Mathematics Department Graduate Pamphlet 2014-2015

DEPARTMENT of MATHEMATICS

OREGON STATE UNIVERSITY

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This Pamphlet This Graduate Pamphlet summarizes the rules and regulations that will govern the graduate career of students beginning their graduate studies with the Mathematics Department at Oregon State University during the 2014-15 academic year. Under normal circumstances, these rules and regulations will remain in effect until the student's studies with the department end.

INTRODUCTION

The Mathematics Department is of moderate size with about 28 graduate faculty and some 65 graduate students. About 60 graduate students are supported by teaching assistantships or research assistantships. The fields of the faculty are diverse: there are groups working in algebra/number theory, analysis, applied mathematics, differential geometry, mathematics education, numerical analysis, probability, and topology. Under the Master's program one also has an option for study in financial math and in actuarial science. Areas of expertise of the faculty can be found on the department's web site at:

http://www.math.oregonstate.edu/faculty_research

General information about Oregon State University and about the Mathematics Department is available via the home pages:

http://oregonstate.edu and http://www.math.oregonstate.edu/

The first part of this document describes the requirements of the Master's and PhD programs, and applies to all graduate students in Mathematics. A second part contains information specific to graduate students holding Graduate Teaching Assistantships (GTAs) or Graduate Research Assistantships (GRAs).

THE GRADUATE COMMITTEE

A list of current members of the Graduate Committee is available from the department's graduate contact person. The Graduate Committee has general oversight responsibility for the academic aspects of the graduate program. In particular, it considers petitions for changes to the normal departmental requirements for advanced degrees. The committee advises students throughout the year on any aspects of the graduate program. The Graduate Committee is responsible for advising and approving the study plans, including course work taken each year, of all graduate students in mathematics until they find major professors and file official degree programs with the graduate school. At that time, major professors and degree committees assume primary advising and approval responsibility for their students.

Students with questions are encouraged to meet directly with individual members of the Graduate Committee or to contact the full committee via e-mail. The e-mail address math_gradcomm@math.oregonstate.edu sends e-mail to members of the graduate committee. In particular, petitions to the graduate committee should be sent to this e-mail address. However, before submitting a petition, a student may wish to discuss the situation with their major professor and a member of the graduate committee. This procedure will expedite action on the petition.

DEPARTMENTAL AND GRADUATE SCHOOL REQUIREMENTS

Graduate students must satisfy both departmental and institutional (general university) requirements for their degree program. This pamphlet describes the departmental requirements. Institutional requirements are given in the Graduate Catalog and the Graduate Student Success Guide, both available from the Graduate School. Specific information may be obtained by calling the Graduate School at (541) 737-4881 or by visiting their web page. Many institutional requirements are mentioned in this pamphlet. **Students are responsible for obtaining complete and up-to-date information on the current institutional requirements from the Graduate School.** In what follows some course requirements distinguish between "blanket" and "non-blanket" numbered courses. See later in this pamphlet for the meaning of these terms.

CORE GRADUATE COURSES

The mathematics department faculty has designated 15 courses as core graduate courses. **Core courses typically have midterm and final examinations and problem assignments.** The first course of each sequence is intended to be accessible to a beginning graduate student with a standard undergraduate mathematics degree. The table below lists the core courses and the terms when they are typically offered.

CORE GRADUATE COURSES		
FALL	**WINTER**	**SPRING**
Analysis 1 (Mth 511)	**Analysis 2 (Mth 512)**	**Complex Analysis (Mth 611)**
Linear Algebra (Mth 543)	Algebra 1 (Mth 644)	Algebra 2 (Mth 645)
Applied Mathematics 1 (Mth 621)	Applied Mathematics 2 (Mth 622)	
Numerical Analysis I (Mth 551)	Numerical Analysis II (Mth 552)	*
Topology 1 (Mth 531)	Topology 2 (Mth 532)	Geometry (Mth 674)
	Probability 1 (Mth 664)	Probability 2 (Mth 665)

***Note:** Numerical Analysis III (Mth 553) may be substituted for Numerical Analysis I in the requirements listed below.

All graduate students must take the 4 courses listed in boldface above, (Mth 511, 512, 611, and 543). Master's students must take at least 4 additional courses from the core, including at least one additional two-term sequence. Ph.D. students must take at least 8 additional courses from the core, including at least 3 additional two-term sequences.

