

DEPARTMENT OF MATHEMATICS AND STATISTICS MISSISSIPPI STATE UNIVERSITY

GRADUATE PROGRAMS INFORMATION BOOKLET

Revised January 15, 1998 – Updated Fall 2004

This handbook is for graduate students and those considering graduate studies in the Department of Mathematics and Statistics at Mississippi State University. It is intended to supplement, not to replace, the Graduate Studies Bulletin of Mississippi State University.

GENERAL INFORMATION

The Department of Mathematics and Statistics at Mississippi State University is housed in the College of Arts and Sciences, and offers programs leading to the degrees of Master of Science in Mathematics, Master of Science in Statistics, and Doctor of Philosophy in Mathematical Sciences. These programs are flexible and permit specialization in many areas of mathematics and statistics.

Mississippi State University is a Doctoral I Land-Grant Institution with an enrollment of over 16,000 of which approximately 3,000 are graduate students. Founded in 1878 as "The Agricultural and Mechanical College of the State of Mississippi," the University has since diversified to become a comprehensive research institution offering both graduate and undergraduate degrees in nine colleges and professional schools. Mississippi State University consistently makes the annual lists of the "top 100" universities in the United States in obtaining research funds from external sources.

The University campus is located adjacent to Starkville, Mississippi, a city of approximately 20,000 situated in the northeastern part of the state. The area surrounding the campus offers excellent opportunities for fishing, hunting, hiking, and other outdoor activities.

FACILITIES

The Department of Mathematics and Statistics is located on the fourth floor of Allen Hall, a six-story administration-classroom building in the central part of the MSU campus. The Department's computing facilities are provided through the campus Unix and Novell networks, accessed locally using both X terminals and PCs. Students and faculty have access to software such as Mathematica, Maple, MATLAB, SAS, SPSS, TeX and to numerous other packages such as word processors and spreadsheets. Mitchell Memorial Library, located near Allen Hall, has extensive holdings in the mathematical sciences and maintains a subscription list of more than 150 mathematical and statistical journals.

ADMISSION REQUIREMENTS

Any person admitted to the Graduate School must hold a Bachelor's Degree; normally, the undergraduate degree must be awarded by an institution having regional accreditation. A prospective applicant who holds a Bachelor's Degree from an educational institution that does not have regional accreditation may request consideration from the Dean of the College of Arts and Sciences prior to making application for admission. In either case, the Dean of the College of Arts and Sciences may prescribe specific undergraduate level courses as prerequisites to admission. The admission to graduate studies is administered by the Office of Graduate Studies.

For admission to a Master's Degree program in the Department of Mathematics and Statistics, the following are required:

1. A minimum undergraduate grade point average on the last two years of undergraduate academic work of 2.75 on a 4.00 scale.
2. A minimum score of 475 paper-based total or 152 computer-based total on the Test of English as a Foreign Language (TOEFL) is required of international students (with some exceptions).
3. In addition to the above requirements, a student is expected to possess those qualities that, in the judgement of the departmental graduate faculty, indicate that the applicant has the ability to do graduate work.
4. Submission of three letters of recommendation.

In addition to the admission requirements for a Master's Degree program, admission to the Ph.D. program requires:

5. Submission of a satisfactory score on the Graduate Record Examination (GRE) General Test.
6. In addition, a student is expected to possess those qualities that, in the judgement of the departmental graduate faculty, indicate that the applicant has the ability to do graduate work at the doctoral level.

APPLICATION PROCEDURE

In order to fulfill the admission requirements, the applicant must submit the following documents to the Graduate School, P.O. BOX G, Mississippi State University, Mississippi State, MS 39762.

1. Application for admission to the Graduate School.
2. Transcripts from former institutions attended.
3. Scores on the Graduate Record Examination (GRE) General Test for Ph.D. students.
4. Test of English as a Foreign Language (TOEFL) for international students (with some exceptions).

The GRE and TOEFL are administered on the MSU campus by the Director of Testing, 102 YMCA Building, on regularly scheduled dates. Application forms for the tests, the deadlines for filing applications and the testing dates may be obtained from that office. The mailing address is Director of Testing, P.O. Box NL, Mississippi State University, Mississippi State, MS 39762.

