UNIVERSITY FACULTY SENATE FORMS

Academic Program Approval

This form is a routing document for the approval of new and revised academic programs. Proposing department should complete this form. For more information, call the Faculty Senate Office at 831-2921.

Submitted by: __Tobin Driscoll_____phone number_____3383_____

Department: __Mathematical Sciences_____email address__driscoll@udel.edu

Date: ___10/21/13_____

Action: ___Revisions to PhD requirements _____
             (Example: add major/minor/concentration, delete major/minor/concentration, revise major/minor/concentration, academic unit name change, request for permanent status, policy change, etc.)

Effective term_____14F_____
             (use format 04F, 05W)

Current degree_____MS_____
             (Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed change leads to the degree of: _____MS_____
             (Example: BA, BACH, BACJ, HBA, EDD, MA, MBA, etc.)

Proposed name:_____
             Proposed new name for revised or new major / minor / concentration / academic unit
             (if applicable)

Revising or Deleting:

      Undergraduate major / Concentration:_____
             (Example: Applied Music – Instrumental degree BMAS)

      Undergraduate minor:_____
             (Example: African Studies, Business Administration, English, Leadership, etc.)

      Graduate Program Policy statement change:_____ Mathematics_____
             (**Must attach** your Graduate Program Policy Statement)

      Graduate Program of Study:_____ Mathematics: MS_____
             (Example: Animal Science: MS Animal Science: PHD Economics: MA Economics: PHD)

      Graduate minor / concentration:_____

Note: all graduate studies proposals must include an electronic copy of the Graduate Program Policy Document, highlighting the changes made to the original policy document.

List new courses required for the new or revised curriculum. How do they support the overall program objectives of the major/minor/concentrations)?

(Be aware that approval of the curriculum is dependent upon these courses successfully passing through the Course Challenge list. If there are no new courses enter "None")

N/A

Explain, when appropriate, how this new/revised curriculum supports the 10 goals of undergraduate education: http://www.ugs.udel.edu/gened/

N/A

Identify other units affected by the proposed changes:
(Attach permission from the affected units. If no other unit is affected, enter "None")

N/A

Describe the rationale for the proposed program change(s):
(Explain your reasons for creating, revising, or deleting the curriculum or program.)

1. *We now require permission for students on financial aid through the department who want to add another degree program outside the department.* Previously some students enrolled in M.S. degree programs elsewhere on campus against the wishes of the department/adviser. The extra coursework lengthens time to our degree while accepting our support. The practice can continue for approved students.
2. *Assorted minor revisions, including*: refocus of the description of teaching assistant duties; clearer definitions of "satisfactory progress"; reorganization of material to better conform to the Graduate Office template; and improvements to wording in the catalog.

Program Requirements:
(Show the new or revised curriculum as it should appear in the Course Catalog. If this is a revision, be sure to indicate the changes being made to the current curriculum and **include a side-by-side comparison** of the credit distribution before and after the proposed change.)

ROUTING AND AUTHORIZATION: (Please do not remove supporting documentation.)

Department Chairperson _____ Date_____

Dean of College_____ Date_____

Chairperson, College Curriculum Committee_____ Date_____

Chairperson, Senate Com. on UG or GR Studies_____ Date_____

Chairperson, Senate Coordinating Com._____ Date_____

Secretary, Faculty Senate_____ Date_____

Date of Senate Resolution_____ Date to be Effective_____

Registrar _____Program Code_____ Date_____

Vice Provost for Academic Affairs & International Programs_____ Date_____

Provost _____ Date_____

Board of Trustee Notification _____ Date_____

Revised 02/09/2009   /khs

Program Overview

The Department of Mathematical Sciences offers programs of study leading to the degrees of Master of Science and Doctor of Philosophy in Applied Mathematics or Mathematics. The department also offers a 4+1 BS/MS program that allows students to complete both the Bachelor of Science degree in any undergraduate major administered by the department and the MS degree in a total of five years of full-time study.

Many of the major areas of mathematics are included among the research interests of the faculty of the department. There are numerous active seminars on these and other mathematical topics, as well as a steady stream of visiting scientists from all over the world.

The department is committed to providing individualized attention and guidance to every student in the program.

Requirements for Admission

Admission is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and who have a sound preparation in linear algebra and advanced calculus. In a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE General Test and a GRE Subject Test (not necessarily in mathematics).

