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GRADUATE OPTIONS IN STATISTICS

Department of Mathematics and Statistics
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Within the Mathematics program students may choose M.S. or Ph.D. options which concentrate in Statistics. This handout discusses the main features of the Statistics options and in places overlaps considerably with the material in the Axioms (which contains full detail of all requirements within the Mathematics programs).

The M.S. option provides students with training in statistical applications, computing, theory and methods, preparing them for jobs in industry or government, or for moving on to a Ph.D. in Statistics, Biostatistics or other quantitative fields. The Ph.D. option provides a combination of theory and application preparing students for positions in academia, industry or government. Each of these programs is described in more detail below.

Departmental web site: *http://www.math.umass.edu*
University web site: *http://www.umass.edu/*

1 M.S. in statistics

The M.S. option in statistics is designed to prepare students for positions in industry or government. It also serves as a basis for future work towards a ph.d. in statistics, biostatistics or other quantitative areas. this program is designed to provide the student with a background in basic theory and methods along with experience in various applications, including computational aspects. Students will receive extensive exposure to the use of SAS, one of the more popular statistical software packages, as well as some exposure to other statistical packages/ programming languages. In addition to courses offered within the department, the program allows room for the students to take statistics courses in other departments on campus.

Students entering the m.s. are expected to have taken linear algebra, calculus (at least through multivariate calculus) and, at a minumum, one prior course in statistics.

The requirements for the M.S. degree involve coursework (incuding a project course or individual project) and qualifying exams.

- courses

  30 hours of coursework with grades of C or better must be completed, including at least 24 hours with grades of B or better. in addition, an overall B average must be maintained. the required 30 hours must include the following (each worth 3 credit hours):

  - ST505/697r applied regression
  - ST506 applied experimental design

- ST607-608 probability and mathematical statistics I, II
- ST705-706 linear models I, II
- m.s. project (course)
- At least two other courses numbered 600 or above from within the department. some graduate courses from outside the department can be used as one of these two courses, subject to prior approval by the statistics coordinator.

Some, 500 level courses (e.g., s505, 506 or 511) may be counted towards the 30 hours but other 500 level courses (such as s501, 515 or 516) would not count towards the 30 hours. Students may take, and in fact are often encouraged to take, courses from other departments. Students should consult with their advisor or other members of the faculty regarding outside courses.

- Basic Exam

  Students doing the m.s. in statistics are required to pass two basic exams, one in probability and one in statistics, which are based primarily on st607-608. The basic exams are given twice a year, in january and in august and are normally taken in august following the first year. the exams must be taken as a pair.

2 Ph.D. in Statistics

The Ph.D. option in statistics prepares students for positions in Academia, Industry or government. Entering students are expected to have had Linear Algebra, Calculus, Advanced Calculus and some prior exposure to Statistics. Student seeking a Ph.D. in statistics must complete the following: coursework, qualifying exams, oral presentation and dissertation.

- Coursework

  The student must complete successfully 36 hours of coursework, including:

  Stat 607-608 Mathematical Statistics I, II

  Stat 605 Probability Theory

  Stat 705-706 Linear Models I, II

  Stat 725 Theory of Estimation and Statistical Inference

  Math 623 Real Analysis I

  Two additional graduate courses in Statistics numbered 600 or above.

  Additional courses may be required by the student's dissertation Committee.

  Any course outside the Department or numbered less than 600 must have the Graduate Program Director's approval if it is to be counted towards the 36 hours. While the required courses focus primarily on theory, all students are strongly encouraged to develop some expertise in applied statistics and statistical computing.

- Qualifying Exams

  There are two tiers of written exams, Basic and Advanced, which are intended to measure a student's overall mastery of standard material. The exams are administered during the week preceding each semester (August and January).

  Basic Exams: All prospective Ph.D. candidates must pass the Basic Exam at the "Ph.D. level". The student must take these exams no later than the beginning of the third semester of graduate study and pass them no later than the start of the fourth semester. If a student fails on an attempt, he or she has to re-take all three parts. The basic exam consists of three parts: Probability, Statistics and Advanced Calculus/Linear Algebra.

  Advanced Exam. The advanced exams must be passed in order to proceed to the dissertation level. The student must take these exams no later than the start of the fifth semester and pass both exams no later than the start of the sixth semester. If the student fails, he or she has to re-take both parts.The advanced exam has two parts: Mathematical Statistics (based on Stat 725, and 605) and Linear Models (based on Stat 705 and 706).

