

This material contains information you will need as you pursue your degree at Michigan State University. Please read it and keep it. If you have a question not answered here, feel free to come to the Graduate Office, A-213 Wells Hall, for help.

The degree requirements listed apply to you. It is your responsibility to make sure that they are met. If you have any questions about the requirements, see your advisor or the Director of Graduate Studies.

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Appendix

Graduate Student Rights and Responsibilities Document

## **I. PROGRAM OVERVIEW**

### **A. Graduate Programs**

The graduate program in mathematics at Michigan State University is one of the best in the country.

The Department of Mathematics has a world class faculty and is rated as a Group I department by the National Research Council – the highest grouping. Almost all major areas of mathematics are covered by the research interest of the faculty, including Algebra, Analysis, Applied Mathematics, Combinatorics, Differential Equations, Dynamical Systems, Graph Theory, Geometry, and Topology.

At Michigan State University, we offer a variety of programs at both the masters and the doctoral levels, and there is great flexibility within programs, to provide our students with as broad a program as they want in pure or applied mathematics. Master of Science degrees are offered in mathematics, applied mathematics, and a professional master's degree in industrial mathematics. The Department also offers a Master of Arts degree for teachers. Doctoral candidates may specialize in almost any active research field of modern mathematics. It is our hope that we give our students the best possible preparation for the many career opportunities available in academics, industry, and government.

### **B. How to Apply**

It is very important for applicants to submit application material on time to be considered for teaching and research assistantships and for a variety of possible university or college fellowships. All application material should be submitted by December 31<sup>st</sup> for the following academic year. The complete application package should be mailed to:

Ms. Barbara S. Miller  
Graduate Secretary  
A-213 Wells Hall  
Michigan State University  
East Lansing, MI 48824-1027

and should include the following:

1. University Application

Go to the website: <http://grad.msu.edu/apply.htm>, following the appropriate link to go to an interactive form that will allow you to send all of your information directly to M.S.U. over the internet. When a completed application has been received by the university, it will automatically be sent to the Department of Mathematics. You can also print out an application form from this website, fill it out, and mail it to M.S.U.

2. Departmental Application

Go to the website: [http://www.math.msu.edu/Academic\\_Programs/graduate/application.aspx](http://www.math.msu.edu/Academic_Programs/graduate/application.aspx) to complete the departmental application. This will give us more information about your background and your interest in any particular field.

3. Letters of Recommendation

Request three letters of recommendation from professors who can assess your promise of success in one of our graduate programs. You can print out the forms for letters of recommendation from <http://grad.msu.edu/apply.htm>. The document name is Recommendation for Admission form.

4. Transcripts

Send official transcripts to the address above. Do not send copies to the graduate school or to Admissions.

5. GRE Scores

The three standard sections of the GRE, verbal, quantitative, and analytic are required for admission. The GRE subject test in mathematics is required for applicants who want to be considered for teaching and research assistantship or for fellowships. Applicants should have test results sent to the Graduate Secretary named above, but it would also help if you were to send an unofficial copy of the results to the Graduate Secretary along with your application materials, since official results often take a long time to arrive. GRE Official Website: [www.gre.org](http://www.gre.org)

6. TOEFL Scores (International Students Only)

Applicants for whom English is not their primary language are required to submit TOEFL (Test of English as a Foreign Language) scores. In September 2005, ETS began offering a new version of TOEFL which includes a speaking test and is scored on a different scale than the previous two tests. Although we prefer the new version of the exam, we will accept old exam scores taken within two years of application (scores from tests taken over two years ago cannot be verified). Our department requires a score of at least 600, with no subscore below 55 on the paper-based exam, a computer-based score of 250, with no subscore below 22, and an internet-based score of 100, with no subscore below 21 for reading or below 22 on the listening, speaking, or writing sections of the exam.

### **C. Important Websites**

More information is available at the following websites:

The Graduate School Home Page:

<http://grad.msu.edu>

Application Information for M.S.U.:

<http://grad.msu.edu/apply.htm>

Mathematics Department Home Page:

<http://www.math.msu.edu>

Graduate Programs in Mathematics Department:

[http://www.math.msu.edu/Academic\\_Programs/Graduate/Default.aspx](http://www.math.msu.edu/Academic_Programs/Graduate/Default.aspx)

Graduate Students Rights and Responsibilities (GSRR):

<http://vps.msu.edu/SpLife/grr1.htm>

MSU/GEU Contract:

<http://grad.msu.edu/geu/agree.pdf>

Guidelines for Integrity in Research and Creative Activities:

<http://grad.msu.edu/all/ris04activities.pdf>

Guidelines for Graduate Student Advising and Mentoring Relationships:

<http://www.msu.edu/user/gradschl/all/ris04relations.pdf>

## **II. GENERAL INFORMATION FOR ALL GRADUATE STUDENTS**

### **A. Advisors**

When admitted, a student is assigned a temporary academic advisor. The advisor will help the students with academic matters. The advisor must be consulted at the time of first enrollment to plan a program of study for the entire year. Each spring semester the student must meet with the advisor to plan a program for the following year. All changes must have the approval of the advisor. Students can request the change of advisors when a more suitable advisor or the dissertation advisor is found.

### **B. Academic Standards**

The minimum grade level at which course credit is awarded is 2.0. The minimum standard for a degree is a 3.0 grade point average. The accumulation of grades below 3.0 in more than three courses (of three or more credits each) or deferred grades in more than three courses (of three or more credits each) automatically removes the student from candidacy for the degree. An accumulation, in excess of four courses, of a combination of grades below 3.0 and deferred grades will also remove the student from candidacy for the degree. A student who fails to meet the standards for any program may be required by the graduate director or the dean to withdraw at the end of the semester.

### **C. The Graduate Studies Committee**

The Graduate Studies Committee consists of three faculty members and two graduate student members and is chaired by the Director of Graduate Studies, who is appointed by the chairperson of the department. The two student members are elected by the graduate students and serve one-year terms. The election is held at the end of spring semester and is conducted by the outgoing student members. The Committee is responsible for, among other things, admission of students to the various graduate programs, appointment and reappointment of graduate assistants, and the hearing of grievances involving graduate students.

### **D. Integrity in Research and Creative Activities**

MSU is committed to creating an environment that promotes ethical conduct and integrity in research and creativity. Every student and his/her faculty advisor must read and understand the document *Guidelines for Integrity in Research and Creative Activities* (<http://grad.msu.edu/all/ris04activities.pdf>..). This document will be distributed to every incoming graduate student and will be discussed in the orientation program at the beginning of each fall semester. Every student is encouraged to participate in the workshop series given by the graduate school: Responsible Conduct of Research.

The University views misconduct in research as the most serious violation of University policy. Criteria for dismissal from the graduate program due to unethical or dishonest behavior is described in *Guidelines for Integrity in Research and Creative Activities*

#### **E. Judicial Structure**

When there are conflicts between a graduate student and his or her faculty advisor or Guidance Committee, including those that may require a change in the student's Major Professor, the following procedure should be followed.

1. The departmental Graduate Director should be consulted, and hopefully an informal resolution is possible.
2. If such a resolution is not possible, a meeting should be set up with the conflicting parties and the Graduate Studies Committee. The Committee will attempt to resolve the conflict in keeping with the policies of the Department and University including the *Guidelines for Graduate Student Advising and Mentoring Relationships* <http://grad.msu.edu/all/ris04.pdf>.
3. If a student remains unsatisfied with the outcome of those conversations, the student may submit a written request to the Department Chairperson for a grievance hearing. The letter must state the specific nature of the complaint or remedy that the student seeks as an outcome of the hearing.
4. Upon receiving a request for a grievance hearing, the Department Chair forwards the letter to the Department Hearing Board. The Hearing Board, for cases involving graduate students, is chaired by the Department Chair and is made up of an equal number of faculty and students.
5. After receiving the written complaint, the Hearing Board can request a response from the faculty member(s) involved with the grievance and then decide if the request for a hearing has merit. If so, the Department Chairperson will schedule a hearing; if not, the Hearing Board can dismiss the case—a decision that the student can appeal to the College of Natural Science Hearing Board.
6. If a hearing is held, both the student and the faculty member(s) are allowed to call on witnesses to appear at the hearing on their behalf, and they can seek an adviser to help them throughout the process. The advisers must be members of the MSU community – faculty, staff or students.
7. If the student prevails at the hearing, the Department Chair will implement an appropriate remedy to accommodate the student. If the faculty member(s) prevails at the hearing, the student may file a request to appeal the Department Hearing Board's decision to the College of Natural Science Hearing Board (see Graduate Student Rights and Responsibilities document at <https://www.msu.edu/unit/ombud/GSRRfinal.html#1>).

