# GRADUATE PROGRAM IN STATISTICS 

Guidelines and Procedures

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## GRADUATE PROGRAM IN STATISTICS UNIVERSITY OF CALIFORNIA, DAVIS

## INTRODUCTION TO DAVIS

The University of California has ten campuses, of which Davis is the third largest. The campus started as an agricultural school (first admitting students in 1908) and later established the School of Veterinary Medicine. It became a general campus in 1959. Since that time, the campus has expanded to 34,000 (fall 2013) students, with undergraduate and graduate programs in many fields, and the professional schools of law, management, medicine and veterinary medicine. Despite the size of the campus, it has retained many of the attributes of a small college, with an informal atmosphere and excellent student-faculty interaction.


The city of Davis has been called the most "energy-conscious" city in the United States. It is an interesting, forward-looking city of about 65,600 located in California's Central Valley. It lies 15 miles west of Sacramento, the State capital, and 75 miles northeast of San Francisco. Davis residents can take advantage of the recreational opportunities of Lake Tahoe, Northern Sierra Nevada, Napa Valley, and the beaches of northern California.

## DEPARTMENT OF STATISTICS AND GRADUATE PROGRAM IN STATISTICS

The Department of Statistics is located in the Division of Mathematical and Physical Sciences in the College of Letters and Science at UC Davis. The department has sixteen full-time senate faculty members and one federation faculty member, and there are usually several visiting faculty and lecturers. The research interests of the faculty cover a broad spectrum, and include applied statistics, theoretical statistics and biostatistics. Faculty interests extend to a variety of other disciplines such as medicine, biology, environmental science, transportation, engineering, computer science, epidemiology, psychology, social science, demography and reliability. For more details on research, view the faculty home pages and research profile pages, which can be reached, via the Statistics web site, at http://www.stat.ucdavis.edu.

The Graduate Program in Statistics consists of twenty-five faculty including members affiliated with various departments on campus. The graduate programs in statistics are based on the premise that good applications are built on strong foundations in theory and methods. Thus, the core program for every graduate student in statistics includes graduate level core courses in mathematical statistics, applied statistics and multivariate analysis.
Students obtain training in computational statistics and can choose from a variety of special topics courses.

Statistics is a subject area of remarkable breadth and diversity. While research problems in statistics often have fascinating mathematical aspects, the beauty of the subject lies in its wide applicability. Research in statistics often addresses a problem of data analysis or data interpretation, motivated from real applications in agriculture, engineering, environmental, biological, medical or social sciences. A complete solution to such a problem typically includes statistical modeling, large sample mathematical analysis and computer work for implementing the method, often also a Monte Carlo study and asymptotic analysis. The interplay of theory and application within the field of statistics suggests that advanced training in the subject should be broadly based.

Each graduate student is assigned a graduate adviser who will help design a program that is consistent with two important goals: (1) broad training in statistical theory, methods and data analysis, and (2) specialized training in the area(s) of application of particular interest. New and continuing students will consult with the graduate adviser at least once per year before the start of classes to discuss their proposed program and coursework. Advanced coursework in applied fields such as ecology, econometrics, engineering or genetics may serve as elective breadth courses within the M.S. or Ph.D. programs. A Ph.D. program in Statistics: Biostatistics Track is also offered. Students in the Biostatistics Track obtain a solid background in mathematical statistics and at the same time acquire comprehensive skills in modern biostatistical methods, data analysis and applications.

## THE STATISTICAL LABORATORY

The "Stat Lab" is a center for statistical consultation and collaborative research. Hundreds of campus researchers consult the laboratory staff each year concerning statistical aspects of their research. Every graduate student in statistics is required to do consulting in conjunction with the Statistical Laboratory for at least one quarter, in the form of the STA 401 (Statistical Consulting) course. The opportunity to work with researchers in other fields and to assist in planning and analyzing their experiments or surveys is a valuable educational experience that plays a key role in the
student's development as a mature researcher and collaborator on interdisciplinary research projects.
Website: http://www.stat.ucdavis.edu/stats-lab/services

## COMPUTING SERVICES

The Department of Statistics maintains a Graduate Student Computing Laboratory with many Pentium 4 desktops, laser printers, scanners and copiers. The Department also operates a cluster of HP/Compaq DS 10 Alpha servers, in addition to several Windows based domain controllers, file servers and backup servers. Several well equipped laptop computers are provided to faculty and students for presentations and classroom instructional use. Wireless networking services are also available. Standard software includes $S_{+}$, R, SAS, Matlab and Minitab.

Campus Computing Services provides the campus with batch, interactive timesharing, and remote job entry mainframe computing. Many microcomputers and scientific workstations are provided for student use at no charge. There are over 300 terminals and microcomputers located throughout the campus, including a SUN Workstation Lab with 29 SUN 3/40 workstations, and a Graphics Workstation Lab with 6 DEC Station 5000s, 3 Silicon Graphics color workstations, and 4 NCD color $X$ display stations.

## Further Information

For more details on course syllabi, see http://registrar.ucdavis.edu/ UCDWebCatalog/. For details on classrooms and schedules, see http:// registrar.ucdavis.edu/csrg/. For general regulations by Graduate Studies regarding exams, forms, etc. see http://gradstudies.ucdavis.edu/. Regarding information for international students see http://siss.ucdavis. edu/.


## STATISTICS DEGREE PROGRAMS

## THE MASTER'S PROGRAM IN STATISTICS

http://WWw.stat. ucdavis.edu/grad/ms

## ADMISSIONS REQUIREMENTS

An undergraduate major in mathematics or statistics is typical for statistics graduate students, but is not required. However, because of the mathematical nature of some of the graduate coursework, students should be able to demonstrate good mathematical ability.

The minimal background for entrance into the master's program is: a bachelor's degree with 3.0 overall grade-point average; one year of calculus; a course in linear algebra; facility with a programming language; and upper-division work in mathematics and/or statistics. The program does not accept part-time students.

## PROGRAM OF STUDY

The program of study will be developed and approved for each student by the Graduate Adviser in consultation with the student. This is a M.S. Plan Il program (no thesis). A minimum of 36 units is required, of which at least 18 must be at the graduate level (according to university regulations). A comprehensive final examination in the major subject is required of each candidate. No thesis is required.