REQUIREMENTS FOR THE MASTER'S DEGREE

Oregon State University offers both an MA and an MS degree in Mathematics. The difference between the two is that the MA has the additional requirement of second-year proficiency in a foreign language, as required by the Graduate School. A student must complete the following steps in order to earn a Master's degree. (Check with the Graduate School directly to verify the institutional requirements and time frames for some of the steps

outlined below.)

A. Acceptance into the Master's Program.

A notice of admission to the Master's Program in Mathematics comes from the University's Graduate School. Subject to the institutional time limits, a student remains in the program as long as satisfactory progress is made toward the degree, with completion expected in two years. Occasionally, additional time may be granted upon petition to the Graduate Committee, particularly in those cases where additional undergraduate background is required.

B. Selection of a Major Professor and Degree Committee.

By the end of Spring term of the first year in residence, a student must choose a major professor from the graduate mathematics faculty. This is done by mutual agreement. If a minor is declared, a minor professor must also be chosen before filing a program. If the thesis option is chosen, a Graduate Council Representative (GCR) (who is in particular a non-mathematics) faculty member must be selected. The GCR is chosen from a list provided by the Graduate School. The Degree Committee consists of the major professor, the minor professor (if a minor is declared), the GCR (if the thesis option is chosen) and two (one, in case of declared minor) other members of the graduate mathematics faculty. The committee members other than the major (and minor) professors need not be selected until the degree work is nearing completion.

C. Master's Degree Program.

A student and major professor develop an official degree program, subject to the Graduate School and departmental requirements in D below. The degree program should include one of the following:

(i) a Master's Thesis, or

(ii) a Master's Expository Paper,

(iii) the non-thesis option without a Master's Expository Paper.

A student who chooses the non-thesis option (iii) is required to earn the grade of "pass" on the Ph.D. qualifying examination and is required to take three additional core courses.

The student records the chosen program on the Master's program form found on the Graduate School web site http://oregonstate.edu/dept/grad_school/forms.php#program. The program must be approved and signed by the major professor, minor professor (if minor is declared), and approved and signed by the Mathematics Department Chair. After the Chair has signed the program, it must to be submitted to the Graduate School for approval. Once approved by the Graduate School Dean a copy will is sent to the student, the advisor, and to the Mathematics Department. Master's programs should be submitted by the end of Fall term of the second year in the program.

D. Departmental and Graduate School Course Requirements.

The Graduate School requires that a Master's degree program include at least 45 credit hours of coursework of which 15 hours may be in a minor. (The minor may be in mathematics.) If an outside minor is chosen, a representative from the minor field must approve that portion of the Master's program.

The Department requires that each student complete the following four core courses and include them on the MS program.

Real Analysis I (Mth511)	Real Analysis II (Mth 512)
Linear Algebra (Mth 543),	Complex Analysis I (Mth 611).

Four additional core courses from the following list must also be completed and included on the program. The four additional courses must be chosen to include a two-term sequence from one of the five groups.

Abstract Algebra (Mth 644, 645)	Applied Math (Mth 621, 622)
Numerical Analysis (Mth 551, 552, *553)	Probability (Mth 664, 665)
Topology, Geometry (Mth 531, 532, 674)	

All of these courses are intended to be accessible to a first

year graduate student with a standard undergraduate mathematics degree. All eight courses must appear on the Master's Degree Program (hence, none may be taken S/U).

*Note: Numerical Analysis III (Mth 553) may be substituted for Numerical Analysis I in satisfying the core course requirement.

A Master's degree program with the thesis option requires 6-12 hours of Mth 503 (Thesis) and the non-thesis options require 3-6 hours of MTH 501 (Research). No courses in the sequence Mth 581-582-583 may be used in a graduate program in mathematics. Each Master's candidate must complete at least 39 credits (inclusive of Mth 503 or Mth 501) of non-blanket numbered, graduate-level course work, which may include courses outside the Mathematics department that are essential for the degree program. These courses must be approved by the student's degree committee and by the Chair of the Graduate Committee. Occasionally a student has inadequate background to successfully begin and complete Mth 511 and/or Mth 543 during their first term in our program. Such a student should meet with the Chair of the Graduate Committee no later than the end of the first week of Fall Term to discuss the situation and to devise a plan of study to propose to the Graduate Committee.

E. Thesis, Paper, or Examination.

Each Master's candidate must either write a Master's thesis, a Master's paper, or pass the Ph.D. qualifying examinations as described below.