FINANCIAL ASSISTANCE

Financial assistance is available, on a competitive basis, to qualified applicants in the form of nine-month Graduate Teaching Assistantships currently at a minimum of \$11,000 for Master's Degree students and \$13,000 for Ph.D. students. In addition, all Graduate Teaching Assistantships carry a full tuition waiver. There is also a possibility of summer support. A score of at least 550 paper-based total or 213 computer-based total on the Test of English as a Foreign Language (TOEFL) is required of all international students seeking support. Duties may consist of teaching two courses (six semester hours) per semester, assisting in large lecture mathematics courses, grading, or assisting in the departmental computer laboratory or the Learning Center.

All new teaching assistants must attend a university-wide workshop for graduate teaching assistants and an orientation course in August prior to the beginning of the Fall Semester. No student may assume teaching responsibilities without satisfactorily completing this workshop and orientation course. All graduate students receiving a teaching assistantship should receive further information about the workshop and orientation course by early August. Continuation of financial support is contingent on the student making satisfactory progress in his/her graduate program, as well as on successfully completing the Graduate Teaching Assistants Workshop administered by the Department of Mathematics and Statistics during their first year.

THE GRADUATE COORDINATING COMMITTEE

At the beginning of the Fall Semester each year, the Head of the Department of Mathematics and Statistics will appoint a departmental Graduate Coordinating Committee. The committee will consist of at least four graduate

faculty members of the Department in addition to the Department's Graduate Coordinator, who serves as its chairperson. Committee responsibilities will include the following:

1. Approving all major professors and graduate committees;
2. Approving all programs of study;
3. Overseeing and coordinating all core examinations and comprehensive examinations; pass or fail on the examinations will be determined by a majority vote of the committee members;
4. Approving the scheduling of all oral examinations, and having a member, who is not a member of the student's graduate committee, present at each oral examination.

MASTER'S DEGREE PROGRAMS IN MATHEMATICS AND STATISTICS

MASTER'S COMMITTEE

By the end of the second semester of graduate study, each student will select a major professor from the mathematics and statistics graduate faculty. The major professor, together with the student, will select a committee consisting of the major professor as chairperson and at least two graduate faculty members from the relevant area (mathematics or statistics). Depending upon the nature of the student's program, this committee may have members from outside the Department of Mathematics and Statistics. If the student declares a minor, then a graduate faculty member from the student's minor area of study will be a member of this committee.

The committee will approve the student's total program. Each student will either write a thesis or do a project, and his/her committee will determine the topic in each case. It will be the responsibility of the student's committee to ensure that the thesis is well written and that its mathematical or statistical content is appropriate. The student will be required to present and defend his/her thesis or make an oral presentation of his/her project to his/her committee and any other interested parties.

MASTER'S PROGRAM IN MATHEMATICS

The Department of Mathematics and Statistics offers a program leading to the Master of Science (M.S.) degree in Mathematics. In this program, thesis and non-thesis options are available. This program gives students excellent preparation for further study toward the doctorate, for employment in industry or government, or for teaching at the high school or community college levels. Unrestricted admission requires undergraduate mathematics training that includes courses in differential equations, linear algebra, modern algebra, and advanced calculus. Admission with some deficiencies in undergraduate training may be granted with the stipulation that the deficiencies are removed early in the program of study. Some opportunities exist for students to work on applied research projects through faculty members who have grants or contracts. There is also sufficient flexibility in most programs to allow a student with an interest in a discipline related to mathematics to either minor in that discipline or to take courses in it.

Mathematics Core

1. MA 6153 - Matrices and Linear Algebra
2. MA 6753 - Applied Complex Variables
3. MA 6933 - Mathematical Analysis I

In addition to the three courses above, students would take one of the courses:

4. MA 6163 Group Theory or MA 6943 Mathematical Analysis II

and one of the courses:

5. MA 6313 Numerical Analysis I or MA/ST 6543 Introduction to Mathematical Statistics I

Specific Degree Requirements

Master of Science with thesis: (30 semester hours)

1. Pass the five Mathematics Core courses, or equivalent;
2. Pass core examinations on the Mathematics Core courses MA 6153, MA 6753, and MA 6933;
3. Pass at least six semester hours in mathematics at the 8000 level or above, exclusive of thesis hours;
4. Earn at least 30 semester hours of graduate credits with six hours earned as thesis; at least 15 of the total hours must be at the 8000 level or above;
5. Present and defend the thesis.

Master of Science with non-thesis option: (36 semester hours)

1. Pass the five Mathematics Core courses, or equivalent;
2. Pass core examinations on the Mathematics Core courses MA 6153, MA 6753, and MA 6933;
3. Pass at least six semester hours in mathematics at the 8000 level or above, exclusive of hours earned for the master's project;
4. Earn at least 36 semester hours of graduate credit with at least 18 hours being course work in mathematics; at least 18 of the total hours must be at the 8000 level or above;
5. Three of the 36 hours of credit required in (4) will be earned by the student by studying a mathematical topic and making an oral presentation to his/her committee. The student will receive credit in MA 8993, Special Topics in Mathematics.