## COURSE REQUIREMENTS

Core courses: (total 32 units)
STA 131A Introduction to Probability Theory
STA 131B-131C Introduction to Mathematical Stats (4 units each)
STA 135 Multivariate Data Analysis (4 units)
STA 206, 207 \& 208 Statistical Methods \& Research (4 units each)
One of the following two courses:
STA 242 Introduction to Statistical Programming (4 units), or
STA 243 Computational Statistics (4 units)
Elective coursess: (total 4 units)
At least one course selected from
STA 137 Time Series Analysis (4 units)
STA 138 Analysing Categorical Data (4 units)
STA 142 Reliability (4 units)
STA 144 Sampling Theory of Surveys (4 units)

STA 145 Bayesian statistical Inference (4 units)
STA 260 Statistical Practice and Data Analysis (3 units) or any four-unit letter grade graduate level course in Statistics.

The following courses can be used as substitutes:

- For students who enter the graduate program as Ph.D. students, successful completion of STA 232ABC substitutes for STA 206, 207, 208 as a requirement for the M.S. degree.
- With the permission of one of the Graduate Advisers, an internship coupled with STA 299 can substitute for STA260


## Summary:

32 units of core coursework and 4 units of electives are required for a total of 36 units. Full-time students must enroll for 12 units per quarter including research, academic and seminar units. Courses that fulfill any of the program course requirements may not be taken $\mathrm{S} / \mathrm{U}$ unless the course is normally graded $S / U$. Once course requirements are completed, students can take additional classes as needed, although the 12 units per quarter are generally fulfilled with a research class (299) and perhaps seminars, or additional electives, approved by one of the Graduate Advisers. Per UC regulations students cannot enroll in more than 12 units of graduate level courses (200) or more than 16 units of combined undergraduate and graduate level (100,200,300) courses per quarter.

## COMMITTEES

ADMISSIONS COMMITTEE: once applications and relevant materials are submitted to the program they are reviewed by the admissions committee, which consists of four to five faculty members. Once a decision has been made to admit or deny an applicant, the admissions committee chair forwards the committee's recommendation to the Dean of Graduate Studies for approval. The priority application and fellowships deadline for entry in Fall of the next academic year is January 15; applications are accepted through May 15.

ADVISING COMMITTEE: there are four faculty members of the advising committee for the Master's program, chaired by the Master Graduate Adviser.

COMPREHENSIVE EXAMINATION COMMITTEE: the Chair of the Graduate Program in Statistics (GPS) will appoint an examination committee that will be responsible for preparing, administering and grading the examination. This committee will forward its recommendation to the GPS, which will make the final decision on each student.

## ADVISING \& MENTORING

The Master Graduate Adviser, selected by the Chair of the program from among the- Graduate Advisers appointed by the Dean of Graduate Studies, assists M.S. students in developing a study plan, and has signatory authority for the Master's program.

## ADVANCEMENT TO CANDIDACY

Plan II M.S. Candidates must file an Advancement to Candidacy form (http://www.gradstudies.ucdavis.edu/forms) prior to taking the written comprehensive examination, typically in Winter of their second year of graduate studies. Candidates must have taken at least half of the required coursework for their degree requirements (18 units).

## M.S. COMPREHENSIVE EXAMINATION

Every M.S. Plan Il student needs to pass a comprehensive exam, typically taken at the end of the Winter quarter in the second year of graduate studies, to continue in the program. The M.S. Comprehensive Examination is a written examination. The examination may include the use of statistical software and may be offered in a computer lab.

Should a student not pass the written comprehensive exam, the student will be offered a second comprehensive examination at the end of the Spring quarter of the second year in graduate studies. If a student does not attempt the second comprehensive exam, it will be counted as a failure.

Failure to pass the comprehensive exam at the second attempt will result in a recommendation to the Dean of Graduate Studies for disqualification of the student from the graduate program.

For students who entered the graduate program as Ph.D. students but subsequently change their degree objective to the M.S. program, passing the STA 232AB part of the program's pre-qualifying Ph.D. written exam is considered as passing the comprehensive exam.

## NORMATIVE TIME TO DEGREE

The Normative Time to Degree for the Statistics M.S. program is six quarters (two years), although it is possible for a well-prepared student to finish the program in three quarters (one year).

## TYPICAL TIME LINE AND SEQUENCE OF EVENTS

Course requirements are typically completed by the end of year two. Graduate Students must be enrolled in a minimum of 12 units every quarter. These 12 units can be made up of both required courses and 299 variable unit courses. The following would be a typical program.

Year 1:

Fall
STA 131A
STA 106
STA 141

Winter
STA 108
STA 131B
STA 135

Spring
STA 131C
STA 144
Elective

Year 2:
Fall
STA 138
STA 206
Elective

Winter
STA 207
STA 242
Elective
M.S. Comprehensive Exam

For a well-prepared student it is possible to complete the course requirements by the end of the first year. The following would be a typical oneyear program.

Year 1:

Fall
STA 131A
STA 141
STA 206

Winter
STA 131B
STA 135
STA 207
STA 243

## PELP, IN ABSENTIA \& FILING FEE STATUS

Information about PELP (Planned Educational Leave), In Absentia (reduced fees when researching out of state), and Filing Fee status can be found in the Graduate Student Guide:
http://www.gradstudies.ucdavis.edu/publications/


## THE Ph.D. PROGRAM IN STATISTICS

http://www.stat.ucdavis.edu/grad/phd

## ADMISSIONS REQUIREMENTS

An undergraduate major in mathematics or statistics is typical for statistics graduate students, but is not required. However, because of the mathematical nature of some of the graduate coursework, students should be able to demonstrate good mathematical ability.
The minimal background for entrance into the master's program is: a bachelor's degree with 3.0 overall grade-point average; facility with a programming language; and upper division work in mathematics and/ or statistics; at least one semester or two quarters of advanced calculus at a level equivalent to MAT 25 and MAT 125A; and a quarter of linear algebra at a level equivalent to MAT 67. The program does not accept part-time students.

## PROGRAM OF STUDY

This degree is offered under Plan A which specifies a five member (minimum) dissertation/final examination committee and a final oral examination (defense of the dissertation).

A Ph.D. student will select an area of specialization and will choose a major dissertation adviser from Graduate Program in Statistics (GPS) faculty working in that area, usually in the second or third year of study. The student's program of study will be developed by the student jointly with the Graduate Adviser.