If a student chooses to write an MS thesis then a Graduate Council Representative (GCR) must be included on the graduate committee. It is recommended that the GCR be selected by the student, by contacting the Graduate School for a list of potential GCRs, soon after the Program of Study is submitted. When the final defense is scheduled (at least one week prior to the defense) with the Graduate School, the pre-text pages from the thesis must also be submitted to the Graduate School for approval. This link explains the steps and formatting requirements for pre-text pages and your thesis. http://oregonstate.edu/dept/grad_school/current/thesis.html Following approval of the thesis by the student's graduate committee a copy, one printed copy and one electronic copy, formatted according to the Graduate School requirements, must be submitted to the Graduate School for their

approval. Questions should be directed to the Graduate School Thesis Editor at 737-1466.

If a student chooses to write an expository paper, a Graduate Council Representative is not required and Graduate School formatting requirements need not be followed. However, a Master's paper must be prepared with a word processor capable of producing standard mathematical symbols and equations and be printed on high quality paper. Each member of the Degree Committee must receive a copy of the expository paper at least one week in advance of the defense date.

A Master's student who is considering applying to the Ph.D. program should take the departmental qualifying exam by the beginning of the second year in the Master's program.

F. Final Oral Examination.

Each Master's candidate must pass an Oral Examination. This examination is based on the courses in the student's Master's program and additionally the work of the thesis or paper. It is the student's responsibility to schedule the Oral Examination at a time that is agreeable to all committee members and then ask the office staff to reserve a room for the examination. At least one week prior to the scheduled defense date the student must submit an Event/Exam Form to the Graduate School officially scheduling the Oral Examination. This allows the Graduate School to audit the student's Program of Study to ensure institutional standards are met and then prepare the defense paper work that will be sent to the student, advisor, and Graduate Council Representative prior to the exam. The Graduate School's Event Scheduling Form is available here.

http://oregonstate.edu/dept/grad_school/forms.php#event

HOW A MASTER'S STUDENT ENTERS THE Ph.D. PROGRAM

The change from the Master's program to the Ph.D. program normally occurs when the Master's degree has been completed or when completion is imminent. The following steps are required for admission to the Ph.D. program:

1) Complete and submit the appropriate change of program form available from the Graduate School or the departmental graduate secretary.

2) Submit the following information to the Graduate

Committee:

a) Two letters from departmental faculty supporting the student's application for admission to the Ph.D. program. One of the letters should be from the student's prospective Ph.D. advisor, who should indicate willingness to serve as advisor.

b) A brief letter of intent that outlines the student's plans, goals, and reasons for wishing to enter the Ph.D. program.

Warning: A change of program form should be submitted to the Graduate School before the end of the term in which the pending degree requirements are completed. Otherwise the Graduate School will consider the student to have completed his or her graduate studies and continuing for another graduate degree will require reapplying for admission. While the reapplication is pending the student may not hold a GTA or GRA.

The Graduate Committee evaluates applications for admission to the Ph.D. program using the foregoing information and the student's overall academic record. Normally, the Graduate Committee expects that an applicant to the Ph.D. program will have at least a 3.5 GPA in non-blanket graduate mathematics courses, will have completed all required MS core courses, and will have taken the Ph.D. qualifying examination with the grade of pass. (The Ph.D. qualifying examinations are discussed later.)

REQUIREMENTS FOR THE Ph.D. DEGREE

The goal of the Ph.D. program is to enable a student to either become a mathematician with the ability to continue with an independent research program, or to become a professional mathematician whose expertise is exercised in an applied setting. In recent years, doctoral theses in our department have been written in the areas of algebra, analysis, applied mathematics, differential geometry, mathematics education, number theory, numerical analysis, probability, and topology.

The following steps are required in the pursuit of the Ph.D. Some of the steps involve deadlines and time restrictions imposed by the Graduate School. These are described in the Graduate School Bulletin, the Graduate Student Success Guide and in periodic announcements by the Graduate School. See http://gradschool.oregonstate.edu/success/deadlines

A. Acceptance into the Ph.D. Program

The official notice of admission to the University Ph.D. program in mathematics comes from the OSU Graduate School. Subject to institutional time limits, a student remains in the program as long as satisfactory progress is made toward the degree.