CORE EXAMINATIONS IN MATHEMATICS

Students in the master's program in mathematics will take written examinations covering the three courses MA 6153, MA 6753, and MA 6933. The student must successfully complete these three courses or their equivalent before taking the examinations. In the case of a failure in any part of the core examinations, only one reexamination is normally allowed. Should a student fail only one of the three parts of the core examinations, then the reexamination would be on that part only and given at a time convenient to the student and the committees involved. Should a student fail two or three parts of the core examinations, then the reexamination would be on all three parts and will be given only at a regularly scheduled time for the core examinations. Failure on any part of the reexamination constitutes failure on the core examinations.

The core examinations will be given by the Graduate Coordinating Committee. Regularly scheduled times for the core examinations are February and October of each year, and in June only in case they are needed for August graduation. Pass or fail will be determined by a majority vote of the Graduate Coordinating Committee.

The core examinations are as follows:

1. Matrices and Linear Algebra and Applied Complex Variables (MA 6153 and MA 6753) -- two one-and-a-half-hour examinations given on the first day of the Core Examinations.
2. Mathematical Analysis I (MA 6933) – a one-and-a-half-hour examination given on the second day of the Core Examinations.

MASTER'S PROGRAM IN STATISTICS

The Master of Science in Statistics degree program is administered through the Department of Mathematics and Statistics and is offered with both a thesis and a non-thesis option. Through this program, students receive excellent training for professional employment in industry or government and at the same time obtain sufficient theoretical background to qualify them to teach elementary statistics or to continue into more advanced degree programs. Admission to the master's program in statistics is open to graduates from all disciplines. The program of study is a blend of both statistical theory and statistical methods, and it provides graduate students with the opportunity to participate as statistical consultants on real projects. In addition, there is ample flexibility in the non-thesis option to

allow a graduate student with special interest in an area of statistical application to minor in that particular applied field.

Prerequisites

All the master's degree programs in statistics require as prerequisite expertise in the following:

1. Matrix Algebra
2. Computer Concepts
3. Calculus at the level of MA 2743 - Calculus IV

Statistics Core

- A. Methods Portion:
1. ST 8533 – Applied Probability
 2. ST 8603 – Applied Statistics
- B. Theoretical Portion:
1. ST 6543 - Introduction to Mathematical Statistics I
 2. ST 6573 - Introduction to Mathematical Statistics II
 3. ST 8613 - Linear Models I

Specific Degree Requirements

Master of Science with thesis: (30 semester hours)

1. Pass the Statistics Core courses, or equivalent;
2. Pass the Core Examinations in Statistics;
3. Pass ST 6111 Seminar in Statistical Packages;
4. Earn at least 30 semester hours of graduate credits with six hours earned as thesis; at least 15 of the total hours must be at the 8000 level or above;
5. The graduate program should contain a minimum of 12 semester hours of coursework in statistics;
6. Present and defend the thesis.

Master of Science with non-thesis option: (36 semester hours)

1. Pass the Statistics Core courses, or equivalent;
2. Pass the Core Examinations in Statistics;
3. Pass ST 6111 Seminar in Statistical Packages;
4. Pass ST 6211 Statistical Consulting in two different semesters of enrollment;
5. Earn at least 36 semester hours of graduate credit with at least 18 semester hours being coursework in statistics; at least 18 of the total hours must be at the 8000 level or above.
6. Three of the 36 hours of credit required in (5) will be earned by the student by studying a topic in statistics and making an oral presentation to his/her committee. The student will receive credit in ST 7003, Directed Individual Study.

CORE EXAMINATIONS IN STATISTICS

As explained below, the student will take two written examinations on the five core courses in the program of study. The student must successfully complete these courses or their equivalent before taking the examinations. In the case of a failure in any part of the core examinations, only one reexamination is normally allowed. Should a student fail only one of the two core examinations as defined below, then the reexamination would be on that part only and given at a time convenient to the student and the committees involved. Should a student fail both of the core examinations, then the reexamination would be on all the core courses and will be given at a regularly scheduled time for the core examinations. Failure on any part of the reexamination will constitute failure on the core examinations.

The Graduate Coordinating Committee will give the core examinations. Regularly scheduled times for the examinations are February of each year, and October only in case they are needed for December graduation. Pass or fail is determined by a majority vote of the Graduate Coordinating Committee.