## COURSE REQUIREMENTS (52 UNITS)

Required courses (34 units total):
STA231 A, B, C (4 units each) STA 401 (3 units) twice STA232 A, B, C (4 units each) STA290 (1 unit) for three quarters STA 242 or 243 (4 units) STA390 (2 units)

Elective courses (18 units total):
In addition, five elective graduate courses (at least 18 units total), out of which at least four must be from Statistics.

## Summary:

All coursework (a total of at least 52 units) and the program of study must be approved by the Graduate Adviser.

## THE BIOSTATISTICS TRACK

The Graduate Program in Statistics offers the program Ph.D. in Statistics: BiostatisticsTrack as a subspecialty. For more information see page 16

## COMMITTEES

ADMISSIONS COMMITTEE: once applications and relevant materials are submitted to the program they are reviewed by the admissions committee, which consists of four to five faculty members. Once a decision has been made to admit or deny an applicant, the admissions committee chair forwards the committee's recommendation to the Dean of Graduate Studies for approval. The application and fellowships deadline for entry in Fall of the next year is January 15.

ADVISING COMMITTEE: there are four faculty members of the advising committee, chaired by the Master Graduate Adviser. The Master Graduate Adviser is identified the Chair of the program from the list of appointed Graduate Advisers, assists graduate students in developing a study plan, and has signatory authority for the Master's and Ph.D. programs.

QUALIFYING EXAMINATION COMMITTEE: the examining committee will be appointed in accordance with the policies of the Graduate Council and Office of Graduate Studies at the recommendation of the Graduate Adviser who consults with the student prior to making the recommendation. The major professor is not eligible to serve as chair of the examining committee.

DISSERTATION COMMITTEE: the student, in consultation with their major professor, nominates five qualified faculty members to serve on the Dissertation Committee. These nominations are submitted to the Office of Graduate Studies for formal appointment in accordance with Graduate Council Policy (DDB 80. Graduate Council B.1.). The major professor serves as Chair of the committee.

## ADVISING STRUCTURE AND MENTORING

The major professor is the faculty member who supervises the research and dissertation; this person serves as the Chair of the Dissertation Committee. The Master Graduate Adviser is identified by the chair of the program from among the appointed Graduate Advisers, assists graduate students in developing a study plan, and has signatory authority for the Master's and Ph.D. programs. A copy of the Statistics Mentoring Guidelines can be found at http://anson.ucdavis.edu/mentor.pdf.

## ADVANCEMENT TO CANDIDACY

The student is eligible for advancement to Candidacy for the Ph.D. degree upon completion of all course requirements and after passing the Ph.D. Qualifying Examination, normally in the fifth quarter.

## EXAMINATION AND DISSERTATION REQUIREMENTS

## Ph.D. Pre-qualifying Written Examination

The Ph.D. Pre-qualifying Written Examination will be given at the beginning of each Spring Quarter and also at the beginning of each Fall Quarter. Students in the Ph.D. program must attempt the exam in the Spring Quarter immediately after they complete both the STA 231AB and STA $232 A B$ core course series. If a student does not attempt the examination at this time, it will be recorded as a 'no pass'. Every Ph.D. student needs to pass the examination in a maximum of two attempts. In case of not pass at the first attempt, the second attempt must take place at the next time the examination is offered, and if a student does not attempt the exam at that time, it will be counted as a failure. Two 'not passes' of the examination will result in a recommendation to the Dean of Graduate Studies for discontinuation of the student in the Ph.D. program.

The Ph.D. Pre-qualifying Written Examination is a written exam with two parts: a theoretical part and an applied part. The duration of each part is about 3-4 hours. The applied part may be administered in a computer lab and may include the use of statistical software. Although the examination consists of two parts, it is considered one exam which must be passed in its entirety.

The Chair of the Graduate Program in Statistics (GPS) will appoint an examination committee that will be responsible for preparing, administering and grading the examination. This committee will forward its recommendation to the GPS, which will make the final decision on each student.

## Ph.D. Qualifying Examination

The Ph.D. Qualifying Examination is an oral exam. The exam will be attempted as soon as the Ph.D. Pre-qualifying Written Examination has been passed and all required coursework for the Ph.D. degree in Statistics has been completed. In accordance with university rules, students are requested to take their qualifying examination before the end of the third year to remain eligible for academic appointments such as TA. The preparation for the exam will be done by working closely with a faculty
mentor (independent study). The Ph.D. Qualifying Examination covers a special research topic assigned by an examining committee consisting of five faculty members. A forty-five minute presentation given by the student is followed by a question period which covers the special research topic as well as coursework in general. The examining committee will be appointed by Graduate Council at the recommendation of the graduate adviser who consults with the student prior to making the recommendation. The major professor is not eligible to serve as chair of the examining committee. Graduate Studies guidelines for Ph.D. Qualifying Examinations apply. A student who passes the Ph.D. Qualifying Examination is eligible for Advancement to Candidacy for the Ph.D. degree. The student must file the appropriate paperwork with the Office of Graduate Studies and pay the candidacy fee to be promoted to Candidacy for the Ph.D. degree.

## Final Examination

Defense of the dissertation before the dissertation committee will constitute the final examination for the Ph.D. degree. The final examination must be passed within four years after promotion to Candidacy, unless a special exception is granted. Pass or no pass is determined by a vote of the dissertation committee. Title and abstract of the Ph.D. Defense presentation will be distributed to all faculty and students of the Graduate Program in Statistics, who are invited to attend the presentation portion of the examination. The subsequent question period is a closed session between the student and the committee.

## Dissertation

The doctoral dissertation is an essential part of the Ph.D. program. A topic will be selected by the student, under the advice and guidance of a major professor (thesis adviser) and a dissertation committee chaired by the major professor. Students are encouraged to begin some research activity as early as possible during the second year of their graduate studies. The dissertation must contain an original contribution of publishable quality to the knowledge of statistics that may expand the theory or methodology of statistics, or expand or modify statistical methods to solve a critical problem in applied disciplines. Acceptance of the dissertation by three designated members of the dissertation committee follows Graduate Studies guidelines (Plan A with defense). The dissertation must be completed and submitted to the dissertation committee prior to taking the final examination.

## NORMATIVE TIME TO DEGREE

The normative time to degree is four to five years.

## TYPICAL TIME LINE AND SEQUENCE OF EVENTS

Every fulltime student at UC Davis is required to take 12 units of coursework per quarter. In addition to the coursework outlined below, students will take Statistics 290 and generally will take additional electives later on, in consultation with their major professor.