B. Departmental Course Requirements

The Department requires that each student complete four required core courses,

Real Analysis I (Mth511)	Real Analysis II (Mth 512)
Linear Algebra (Mth 543),	Complex Analysis I (Mth 611).

Eight additional core courses from the following list must also be completed. The eight additional courses must be chosen to include three two-term sequences from the five groups:

Abstract Algebra (Mth 644, 645)	Applied Math (Mth 621, 622)
Numerical Analysis (Mth 551, 552, *553)	Probability (Mth 664, 665)
Topology, Geometry(Mth 531, 532, 674)	

All twelve courses must appear on the Ph.D. Degree program of study (hence, none may be taken S/U).

*Note: Numerical Analysis III (Mth 553) may be substituted for Numerical Analysis I in satisfying the core course requirement.

Students using transfer courses from other institutions to fulfill core course requirements are typically expected to include an equivalent number of advanced mathematics courses with core course prerequisite in their Program of Study. Approval to any changes in the core course requirements must be obtained from the Graduate Committee prior to filing the program of study.

Students should formulate the strongest and broadest possible

program, and are encouraged to take as many core courses as possible. (No courses in the sequence MTH 581-582-583 may be used in a graduate program in mathematics.)

C. Qualifying Examination

The Qualifying Examination is a written examination. The coverage of the qualifying exam is roughly the material typically covered in the core courses Real Analysis I, Real Analysis II, Complex Analysis I, and Linear Algebra. Syllabi for the qualifying examination and copies of previous examinations are available on the Department web page. Beginning academic year 2014-15 the qualifying exam is given twice each year, normally during the week before classes begin in the fall and then during the first week of spring quarter. The qualifying exam is a single examination administered in two parts. Part one covers Real Analysis and part two covers Complex Analysis and Linear Algebra. The two parts of the exam are usually given two days apart.

The possible grades for the qualifying examination: "pass", ``pass in (specified part) only" and "fail". A student may take neither part of the exam more than three times. A pass of both parts of the exam is required by the end of the seventh academic term of supported study. (``Supported" here means as GTA or GRA.)

D. Selection of a Major Professor.

A Major Professor must be selected from the Graduate Faculty (roughly speaking, this is the set of tenure-track faculty). Selection, which is a matter of mutual agreement, occurs sometime between arrival at OSU and soon after completing the qualifying examinations.

E. Formation of a Degree Committee.

After a Major Professor is selected and the general direction of graduate studies is agreed upon, the student and the Major Professor arrange for the formation of a Degree Committee. This Committee consists of at least five professors: the Major Professor, at least two other members of the Mathematics Graduate Faculty, a Professor from the minor department (<u>if</u> a minor has been selected) and a Graduate Council Representative. If there is no minor field of study is declared, then no minor professor is on the committee and one additional professor from any department, including Mathematics, must serve on the committee. The student contacts the Graduate School for a list

of potential Graduate Council Representatives (the GCR can't be a Mathematics professor). The student is responsible for finding a faculty member on the list that is willing to serve on the degree committee. The student's major professor may have suggestions for possible Graduate Council Representatives from those on the list provided by the Graduate School.

F. Program Meeting.

The student and Major Professor together formulate a proposed Ph.D. program and the student then completes a Ph.D. program of study form and schedules a meeting with the members of the degree committee. It is the responsibility of the student to find a time agreeable to the committee members, ask Mathematics office staff to reserve a room, and inform all committee members of the date, time, and location of the meeting. The graduate student should bring a copy of the program of study, any relevant transcripts (OSU and/or graduate math courses from other institutions), and the Graduate School's doctoral program meeting checklist. The program of study and the checklist can be found at the following link.

http://oregonstate.edu/dept/grad_school/forms.php

At the program meeting, which the student attends, the official Ph.D. program is approved. The student and each committee member will need to sign the program of study at the end of the meeting. After the meeting the student brings the Program of Study to the Mathematics Department chair for signature. Once signed the student should make a copy (to keep for their records) and submit the original to the Graduate School. The Graduate School audits the Program of Study to ensure it meets the institutional requirements. It is then signed by the Dean of the Graduate School and copies are sent to the Mathematics department, the student, and all committee members. The Program of Study is in essence a contract between the student, the Mathematics department, and OSU. It may be changed subsequently by mutual agreement of the student and the Degree Committee via the Graduate School's Petition for Change in Program form.

http://oregonstate.edu/dept/grad_school/forms.php

The proposed Ph.D. program must be equivalent to at least three years of full-time work beyond the Bachelor's degree. In particular, the program should contain at least 108 term credit hours and include the cumulative equivalent of one full-time

academic year (defined as 36 credits) of non-blanket course work and a minimum of 36 thesis credits. It is common for a Ph.D. program to include some hours that were used also for the Master's degree. Thesis and transfer credits count toward the total credit hours on the program.