The University Ombudsman is available to assist students, instructors and hearing boards through every stage of the grievance process. The Office of the Ombudsman can be consulted to determine the process for resolution at the Departmental, College or University level (<http://www.msu.edu/unit/ombud/>).

## **F. Student Rights and Responsibilities**

Michigan State University is committed to maintaining a learning and working environment for all students, faculty, and staff that is fair, humane, and responsible – an environment that supports career and educational advancement on the basis of job and academic performance. The University is a community of scholars and all graduate students are expected to conduct themselves in a civilized and scholarly manner.

The principles of truth and honesty are fundamental in a community of scholars. The University expects students to honor these principles and to protect the integrity of the University grading system.

No student shall knowingly, without proper authorization, procure, provide, or accept any materials which contain questions or answers to any examination or assignment to be given on a subsequent date.

No student shall, without proper authorization, complete, in part or in total, any examination or assignment for another person.

No student shall, without proper authorization, knowingly allow any examination or assignment to be completed, in part or in total, for the student by another person. No student shall plagiarize or copy the work of another person and submit it as his or her own.

It is the responsibility of each student in each course to scrupulously follow the policy on external assistance in examinations and in problem sets that is described by the instructor at the beginning of the semester.

Specifics of students' rights and responsibilities are contained in the Graduate Students Rights and Responsibilities document (see Appendix).

## **G. Annual Evaluation**

When a student is admitted into our program, it is expected that they progress towards the degree requirements in a timely fashion.

To assist in the evaluation progress, each student is required to file an annual progress report in early March. The chair of the guidance committee, the dissertation advisor, or the student's initial academic advisor must sign the progress report and may wish to supply written comments at that time. The student can then add a written response to the professor's comments. A copy of the progress report and evaluation will be kept in the student's departmental file and can be accessed by the student or any member of the

faculty. The student will meet annually with the Director of Graduate Studies to discuss his/her annual report and his/her progress towards the advanced degree before the end of March.

If a student is not making timely and reasonable progress towards his/her degree in terms of completing coursework or taking the necessary exams, within fifteen days following their annual meeting with the Director of Graduate Studies, the student should receive a letter from the Director specifying the deficiencies and describing the expected steps, with a timetable, to get back in good standing. The student may wish to respond in writing if they disagree with the deficiencies listed or with the steps and timetable for remediation. Any responses will become part of the student's file.

It is a disservice to permit a student to continue towards the advanced degree without necessary qualifications, a high level of motivation, commitment, and aptitude. Judgment regarding retention is made by the student's guidance committee or dissertation committee. The committees may consult the Director of Graduate Studies and the department chairperson. If a majority of the guidance committee decides that a student lacks such standards, he/she may be asked to withdraw from the program according to the procedures as defined in the Graduate Students Rights and Responsibilities (<http://vps.msu.edu/SpLife/grr1.htm>).

#### **H. Enrollment**

The University stipulates that a minimum of five students is needed before a graduate level course can be offered. Therefore, all graduate students are asked to enroll for each subsequent semester they plan to be in attendance according to the dates on their Notification of Enrollment letters. Courses with fewer than five students enrolled may be canceled.

#### **I. Seminars and Colloquia**

Throughout the academic year, the department issues a weekly bulletin announcing seminars and colloquia being held that week. These bulletins are e-mailed to faculty and students and a copy is posted on the web. Participation in seminars and regular attendance at colloquia are strongly recommended. Announcements of seminars, colloquia, faculty actions, and other items of interest are posted on the bulletin board near the Graduate Office, Room A-213 Wells Hall.

### **III. THE MASTER'S DEGREE IN MATHEMATICS**

The Department of Mathematics offers graduate work leading to the degrees of Master of Science, Master of Science in Applied Mathematics, Master of Science in Industrial Mathematics, and Master of Arts for Teachers. An incoming student with a bachelor's degree or its equivalent is usually admitted into a master's program first. The requirements for the various master's degrees are as follows.

#### **A. Master of Science Degree**

The Master of Science degree is awarded to the student who successfully completes a program of course work subject to the requirements listed below.

1. Thirty total credits (ten semester courses) in approved courses are required for the degree.
2. Twenty-four of these credits must be in Mathematics courses; credits outside the department must be approved by the graduate director to count toward the degree.
3. At most twelve credits at the 400 level can count toward the degree.
4. At least six credits from the following sequences must be taken: MTH 818-819 (Algebra), MTH 828-829 (Analysis), MTH 848-849 (Differential Equations), MTH 868-869 (Geometry/Topology).
5. A grade point average of at least 3.0 for the thirty credits must be attained with no more than three grades of 2.5 or below.
6. Pass the master's certifying examination which is given each spring semester.

#### **B. Master of Science with Concentration in Applied Mathematics**

This degree is awarded to masters students who, as part of their thirty credit requirement, take at least twelve credits in 800-level Applied Mathematics courses, including at least one complete sequence from the following: MTH 841-842 (Boundary Value Problems), MTH 848-849 (ODE-PDE)\*, MTH 850-851 (Numerical Analysis), MTH 880-881 (Combinatorics and Graph Theory).

\*MTH 848-849 cannot be used for both the "sequence requirement" and item 4 above.

### **C. Master of Science Degree in Industrial Mathematics**

The goal of this professional program is to produce generalized problem solvers of great versatility with business savvy. The degree requires 36 hours of coursework, the successful completion of the Certificate in Business and Communications, and the successful completion of an oral masters certifying examination on the student's portfolio of completed projects. The certifying examination is given during the last term of study.

#### Requirements:

Both of the following courses (normally taken during the first year):

**MTH 843 - Survey of Industrial Mathematics**, Fall, 3 credits, standard lecture course.

Visit <http://www.math.msu.edu/msim> for course description.

**MTH 844 – Projects in Industrial mathematics**, Spring, 3 credits, tutorial, term project.

Visit <http://www.math.msu.edu/msim> for course descriptions.

#### As well as participate in:

**Business/Communication Certificate:** a series of 10 intensive weekend short courses. See <http://www.math.msu.edu/msim> for the description of the ten modules. There is an additional cost to the student for enrollment in the certificate program beyond tuition and fees.

#### Additional course work:

Mathematics (at least 4 courses)

MTH 841, 842	Boundary Value Problems I and II
MTH 848, 849	ODE, PDE
MTH 850, 851	Numerical Analysis I and II
MTH 852	Numerical Methods for ODE
MTH 810, 880, 881	Error-correcting Codes, Combinatorics, Graph Theory

Statistics (at least 2 courses)

STT 461	Computations in Probability and Statistics
STT 471	Quality and Productivity
STT 801	Design of Experiments
STT 852	Operations Research
STT 861, 862	Theory of Probability and Statistics I and II
STT 844	Time Series Analysis
STT 887	Stochastic Models in Finance

and at least 4 cognate courses chosen from:

Economics

EC 805	Microeconomic Analysis
EC 807	Applied Microeconomic Analysis
EC 811	Structure of Economic Analysis
EC 812A, 812B	Microeconomics
EC 813A, 813B	Macroeconomics
EC 820	Econometrics I
EC 827	Economics Forecasting

#### Electrical and Computer Engineering

ECE 466	Digital Signal Processing
ECE 809	Algorithms
ECE 826	Linear Control Systems
ECE 827	Nonlinear System Analysis
ECE 829	Optimal Multivariable Control

#### Mechanical Engineering

ME 451	Control Systems
ME 852	Intermediate Control Systems
ME 855	Digital Data Acquisition and Control
ME 857	Modeling and Simulation of Dynamic Systems
ME 860	Theory of Vibrations
ME 863	Nonlinear Vibrations

#### Computer Science

CSE 802	Pattern Recognition
CSE 803	Computer Vision
CSE 808	Modeling and Discrete Simulation
CSE 830	Design and Theory of Algorithms
CSE 835	Algorithmic Graph Theory

#### Civil and Environmental Engineering

CE 810	Reliability-Based Design in Civil Engineering
CE 841	Traffic Flow Theory

#### Environmental Engineering

ENE 801	Dynamics of Environmental Systems
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#### Material Science and Mechanics

MSM 401	Intermediate Mechanics of Deformable Solids
MSM 402	Computational Mechanics
MSM 444	Introduction to Composite Materials
MSM 809	Finite Element Method
MSM 810	Continuum Mechanics
MSM 813	Linear Elasticity
MSM 865	Advanced Theory of Solids

The choice of courses can be modified to fit the student's interests, but no 400 level mathematics course will count toward fulfilling the mathematics course requirement. No more than 12 hours of 400 level courses can be used to satisfy the requirements for the degree.

#### **D. Master of Arts for Teachers**

The Master of Arts for Teachers degree is designed for experienced secondary teachers of mathematics or persons with degrees who want to become certified to teach secondary school. The entrance requirements are a Bachelor's degree in mathematics or the approval of the Department. Each program must be approved by the student's advisor.

