The oral examination/dissertation defense is scheduled when the student has finished their dissertation and is in the process of completing their final draft. The oral exam consists of a 40-minute presentation on the thesis topic, followed by a question period. The questions relate both to the student's presentation and also explore the student's familiarity with broader statistical topics related to the thesis research. The oral examination is normally completed within the last few months of the student's Ph.D. period. The examining committee usually consists of the dissertation proposal meeting committee and a fifth faculty member from outside the department. Four out of five passing votes are required and no grades are given. Nearly all students can expect to pass this examination, although it is common for specific recommendations to be made regarding completion of the thesis.

For further information on University oral examinations and committees, see the Graduate Academic Policies and Procedures (GAP) Handbook, section 4.7 (http://gap.stanford.edu/4-7.html) or the "University Oral Examination (http://exploredegrees.stanford.edu/graduatedegrees/#doctoraltext)" section of this bulletin.

Doctoral and Research Advisers

From the student's arrival until the selection of a research adviser, the student's academic progress is monitored by the department Director of Graduate Studies. Each student should meet at least once a quarter with the Doctoral Adviser to discuss their academic plans and their progress towards choosing a thesis adviser.

Financial Support

Students accepted to the Ph.D. program are offered financial support. All tuition expenses are paid and there is a fixed monthly stipend determined to be sufficient to pay living expenses. Financial support can be continued for five years, department resources permitting, for students in good standing. The resources for student financial support derive from funds made available for student teaching and research assistantships. Students receive both a teaching and research assignment each quarter which, together, do not exceed 20 hours. Students are encouraged to apply for outside scholarships, fellowships, and other forms of financial support.

Ph.D. Minor in Statistics

Students must complete 30 total units for the Ph.D. minor. 20 units must be from Statistics courses numbered 300 and above and taken for letter grades. The remaining 10 units can be from Statistics courses numbered 200 and above, and may be taken for credit. The selection of courses must be approved by the Director of Graduate Studies. The Application for the Ph.D. Minor form must be approved by both the student's Ph.D. department and the Statistics department.

For further information about the Statistics Ph.D. degree program requirements, see the department web site (https://statistics.stanford.edu/academics/doctoral-program).

Emeriti: Theodore W. Anderson, Jerome H. Friedman, Ingram Olkin, Charles Stein, Paul Switzer

Chair: Guenther Walther (Aut), Emmanuel Candés (Win, Spr, Sum)

Professors: Emmanuel Candés, Sourav Chatterjee, Amir Dembo, Persi Diaconis, David L. Donoho, Bradley Efron, Trevor J. Hastie, Susan P. Holmes, Iain M. Johnstone, Tze L. Lai, Art Owen, Joseph P. Romano, David O. Siegmund, Jonathan Taylor, Robert J. Tibshirani, Guenther Walther, Wing H. Wong

Associate Professor: Andrea Montanari

Assistant Professors: John Duchi, Lester Mackey, Balakanapathy Rajaratnam

Courtesy Professors: John Ioannidis, Philip W. Lavori, Richard A. Olshen

Courtesy Associate Professors: Simon Jackman (on leave), David Rogosa, Chiara Sabatti, Hua Tang

Courtesy Assistant Professors: Mike Baiocchi, Percy Liang

Consulting Professor: John Chambers

Stein Fellows: Rajarshi Mukherjee, Rachel Wang, Lucy Xia