The following track will be a typical program for a well-prepared student seeking a Ph.D. degree.

## Year 1:

Fall
STA 231A
STA 232A
STA 390

Winter Spring
STA 231B STA 231C
STA 232B STA 232C
STA 141 STA 401
Ph.D. Pre-qualifying Written Exam
Year 2:
Fall
Statistics Elective
Statistics Elective
Statistics Elective
STA 401

Winter
Statistics Elective Research
Statistics Elective
Ph.D. Qualifying Exam

## Years 3, 4:

Complete requirements for the Ph.D. degree, including Dissertation and Defense

## SOURCES OF FUNDING

Funding for each student is specified when students are offered to join the program, and the funding itself can vary from student to student. An offer letter sent to the student will spell out the individual funding. Typically such funding consists in a combination of stipends and TA-ships. After the students have gained some more experience, they typically will also receive funding through a Graduate Student Researcher (GSR) position.

## PELP, IN ABSENTIA, AND FILING FEE STATUS

Students requiring time away from the program can opt to go o PELP. Please note stduents cannot go on PELP for research purposes. Full nformation about PELP, In Absentia, and Filing Fee status can be found in the Graduate Student Guide:
http://www.gradstudies.ucdavis.edu/publications/

## LEAVING THE PROGRAM PRIOR TO COMPLETION

Should a student leave the program prior to completing the requirements for the PhD, they may still be eligible to receive the masters if they have fulfilled all the requirements for that degree (see masters requirements). Passing the PhD pre-qualifying written exam is considered as passing the MS comprehensive exam. Students may use the Change of Degree Objective form available from the Registrar's Office: http://registrar.ucdavis. edu/PDFFiles/D065PetitionForChangeOfGraduateMajor.pdf

## COMPLETING THE PROGRAM

Once a student has completed the dissertation and passed the final examination, they must file the dissertation online and arrange an appointment with the student affairs officer at the Office of Graduate Studies, to which the student must bring the original Plan A Exam Report Form, the Program Exit Form, the original signed dissertation title page and copies of the abstracts, along with any other relevent forms that are requested. Once this meeting has taken place, the student has officially completed the program. Please see the academic calendar on page 30 for all of the deadlines. Official diplomas are usually given a few months after the degree date. Full information about the completion process can be found on the Graduate Studies website: http://gradstudies.ucdavis.edu/students/filing.html


## THE Ph.D. PROGRAM IN STATISTICS: BIOSTATISTICS TRACK

http:/ / www.stat.ucdavis.edu/grad/biostatistics_track
The Graduate Program in Statistics offers the program Ph.D. in Statistics: Biostatistics Track as a subspecialty. Biostatistics may be understood as the application of statistical methods in the biological, medical, agricultural and environmental sciences, as well as the study of statistical methodology concerning problems and statistical areas originating from such scientific fields. This subspecialty builds on the strong, diverse Statistics program and the UC Davis environment of highly regarded programs in Biological Sciences, Veterinary Medicine, and Agricultural and Environmental Sciences, as well as the School of Medicine. The collective research interests of the GPS faculty include a broad range of topics in Biostatistics.

Students who wish to enroll in the Biostatistics track are encouraged to do so as early as possible. Enrollment may be declared anytime prior to the Ph.D. Qualifying Exam. On the Ph.D. diploma, transcripts and the first title page of the Ph.D. thesis, the program will still be denoted as "Statistics". Completion of this program will be recognized by a letter from the GPS Chair, stating that the student has completed all requirements of the Biostatistics track.

Admissions requirements are the same as for the Ph.D. program, as are dissertation and examination requirements; coursework requirements are as follows:

## PROGRAM OF STUDY

A Ph.D. student in this program will select an area of specialization within Biostatistics and will choose a dissertation advisor from GPS faculty working in Biostatistics, usually in the second or third year of study. The student's program of study will be developed by the student jointly with the Graduate Adviser.

## Required Courses (46 units):

STA 231 A, B, C (4 units each) STA 290 (1 unit) for three Quarters
STA 232 A, B, C (4 units each) STA 390 (2 units)
STA 222 (4 units) STA 401 (3 units) twice
STA 223 (4 units) STA 242 or 243 (4 units)
STA 224 (4 units)
In addition, one life sciences course (non-quantitative biology course) at the upper division or graduate level (4 units) and one elective graduate course from Statistics or Biostatistics (at least 3 units). All coursework (a total of at least 53 units) and the program of study must be approved by the Graduate Adviser.

## STATISTICS COURSES

| Lower Division Courses |  |
| :--- | :--- |
| 10 | Statistical Thinking (4) |
| 12 | Introduction to Discrete Probability |

(4)
13
13 Elementary Statistics (4)

13V Elementary Statistics (Web Based)
32 Basic Statistical Analysis Through Computers (3)
90X Seminar (1-2)
98 Directed Study (1-5)
99 Special Study for Undergraduates (1-5)

## Upper Division Courses

100 Applied Statistics for Biological Sciences (4)
102 Introduction to Probability Modeling and Statistical Inference (4)

103 Applied Statistics for Business and Economics (4)
104 Applied Statistical Methods:
Nonparametric Statistics (4)
106 Applied Statistical Methods:
Analysis of Variance (4)
108 Applied Statistical Methods:
Regression Analysis (4)
120 Probability and Random Variables for Engineers (4)
130A-130B Mathematical Statistics: A Brief Course $(4,4)$
131A Introduction to Probability Theory (4)

131B-131C Introduction to Mathematical Statistics (4, 4)
133 Mathematical Statistics for Economists (4)
135 Multivariate Data Analysis (4)
137 Applied Time Series Analysis (4)
138 Analysis of Categorical Data (4)
141 Statistical Computing (4)
142 Reliability (4)
144 Sampling Theory of Surveys (4)
145 Bayesian Statistical Inference (4)
190X Seminar (1-2)
192 Internship in Statistics (1-12)
194H / 194 A-B Special Studies for Honors Students (4, 4)
198 Directed Group Study (1-5)
199 Special Study for Advanced Undergraduates (1-5)