The Master of Arts for Teachers degree is awarded to the student who successfully completes a program of course work subject to the requirements listed below and completes all requirements for a secondary provisional teaching certificate. The teaching certificate may have been completed wholly or in part prior to the beginning of graduate study.

1. At least thirty credits in approved courses at the 400 level and above.
2. At least nine of these credits must be in Mathematics Education courses (Math 801, 802A, 802B, or equivalent DSME courses).
3. At least fifteen of these credits must be approved courses in mathematics and statistics, including at least one complete sequence from an approved list (see below).
4. Up to six credits can be taken from outside the Department of Mathematics. These can be in education as a part of certification requirements or in courses which use mathematics in interesting ways. These courses must be approved by the student's advisor.
5. Students must have completed course work in the following five areas by the time they finish the Master of Arts for Teachers degree: (1) geometry, (2) algebra, (3), analysis, (4) discrete mathematics, (5) probability and statistics. Part of this work could have been completed in the student's undergraduate program and is approved by the Director of Graduate Studies.
6. Pass the master's certifying examination which is given each spring semester.

Approved list of sequences:

MTH 481-482  
MTH 411-414  
MTH 421-425  
MTH 421-461  
MTH 432-434  
STT 861-862

Sequences at the 800 level may also be used to satisfy the sequence requirement, for examples MTH 880-881, MTH 818-819, etc.

**E. Residency Requirements and Time Limits for all Master's Degrees**

A minimum of six (6) credits of mathematics must be earned in residence on campus. The time limit for completion of the requirements for the degree is six (6) calendar years. The time starts with the date of the first course that the student is using to apply to the degree. For example, if a student is admitted in Fall Semester 2008 and wants to count a course taken previous to that date toward the degree, the time starts with the earlier course.

**F. Master's Certifying Examination**

Passing a master's certifying examination is a requirement of all four master's degree programs. The certifying examinations for the Master of Science, the Master of Science in Applied Mathematics, and the Master of Arts for Teachers degrees are given each spring semester and have typically been given in linear algebra, advanced calculus, geometry, and numerical analysis. The certifying examination for the Master of Science in Industrial Mathematics is an oral examination given during a candidate's last semester of study and is based on the portfolio of the candidate's completed projects. Students can take the certifying examination twice and must be enrolled the semester they take the examination. The exam is prepared and graded by faculty designated by the Director of Graduate Studies.

## **IV. DOCTORAL DEGREES IN MATHEMATICS**

The Department of Mathematics offers graduate work leading to the degrees Doctor of Philosophy and Doctor of Philosophy in Applied Mathematics. An incoming student with a bachelor's degree or its equivalent is usually admitted into a master's program first. Admission to the doctoral program is limited to those applicants who possess a master's degree in mathematics or equivalent preparation as determined by the Director of Graduate Studies. The requirements for the various doctoral degrees are listed below. Please note that credits used to satisfy requirements for a Master's degree may not be applied toward the requirements for a Ph.D. degree. Students must be enrolled the semester they take the qualifying and comprehensive examinations and the semester they defend their dissertation.

### **A. Ph.D. Degree in Mathematics**

In order to receive the Ph.D. degree in mathematics the student must:

1. Satisfy the qualifying examination requirements.
2. Pass the comprehensive examination.
3. Take thirty credits of 800-900 level mathematics courses, excluding dissertation credits (Math 999) and core courses in areas in which the qualifying examination requirements are fulfilled. These courses must be approved by the student's guidance committee.
4. Satisfy the foreign language requirement.
5. Satisfy the seminar requirement.
6. Take twenty-four credits of dissertation (Math 999).
7. Write and defend a doctoral dissertation acceptable to the student's dissertation committee.

### **B. Ph.D. Degree in Applied Mathematics**

The requirements are the same as for the Ph.D. in Mathematics with the following additions:

1. At least 18 credits of the 30 required in (3) above must be in approved applied mathematics courses and
2. The doctoral dissertation must be in an area of applied mathematics.

### **C. Dual Ph.D. Degree**

The Mathematics Department offers the Dual Ph.D. degree jointly with other programs. For a current program with Quantitative Biology and Modeling Initiative (QBMI), please consult [http://biomodel.msu.edu/grad\\_research.php](http://biomodel.msu.edu/grad_research.php).

Students who are interested in these dual degree programs should contact the Director of Graduate Studies to obtain further information regarding the policies and requirements.

### **D. Qualifying Examination Requirements**

Written qualifying examinations are given in five areas: (1) Algebra, (2) Differential Equations, (3) Geometry/Topology, (4) Numerical Analysis, and (5) Real and Complex Analysis. These exams are based on syllabi available to the student and are given twice yearly, at the beginning of each semester.

Parallel to these exams the department offers five "core" sequences: (1) Algebra - MTH 818-819, (2) Differential Equations - MTH 848-849, (3) Geometry/Topology - MTH 868-869, (4) Numerical Analysis - MTH 850,851,852, and (5) Real and Complex Analysis - MTH 828-829. See the descriptions for these courses on pages 19-22 of this handbook. While these courses will cover much of the material on the corresponding exam syllabi, the student may need to learn some of this material, independently.

Ph.D. students in mathematics and applied mathematics satisfy the qualifying examination requirements by passing written examinations in three of the following five areas: (1) Algebra, (2) Differential Equations, (3) Geometry/Topology, (4) Numerical Analysis, and (5) Real and Complex Analysis. These requirements must be completed within four semesters of entering the doctoral program. Within this period of time the written exams can be taken at most three times for each area and passed in any order, and all exams do not need to be passed at the same time.

### **E. The Comprehensive Examination**

The content of the comprehensive exam will be decided by the student's guidance committee and will cover material germane to the students' research interest. The committee chair, with the student, will prepare the syllabus at least three months before the exam. The comprehensive exam will be an oral exam based upon this written syllabus. The purpose of the exam is to determine if the student can do independent research. Consequently, the exam will not necessarily correspond to specific course material. The exam may be taken twice and should normally be completed within one year of completion of the qualifying examinations. If one of the committee members is not available to attend the exam, the student can still be tested and either pass or fail by majority vote.

The content of the exam should be roughly that of a semester course at the 900 level. It should be material known to most researchers in the field. The student should be able to learn the material in about a semester from completion of the qualifying exams. In fact, the content of the exam may overlap with that of graduate courses. Examples of content might be: (1) Schauder theory (in pde), (2) Seiberg-Witten theory (in topology), (3) class field theory (in algebra), (4) one-dimensional dynamical systems (in dynamics).

The comprehensive examination should test both knowledge of material and research promise. The examination itself should be open to any interested student or faculty member.

#### **F. The Foreign Language Requirement**

The Foreign Language Requirement consists of one language from among French, German, and Russian. The requirement for a language may be satisfied in one of the following ways:

1. Native fluency.
2. Course work: passing approved course(s) with a grade of 3.0 or above in the respective foreign language department at Michigan State University (e.g. French 400, German 400).
3. Exam: passing a foreign language test given by a member of the faculty in the Department of Mathematics or by making arrangements for testing with the appropriate language department.

#### **G. Ph.D. Seminar Requirement**

Each Ph.D. student must give at least two fifty-minute seminar talks. The talks, which should be at an advanced level, can be given either in a faculty or student seminar. The completion of this requirement must be certified by a faculty member knowledgeable in the area covered by the talks. A student should be certified as having fulfilled this requirement only if the talks are reasonably good, both in content and form.

#### **H. Guidance Committee and Dissertation Committee**

It is the responsibility of the candidate, in consultation with the Director of Graduate Studies, to form a guidance committee during the first year of doctoral study. The guidance committee is to consist of four faculty members, selected by the Director of Graduate Studies in consultation with the student.

The guidance committee must be chaired or co-chaired by a regular tenure system faculty member currently having at least a 50% appointment in the Department of Mathematics. Furthermore, at least two of the four guidance committee members must satisfy this description.

The responsibilities of the guidance committee are:

1. To plan the student's program, taking into account the student's goals and the courses and seminars appropriate to these goals.
2. To assess progress, approve program changes, and to offer its best advice.
3. To prepare a syllabus for the comprehensive examination.
4. To indicate a timetable for the completion of courses, the comprehensive examination, and the language and seminar requirements based on the student's entering level.
5. To observe the student's classroom performance, upon request, and to prepare a teaching letter on behalf of the student for job applications.

It is the responsibility of the student to plan a tentative program and have it approved by his or her guidance committee.