To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by scoring at least 600 on the paper-based TOEFL exam, at least 100 on the TOEFL iBT, with a minimum score of 20 in each section, or at least 7.5 on the IELTS, with a minimum score of 6.0 in each subsection.

Students applying to the 4+1 BS/MS program must be in their junior year of study at the University of Delaware, enrolled in a Bachelor of Science degree program administered by the Department of Mathematical Sciences, must have a cumulative GPA of at least 3.2, a GPA of at least 3.4 in their major, and must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation and academic transcripts are required as part of the application process. The letters of recommendation must be from University of Delaware faculty.

Financial Aid

We offer financial aid, including tuition waiver and a stipend, for up to ten consecutive semesters. These semesters include assistantships and fellowships from all sources. Annual renewal of financial aid is not automatic. Students holding assistantships are expected to perform satisfactorily in their assigned duties and to make satisfactory progress in their academic work.

For support to continue past the second year, a student must pass the Preliminary Examination requirement by the start of the fourth semester. For support to continue beyond the third year, a student must complete the Candidacy Examination requirement by the start of the sixth semester.

Requirements for the Master's Degree

To be eligible for the degree an M.S. candidate must complete 30 credits of coursework beyond the Bachelor's degree. The student must maintain a GPA of 3.0 or better. The thirty hours of coursework must be at or above the 600 level, exclusive of certain courses designated in the catalog.

Students may count 3 credits of coursework at the 600 level or above taken outside of the department, and may count up to 3 credits from a reading course (MATH 870). Exceptions to these restrictions require permission of the Graduate Studies Committee.

All requirements above must be fulfilled by a student enrolled in the 4+1 B.S./M.S. program. However, the student may count up to six credits of graduate courses in the mathematical sciences towards both the B.S. and the M.S. degrees.

The thesis option for the M.S. degree consists of 24 credit hours of course work plus 3 credit hours of research via Math 868 and 3 credit hours of thesis via Math 869, leading to a Master's Thesis. The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her Thesis Advisor and the Thesis Committee. The Thesis Committee shall consist of three faculty; it is not required that a member of the committee be from outside mathematics. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages). An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis.

Requirements for the Ph.D. Degree

To obtain the Ph.D., the student must meet a coursework requirement, a Preliminary Examination requirement, and a Candidacy Examination requirement.

Coursework: The student must complete 48 credits of courses at the 600 level or above, exclusive of certain courses designated in the catalog, subject to these restrictions:

– A maximum of 27 credits of MATH courses at the 600 level.

– A maximum of 12 credits of MATH 868 (Research) and MATH 870 (Reading) combined.

– A maximum of 6 credits at the 600 level or above in non-MATH courses.

An alternative accelerated coursework requirement is available to students who arrive with an M.S. degree and complete the Preliminary Exam requirement upon arrival. For these students the requirement is 30 credits at the 600 level or above, subject to these restrictions:

– MATH 600, MATH 602, and MATH 672 may not be counted.

– A maximum of 9 credits of MATH courses at the 600 level.

– A maximum of 12 credits of MATH 868 (Research) and MATH 870 (Reading) combined.

– A maximum of 3 credits at the 600 level or above in non-MATH courses.

Preliminary Examination: The Preliminary Exam consists of two mandatory components, Analysis and Linear Algebra. The Linear Algebra component allows the selection of one of two options, Vector Spaces and Numerical Linear Algebra. Each component may be attempted up to two times. Both components of the Preliminary Exam must be successfully completed before the start of the fourth semester of study in order to maintain eligibility for the Ph.D.

Candidacy Examination: The Candidacy Exam is conducted by a committee of four faculty chosen by the student. The student first publicly presents a research plan or survey, after which the examiners orally assess the student's preparation to conduct research. The Candidacy Exam may be attempted up to two times. It must be completed successfully before the start of the sixth semester of study in order to maintain eligibility for the Ph.D.

Other requirements: The student must maintain a GPA of 3.0 or better; complete two semesters of experience in teaching undergraduate students; select a Dissertation Committee and be admitted to candidacy; complete 9 credits of MATH 969 (Doctoral Dissertation) after admission to candidacy; and complete and successfully defend a dissertation.

Exceptions to the degree requirements can occur only with the permission of the Graduate Studies Committee.