G. Foreign Languages.

Reading proficiency in French, German, or Russian is required. In cases where another language is preferable for professional reasons, the student may petition his or her Ph.D. Degree Committee for a substitution. Language proficiency is verified by a Departmental Language Examiner either by means of an examination or on the basis of an Educational Testing Service Foreign Language Test. A departmental language examination is meant to test reading proficiency in mathematics. The names of current Departmental Language Examiners can be obtained from the graduate contact person.

H. The Oral Preliminary Examination.

Requirements A-G, cited above, must be completed before scheduling the Preliminary Examination. The Preliminary Examination is a two-hour oral examination, conducted by the student's Degree Committee. It must be scheduled with the Graduate School at least one week in advance. The student schedules the Preliminary Examination with the Graduate School at a time agreeable to the Degree Committee and at a place arranged by Mathematics Department office staff. It is the responsibility of the student to ensure that all committee members are informed of the date, time, and place of the examination. The Preliminary Examination is taken near the completion of the course work on the student's Ph.D. program. The student's Degree Committee conducts the examination. The Graduate School requires that at least half of the examination be over the course work on the Ph.D. program. The examination also may include an oral presentation by the student on aspects of the proposed thesis topic.

By graduate school regulation, at least one complete academic term must elapse between the Preliminary Oral Examination and the Final Oral Examination. (See section J. below.) At the end of the examination, the student temporarily leaves the room and the committee members discuss the student's performance and vote to determine whether the student has passed the examination. The candidate passes unless there are two or more negative votes. In

the event of a failure, the Graduate School permits no more than two re-examinations.

I. Thesis.

The Ph.D. thesis should contain a significant research contribution by the student. It should include original results, which are publishable in a recognized mathematics journal. Also, it should be a well-written exposition describing the significance of the results and their relevance to related mathematical areas. The Graduate School mandates the format of the thesis. One printed and one electronic copy of the thesis must be given to the university- the electronic copy for the Graduate School and one printed copy for the Department.

J. Final Oral Examination.

At least two weeks prior to the Final Oral Examination the student must submit an Event/Exam Form to the Graduate School. The student schedules the final examination with the Graduate School at a time agreeable to the Degree Committee and at a place arranged by a departmental coordinator. The examining committee consists of the student's Degree Committee and any additional members, including professors from other institutions, whom the major department may appoint. It is highly recommended prior to this the student prints a copy of their transcript(s) and compare it to their approved program of study. The course numbers, titles, grades, and credits must match between the Program of Study and the transcript(s). Then bring your Program of Study and transcript to the Mathematics Academic Programs Coordinator (aka Graduate Contact Person) for a review before submission to the Graduate School.

The two-hour final oral examination is conducted by the student's Degree Committee. It is usually limited to a defense of the thesis and an examination. All interested parties are invited to the defense and have an opportunity to ask questions. After the thesis defense, the examination committee may exclude all other persons and continue with the examination of the candidate's knowledge of their field.

K. Graduate Council Representative (GCR)

A graduate faculty member chosen from an area outside the student's department represents the Graduate Council on a Ph.D. student's committee. The GCR is responsible for ensuring that

the examinations are conducted in accordance with Graduate School guidelines. The GCR is a full voting member of the committee and must participate in the program meeting, the preliminary oral examination, and the final oral examination. The GCR handles procedural problems during the examinations and chairs the portion of the examinations concerned with evaluation of the student's performance. The student's major professor chairs other portions of the examination. As mentioned in Section J the Graduate School provides the GCR with paperwork, which is brought to the final examination and completed following the exam.

A SYNOPSIS OF GRADUATE SCHOOL REQUIREMENTS

Graduate students must become familiar with the requirements and regulations of the Graduate School. A few of the more important ones are listed here.

- The maximum load for a graduate student devoting full time to graduate study is 16 hours. For graduate teaching and research assistants, the minimum load is 12 term hours (**The department expects 15 hours.**) Students may be charged for credits taken in excess of the maximum 16 credit hours.
- A graduate student must enroll for at least 3 term hours in any term that the student uses university space or facilities, or is supervised by a major professor.