When a student passes the comprehensive examination, the guidance committee for that student will be dissolved. The student will then be expected to find a dissertation advisor. The dissertation advisor has the right to indicate conditions (courses, seminars, specific languages, specialty examinations) under which the student will be accepted by the advisor. If a student has difficulty finding a dissertation advisor, the Director of Graduate Students and the department chairperson will intervene with the faculty to resolve the problem. If, for any reason, a student desires to change a member of the guidance or dissertation committee, including the guidance committee chairperson or dissertation advisor, the change should be requested as early as possible. Any changes should be discussed with the graduate director, the current member, and the prospective new committee member, prior to initiation. Before relations with the dissertation advisor are severed, the student has to be sure that another faculty member will serve in that capacity.

A dissertation committee will be formed after a faculty member has agreed to be the student's dissertation advisor. The dissertation committee is to consist of five members, selected by the Director of Graduate Studies in consultation with the dissertation advisor and the student. These members must agree to be on the committee. In addition, the dissertation committee must be chaired or co-chaired by a regular tenure system faculty member currently having at least a 50% appointment in the Department of Mathematics. Furthermore, at least three out of five dissertation committee members must satisfy this description.

The responsibilities of the dissertation committee include:

1. Assessing the student's progress.
2. Planning the seminar and research phase of the student's work, not excluding additional course requirements in areas deemed appropriate to the student's research.
3. Reading and approving the dissertation.

#### **I. The Dissertation**

Every doctoral candidate must write a dissertation acceptable to the faculty. The dissertation is to be an original and significant contribution to mathematical knowledge. It constitutes evidence that the candidate is a well-trained and capable research worker in some specialized area of mathematics. The research on the dissertation is done under the guidance of the dissertation advisor and dissertation committee.

#### **J. The Dissertation Defense**

The final public oral examination in defense of the dissertation is conducted by the dissertation committee and is arranged by the candidate in consultation with the dissertation committee and the Director of Graduate Studies. The candidate must present copies of the dissertation to the committee at least three weeks prior to the date of the defense. It is the responsibility of the candidate to determine that all members of the committee are available on the expected date of the defense. Requests for changes or substitutions in the dissertation committee must be submitted to and approved by the Director of Graduate Studies at least four weeks prior to the anticipated date of the defense. Last minute requests for changes may not be honored.

#### **K. Teaching**

Every doctoral candidate is required to complete one year of teaching as part of his or her professional training.

#### **L. Residency Requirements and Time Limits for all Ph.D. Degrees**

One year of residence on the campus after completion of the master's degree or its equivalent is required to permit the student to work with the faculty, and to engage in independent and cooperative research utilizing University facilities. A year of residence is two consecutive semesters, involving completion of at least six credits of graduate work each semester.

The time limit for completion of the requirements for the degree is eight calendar years.

**M. Credit-No Credit System**

The University has a credit-no credit grading option but graduate degree candidates in the Department of Mathematics may not take any courses to be applied towards their degrees under the CR-NC system. Language courses may be taken CR-NC.

## V. GRADUATE COURSES

### A. 800 Level Courses

**810 Error-Correcting Codes** Spring

Prerequisite: Math 411 or MTH 414 or MTH 415

Block codes, maximum likelihood decoding, Shannon's theorem. Generalized Reed-Solomon codes, modification of codes, subfield codes. Alternant and Goppa codes, cyclic codes and BCH codes.

**818 Algebra I (Core Course)** Fall

Prerequisite: MTH 411 or equivalent

Group theory: Sylow theory, permutation groups, Jordan-Holder theory, Abelian groups, free groups. Ring theory: algebra of ideals, unique factorization, polynomial rings, finitely generated modules over PID's.

**819 Algebra II (Core Course)** Spring

Prerequisite: MTH 818

Modules and vector spaces, projective modules, tensor algebra. Fields and Galois groups, algebraic and transcendental numbers, non-commutative rings. The Jacobson radical, the structure of semisimple rings with the descending chain condition.

**822 Calculus on Manifolds** Fall

Prerequisites: MTH 421

Recommended Background: MTH 414 or equivalent

A modern treatment of differential and integral calculus on manifolds in Euclidean space. Differential forms, generalized Stokes' Theorem. Interaction among linear algebra, topology, and analysis.

**828 Real Analysis I (Core Course)** Fall

Prerequisites: MTH 421, MTH 461 or equivalent

Lebesgue measure on real line, general measure theory. Convergence theorems, Lusin's theorem, Egorov's theorem,  $L^p$ -spaces, Fubini's theorem. Functions of bounded variation, absolutely continuous functions, Lebesgue differentiation theorem.

**829 Complex Analysis I (Core Course)** Spring

Prerequisites: MTH 421, MTH 425 or equivalent

Cauchy theorem, identity principle, Liouville's theorem, maximum modulus theorem. Cauchy formula, residue theorem, Rouche's theorem. Casorati-Weierstrass theorem, Arzela-Ascoli theorem. Conformal mapping, Schwarz lemma, Riemann mapping theorem.

- 840 Chaos and Dynamical Systems** Spring  
 Prerequisites: MTH 320 and MTH 414  
 Recommended Background: MTH 441, some experience with mathematical software such as Mathematica or Matlab
- Chaotic or random motions in differential and difference equations.
- 841 Boundary Value Problems I** Fall  
 Prerequisites: MTH 414, MTH 421 or equivalent
- Boundary value problems for ordinary and partial differential equations. Sturm-Liouville theory. Fourier series and generalized Fourier series. Eigenfunction expansions. Variational methods. Fredholm integral equations. Potential theory. Green's functions. Special functions. Integral transform methods.
- 842 Boundary Value Problems II** Spring  
 Prerequisite: MTH 841
- Continuation of MTH 841.
- 843 A Survey of Industrial Mathematics** Fall  
 Prerequisites: MTH 414, MTH 421 or equivalent
- The course has three objectives: to survey mathematics of particular importance to industry, to gain experience in team project report generation, and to gain experience in oral presentation of technical reports.
- 844 Projects in Industrial Mathematics** Spring  
 Prerequisite: Approval of Department
- Representatives from Industry or Government will come to campus to pose problems of interest to their unit. Students will divide into teams of 2 or 3 to tackle one of the posed problems. By the end of term each student team will present both a written and oral report of their findings to the industrial or governmental unit that posed the problem. Teams will be advised by a faculty member plus a liaison from the unit that posed the problem.
- 848 Ordinary Differential Equations** (Core Course) Fall  
 Prerequisites: MTH 414, MTH 421 or equivalent
- Existence and uniqueness theorems. Theory of linear differential equations. Floquet theory. Stability theory and Poincare-Bendixson theory. Green's functions and boundary value problems.
- 849 Partial Differential Equations** (Core Course) Spring  
 Prerequisites: MTH 414, MTH 421 or equivalent
- Cauchy-Kowalewski theorem. Characteristics. Initial-boundary value problems for parabolic and hyperbolic equations. Energy methods, boundary value problems for elliptic equations, potential theory. Green's function, maximum principles, Schauder's method.

- 850 Numerical Analysis I** (Core Course) Fall  
Prerequisites: MTH 414, MTH 421 or equivalent
- Convergence and error analysis of methods in computational linear algebra. Direct methods for linear systems, matrix decompositions, iterative methods. Eigenvalue programs: the power, QR, Lanczos and other methods. Singular and generalized eigenvalues.
- 851 Numerical Analysis II** (Core Course) Spring  
Prerequisite: MTH 850
- Interpolation theory and approximation of functions. Numerical solutions of nonlinear equations. Numerical integration methods.
- 852 Numerical Methods for Ordinary Differential Equations** (Core Course) Fall  
Prerequisite: MTH 414, 421
- Linear multi-step methods and single step nonlinear methods for initial value problems. Consistency, stability and convergence. Finite difference, finite element, shooting methods for boundary value problems.
- 864 Geometric Topology** Spring  
Prerequisites: MTH 421
- Topology of surfaces and higher dimensional manifolds, studied from combinatorial, algebraic or differential viewpoints.
- 868 Geometry and Topology I** (Core Course) Fall  
Prerequisite: MTH 411, MTH 421 or equivalent
- Fundamental group and covering spaces, vanKampen's theorem. Homology theory, differentiable manifolds, vector bundles, transversality, calculus on manifolds. Differential forms, tensor bundles, deRham theorem, Forbenius theorem.
- 869 Geometry and Topology II** (Core Course) Spring  
Prerequisite: MTH 868
- Continuation of MTH 868.
- 870 Set Theory and Foundations of Mathematics** Spring  
Prerequisite: MTH 411 or MTH 421 or equivalent
- Zermelo-Fraenkel axioms. Cardinals and ordinals and their arithmetics. Axiom of choice and maximal principles. Transfinite induction and recursion, consistency and independence.

**880 Combinatorics** Fall

Prerequisite: MTH 411 or MTH 482 or equivalent

Enumerative combinatorics, recurrence relations, generating functions, asymptotics, applications to graphs, partially ordered sets, generalized Möebius inversions, combinatorial algorithms.