Graduate Programs in the Department of Mathematical Sciences

Last updated and approved by the faculty: May 2013

1. History and Overview

Mathematics was present at the University of Delaware from the start. The founder of the university, Francis Alison, wrote of his new school in 1768, "The Languages are carefully taught, along with arithmetic, geometry, practical branches of mathematics, and logic." By 1773, the fledgling academy employed two professors--a philosopher and a mathematician. By 1826, the department structure had arrived at U.D., with a separate room set aside for a "Mathematical and English Department." In 1832, mathematics became part of a new department of "Mathematics and the Natural Sciences." Over the next century, both the university and the department underwent significant growth, but it wasn't until the late 1950's that doctoral programs were established at the University of Delaware. In 1965, the Department of Mathematical Sciences created the seventh doctoral program hosted by the university. By 1969, the department had awarded its first Ph.D. degree.

Over the last forty years, well over one hundred students have received doctoral degrees in Mathematics or Applied Mathematics from the University of Delaware. Graduates from our program have gone on to prestigious postdoctoral positions at institutions such as Oxford University, the University of Arizona, and the University of Minnesota. They hold or have held academic positions worldwide and they work in industry, commerce, and government, at organizations such as DuPont, Amazon, and the National Security Agency. Today, with active research groups in numerous areas of pure and applied mathematics, the department continues to train high-quality mathematics researchers destined to impact the future of mathematics and its applications worldwide.

The Department of Mathematical Sciences offers programs of study leading to Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Applied Mathematics and Mathematics. The department also offers a 4+1 BS/MS program allowing students to complete both a Bachelor of Science and Master of Science degree in five years of full-time study. Requirements for the degrees in the various programs are detailed in Section 3. Many areas of mathematics and its applications are included among the research interests of the faculty of the department. The department offers a wide range of regularly scheduled seminars and colloquia, including the Hallenbeck Graduate Student Seminar, Rees Distinguished Lecturers, and numerous seminar series organized by the faculty around research interests in the department. Students should attend the Graduate Student Seminar each week and departmental colloquia, in addition to sampling other available seminars during their first year. By the second year of study, doctoral students should have become a regular attendee at one or more research-oriented department seminars.

2. Admission

Admission to the graduate programs in Applied Mathematics and Mathematics is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and who have a sound preparation in linear algebra and advanced calculus. On a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE General Test and one GRE Subject Test. It is not required that the GRE Subject Test be in mathematics.

To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by meeting at least one of the following criteria:

- Score at least 600 on the paper-based TOEFL exam.
- Score at least 100 on the TOEFL iBT, with a minimum score of 20 in each section.
- Score at least 7.5 on the IELTS with a minimum score of 6.0 in each subsection.

Admission to the graduate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths.

Students who wish to be admitted to the 4+1 B.S./M.S. program should submit an application during their junior year of academic study toward an undergraduate degree at the University of Delaware. Such students must be enrolled in a Bachelor of Science degree program administered by the Department of

Mathematical Sciences. At a minimum, the applicant must have a cumulative GPA of 3.2 and a GPA of 3.4 in their undergraduate major. The applicant must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation from University of Delaware faculty and academic transcripts must be submitted. Neither the GRE nor the TOEFL exam is required. Meeting minimum requirements is not a guarantee of admission. Similarly, those who fail to meet minimum requirements are not precluded admission if they offer other appropriate strengths.

3. Academic Regulations

The authority for administering the program rests with the Graduate Studies Committee. The Director of Graduate Studies serves as academic advisor to all students until such time as a supervisor for the thesis or dissertation is selected. New students, as part of the orientation program, will meet with the Director of Graduate Studies to plan their first year of study in the program.

Before each semester, you must obtain your advisor's permission to register for courses. During advisement, you will be given help with course selection based your interests and record. You will have a progress sheet on which the courses taken, grades, and progress toward the degree are noted. The department is committed to providing individualized attention and guidance to every student in the program. If at any time you have concerns, questions, or difficulties, you are encouraged to discuss them with the Director.

In making your plan of study, you should pay particular attention to the timing of course offerings and your background and interests. It is not unusual that you may want to change your plan as your experience in the department grows. Nevertheless, having even a tentative plan will serve to ensure a timely completion of your goals. You should consult Section 3.2.5 often to ensure that you continue to make satisfactory progress.