The core examinations are as follows:

1. Mathematical Statistics I & II (ST 6543 and ST 6573) and Applied Probability (ST 8533) with an emphasis on Mathematical Statistics II and Applied Probability – a three hour exam given on the first day of the Core Examinations.
2. Linear Models I (ST 8613) and Applied Statistics (ST 8603) – a three hour exam given on the second day of the Core Examinations.

MINOR IN MATHEMATICS OR STATISTICS (M.S.)

For a Master's Degree with a minor in mathematics or statistics, the student must complete at least 9 graduate hours in the Department of Mathematics and Statistics. This should include at least one three-hour course at the 8000 level or above. All minor professors and minor programs are subject to the approval of the Graduate Coordinating Committee.

The Department of Mathematics and Statistics does not require comprehensive examinations for the minor in mathematics or statistics. The student must achieve at least a grade of B in each of the courses included on the minor program.

THE Ph.D. IN MATHEMATICAL SCIENCES PROGRAM

The Ph.D. in Mathematical Sciences program is an interdisciplinary program designed to ensure that the student acquires knowledge in a broad spectrum of the mathematical sciences in addition to expertise in a chosen field of concentration. Programs of study are structured to reflect the belief that a student in the mathematical sciences should not only be proficient in a specialized area, but also understand how it relates to other areas and be able to apply this knowledge to solve real-world problems. As a result, the Ph.D. graduate is prepared to work in industry, government, or academia. Besides opportunities for consulting experience through the Center for Statistical and Mathematical Services, students in the Ph.D. program may have opportunities for participation on research projects through other facilities on campus such as the Engineering Research Center for Computational Field Simulation.

Breadth Requirements for the Ph.D.

In keeping with the emphasis in the doctoral program that each student acquire breadth in the mathematical sciences, each student in the program will demonstrate a satisfactory grasp of each of the areas listed below.

1. A programming language other than BASIC
2. Matrices/Linear Algebra
3. Probability/Statistics
4. Advanced Calculus
5. Computational Mathematics or Computational Statistics

A student's satisfactory grasp of the areas listed above should be determined by the student's doctoral committee. In addition to 1 - 5, it is required that:

6. A student concentrating in mathematics complete six semester hours of statistics course work at the 6000 level or above, and a student concentrating in statistics complete six semester hours of mathematics course work at the 6000 level or above.

With special permission from the departmental Graduate Coordinating Committee, a student may substitute six semester hours of graduate courses from outside the Department of Mathematics and Statistics for the requirement in (6).

Foreign Language Requirements

Before the preliminary examination, the student must satisfy the departmental foreign language requirement. This consists of a reading knowledge of a foreign language appropriate to the student's area of specialization. The student's major professor will evaluate the student's ability to read in the appropriate language. The major professor will inform the Graduate Coordinating Committee when the student has satisfied the departmental language requirement.

Course Requirements

Each student will choose four areas from the list A -- M below. Normally, the student will complete at least six hours of graduate courses in each of these areas. Students in a mathematics track must choose at least two areas from A -- D and at least one area from E -- M, while students in a statistics track must choose at least two areas from E -- H and at least one area from A -- D or I -- M. The areas and typical course sequence in each area are listed below.

A. Algebra

1. MA 8113 - Modern Higher Algebra I
2. MA 8123 - Modern Higher Algebra II

B. Real Analysis

1. MA 8633 - Real Analysis I
2. MA 8643 - Real Analysis II

C. Functional Analysis

1. MA 8663 - Functional Analysis I
2. MA 8673 - Functional Analysis II

D. Topology

1. MA 8913 - Introduction to Topology I
2. MA 8923 - Introduction to Topology II

E. Multivariate Statistics

1. ST 8413 - Multivariate Statistical Methods
2. ST 8423 - Multivariate Analysis

F. Statistical Inference

1. ST 9733 - Statistical Inference
2. ST 9723 - Nonparametric Statistical Inference I

G. Linear Models

1. ST 8613 - Linear Models I
2. ST 8633 - Linear Models II

H. Design of Experiments

1. ST 8853 - Advanced Design of Experiments I
2. ST 8863 - Advanced Design of Experiments II

I. Probability and Stochastic Processes

1. ST 9533 - Probability Theory
2. ST 8543 - Stochastic Processes

J. Ordinary Differential Equations

1. MA 8313 - Ordinary Differential Equations I
2. MA 8323 - Ordinary Differential Equations II

- K. Partial Differential Equations
 1. MA 8333 - Partial Differential Equations I
 2. MA 8343 - Partial Differential Equations II

- L. Numerical Analysis
 1. MA 8473 - Advanced Numerical Analysis I
 2. MA 8483 - Advanced Numerical Analysis II

- M. Complex Analysis
 1. MA 8713 - Complex Analysis I
 2. MA 8723 - Complex Analysis II

In addition to the courses in his/her four areas, the student will normally complete at least nine to twelve hours of graduate courses (8000 and above) in an area of specialization which will be the area of research for the Ph.D. dissertation.