**881 Graph Theory** Spring

Prerequisite: MTH 880

Graph theory, connectivity, algebraic and topological methods. Networks, graph algorithms, Hamiltonian and Eulerian graphs, extremal graph theory, random graphs.

**890 Reading in Mathematics** Every Semester

Prerequisite: Approval of Department

Individualized study for Master's level students.

## **B. 900 Level Courses**

The descriptions of the 900 level course given below are a list of topics covered in the past.

**910 Commutative Algebra I** Fall of odd numbered years

Prerequisite: MTH 819

Noetherian rings and modules, localization and tensor products, primary decomposition, Krull dimension, graded rings and modules, Hilbert's Nullstellensatz, integral extension, discrete valuation rings, Dedekind domains.

**911 Commutative Algebra II** Spring of even numbered years

Prerequisite: MTH 910

Ext and Tor, regular sequences, Cohen-Macaulay rings, regular rings, Gorenstein rings, completion, modules of differentials, Cohen's structure theorems.

**912 Group Theory I** Fall of even numbered years

Prerequisite: MTH 819

Permutation groups, solvable and nilpotent groups, simple groups. Representation and character theory. Extension theory and cohomology groups.

**913 Group Theory II** Spring of odd numbered years

Prerequisite: MTH 912

Groups of Lie type, linear groups, locally finite groups, free groups and free products, the subgroup theorems.

**914 Lie Groups and Algebras I** Fall of odd years

Prerequisite: MTH 819

Nilpotent and semisimple algebras, the adjoint representation, root spaces, Weyl groups, Dynkin diagrams, classification of simple algebras.

**915 Lie Groups and Algebras II** Spring of even numbered years

Prerequisite: MTH 914

Weights, symmetric spaces, groups of Lie type, finite groups of Lie type, Lang's theorem.

**916 Algebraic Geometry I** Fall of even numbered years

Prerequisites: MTH 818 and MTH 819

Affine and projective algebraic varieties and their properties. Morphisms and singularities. Schemes and coherent sheaves. Sheaf cohomology and other related topics.

- 917 Algebraic Geometry II** Spring of odd numbered years  
 Prerequisite: MTH 916  
 Continuation of MTH 916.
- 920 Functional Analysis I** Spring  
 Prerequisite: MTH 828  
 Hilbert spaces: Riesz representation theorem, Parseval's identity, Riesz-Fisher theorem, Fourier series operators. Banach spaces: Hahn-Banach theorem, open mapping and closed graph theorems, Banach-Steinhaus theorem.
- 921 Functional Analysis II** Fall of even-numbered years  
 Prerequisites: MTH 829 and MTH 920  
 Topological vector spaces, convexity, Krein-Milman theorem, Banach algebras, operators on Banach spaces, spectral theorem,  $C^*$ -algebras.
- 922 Harmonic Analysis** Fall of odd-numbered years  
 Prerequisites: MTH 829 and MTH 920  
 Fourier series, mean and pointwise convergence, conjugate functions, Fourier transform, Plancherel theorem, Paley-Wiener theorem, interpolation of operators, Hausdorff-Young theorem.
- 928 Real Analysis II** Fall  
 Prerequisites: MTH 828  
 Positive Borel measure, complex measure, Riesz representation theorem, Radon-Nikodym theorem, Lebesgue decomposition theorem. Differentiable transformations and change of variables, differentiation of measures, maximal functions.
- 929 Complex Analysis II** Spring  
 Prerequisites: MTH 828, MTH 829  
 Phragmen-Lindeloff method. Hadamard's theorem, Runge's theorem, Weierstrass factorization theorem, Mittag-Leffler theorem, and Picard's theorem. Poisson integrals, Harnack's inequality, Dirichlet problem.  $H^p$ -spaces, Blaschke products.
- 930 Riemannian Geometry I** Fall of even numbered years  
 Prerequisite: MTH 869  
 Riemannian metrics, connections, curvature, geodesics. First and second variation, Jacobi fields, conjugate points. Rauch comparison theorems, Hodge theorem, Bochner technique, spinors. Further topics on curvature or submanifold theory.

- 931 Riemannian Geometry II** Spring of odd numbered years  
Prerequisite: MTH 930  
Continuation of MTH 930.
- 935 Complex Manifolds I** Fall of odd numbered years  
Prerequisites: MTH 829, MTH 869  
Riemann surfaces, Serre duality, Riemann-Roch theorem. Weierstrass points, Abel's theorem, Plucker formulas. Hermitian metrics, connections, curvature, Hodge theorem. Kaehler metrics, Kodaira vanishing theorem, Chern classes.
- 936 Complex Manifolds II** Spring of even numbered years  
Prerequisite: MTH 935  
Continuation of MTH 935.
- 940 Applied Analysis I** Fall  
Prerequisite: MTH 828  
Sobolev spaces, trace theorem, imbedding theorems, sectorial forms. Linear elliptic boundary and eigenvalue problems.
- 941 Applied Analysis II** Spring  
Prerequisite: MTH 940  
Fixed point theorems. Variational methods. Applications to nonlinear integral and elliptic differential equations. Semigroup theory.
- 942 Foundations of Applied Mathematics I** Fall  
Prerequisites: MTH 841, MTH 842 or equivalent  
Modeling in classical applied mathematics. Newtonian and continuum mechanics. Special mathematical techniques.
- 943 Foundations of Applied Mathematics II** Spring  
Prerequisite: MTH 848  
Asymptotic series. Fundamental techniques. Perturbation of integrals. Stationary phase. Steepest descent. Perturbation of eigenvalue problems. Periodic and almost periodic solutions. Averaging. Multiple scales. Singular perturbation. Boundary layer theory. Matched asymptotic expansions. Applications.

**950 Numerical Methods for Partial Differential Equations I** Spring odd-numbered years

Prerequisite: MTH 852 strongly recommended

Analysis of finite difference methods for ordinary and partial differential equations. Evolutionary problems, stability of initial value problems, ADI methods, wave equations and first order hyperbolic systems. Elliptic problems, approximation of boundary conditions, multigrid methods. Applications to structural analysis.

**951 Numerical Methods of Partial Differential Equations II** Spring even-numbered years

Prerequisite: 950

Finite element methods, variational formulations, Sobolev spaces, finite element spaces, a priori estimates, collocation methods, applications to computational fluid dynamics.

**960 Algebraic Topology I** Fall

Prerequisite: MTH 869

Cohomology, products, duality, basic homotopy theory, bundles, obstruction theory, spectral sequences, characteristic classes, and other related topics.

**961 Algebraic Topology II** Spring

Prerequisite: MTH 960

Continuation of MTH 960.

**990 Reading in Mathematics** Every Semester

Prerequisite: Approval of Department

Individualized study for doctoral level students.

**C. Others**

**991 Special Topics in Algebra**

**992 Special Topics in Analysis**

**993 Special Topics in Geometry**

**994 Special Topics in Applied Mathematics**

**995 Special Topics in Numerical Analysis and Operations Research**

**996 Special Topics in Topology**

**998 Special Topics in Combinatorics and Graph Theory**

**999 Doctoral Dissertation Research**

## VI. FACULTY AND AREAS OF INTEREST

### A. Faculty

### Areas of Interest

Abbas, Casim	Contact Geometry, Dynamical Systems
Akbulut, Selman	Geometric Topology, Real Algebraic Manifolds
Bao, Gang	Applied and Computational Mathematics
Bates, Peter W.	Partial Differential Equations, Applied Mathematics
Bell, Robert	Group Theory
Brown, William C.	Commutative Algebra, Linear Algebra
Chen, Bang-Yen	Differential Geometry
Chiu, Chichia	Differential Equations, Numerical Analysis
Christlieb, Andrew	Numerical Analysis
Fintushel, Ronald**	Topology and Geometry
Francsics, Gabor*	Analysis, Partial Differential Equations
Hall, Jonathan I.	Group Theory, Combinatorics, Coding Theory
Hill, Richard O.	Numerical Analysis
Hu, Huyi	Dynamical Systems, Analysis
Ivanov, Nikolai	Complex Analysis
Kalfagianni, Efstratia	3-Manifolds, Knot Theory
Keller, Brin	Collegiate Mathematics Education, Discrete Mathematics
Kulkarni, Rajesh**	Algebraic Geometry
Kurtz, Jay C.	Differential Equations, Applied Statistics
Lamm, Patricia	Inverse Problems, Numerical Analysis
Li, Tien-Yien	Dynamical Systems, Numerical Analysis
Liu, Di	Applied Mathematics
Ludden, Gerald D.	Differential Geometry
MacCluer, Charles R.	Control Theory, Industrial Problems
Magyar, Peter	Algebraic Geometry, Combinatorics
McCarthy, John D.	Geometric Topology
Meierfrankenfeld, Ulrich	Group Theory
Miklavcic, Milan	Differential Equations, Numerical Methods
Nazarov, Fedor***	Harmonic and Fourier Analysis
Newhouse, Sheldon E.	Dynamical Systems, Differential Equations