Transfer of credit from other U.S. institutions is available only for courses at the graduate level that have not counted towards the requirements of any other academic degree. Permission is required from the student's advisor and the Chair of the department. A form and instructions are available from the website of the Graduate Office. Transfers of credit should be requested in a timely manner so that the student's plan of study is clear. Transfer of credit from non-U.S. institutions is generally not possible.

3.1. Requirements for the M.S. in Mathematics and Applied Mathematics

The M.S. degree in Mathematics or Applied Mathematics can be earned through one of two options: 30 credits of graduate level coursework; or 24 credits of graduate level coursework, six credits for research and thesis in the final semester, and a successfully completed and defended Master's thesis.

3.1.1. Coursework

To be eligible for the degree, an M.S. candidate (including 4+1 B.S./M.S. students) must complete 30 credits of course work beyond the Bachelor's degree, subject to all of the following conditions except where granted a waiver after petition to the Graduate Studies Committee. Credit hours for which the grade is below C-minus do not count toward a graduate degree.

1. Coursework must be at or above the 600 level and exclusive of courses that the catalog designates as not counting towards mathematics graduate degrees.

2. A maximum of 3 credits of course work at the 600 level or above in non-MATH courses may be applied.

3. A maximum of 3 credits may be from a reading course (MATH 870).

4. For students who select the thesis option for the M.S., the 30 credit total must include 3 credit hours of research (MATH 868) and 3 credit hours of thesis (MATH 869), leading to a successfully defended Master's Thesis. Note that MATH 869 is normally taken for 6 credits. See Section 3.1.2.

Students in the 4+1 B.S./M.S. program may count up to six credits of coursework in the mathematical sciences, at or above the 600 level and not otherwise restricted by the catalog, toward both their B.S. and M.S. degrees.

3.1.2. Thesis (option for the M.S. degree)

The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her thesis advisor and the Thesis Committee.

The Thesis Committee shall consist of three faculty and is chaired by the advisor. It is not required that a member of this committee be from outside the department. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages).

The student is responsible for following the Graduate Office deadlines and procedures relating to the thesis, defense, and application for the degree. An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis. This defense will be open to the academic community.

3.1.3. Timetable and satisfactory progress

All students are subject to the regulations of the Office of Graduate and Professional Education. The OGPE sets specific policies regarding probationary status and satisfactory progress. In particular, a student must maintain a cumulative GPA of 3.0 or better or risk dismissal. A student must have a cumulative GPA of 3.0 or better in order to receive a graduate degree.

In addition to the Graduate Office regulations, the following regulations are specific to the Department of Mathematical Sciences. Except where noted otherwise, students seeking a waiver of any these regulations must petition the Graduate Studies Committee.

1. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), or departmental or university fellowships must observe the following course registration conditions each semester until reaching sustaining (candidacy) status:

a) A minimum of nine credits of graded coursework (not as "listener") is required. The sole routine exception is for students in the last semester, who may register for a minimum of six credits.

b) No more than nine credits of graded coursework may be taken without the permission of the Graduate Director. Students are permitted to register as "listener" for up to three credits beyond the nine graded credits.

2. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), and departmental or university fellowships may not be enrolled in any other degree program, at the University of Delaware or elsewhere, while receiving such support.

3. Students receiving support through Graduate Assistantships or Teaching Assistantships must perform all required duties satisfactorily, as determined by the Associate Chair of the department or his/her designee.

Satisfactory progress for the M.S. degree is defined as meeting all minimum registration and grade requirements. Those who wish to take the thesis option should have selected a thesis advisor and Thesis Committee before the start of the fourth semester of study.

Full-time students should meet the requirements for the M.S. after four semesters of study. Financial aid is normally not extended to terminal M.S. students past four semesters.

3.2. Requirements for the Ph.D. in Mathematics and Applied Mathematics

An outline of the degree requirements for the Ph.D. is as follows.

1. Meet the coursework requirement (section 3.2.1).

2. Pass the Preliminary Examination requirement (section 3.2.2).

3. Select a Dissertation Committee and pass the Candidacy Examination (see section 3.2.3).

4. Complete two semesters of experience in teaching undergraduate students, either as teaching assistant or as instructor of record.