- Oral Presentation. By completing the required coursework and passing the Advanced Exam, a student becomes a Ph.D. candidate. All students are expected to acquire experience in preparing and presenting high-level material. After passing the Advanced Exam but before registering for any dissertation credits, each Ph.D. candidate must give a public presentation of some topic beyond the textbook level which is relevant to the student's proposed area of specialization. This would typically have the format of a one-hour seminar (either regularly scheduled or *ad hoc*). It might be coordinated with the forming of the dissertation committee and preparation of the prospectus. The topic presented is to be chosen in consultation with a faculty advisor and might for example be drawn from a recent research paper.

- Dissertation. After passing the Advanced Exam and oral presentation, the student becomes a Ph.D. candidate. The student must write a satisfactory dissertation under the direction of a faculty member and pass a final oral examination/defense of the dissertation.

3 Graduate statistics and Related Mathematics Courses

3.1 Statistics Courses

Every year courses

Stat 505/697R Applied Regression Analysis (Fall)

Stat 506 Design of Experiments (Spring)

Stat 515 Introduction to Statistics I (Fall, spring)

Stat 516 Introduction to Statistics II (usually just spring)

Stat 597ABCD Statistical Computing with SAS (Fall)

Stat 697F Topics in Regression (every other spring: 2005, 2007, ...)

Stat 605 Probability Theory (Advanced) (Spring)

Stat 607-608 Mathematical Statistics I, II (Fall-Spring)

Stat 705-706 Linear Models I, II (Fall-Spring)

Stat 725 Advanced Statistical Theory (Fall)

Stat697K Bioinformatics (Fall)

Other courses frequently offered, usually every other year or so, including.

Stat 511 Multivariate Statistical Methods

Stat 640 Sampling Theory

Stat 697 Time Series

Stat 697G Reliability/Surival Analysis.

There are also additional Statistics courses at the graduate level offered by other departments on campus.

3.2 Related Mathematics Courses

Math 425 Advanced Multivariate Calculus

Math 523 Real Variables

Math 597L Linear Algebra for Applied Mathematics

Math 623-624 Real Analysis I, II

Math 645-646 Applied Mathematics I, II

4 General Information

4.1 Financial Aid

Most graduate students are supported by Teaching Assistantships which provide a stipend and a waiver of tuition and most fees. Students in the M.S. program have a smaller stipend (approximately 2/3rds) than Ph.D. students with a proportional reduction in duties.

There are also opportunities for summer teaching, Graduate School fellowships and grants from various government and private agencies.

The renewal of support depends on the student's academic and teaching performance. The department does not normally support a Master's student longer than two years, and does not normally support any student beyond the fifth year.

4.2 Research/Seminars.

There is a weekly seminar series in statistics and probability which features a wide variety of speakers, both from within and from outside the university.

The faculty in statistics have a broad range of research interests in both theoretical and applied areas. A listing of faculty and their research interests appears in Section 5.

4.3 Computing Facilities

The Department of Mathematics and Statistics maintains a research computing facility equipped with a "mainframes", workstations and PC's supporting basic computing including Fortran, C, Mathematica, SAS, SPlus, Latex, email, etc.

5 Faculty in Statistics and Probability

There are about 50 resident faculty in the Department of Mathematics and Statistics. The following are faculty whose main research interests are related to Statistics or Probability. Local email addresses are given in parentheses. From outside the department these should be followed by @math.umass.edu. Most faculty have websites which are accessible through the department homepage.

John P. Buonaccorsi. Linear Models and Regression, Measurement Error, Quantitative Ecology, Spatial-Temporal Models, Applied Statistics. (johnpb)

Erin Conlon. Statistics, biostatistics and bioinformatics. (conlon)

Richard S. Ellis. Probability, math physics, applied mathematics. (rsellis)

Hui-Kuang Hsieh. Multivariate analysis, reliability analysis. (hsieh)

Joanna Jeneralczuk (Instructor): Statistics, bioinformatics. (jeneral)

Markos Katsoulakis: Stochastic Processes, Statistical Mechanics, Monte Carlo Methods (markos)

Anna Liu. Non-parametric statistics, mixed models and biostatistics applications. (anna)

Luc Rey-Bellet. Probability, Stochastic Analysis, Mathematical Physics/Statistical Mechanics (lr7q)

Arunas Rudvalis. Discrete probability, finite groups. (rudvalis)

John Staudenmayer. Measurement Error, Mixed Models, Environmental Applications. (jstauden)

Georgios Tripodis (Visiting Professor): Statistics, econometrics, time series. (tripodis)