Courses numbered 501 or 601 (Research), 503 or 603 (Thesis), 505 or 605 (Reading and Conference), 506 or 606 (Projects/Special Topics),507 or 607 (Seminar) are called "Blanket Numbered Courses". All other courses are non-blanket numbered courses. Other than thesis or research credits, no more than 9 blanket hours are allowed on a Master's program and no more than 15 on a Ph.D. program. (**The Department requires 39 non-blanket hours on an MS program.**) Thesis credit (course number 503 or 603) is limited to 12 hours on Master's programs and to 72 hours on Ph.D. programs. The 50x blanket numbered courses are for Master's students; the 60x for PhD students.

POSTBACCALAUREATE STUDENTS

A Postbaccalaureate student is a student who is working for a second undergraduate degree. For academic purposes, they are undergraduate students, but they also must meet certain Graduate School requirements. Questions concerning Postbaccalaureate work should be directed to the Mathematics Head Undergraduate Advisor. Postbaccalaureate students should check with the Graduate School about restrictions on graduate transfer credit.

GRADUATE TEACHING ASSISTANTS AND RESEARCH ASSISTANTS

A Graduate Teaching Assistantship is a working scholarship. The teaching duties of an assistantship are very important, and competent performance of these duties is necessary for reappointment. However, just as with the initial GTA appointment, reappointment depends largely on academic performance. Maintaining a strong academic record and making timely progress toward completion of the requirements for graduate degrees are essential considerations for reappointment. This includes timely completion of the Master's degree, Ph.D. Qualifying Examination, and the Oral Preliminary Examination.

Likewise, a Graduate Research Assistantship is a working scholarship. GRA appointments are made by the faculty member supporting the research, with the concurrence of the Department Chair and Graduate Committee. As funds become available, a faculty member may offer a GRA to a current GTA. When such an offer is made and it is envisioned that the new GRA will return to GTA status in the future, arrangements for such a return to GTA status must be made in advance with the Department Chair. Such arrangements should be made in writing. It is the student's responsibility to see that such arrangements are formalized before a change in status is made. Graduate students should not relinquish a GTA for a GRA until such arrangements have been made.

Both GTAs and GRAs must make normal academic progress to be eligible for renewal of their assistantships. Guidelines for normal academic progress follow. **All GTAs and GRAs are required to register for 15 credit hours for Fall, Winter, and Spring terms. See Section F for Summer term enrollment requirements.**

A. Qualifying examinations and continued support

In order to continue in the program, a student is expected to pass the qualifying examination by the end of the second year. However, the student may receive support as a GTA during fall term of the third academic year if his/her overall record merits such support. A student supported in this way will be expected to pass the qualifying exam at the outset of fall term to be eligible for further support.

B. Guidelines for expected academic progress:

The parenthetical material that follows refers to the Graduate Catalog of the Graduate School.

1st Year: Complete the required core classes and choose a graduate advisor.

2nd Year:

Masters students should submit a program of study to the Graduate School and complete all requirements for the Master's degree. Students seeking support for a third year of study must appeal to the graduate committee for support during their third year of study (or must be admitted to the Ph.D. program). (Students who are admitted to the Ph.D. program may defer completion of the Master's degree until the third year.)

Students who do plan to enter, or continue in, the Ph.D. program should:

a) Pass the Ph.D. qualifying examination,

b) Complete at least one Ph.D. core sequence.

3rd Year:

a) Complete the qualifying examination requirement if not already done.

b) File a Ph.D. program.

4th Year:

a) Satisfy the foreign language requirement.

b) Pass the Ph.D. Oral Preliminary Examination.

5th Year:

Demonstrate likelihood of completing the Ph.D. program in the sixth year.

In summary, GTAs who are masters students maintaining a good academic record, making timely progress and are satisfactorily performance of assigned duties can expect 2 years of support.

GTA Ph.D. students who maintain a good academic record, make timely progress toward the Ph.D., and satisfactorily perform their assigned duties can reasonably expect 6 years of support.