Ow, Wellington H.	Complex Analysis
Pappas, George	Number Theory, Arithmetic Algebraic Geometry
Parker, Thomas	Geometric Analysis
Pearlstein, Gregory	Algebraic Geometry
Peller, Vladimir	Complex Analysis, Harmonic Analysis
Promislow, Keith	Nonlinear Partial Differential Equations, Dynamical Systems
Qian, Jianliang	Numerical Analysis
Rotthaus, Christel	Commutative Algebra, Algebraic Geometry
Sagan, Bruce E.***	Combinatorics, Graph Theory
Schenker, Jeffery	Harmonic and Functional Analysis
Shapiro, Michael*	Functional Analysis
Sreedharan, V. P.	Mathematical Economics
Tang, Moxun	Nonlinear PDE, Mathematical Biology
Uriarte-Tuero, Ignacio	Analysis
Vaninsky, Kirill	Applied Analysis
Volberg, Alexander	Harmonic and Complex Analysis
Wald, Jeanne	Ring Theory
Wang, Chang Yi	Fluid Dynamics, Numerical Methods
Wang, Xiaodong	Geometric Analysis
Wang, Yang	Analysis, Applied Mathematics
Wei, Guowei*	Applied Mathematics
Wolfson, Jon G.	Differential Geometry, Partial Differential Equations
Yan, Baisheng	Partial Differential Equations, Calculus of Variations
Zeidan, Vera	Optimal Control Theory
Zhou, Zhengfang	Differential Equations, Mathematical Physics

\*On leave Fall 2008

\*\*On leave Spring 2009

\*\*\*On leave Fall 2008/Spring 2009

**B. SPECIALISTS**

Courtney, John

Griffin, Sharon

Hensh, Rick

Kadyrova, Irina

Sikorskii, Pavel

## **VII. GRADUATE TEACHING ASSISTANTSHIPS**

### **A. General Information**

The University criteria for awarding, renewing, and terminating graduate teaching assistants can be found in the MSU/GEU contract: <http://grad.msu.edu/geu/agree.pdf>. The policies stated below are subservient to new contract agreements that may be posted in the above website in the future.

The Department of Mathematics employs about 100 ½-time graduate students in mathematics as teaching assistants each fall and spring semester. An assistant's duties include teaching elementary courses or assisting in recitation sections. Normally, an assistant will have no more than six classroom contact hours per week when averaged over fall and spring semesters. The Department estimates that teaching combined with lecture preparation, paper grading, and student consultations takes about twenty hours per week. Teaching assistants are granted a nine credit per semester tuition waiver for fall and spring semesters and a five credit tuition waive for summer semester. Teaching assistants pay tuition at the in-state rate for credits beyond the first nine. In addition, registration fees are waived and assistants are automatically enrolled in a health insurance plan, the premium of which is paid by the University.

### **B. Departmental Orientation**

All new graduate teaching assistants are required to attend an orientation program prior to the start of fall semester. The purpose of this program is to acquaint the graduate assistants with the policies and procedures of the University and the Department of Mathematics and to provide a few valuable tools to enable the graduate assistants to become successful teachers.

### **C. Levels**

There are three levels of teaching assistant: For definition of these levels, see Article 19 of the GEU contract. Promotion to level 3 is granted to a student with a master's degree and six semesters of teaching experience (including summers) at Michigan State University, or to a student with the equivalent of a master's degree (thirty credits of mathematics courses) and six semesters of teaching experience (including summers) at Michigan State University. The Department Chairperson may decide whether to accept teaching experience at other universities.

The pay period begins on August 16, 2008 and the assistant receives a paycheck on the 15th of each month, beginning in September. If the 15th falls on a Saturday or Sunday, checks arrive the Friday before.

Quarter-time assistantships are awarded occasionally. These have a proportionate reduction in duties and stipend.

New graduate assistants need to complete three payroll processing steps:

1. Complete federal and state W-4 forms for tax withholding;
2. Have social security card information verified;
3. Take visa and I-20 to Payroll Office, 350 Administration Building (10:00am – 4:00pm).

Graduate assistants are required to use the ePayroll system to submit payroll information related to direct deposit and tax withholdings (W-2 forms). Some international students may be limited in their access capabilities in ePayroll. These students are required to file their paperwork and related documents in person to the Payroll Department.

ePayroll web address: [www.epayroll.msu.edu](http://www.epayroll.msu.edu)

You can also link to the ePayroll system through STUINFO (under “Online Student Services” with a heading of “Payroll Forms”).

The Payroll Office is required by federal law to verify each student’s name and social security number as they appear on their social security card. Social security numbers can be verified as follows: either take your social security card to the Payroll Office or take your social security card to the graduate secretary in A-213 Wells Hall and she will fax a copy of your card to the Payroll Office.

If you have not completed the required processing by September 14<sup>th</sup>, your check for the September graduate assistant payroll will be held in the Payroll Office. Checks will also be held for all graduate assistants who have not registered (i.e., fees paid) by payday. Graduate assistants not registered by September 7<sup>th</sup> may not be eligible for direct deposit for the September payroll.

#### **D. Vehicle Registration**

If you own a motor vehicle or a bicycle and want to use it on campus, you must register it with the University Vehicle Office. The Vehicle Office is located in the Public Safety Building, 87 S. Red Cedar Road. To register a vehicle you need your student ID, current vehicle registration, proof of insurance, and a copy of your appointment form which is given to you by the Graduate Secretary in A-213 Wells Hall.

#### **E. Health Insurance**

"Student only" coverage will be automatically provided, at no cost to graduate assistants. Michigan State University will provide a full twelve months of coverage if your appointment is at least nine months. No enrollment is necessary, unless you wish to enroll your legal spouse and/or dependent children. Questions regarding enrollment, premium payment and coverage should be directed to the Chickering Group at 1-

800-859-8452. Questions or issues that cannot be resolved with the Chickering Group may be directed to the MSU Benefits office at 1407 South Harrison Road, Room 140 Nisbet Building at 517-353-4434.

#### **F. Language Skills**

New graduate assistants for whom English is not a primary language are required to take and pass the Speak Test before they can be assigned teaching duties. Michigan State University requires a minimum score of 50 or waiver approval prior to being allowed to teach. Students who do not pass the Speak Test immediately will be given a grading assignment for their first semester. The expectation is that they will be able to improve their language skills and assume classroom duties in later semesters. Lack of progress in language skills as evidenced by the inability to successfully pass the Speak Test and undertake a classroom assignment may lead to loss of the assistantship after the first year.

#### **G. Reappointments**

At the beginning of spring semester you will be asked to indicate whether or not you wish to be reappointed as a graduate assistant for the following academic year. Requests for reappointment are considered by the Graduate Director and decisions are made by the end of March. An assistant is allowed two years to complete the master's degree. Graduate assistants in the doctoral program are not guaranteed reappointment beyond the sixth year. Unsatisfactory performance of teaching duties or violation of general student regulations contained in the Student Rights and Responsibilities document, can result in termination of an assistantship, following the procedures specified in the MSU/GEU contract. Teaching performance is evaluated at the end of each semester by course supervisors, and evaluations are kept in the students' assistantship file according to the MSU/GEU contract.

#### **H. Summer Support**

The budget for teaching in the summer semester is very limited. The department can usually support about sixty students as teaching or research assistants. The teaching and research assistantships for summer are awarded on a merit basis.

#### **I. Course Load for Graduate Assistants**

The University requires that every quarter and half-time graduate assistant carry at least six credits per semester during the academic year in order to be paid. For Ph.D. students who no longer need additional credits, the six credit minimum enrollment for graduate assistants is reduced to three credits. None of these credits can be taken as a visitor. For those with any type of student loan, you should know that the Registrar's Office does not consider a master's student carrying less than nine credits, or a doctoral student carrying less than six credits, to be a full-time student. This could affect the repayment of your student loan since a financial institution will require that the Registrar's Office sign an affidavit stating that you are a full-time student. If this affidavit is not signed, you could be asked to begin repaying your loan

immediately. International students should always follow the rules of SEVIS regarding the proper course load.