## Graduate Level Courses

205 Statistical Methods for Research (4)

222* Biostatistics: Survival Analysis (4)
223* Biostatistics: Generalized Linear Models (4)
224* Analysis of Longitudinal Data (4)
225 Clinical Trials (4)
226 Statistical Methodology for Bioin formatics (4)
231A-231B-231C Mathematical Statistics (4, 4, 4)
232A- 232B- 232C Applied Statistics (4, 4, 4)

233 Design of Experiments (3)
235A- 235B- 235C**Probability Theory $(3,3,3)$
237A- 237B Time Series Analysis (4, 4)
238 Theory of Multivariate Analysis
240A- 240B Nonparametric Statistics (4, 4)
241 Asymptotic Theory of Statistics (4)
242 Statistical Programming (4)
243 Computational Statistics (4)
250 Topics in Applied and
Computational Statistics (4)
251 Topics in Statistical Methods and Models (4)
252* Advanced Topics in Biostatistics
260 Statistical Practice and Data
Analysis
280 Orientation to Statistical Research (2)

290* Seminar in Statistics (1)
298* Group Study (1-5)
299* Special Study for Graduate Students (1-12)
299D* Dissertation Research (1-12)
390 Methods of Teaching Statistics (2)
401 Methods in Statistical Consulting

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## SPECIAL REGULATIONS

For a list of available forms and policies, please visit: http://www.stat.ucdavis.edu/grad/forms-policies

## DOUBLE-MAJOR PROGRAM

Current UC Davis graduate students can apply to enter the M.S. program in Statistics as a Double Major during any quarter. We do not require a separate application, however you will need to complete a Double Major Application (see http://www.stat.ucdavis.edu/grad/forms-policies for the form). This form must be signed by the graduate adviser of your present program, and then by the admissions chair for Statistics, after consultation with the admissions committee. This form is then submitted to the graduate program coordinator. There will, however, usually be no financial support available for such students.
Under a Graduate Council ruling, a student in a double major program may transfer up to 12 units from one program to another with the approval of the graduate adviser and the Dean of Graduate Studies. The student must spend a minimum of two quarters in regular graduate standing in the Statistics master's program to meet the residency requirements of the Graduate Division.

## TRANSFER CREDIT

Master's students may request to transfer 6 units of required credit from an accredited non-UC campus, up to one-half of the quarter-units from another UC campus, or 12 units from UC Davis Extension to their graduate transcript. Only graduate and upper division coursework may be transferred; lower division coursework is not transferrable. For doctoral students, some work taken elsewhere may be used to satisfy certain degree requirements with the consent of the Graduate Adviser and the Dean of Graduate Studies.
FROM UNDERGRADUATE: Up to 6 units of graduate work (that is, only 200-level courses) taken by an undergraduate student may be credited toward their graduate degree program. This does not apply if units were used to satisfy any requirements for the bachelor's degree

## RESIDENCE REQUIREMENTS

The minimum residence requirement at the University of California is three quarters for the Master's

degree, nine quarters for the degree of Juris Doctor, and six quarters for the degrees of Doctor of Philosophy and Doctor of Engineering, as is prescribed by UC Senate Regulations. Please note that per our degree requirements students must be enrolled full-time in a minimum 12 units each quarter.

## REPEAT COURSES AND INCOMPLETE GRADE ASSIGNMENT

Any graduate student may, with the consent of the graduate adviser and the Dean of the Graduate Studies, repeat a course in which a grade of C, D, F, or Unsatisfactory was assigned, up to a maximum of nine units. Any repeated course, except for courses offered only on a S/U basis, must be taken for a letter grade.
The grade of Incomplete ("I") must be removed before the end of the third succeeding quarter of academic residence. In the event a student accumulates more than 8 units of Incomplete, the student shall be subject to disqualification.
A statistics graduate student will be prohibited from taking a qualifying examination if 8 units of "I" appear on the scholastic record or if any of the "I" grades were received for courses required for the master's or Ph.D. degrees.

## MINIMUM GPA REQUIREMENT

Graduate students must at all times maintain a cumulative and per quarter GPA of 3.0 or higher to remain in good standing. They also need to make normal progress towards their degree. The sample study plans provided above serve as guidelines for normal progress.

## GUIDELINES FOR Ph.D. QUALIFYING EXAMINATIONS

To be eligible for examination, the student must have satisfied all program requirements (course work, Ph.D. Written Exam), have removed all deficiencies, and must have at least a 3.0 GPA in all work undertaken in graduate standing. Students must be registered the quarter in which they take any portion of their Qualifying Examination.

A student may not take the examination prior to approval from Graduate Studies. If the examination is held prior to approval and the committee is deemed unsuitable by the Dean of Graduate Studies after the fact, the examination can be considered null and void. It takes approximately four weeks for Graduate Studies to process the application and to notify the student and the chair of the committee of the approval. The application should be submitted through the graduate adviser early enough in advance of the examination date. For further details, consult Graduate Studies regulations on Ph.D. Qualifying Examinations.

## FINANCIAL SUPPORT

Many doctoral students in good standing receive some form of financial aid. The department offers funding in the form of employment as a Teaching Assistant (TA), Graduate Student Researcher (GSR), Associate Instructor (AI), or Reader. To hold one of these appointments, students must be enrolled in at least 12 units and maintain a minimum GPA of 3.0.

## Teaching Assistant ("TA")

TAs are employed at either $25 \%$ and $50 \%$ time ( 10 to 20 hours per week), and currently (2014) receive a monthly salary of between $\$ 1030$ and $\$ 2060$. In addition, TAs receive remissions covering most of their in-state fees. TA Duties may include (among other assignments) discussion sessions, office hours, problem-solving, preparing handouts, preparing, setting up and holding computer lab sessions, grading exams and homework. Teaching assistants who have performed satisfactorily and who are making normal progress toward their degrees have preference for renewal. A teaching assistant who has not yet taken Statistics 390 must take it at the first available offering. All TAs are first required to take the TA Orientation offered by UC Davis, per campus policy.
Teaching assistantships are governed by a union contract: (http://atyourservice.ucop.edu/employees/policies/systemwide_contracts/vaw/index.html)

## Associate Instructor ("AI")

Als are in charge of instruction of record for the course, and for supervision of Teaching Assistants. An AI is employed at 50\%. An AI currently (2014) receives a monthly salary of approximately $\$ 2160$, and receives the same fee remissions as a TA.