5. Complete 9 credits of MATH 969 (Doctoral Dissertation). These credits are not included in the coursework requirement.

6. Complete and successfully defend a dissertation (section 3.2.4).

3.2.1. Coursework

There are two options for the coursework requirement: *standard* and *accelerated.*

3.2.1.1. Standard requirement

Complete 48 credits, subject to the following conditions:

1. At least 42 credits in MATH courses at the 600 level or above, exclusive of courses designated in the catalog as not counting towards graduate degrees in mathematics.
2. A maximum of 27 credits of MATH courses at the 600 level.
3. A maximum of 12 credits total from MATH 868 (Research) and MATH 870 (Reading) combined.
4. A maximum of 6 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Committee.

These coursework requirements are a superset of those for the Master's degree. An M.S. degree is awarded once the requirements for it have been met.

3.2.1.2. Accelerated requirement

This option is available only to those who enter the program with a Master's degree in Mathematics or Applied Mathematics. To qualify for the accelerated coursework requirement, the student must successfully complete the entire Preliminary Exam requirement (section 3.2.2) before the start of the first semester (that is, by passing all required exams on the first possible date). Such an attempt at the exams counts as one of the student's regular allowed attempts.

Upon successful completion of the accelerated Preliminary Exam requirement, the accelerated course requirement is 30 credits, subject to the following conditions.

1. MATH 600, MATH 602, and MATH 672 may not be counted towards the requirement.
2. At least 24 credits of MATH courses at the 600 level or above, exclusive of courses designated in the catalog as not counting towards graduate degrees in mathematics.
3. A maximum of 9 credits of MATH courses at the 600 level.
4. A maximum of 12 credits total from MATH 868 (Research) and MATH 870 (Reading) combined.
5. A maximum of 3 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Committee.

3.2.2. Preliminary Examination

All students who wish to obtain a Ph.D. degree must take a written examination called the Preliminary Examination. The Preliminary Examination contains two subject areas: Real and Complex Analysis, which covers material from MATH 600 and MATH 602, and either Linear Algebra, which covers material from MATH 672, or Numerical Linear Algebra, which covers material from MATH 612. Note that material outside the course syllabus may be on the syllabus for the exam.

The Preliminary Exam is given twice each year, generally in the weeks just before the start of the fall and spring semesters. The Preliminary Exam requirement must be successfully met by the beginning of the fourth semester of study. Providing it is before the beginning of the fourth semester, a student may take each subject area of this exam up to two times. Only the area not passed needs to be repeated. Students who fail to pass both subject areas of the Preliminary Exam by the beginning of the fourth semester will not be permitted to become a PhD candidate and may lose financial aid support after the fourth semester. However, such students are still eligible for the M.S. degree.

The syllabus to be covered by each examination, including suggested references, is kept by the department and available on the web and by request. You may obtain copies of past examinations and the syllabus from the Graduate Program Secretary.

3.2.3. Candidacy Examination

The purpose of the Candidacy Examination is to assess the student's readiness to undertake and complete a research project for the doctoral thesis. Each student must pass the Candidacy Examination by the beginning of his or her sixth semester of study. For students using the accelerated coursework requirement, the Candidacy Exam should be completed before the start of the fourth semester. After passing the exam, students are encouraged to pursue Admission to Candidacy with the Office of Graduate Studies. A student who fails the Candidacy Examination twice will be eligible for the M.S. degree but not the Ph.D.

Prior to taking the Candidacy Examination, the student must choose a PhD advisor and research area. The Examination consists of two parts: (1) a public presentation (not to exceed 30 minutes) about the research area, including a summary of a relevant published paper, and (2) an oral examination (not to exceed two hours) by members of the student's Examining Committee.

The student should take the following steps to organize a Candidacy Examination and is advised to allow ample time for the process.

1. Contact four faculty members to act as an Examining Committee. The thesis advisor must be the Chair of the committee. The choices of committee members should be discussed with the thesis advisor.
2. Complete and submit the Candidacy Exam Proposal at least eight weeks before the requested examination date (or two weeks before a second attempt). The proposal must include:

   a) Date of the exam.

   b) A list of up to ten specific topics relevant to the student's research area, to be used as a guide to the oral examination. Typically these will be topics chosen from the catalog descriptions or syllabi of the courses taken by the student.

   c) Full reference (author, title, publication data) of the research paper that will be presented by the student.

   d) Names and signatures of the thesis advisor and all other members of the Examining Committee.