The Department of Mathematics “expects” that all graduate assistants who are candidates for a degree in mathematics carry a minimum of nine credits per term. The Graduate Studies Committee interprets this as follows:

1. A master's candidate or a doctoral student who has not yet taken the qualifying exams should register for at least nine credits. Of these credits, at least three must be taken for a grade in mathematics. Any student who is required to take course work at the English Language Center may take a reduced number of credits in mathematics, that number being subject to approval by the student's advisor and the Director of Graduate Studies. Upon recommendation of the advisor and approval by the Director of Graduate Studies, a first year student teaching for the first time may take a program consisting of fewer than nine credits.
2. Doctoral candidates may not sign up for MTH 999 until they have passed the qualifying examinations, the comprehensive examination, and have selected a dissertation advisor. Appropriate exceptions to this may be granted by the Director of Graduate Studies.
3. For a doctoral candidate who has failed the qualifying examinations in September and will make a second attempt the following January, the department will accept the minimum load of six credits for a grade during the fall semester without prejudicing the candidate's chances for reappointment.
4. For a doctoral candidate who has passed the qualifying examinations, the recommended minimum load is six credits.
5. Doctoral students are strongly urged to take no more than the required twenty-four credits of doctoral dissertation research (MTH 999), but rather to enroll in regular courses to fulfill the minimum enrollment requirements.
6. Exceptions to the above may be made with the approval of the assistant's advisor or guidance/dissertation committee and with the permission of the Director of Graduate Studies.

The maximum course load for a half-time assistant is twelve credits per semester unless written permission to carry more is obtained from the dean's office prior to registration.

#### **J. Minimum Registration for Graduate Assistants**

Deviation from the minimum enrollment requirement of six credits for a master's degree student is permitted only during summer session, when a three credit minimum is allowed for all types of assistantships, and in the semester in which the degree is granted. Assistants must enroll for at least the number of credits required to complete the degree requirements or meet the University's minimum registration requirement of one credit. This exception to the regular policy is to be used only one time per student per graduate degree earned. Please notify the graduate secretary in A-213 Wells Hall prior to the

beginning of the semester you plan to apply for your degree if you will be taking less than the required number of credits.

Doctoral students who have successfully completed all comprehensive exams may enroll for only one credit beginning the semester after completion of the exam only if the “Record of Comprehensive Examinations” form, with all appropriate signatures, has been sent to the Dean’s office no later than thirty days (sixty days is preferable) prior to the beginning of the semester in which the one-credit full-time status will be effective.

**K. Course Load for Non-Assistants**

If you consider yourself a full-time student, we recommend a nine credit per semester minimum. For those with any type of student loan, you should know that the Registrar's Office does not consider a master's student carrying less than nine credits, or a doctoral student carrying less than six credits, to be a full-time student. This could affect the repayment of your student loan since a financial institution will require that the Registrar's Office sign an affidavit stating that you are a full-time student. If this affidavit is not signed, you could be asked to begin repaying your loan immediately.

## **VIII. DEPARTMENT FACILITIES**

### **A. Mathematics Library**

The Vernon G. Grove Research Library, popularly referred to as the *Mathematics Library*, opened in 1970 on the first floor of the 3-story D-wing in Wells Hall.

### **B. Computing Facilities**

#### **1. Research Computing**

Room A-216 Wells Hall contains ten Dell computers running Windows XP and a network HP Laserjet 4350 (LW3) printer. These machines are dedicated to research purposes and any mathematics graduate student can request an info server account. To apply for this account go to: <https://mathdata.msu.edu/Accounts/Default.asp>.

#### **2. General Computing**

Room A-514 Wells Hall contains ten Dell computers running Windows XP and a Konica Minolta Bizhub 600 that works as a copier and a network printer. These machines are for general word processing, spread sheets, and other course related material. You will need an info server account to log into these computers. To apply, go to: <https://mathdata.msu.edu/Accounts/Default.asp>. To use the Bizhub 600 as a copier, you log in with your PID (Personal ID) minus the letter A.

The computer lab in B-100, which is shared by the mathematics and statistics departments, contains approximately seventy networked PCs which can be used for e-mail, web browsing and online registration and are also equipped with many of the standard mathematical and statistical software packages.

### **C. Electronic Mail**

All students can obtain electronic mail accounts on the MSU pilot e-mail system at no cost. Once you have enrolled, you can use any campus terminal to set up your e-mail account. You should activate your pilot account as soon as possible and check your mail frequently as many important notifications are only sent out electronically.

### **D. Graduate Mailboxes**

Every graduate student will be assigned a mailbox in room A-214 Wells Hall. Please check your mailbox *daily* as this is an important means to give you messages or notification about important events.

### **E. Supplies**

Teaching assistants may obtain supplies (e.g. pencils, pens, pads of paper, instructor grade books) from one of the secretaries in A-212 Wells Hall.

### **F. Copy Machines**

Graduate teaching assistants in the Department of Mathematics will have access to two copy machines. The Konica Minolta Bizhub 600 located in A-514 Wells Hall has a 4000 copy limit and can be used as a copier and a network printer. When you get close to the copy limit, contact the graduate secretary in A-213 Wells Hall to get your account reset. This machine is to be used for copying all material pertaining to the courses you are teaching and courses you are taking. Note: If you wish to make transparencies, please obtain them from either the Undergraduate Office, A-212 Wells Hall or the Graduate Office, A-213 Wells Hall. The copy machine located in the Mathematics Library has a 500 copy per year limit. This page limit policy will be enforced. This machine is strictly for Mathematics Library material.

Photocopying whole books and other copyrighted material is illegal and is not allowed on department equipment. This policy is to be rigidly enforced.

The account number, which must be entered before using the Konica Minolta Bizhub 600 in A-517 Wells Hall, is your PID (Personal ID) minus the A. Please see the graduate secretary in A-213 Wells Hall for your account number for the Math Library copier. You are not to give your account numbers to anyone else. The photocopy machines are for your use only.

### **G. Office Space**

Each graduate teaching assistant will be supplied with an office and desk. As office space is limited, you can expect to have to share your office with at least one other person. Office assignments are made by the graduate secretary.

## IX. UNIVERSITY RESOURCES

### A. Directory of Frequently Contacted Offices

#### 1. Department

Department Chairperson---D-207 Wells Hall.....	355-9680
Graduate Program Director---A-215 Wells Hall.....	353-4650
Graduate Secretary---A-213 Wells Hall.....	353-6338
Undergraduate Director---A-220 Wells Hall.....	355-9683
Undergraduate Office---A-212 Wells Hall.....	353-0844
Undergraduate Secretary---A-221.....	355-3333
Mathematics Library---D-101.....	353-8852

#### 2. College

Dean---104 Nat. Sci.....	355-4473
Associate Dean---103 Nat. Sci.....	355-4474

#### 3. University Administration

Admissions and Scholarships---250 Admin. Bldg.....	355-8332
Billing Statements---142 Admin. Bldg.....	355-3343
Graduate School---118 Linton Hall.....	355-3220
Payroll (direct deposit)---350 Admin. Bldg.....	355-5010
Registrar's Office.....	355-3300
Enrollment Services	
Degree & Certification	
Transcripts---50 Admin. Bldg. ....	355-3456

#### 4. Computer Center

Computing Resource Center .....	355-4500 (ext. 122)
Computer Store---110 Computer Center .....	432-0700
Scoring Office.....	355-1819

#### 5. International Center

English Language Center---A-714 Wells Hall .....	353-0800
Office for International Students & Scholars---103 International Center.....	353-1720
Office of Study Abroad---109 International Center.....	353-8920

#### 6. Library

Information Desk.....	353-8700
Library Hours.....	432-6123

#### 7. Student Health Services

Olin Health Center Information Desk.....	355-4510
Olin Health Center Appointments .....	353-4660
Olin Pharmacy .....	353-9165
Student Insurance Questions-Benefits Administration---140 Nisbet Bldg.....	353-4434

## **8. Student Services**

ASMSU/COGS Legal Services---329 Student Services.....	353-3716
Career Services & Placement Center---113 Student Services .....	355-9510
Council of Graduate Students (COGS)---316 Student Services .....	353-9189
Counseling Center--207 Student Services.....	355-8270
Div. of Student Affairs & Services--153 Student Services .....	355-2264
Employee Assistance Program--330 Olds Hall .....	355-4506
Financial Aid/Student Loan---252 Student Services .....	353-5940
Graduate Employee Union (GEU) .....	332-2824
Graduate Record Examination Sign-Up---207 Student Services.....	355-8385
University Housing---1205 S. Harrison Rd .....	355-9550

## **B. Resources and Services for Graduate Students**

The University provides a wide array of services to students to assist them in adjusting to the rigors and inevitable stresses that go with a rigorous academic life.

### **1. Bookstore**

The MSU Bookstore is located in the International Center on Shaw Lane. Off-campus bookstores are located in the East Lansing area.

### **2. Computer Facilities**

Microcomputer facilities are available on campus at many locations, including laboratories in the Wells Hall and the Union Building. Policies regarding use of equipment should be obtained from individual facilities.