C. Teaching Assignments.

The Department attempts to assign a graduate teaching assistant corresponding to his or her interests and strengths. A GTA may be assigned recitation sections of a large lecture class and be asked to assist with quiz preparation and grading for the class. Some GTAs will teach their own classes and advanced doctoral students may be assigned as a consultant for a graduate class. Office hours and tutoring time in the Mathematics Learning center are typically a required part of GTA duties. Occasionally, a GTA's principal assignment may be to work in the Mathematics Learning Center or to be a grader for an advanced undergraduate or core graduate course. Specific duties will be determined by the Chair of the Department of Mathematics. Assignment requests should be addressed to the department course scheduler.

D. GTA Salaries and Benefits.

Salaries and appointment levels quoted here are for the 2014-2015 academic year. The standard appointment level for a Mathematics graduate assistant is .4 of a full-time equivalent. This corresponds to 16 hours of work each week during the academic year, with the bulk of the work occurring during the 10 week terms and the following finals weeks. The corresponding salary of an entering graduate assistant with no previous graduate coursework is $16,060 for the nine month academic year.

The salary rate increases as the student progresses through the graduate program. Additionally, OSU provides a graduate health insurance benefit and a lump sum payment of $430 toward university fees each term during the regular academic year. Graduate employees are represented by the Coalition of Graduate Employees in contract negotiations with OSU; see the following link for information.

http://cge6069.org/

E. Course Loads

All GTAs and GRAs are required to register for 15 credit hours per term. In addition, the courses selected must satisfy the following departmental requirements.

- *Each first year GTA and GRA must take three non-blanket numbered courses each term including two each term in the mathematics department.*
- *Each second year GTA and GRA must take two non-blanket numbered courses each term including at least one in the mathematics department. Courses not on the student's program may be taken on a Pass/No Pass or S/U basis.*
- *Each third and fourth year GTA and GRA must take one non-blanket numbered course each term in the mathematics department. This course may be taken on a Pass/No Pass or S/U basis.*
- *Each fifth or sixth year GTA and GRA must take two non-blanket numbered courses **per year**. These courses may be taken on a Pass/No Pass or S/U basis.*

When the Graduate Committee considers renewal of a GTA, the GTA will have made satisfactory progress as far as course work is concerned if the non-blanket course requirement is met each term with an overall grade point average of 3.0 or higher.

Course plans will be collected the first week of fall term. The major professor must approve any changes to a course plan and a signed and approved updated plan must be filed with the Graduate Committee in the term when the changes are made.

While many GTAs take minor area courses outside the department, each GTA is required to register for a minimum of 6 hours of Mth 5xx, Mth 6xx per term and a minimum of 21 credit hours of such courses per year. Any deviation from this policy MUST have the PRIOR approval of the Graduate Committee. The committee encourages study outside the department when it contributes substantially to the overall mathematical and professional

development of a student.

F. Summer Term GTAs.

About 20 to 25 summer term GTAs are available each year. To be considered for a summer term GTA, a student must have satisfactory teaching experience as determined by the Departmental Teaching Committee and a satisfactory academic record as determined by the Graduate Committee. Candidates who meet these requirements will be ranked according to the following scheme:

1. Needs of the department and special cases as identified by the mathematics summer term director.

2. Non-first year GTAs who have not taught summer school at OSU before.

3. GTAs who last taught summer school at OSU three or more summers ago.

4. GTAs who last taught summer school at OSU two summers ago.

5. GTAs in their first year at OSU.

6. GTAs who taught summer school at OSU the prior summer.

Candidates who are in the same category may be distinguished on the basis of academic record and teaching record, on the basis of a coin toss, or on the basis of who can be contacted first in cases where appointments must be made on short notice. The Graduate Committee and the Department Chair will assess qualifications.

Summer GTAs must register for at least 12 credits of graduate level mathematics, and this must include Mth 507. Reading and Conference (505/605), Projects (506/606), Thesis (503/603), Research (501/601), and regular courses, as appropriate, may be used to make up the remainder. Summer GTAs who wish to register in non-mathematics courses as part of the 12 credits MUST obtain PRIOR approval from the Mathematics Department Chair. Otherwise, the GTA may be billed for courses taken outside the department. (During Summer Term, the department is only reimbursed for your tuition to the extent that the student takes courses with the MTH designator.) A student on a summer GRA appointment need only register for 9 credit hours.

Summer term GTAs teaching in the 8-week session must schedule 3 to 4 contact hours per week in addition to regular class hours. At least 2 of these hours must be in the Mathematics Learning Center. The MLC duty is important to the functioning of the MLC. GTAs are expected to show up promptly for their assigned time slots. GTAs teaching a 4-week course should schedule 5 out-of-class contact hours per week.