## Graduate Student Researcher ("GSR")

GSRs are hired by a faculty member to conduct research. They are employed at either $25 \%$ or $49 \%$ time, and their monthly salary depends on how advanced they are in their degree. Those who have not yet advanced to PhD candidacy are appointed at Step IV, receiving between $\$ 943$ and $\$ 1850$ per month during the academic year (in summer it is possible to work up to $100 \%$ ). Students who have passed their PhD Qualifying Exam and advanced to candidacy are appointed at Step $V$, receiving between $\$ 1006$ and $\$ 1972$ per month. GSRs receive full remissions on their in-state fees and on their non-resident tuition. Students usually apply to a faculty member offering the research assistantship on an individual basis. If a student wishes to terminate a TA-ship contract early, a release from the TA contract should be obtained prior to accepting a GSR position.

## Readers

Readers grade homework and may hold an appointment as a reader for a
maximum of 19 hours a week. Assignments are made according to experience and grades. The current (2014) rate for graduate readers is $\$ 14.16$ per hour.

## SCHOLARSHIPS AND FELLOWSHIPS

Awards are made as a mark of honor, primarily on the basis of scholarship and promise of outstanding academic and professional contribution. Application forms and supporting documents, including GRE scores and letters of recommendation, must be filed online by January 15.

## Nonresident Tuition Fellowships

US citizens, permanent residents, or immigrants, who are not legal residents of California are eligible for a nonresident tuition fellowship in their first year only. All non-resident students admitted to the Ph.D. program are considered. U.S. citizens must become California residents after one year.

## Other Financial Aid

Other forms of financial assistance, such as grants, loans, work-study positions are available to graduate students. Contact the Graduate Financial Aid Services, 1100 Dutton Hall, [(530) 752-9246] for information.

## GRADUATE FEES AND TUITION REMISSIONS, 2014-15

## California Residents:

|  | Total Annual | Fall | Winter | Spring |
| :--- | :--- | :--- | :--- | :--- |
| Tuition | $\$ 16,540.62$ | $\$ 5,513.54$ | $\$ 5,513.54$ | $\$ 5,513.54$ |
| GSR Fee Remission | $\$ 5,513.54$ | $\$ 5,513.54$ | $\$ 5,513.54$ |  |
| TA / AI Fee Remission | $\$ 5,252.00$ | $\$ 5,252.00$ | $\$ 5,252.00$ |  |
| Student in TA position pays | $\$ 261.54$ | $\$ 261.54$ | $\$ 261.54$ |  |

Non-California Residents:

|  | Total Annual | Fall | Winter | Spring |
| :--- | :--- | :--- | :--- | :--- |
| Tuition | $\$ 16,102.60$ | $\$ 5,513.54$ | $\$ 5,513.54$ | $\$ 5,513.54$ |
| NRST* $^{*}$ | $\$ 15,102.00$ | $\$ 5,034.00$ | $\$ 5,034.00$ | $\$ 5,034.00$ |
| GSR Fee Remission | $\$ 10,547.54$ | $\$ 10,547.54$ | $\$ 10,547.54$ |  |
| TA / AI Fee Remission | $\$ 5,252.00$ | $\$ 5,252.00$ | $\$ 5,252.00$ |  |
| Student in TA position pays lif <br> also receiving full NRST waiver) | $\$ 261.54$ | $\$ 261.54$ | $\$ 261.54$ |  |

[^1]
# FACULTY OF THE STATISTICS GRADUATE PROGRAM 

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## GRADUATE PROGRAM ROLES \& COMMITTEES 2014-15

## Program Chair: Hans-Georg Müller

## Executive Committee (elected)

| Hans Müller (Chair) | Alexander Aue | Debashis Paul | Wolfgang Polonik |
| :--- | :--- | :--- | :--- |

## Graduate Advising Committee

New Ph.D. students should meet with Prof. Debashis Paul to discuss course plans. Master's students should meet with Prof. Prabir Burman. If you require a signature for a form you please see the primary graduate adviser. If unavailable, any of the other members of the advising committee is authorized to sign. The Graduate Advisers are:

| PhD Advising, including Awards | MS Advising |
| :--- | :--- |
| Debashis Paul (Chair; PhD Adviser) | Prabir Burman (MS Adviser) |
| Ethan Anderes | Chris Drake |
| Wolfgang Polonik | Debashis Paul |
| Jane-Ling Wang | Duncan Temple Lang |

## Admissions Committee (including IDP)

| PhD Admissions | MS Admissions (including IDP) |
| :--- | :--- |
| Jie Peng (Admissions Chair) | Jie Peng (Admissions Chair) |
| Ethan Anderes | Alexander Aue |
| Fushing Hsieh | Prabir Burman |
| Wolfgang Polonik | Jiming Jiang |
| Jane-Ling Wang |  |

## Examinations Committees

| Written PhD Pre-Qualifying Exam | Written MS Comprehensive Exam |
| :--- | :--- |
| Jiming Jiang (232 section) Chair | Fushing Hsieh (Chair) |
| Rudy Beran (232 section) | Prabir Burman |
| Wolfgang Polonik (231 section) | Hao Chen |
| Debashis Paul (231 section) | Chris Drake |
|  | Jie Peng |

These are the committees most relevant to graduate students. For a full list of Graduate Program committees please visit the website:
http://www.stat.ucdavis.edu/administration

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## FLOOR PLAN OF MATH SCIENCES BUILDING, 4th FLOOR



FALL 2014

## A History of the Statistics Department

by Distinguished Professor Emeritus Francisco Samaniego

As in most universities in the U.S., UC Davis initially made the development of coursework in Statistics at Davis the province of the Department of Mathematics. The first Ph.D. level statistician on the Davis campus was Dr. George Baker, who joined the mathematics faculty in the 1930s. Baker was, by training, a mathematical statistician, but his career at Davis, spanning nearly 40 years, included a good deal of applied work, much of it supported by the UC Davis Agricultural Experiment Station. Baker was a prominent contributor to the Annals of Mathematical Statistics in its early years. He was among the first statisticians honored by election as Fellow of the Institute of Mathematical Statistics, publishing over one hundred published papers in theoretical and applied statistics and many contributions to collaborative work with faculty in the fields of plant science, agronomy, pomology and animal science.