Doctoral Committee

Each student shall have a doctoral committee to guide his/her program of study. The committee will consist of at least five graduate faculty members including a major professor and at least three other graduate faculty members from the Department of Mathematics and Statistics, subject to the approval of the Graduate Coordinating Committee. Students are encouraged to choose their major professors early in their programs of study. The student and the major professor will then select the other committee members subject to the approval of the Graduate Coordinating Committee. The departmental Graduate Coordinator or his/her designate will serve as temporary advisor for the student until the major professor is chosen.

The student and the doctoral committee will select the courses for the student's program of study with approval of the Graduate Coordinating Committee. The doctoral committee will also monitor the student's progress.

EXAMINATION PROCEDURES

Comprehensive Examinations

In order to ensure that the skills and basic knowledge have been acquired to carry out the research necessary for the dissertation, the student must demonstrate competence in the four areas chosen from the list A - M above. Competence will be demonstrated by comprehensive examinations which shall consist of written examinations over each of these four areas; passing an appropriate graduate-level sequence of at least two courses with a grade of at least B in each course may be substituted for one of the area examinations. Knowledge of the content of a graduate-level sequence of two courses from each of the four areas, such as the typical course sequence listed under each area, should be adequate preparation for the comprehensive examination. Content syllabi for each of the examination areas will also be available.

Comprehensive examinations will normally be scheduled at the beginning of the spring semester and once during the summer. To show satisfactory progress in his/her graduate studies, a student is normally expected to complete his/her comprehensive examinations by the end of the third full academic year of Ph.D. work. A student will be allowed to repeat an examination only once.

Preliminary Examination

When the comprehensive examinations have been passed, the breadth and foreign language requirements have been met, and all course work on the program of study has been completed, the student may request the preliminary examination to be scheduled.

This examination will be an examination in the allied areas as well as an in-depth examination in the area of specialization. It will be administered by the student's doctoral committee and must contain an oral component. Pass

or fail will be determined by majority vote of the committee. The oral component of the examination is open to members of the faculty.

The Dissertation

After the preliminary examination has been passed, the student's doctoral committee will be reconstituted to form the dissertation committee. The student and the major professor of the doctoral committee will select the student's dissertation committee, subject to the approval of the departmental Graduate Coordinating Committee. The dissertation committee will consist of at least five graduate faculty members, including a major professor and at least three additional graduate faculty members from the Department of Mathematics and Statistics. The primary responsibility of the committee will be to supervise the student's research and writing of a dissertation in the area of specialization, and its members should be chosen with this mission in mind.

In the early stages of the research effort, the student will make a formal dissertation proposal to the dissertation committee. The dissertation will be an original work that makes a significant contribution to the student's area of specialization.

A person from outside the Department of Mathematics and Statistics who has expertise in the dissertation area will be enlisted by the student and his/her committee to serve as an external examiner for the dissertation. This person will read the dissertation and submit written comments regarding its quality and significance to the student's committee.

Final Examination

After all other examinations and the dissertation have been completed, the student's committee will schedule the final examination for the student. This examination will consist of an oral defense of the dissertation and will be open to the public.

After consultation with the Graduate Coordinator, the major professor will publicize the time and place that the examination will be held. This announcement should be at least one week prior to the scheduled date of the examination.

A pass or fail on this examination will be determined by a majority vote of the student's committee. In making its decision, the committee will give due consideration to the external examiner's assessment of the dissertation.

MINOR IN MATHEMATICS/STATISTICS (Ph.D.)

For a Ph.D. degree with a minor in mathematics or statistics, the student must complete at least 12 graduate hours in this Department. This should include at least two three-hour classes at the 8000 level or above. All minor professors and minor programs are subject to the approval of the Graduate Coordinating Committee.

The Department of Mathematics and Statistics does not require comprehensive examinations for the minor in mathematics or statistics. However, the student must achieve at least a grade of B in each of the courses in the minor program.