A GTA who completes a degree program during a given summer is eligible for up to 12 hours of summer term tuition remission during that term. A GTA who completes a Master's degree in the Spring and is not admitted to the Ph.D. program is not eligible to teach as a GTA during the summer. All GTAs with appointments for both the preceding Spring Term and following Fall Term are eligible for up to 12 hours of summer term tuition remission. More information on the Summer Study Privilege is available from the Graduate School.

COURSE PLAN

All GTAs and GRAs must file an academic year course plan with the Mathematics Graduate Committee during the first week of Fall term. The major professor must approve and sign the course plan. Any changes to the plan during the year must be approved and signed by the major professor on an updated form filed by the end of the first week of the term in which the change occurs. A member of the graduate committee takes the place of the major professor for those students who have not yet filed programs. The completed and signed course plan should be turned in to the graduate coordinator. The course plan will be kept in the student's file. GTAs and GRAs are expected to sign up for 15 credits including possibly Mth 506 (tutoring in the MLC) and Mth 507 or Mth 607.

CHECKLIST OF SOME REQUIREMENTS FOR GTAs AND GRAs

Specific requirements for the Master's Degree, the Ph.D. Degree and additional requirements for GTAs and GRAs are listed in this pamphlet. The following is a checklist intended to remind GTAs and GRAs of some of the requirements.

Fall Term:

- File a course plan for the year with the graduate committee.

Each Term:

- Sign up for 15 credits including the correct number of non-blanket numbered courses. (See the section on course loads.)

General Requirements:

- File a degree program in a timely manner. See the specific sections on Master's or Ph.D. degrees for details.
- Sign up for and take the qualifying exam in a timely manner if you are a Ph.D. student. See the specific section on the qualifying examination.
- Take the correct number of core courses and other courses required for your degree. See the specific sections on Master's or Ph.D. degrees for details.
- Be aware of Graduate School requirements for the degree that you are working on. Check with the Graduate School for details.

GRADUATE COURSE OFFERINGS

Listed below are the graduate courses offered by the Mathematics Department. Not all courses are offered every year. See the University catalog or the department's web pages for course descriptions, and the schedule of classes for current term offerings.

Blanket Numbered Courses:

501, 601	Research	503, 603	Thesis
505, 605	Reading and Conference	506	Projects MLC tutoring
507, 607	Seminar	606	Special Topics

Non Blanket Numbered courses:

510 Occupational Internships

511-12-13 Real Analysis

520 Models and Methods of Applied Mathematics

524-525 Dynamical Systems (alternate years)

531-32 General Topology and Fundamental Groups

534-35-36 Differential Geometry

537 General Relativity

540 Computational Number Theory

541-42 Applied and Computational Algebra

543 Abstract Linear Algebra

551 Numerical Linear Algebra

552 Numerical Solution of Ordinary Differential Equations

553 Numerical Solution of Partial Differential Equations

563-64-65 Probability I, II, III

567 Actuarial Mathematics

570 Discrete Topics in K-8 Math

574 Number Systems and Operations in K-8 Mathematics

575 Comparing Geometries in K-8 Mathematics

577 Measurement and Change in K-8 Mathematics

578 Probability and Data Analysis in K-8 Mathematics

591-92-93 Algebra and Geometric Transformations

599 Topics in Mathematics

611-12 Complex Analysis (612 alternate years)

614 Functional Analysis (alternate years)

619 Topics in Analysis

621-22-23 Differential and Integral Equations of Math Physics

627-28 Partial Differential Equations (alternate years)

634-35-36 Algebraic Topology

644-45 Abstract Algebra

649 Topics in Algebra and Number Theory

654-55-56 Numerical Analysis

657 Topics in Applied Mathematics

658 Topics in Mathematical Modeling

659 Topics in Numerical Analysis

664-65 Probability Theory

669 Topics in Stochastic Processes

674-75 Differential Geometry of Manifolds

676 Topics in Topology

679 Topics in Geometry

680 Modern Approaches to Calculus

681 Modern Approaches to Euclidean Geometry

682 Teaching and Learning Probability and Statistics

683 Graphics Calculators in Precalculus Mathematics

684 Computers and Mathematics

685 Advanced Problem Solving

689 Topics in Mathematics Education

699 Special Topics in Mathematics