Several mathematicians joined Baker in developing a Statistics curriculum. Most offerings were aimed at students in the applied sciences. Mathematicians Henry Alder and Edward Roessler were especially influential in developing an introductory course in statistics for the general campus. Their textbook for this course was used at Davis for many years and was adopted quite widely across the U.S., as there were rather few comparable books in the 1950s and 1960's when this book written and refined through multiple editions. In the 1960s and 1970s, this introductory course was offered as Mathematics 13 at UC Davis and was taken by approximately 3000 students per year. Prior to the formation of an independent unit in statistics, a number of other prominent statisticians joined the Davis mathematics faculty. Howard Weiner, an applied probabilist with a degree from Stanford, joined the math department in the 1960s and served in that department until his retirement. Peter John was a member of the mathematics faculty at Davis in the 1960s. In the 1970s, a small cadre of young statisticians joined the department, including Max Layard, George Duncan, John Moore, Francisco Samaniego, Alan Fenech, Cory Atwood, Ronald Glaser, Norman Matloff and Jessica Utts. John Van Ryzin joined the Mathematics Department in 1977, but left to take a position at the Rand Corporation at the end of that academic year. During his year at Davis, Van Ryzin authored a formal proposal for the establishment of an independent unit in statistics in response to the recommendations of a campus committee organized to study the need for such a unit at Davis.

In July, 1978, Francisco Samaniego, then an Associate Professor of Mathematics, was appointed as Faculty Assistant to the Vice Chancellor for Academic Affairs and charged with the task of coordinating matters dealing with the formation of a separate academic unit in Statistics. Discussions about the most appropriate organizational structure for the new unit had been going on for several years. In the end, it was decided that Statistics should be established as an Intercollege Division. Such units are generally larger than individual departments, often having several separate departments within them. The Intercollege Division of Statistics was formed as a unitary academic unit which would function as an ordinary department in most matters, but would be overseen by a "Work Group of Deans", ensuring that the Division maintained ongoing ties and relationships to various schools and colleges. The Deans of Letters and Science, Agriculture, Medicine and Veterinary Medicine were asked to oversee the Division of Statistics, with Larry Andrews, Dean of Letters and Science, serving as the Chair of the Workgroup. Professor Samaniego completed the design of the new unit, composing proposals for the establishment of the M. S. and Ph. D. degrees in Statistics, a Graduate Group in Statistics and the Statistical Laboratory, the Division's consulting arm. The Intercollege Division of Statistics officially came into existence on January 1, 1979. Professor Samaniego was appointed as Acting Associate Dean of the unit.

The first six months of operation of the unit was largely devoted to making preparations for the offering of a full curriculum in academic year 1979-1980. Key among the initial priorities of the unit was the recruitment of a senior-level statistician to join the unit as head and Associate Dean. A broadly-based search committee chaired by Professor Samaniego considered an impressive list of candidates and was fortunate to recruit Professor Julius Blum as Associate Dean, beginning July 1, 1979. Blum was a Berkeley Ph. D. from the early 50's with a strong research reputation in probability and statistics and with a successful experience as Chair of the department of mathematics and statistics at the University of New Mexico. Further, he had recently completed a tour of duty as a program director at the National Science Foundation. On paper, and in his interview at Davis, he seemed to be an ideal candidate. Professor Jack Kiefer, then at Berkeley, called several times in the course of the search and graciously offered to provide advice, as needed, on the recruitment effort. When asked for his opinion following our interview process, he said emphatically: "Blum is a winner! You can't do better than Julius Blum."

Blum arrived in Davis in July of 1979. Besides taking over the general administration of the unit, he began the process of recruiting additional faculty. There were six faculty members at Davis who transferred to full-time positions in the Intercollege Division of Statistics: Fenech, Glaser, Matloff, Samaniego and Utts from the Mathematics Department and Alvin Wiggins from the School of Veterinary Medicine. Professor Wiggins was appointed Director of the Statistical Laboratory. Blum was a talented, extroverted, fair-minded academic who infused the unit with energy and activity. He led by example, maintaining an active research program of high quality, involving himself in many collaborative research projects and building consensus about the new unit's direction. Arguably, his greatest contribution to the unit was the strong priority he gave to recruiting the best possible new members. In his first year, he chaired search committees that resulted in the recruitment of two outstanding senior scholars, P.K. Bhattacharya from the University of Arizona and Robert Shumway from George Washington University, to the Division of Statistics at Davis. Tragically and unexpectedly, Julius Blum suffered a massive heart attack and passed away in April of 1982. His colleagues from that day still miss the man. Stealing a line from the movie "Something's Gotta Give", he was a man to love! Three of his colleagues - Samaniego, Bhattacharya and Shumway - served in succession as Acting Associate Dean following Blum's death. The Julius Blum Award has been presented annually since 1983 to an outstanding Statistics graduate student.

Professor George Roussas joined the Division of Statistics in July, 1985, as Associate Dean and as Chair of the Graduate Group in Statistics. He served in these two capacities for 14 years - an era marked by dynamic leadership, well-considered growth and a general expansion of the unit's reputation and influence both on the campus and beyond. In a study sponsored by the National Sciences and Engineering Council of Canada and disseminated in 1992, the UC Davis Statistics group ranked 14th among 300 Statistics institutes worldwide in terms of research productivity. In a follow-up study published in the Canadian Journal of Statistics in 2002, the UC Davis Statistics Department ranked 4th, among 202 Statistics institutes surveyed, in the category of published papers per capita in "the top 25 " journals in the field. Highlights of Roussas's tenure as Associate Dean include the doubling of the size of the faculty and of the curriculum offered, the development of a biostatistics component to the Statistics graduate program and a whole-scale revamping of the graduate curriculum and qualifying examination process in Statistics. Professor Roussas was recognized by his peers for his myriad contributions to the statistics profession by the Festschrift "Asymptotics in Statistics and Probability: Papers in Honor of George G. Roussas" published in 2000 and by a workshop held in his honor in May, 2001. Roussas continues his teaching and research at Davis, serving as Distinguished Professor Emeritus of Statistics.