### **3. Career Development & Placement Services - 113 Student Services - 355-9510**

The Career Development and Placement Services office assists students in career advising and seeking employment upon graduation. Their office is located in 113 Student Services Building and can be contacted at 355-9510. Their staff does workshops, classes and individual advising on topics such as how to interview successfully and steps to creating a well-written resume. You may also interview for internships or full-time employment through the Career Placement office.

### **4. Counseling Center Main Office:**

207 Student Services Building – 353-8737

Multi-Ethnic Counseling 207 Student Services Building -355-8270

Students should feel free to contact the Counseling Center for personal concerns and crisis. Professional counseling and psychological services are offered to assist with personal, as well as career concerns. All services are confidential.

### **5. Intramural Sports Facilities - 355-5250**

Intramural Sports & Recreational Services-102 IM Sports West

Students have access to equipment and facilities in the intramural facilities located in the IM-West, IM-East, and IM-Circle. Students must present a current MSU student ID and a picture ID in order to be admitted to these facilities and borrow the equipment. Use of most of the facilities is free to currently enrolled students, although there are a few exceptions, such as a small charge for the use of the weight room in the IM-East.

## **6. Office for International Students and Scholars (OISS)**

The Office for International Students and Scholars (OISS) serves international students and international faculty. OISS is a resource center for information and consultation on matters related to the international student and faculty/scholars. The staff is prepared to help in any of the various areas of concern, including academic problems, immigration questions, social health, employment or financial matters. The office also organizes seminars and workshops on topics of interest to the broad university community. These have included immigration regulations, cross-cultural communication, pre-departure programs for graduating students and various training programs. They also publish a very informative handbook called Welcome to Our Community, that answers questions you may have about living and going to school in our community. A copy of this handbook can be picked up in the OISS. The OISS is located in room 103 in the International Center and can be contacted by phone at 353-1720, e-mail: [oiss@msu.edu](mailto:oiss@msu.edu).

## **7. Olin Health Center - 355-4510**

Olin Health Center provides medical, dental, optical, and health education services to the students of MSU on an outpatient basis. It is located on East Circle Drive between Berkey and Morrill Halls. Appointments are recommended and can often be made for the same day you call. Graduate students who have insurance through The Chickering Group must begin treatment at Olin for benefits to be paid.

## **8. Women's Resource Center - 353-1635**

Coordinates contacts relating to concerns of women and advocates women's issues by developing and implementing programs targeted for women faculty staff and students. They sponsor many workshops on campus.

## **C. Council of Graduate Students (COGS)**

The Council of Graduate Students offers the following services to MSU graduate and professional students:

### **1. Copy Center**

Open to all members of the MSU community, the COGS copy center features the lowest rates available. All 8.5" x 11" copies are 5 cents each. Transparencies are also available for 35 cents.

### **2. MSU Student Food Bank**

COGS and ASMSU jointly established a Student Food Bank to address the problems of students and their families with financial hardship. The SFB is located at Olin Health Center, and hours are 5:30 to 7:30 p.m. on Thursday evenings. Students may visit bi-monthly. For more information, or to volunteer, stop by the office (320 Student Services) or call 353-2898.

## **D. Graduate Assistant Illness/Injury/Pregnancy Leave Policy**

A graduate assistant unable to fulfill the duties of his/her appointment because of illness or injury shall notify an administrator of his/her major unit as soon as circumstances permit. Similarly, a graduate assistant unable to fulfill the duties of her appointment because of pregnancy shall notify the administrator of her major unit as soon as circumstances permit.

During the illness, injury, or pregnancy the major unit shall adjust (reduce, waive, or reschedule) the graduate assistant's duties as those duties and the assistant's physical circumstances reasonably dictate. If total absence from duties becomes necessary, the major unit shall maintain the stipend of the appointment, provided the graduate assistant is still enrolled, for a period of two months, or to the end of the appointment period or of the semester, whichever should occur first.

The graduate assistant shall have the right to return to the assistantship, within the original terms of the appointment, at such time as he/she is able to reassume the duties of the position.

## **E. Transportation**

### **1. Parking on Campus**

Any vehicle you bring on campus must be registered through the Department of Public Safety. Required student registration of motor vehicles can be done through the Department of Public Safety's Office for Parking and Permits between the hours of 7:30 a.m. and 6:00 p.m. Generally, students with assistantships are eligible to obtain parking permits which allow parking at several lots throughout the campus. Graduate students without assistantships have permits allowing them to park in commuter lots on the outer edge of the campus. To obtain a parking permit the applicant must present their vehicle registration, student ID, driver's license and, if appropriate, last year's gate card.

If you do not have a graduate assistantship, you may, under special circumstances, qualify for a parking permit. For example, if your vehicle is necessary in performing the duties for a job you hold on campus, you may wish to apply for a parking permit. You will need to go to DPS and fill out a Special Request form for a parking permit. A member of the staff of DPS will review your request and if they feel you need a parking permit for campus they will give you the opportunity to buy one.

The Department of Public Safety, Parking Division, can be contacted at 355-8440 to answer any further questions.

### **2. Bikes**

The University maintains bicycle racks throughout the campus. Bikes should be locked to these racks when parked. Bikes are not permitted in campus buildings. Improperly parked bikes are subject to impoundment by the Department of Public Safety. Bicycle registration through the MSU Department of Public Safety or the cities of East Lansing or Lansing is required.

### **3. Buses**

CATA serves all parts of the campus and connects with CATA routes serving the Lansing and East Lansing area.

## **F. Organizations**

### **1. Council of Graduate Students (COGS)**

COGS is the official graduate student organization at Michigan State University. Officers and departmental representatives (one representative per department for the entire University) are voting members. The primary objective is improvement of the academic, social, and economic position of graduate students at MSU. The organization has official delegates to the Graduate Council, the Academic Council and standing committees thereof, and several all-university and presidential committees. Through membership in these and other bodies, COGS participates in decisions on such matters as tuition and fees, the grading system, traffic regulations, academic and extracurricular programs of the university, graduate assistant stipends, improvements in on and off campus student living conditions, academic freedom and responsibilities, student representation in university government, and the selection of principal administrative officers. Meetings are open to all graduate students. For further information, contact the department for the name of your representative.

### **2. Graduate Employees Union (GEU)**

The Graduate Employees Union consists of graduate students at Michigan State University who are employed as teaching assistants. In the spring of 2001, graduate teaching assistants voted to certify GEU

as their sole legal representative on issues of employment, working conditions, and benefits. In affiliation with the American Federation of Teachers (AFT), the GEU was organized to negotiate with the University for acceptable health care benefits, fair working conditions, and reasonable limits on work hours. All GEU decisions are made by graduate assistants at MSU.

The office is located at 319½ E. Grand River Ave.

Phone: 517.332.2824

E-mail: [geu@msu.edu](mailto:geu@msu.edu)

Webpage: [www.msu.edu/~geu](http://www.msu.edu/~geu)

## **G. Publications**

### **1. Academic Programs**

This is the primary source for university regulations, policies, procedures, costs, and academic program requirements – [www.reg.msu.edu/UCC/AcademicPrograms.asp](http://www.reg.msu.edu/UCC/AcademicPrograms.asp)

### **2. Funding Guide**

The Graduate School has produced a Funding Guide for Graduate Students, Graduate Professional Students and Postdoctoral Fellows, to assist students in identifying funding sources such as grants, fellowships, scholarships and awards. The Funding Guide, which is updated annually, can be accessed through the Graduate School's home page at: <http://www.msu.edu/user/gradschl/funding.htm>.

### **3. The Graduate School Guide to the Preparation of Master's Theses And Doctoral Dissertations**

This formatting guide describes the final procedures for degree completion and manuscript requirements for your dissertation – <http://grad.msu.edu/format.htm#tutor>.

### **4. The Graduate Post**

A newsletter published every semester by The Graduate School. Its purpose is to highlight activities in graduate education at MSU and elsewhere, to publish opportunities available for professional enrichment through fellowships, scholarships and study programs, to announce important deadline dates and announce upcoming colloquia and symposia.

### **5. MSU News Bulletin**

A weekly newspaper geared to University and faculty interest.

### **6. Spartan Life**

Spartan Life is revised and published annually. Hard copies are available through the Department of Student Life, Room 101 Student Services. The web version of Spartan Life is updated throughout the year - [www.vps.msu.edu/SpLife/index.htm](http://www.vps.msu.edu/SpLife/index.htm).

### **7. The State News**

A daily newspaper that contains news and a listing of events of interest.

### **8. Graduate Student Rights and Responsibilities**

This document is published in Spartan Life, and can also be accessed via Michigan State University's Web page at <http://www.vps.msu.edu/SpLife/index.htm>, and contains University policies concerning graduate education (see Appendix).

**APPENDIX**