Recent history of Statistics includes changes in its organizational structure. It abandoned its designation as an Intercollege Division in 1999 and became a Department within the newly formed Division of Mathematical and Physical Sciences of the College of Letters and Sciences. The title of Associate Dean was replaced by the traditional title of chair, a position that would be filled on a rotating basis. Professor Jane-Ling Wang served as Department Chair from 1999 to 2003. She presided over the planning of the unit's move to the new Mathematical Sciences Building, a move that was finally accomplished in 2005. During her tenure, the Graduate Group in Statistics was replaced by the departmental Graduate Program in Statistics, and the Graduate Group in Biostatistics was formed. The healthy coexistence of separate graduate degree programs in Statistics and Biostatistics in one department is a rarity, and Professor Wang's planning and foresight contributed considerably to its success. Professor Hans-Georg Müller provided the principal leadership in this latter development, authoring the proposal for graduate degree programs in Biostatistics and serving generously and effectively as Chair of the Biostatistics Graduate Group from 2001 to 2007. Professor Rudolf Beran served as Department Chair from 2003 to 2007. The signal accomplishment of Professor Beran's tenure was, without doubt, the recruitment of Peter Hall to the Davis faculty as a "target of excellence". Professor Hall accepted a $25 \%$ appointment at Davis, beginning in 2005 and spends Spring Quarters (April - June) in Davis, teaching one course per year. The unit recruited five additional new faculty members during Professor Beran's tenure (Paul, Peng, Pollard, Sen and Temple Lang) but also experienced three retirements (Fenech, Shumway and Mack) and, regrettably, two resignations (Johnson and Christianini) during this period. The Graduate Program in Statistics was reviewed during Professor Beran's tenure as chair, and received very high marks on all counts. Professor Beran also planned for a seamless and relatively painless transition from Kerr Hall to the Department's new home in the Mathematical Sciences Building.

Professor Wolfgang Polonik was appointed Department Chair in 2007 and oversaw more faculty recruitment in Alexander Aue, Ethan Anderes and Paul Baines as both the undergraduate and graduate programs expanded further. Professor Polonik also applied successfully for a prestigious NSF Research Training Grant for the department. Professor Hans-Georg Müller became Chair in 2012, and continues to oversee the growth in our programs.

## SOME USEFUL LINKS

Office of Graduate Studies
(530) 752-0650
http://gradstudies.ucdavis.edu
Registrar's Office
(530) 752-2973
http://registrar.ucdavis.edu/
Services for International Students and Scholars (SISS)
(530) 752-0864
http://siss.ucdavis.edu

## CODE OF ACADEMIC CONDUCT

The University of California, Davis and the Department of Statistics take academic conduct and integrityas a serious matter, and all instances of suspected cheating will be reported to Student Judicial Affairs. The following is an extract from the UC Davis Code of Academic Conduct, which can be found at : http://sja.ucdavis.edu/cac.html

## Responsibility of Students

The ultimate success of a code of academic conduct depends largely on the degree to which it is willingly supported by students themselves. The following recommendations are made for students:

- Be honest at all times.
- Act fairly toward others. For example, do not disrupt or seek an unfair advantage over others by cheating, or by talking or allowing eyes to wander during exams.
- Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and report acts of misonduct that you witness.
- Do not submit the same work in more than one class. Unless otherwise specified by the instructor, all work submitted to fulfill course requirements must be work done by the student specifically for that course. This means that work submitted for one course cannot be used to satisfy requirements of another course unless the student obtains permission from the instructor.
- Unless permitted by the instructor, do not work with others on graded coursework, including in class and take-home tests, papers, or homework assignments. When an instructor specifically informs students that they may collaborate on work required for a course, the extent of the collaboration must not exceed the limits set by the instructor.
- Know what plagiarism is and take steps to avoid it. When using the words or ideas of another, even if paraphrased in your own words, you must cite your source. Students who are confused about whether a particular act constitutes plagiarism should consult the instructor who gave the assignment.
- Know the rules - ignorance is no defense. Those who violate campus rules regarding academic misconduct are subject to disciplinary sanctions, including suspension and dismissal.

Student Judicial Affairs: http://sja.ucdavis.edu/

| 2014-15 |  |  |  |
| :--- | :--- | :--- | :--- |
| \begin{tabular}{\|l|l|l|}
\hline
\end{tabular} Fall '14 | Winter '15 | Spring '15 |  |
| Campus Dates | Sept 29 | Jan 2 | Mar 26 |
| Quarter begins | Oct 2 | Jan 5 | Mar 30 |
| Instruction begins | Dec 12 | Mar 16 | Jun 4 |
| Instruction ends | Dec 19 | Mar 21 | Jun 11 |
| Quarter ends | Oct 15 | Jan 16 | Apr 10 |
| Late registration/last day to <br> drop courses | Oct 17 | Jan 21 | Apr 14 |
| Last day to add | Nov 11, 27, 28, <br> Dec 25-26, 31 | Jan 1, 19, <br> Feb 16 | Mar 27, <br> May 25 |
| Last day to pay tuition balance |  |  |  |
| Holidays |  |  |  |
| Diploma Date |  |  |  |
| Graduate Commencement |  |  |  |


| Statistics Dept Dates |  |
| :--- | :--- |
| New Student Orientation | October 1, 2014 |
| PhD Written Pre-Qualifying Exam | March 23-24, 2015 |
| MS Written Comprehensive Exam | March 25, 2015 |
| Department Spring Picnic | June 5,2015 |

All dates subject to change

| PhD Deadlines | MS Deadlines |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| DEGREE <br> LIST | File PhD <br> Candidacy | File PhD <br> Thesis online | DEGREE <br> LIST | File MS <br> Candidacy | Final Date for <br> MS Exam* |
| Dec 2014 | Aug 5 | Dec 5 | Dec 2013 | Aug 5 | Dec 19 |
| Mar 2015 | Oct 27 | Mar 6 | Mar 2014 | Oct 27 | Mar 20 |
| June 2015 | Jan 30 | May 29 | June 2014 | Jan 30 | June 11 |
| Sept 2015 | May 15 | Aug 28 | Sept 2014 | May 15 | Sept 11 |

[^2]
## UCDAVIS

## DEPARTMENT OF STATISTICS

Please visit the department website:

## http://www.stat.ucdavis.edu

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Call (530) 752-2071 for more information. Speech and hearing impaired persons may dial (530) 752-7320 (TDD)


[^0]:    * course jointly listed with Biostatistics
    ** course jointly listed with Mathematics

[^1]:    ${ }^{*}$ Non-Resident Supplemental Tuition. For international students who are Advanced to PhD Candidacy the rate is reduced to $\$ 0$ for three years only

[^2]:    *Final date for MS Exam report to be submitted to Graduate Studies; the Statistics MS Exam is on a set date, March 25, during spring break.