3. Receive approval or a request for revisions from the Graduate Studies Committee. Only after the Graduate Studies Committee has approved the proposal may the exam take place. The scheduling and composition of the Examination will be announced to the faculty.

Once the Examination has taken place, each member of the Examining Committee shall report the results, including a recommendation of Pass or Fail with written justification, to the Director of Graduate Studies within two business days.

A decision on the outcome of the Examination is the responsibility of the Graduate Studies Committee. Following a failed attempt at the exam, a student is permitted a second attempt. The same procedures should be followed. The research advisor, research area, Examining Committee, and published paper for presentation should all be identical to those for the first attempt; changes will be made only after petition to and at the discretion of the Graduate Studies Committee.

3.2.4. Dissertation

Students must select a dissertation advisor before completing the Candidacy Examination. The dissertation advisor will guide the preparation for the examination, including selection of the examining committee. Notify the Graduate Studies assistant when you have selected a dissertation advisor, or to change your selection at any time prior to filing the Recommendation to Candidacy form.

The dissertation is expected to reflect the results of original, significant research written in a literate and scholarly manner worthy of publication. The student must defend his or her dissertation before a Dissertation Committee consisting of the student's dissertation adviser and no less than three and no more than five additional members. One member of the Dissertation Committee must be from a different academic unit, or from outside of the University of Delaware. This committee must be designated, with members' signatures, on the Recommendation to Candidacy form. The form must be filed again if the student wishes to change the Dissertation Committee.

The student is responsible for following the Graduate Office deadlines and procedures relating to the dissertation, defense, and application for the degree. The time, date, and place of the oral defense will be announced to the faculty, and the defense will be open to the academic community.

3.2.5. Timetable and satisfactory progress

All students are subject to the regulations of the Office of Graduate and Professional Education. The OGPE sets specific policies regarding probationary status and satisfactory progress. In particular, a student must maintain a cumulative GPA of 3.0 or better or risk dismissal. A student must have a cumulative GPA of 3.0 or better in order to receive a graduate degree.

In addition to the Graduate Office regulations, the following regulations are specific to the Department of Mathematical Sciences. Except where noted otherwise, students seeking a waiver of any these regulations must petition the Graduate Studies Committee.

1. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), or departmental or university fellowships must observe the following course registration conditions each semester until reaching sustaining (candidacy) status:

   a) A minimum of nine credits of graded coursework (not as "listener") is required.
   b) No more than nine credits of graded coursework may be taken without the permission of the Graduate Director. Students are permitted to register as "listener" for up to three credits beyond the nine graded credits.

2. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), and departmental or university fellowships may not be enrolled in any other degree program, at the University of Delaware or elsewhere, while receiving such support.

3. Students receiving support through Graduate Assistantships or Teaching Assistantships must perform all required duties satisfactorily, as determined by the Associate Chair of the department or his/her designee.

In addition to the regulations above, a timeline for satisfactory progress toward the Ph.D. is as follows.

Standard coursework option:

1. Pass the Preliminary Examination (both subjects) and file a Change of Classification form before the beginning of the fourth semester of study.
2. Complete the coursework requirements of the M.S. degree by the end of the fourth semester of study. The M.S. degree will be awarded at this time.
3. Select a dissertation advisor and Dissertation Committee, file a plan for the Candidacy Examination, and successfully complete the Candidacy Examination before the start of the sixth semester of study.
4. Submit the Recommendation to Candidacy form and complete 9 credits of MATH 969.
5. Once you have completed MATH 969, you are released from minimum course enrollment requirements. Instead, you will be enrolled in Doctoral Sustaining (UNIV 999). A student must be registered in the semester in which the degree is awarded.

Accelerated coursework option:

1. Pass the Preliminary Examination (both subjects) and file a Change of Classification form at the start of the first semester of study.
2. Complete the coursework requirements of the M.S. degree by the end of the second semester of study. The M.S. degree will be awarded at this time.
3. Select a dissertation advisor and Dissertation Committee, file a plan for the Candidacy Examination, and successfully complete the Candidacy Examination before the start of the fourth semester of study.
4. Submit the Recommendation to Candidacy form and complete 9 credits of MATH 969.
5. Once you have completed MATH 969, you are released from minimum course enrollment requirements. Instead, you will be enrolled in Doctoral Sustaining (UNIV 999). A student must be registered in the semester in which the degree is awarded.

All students are reviewed for satisfactory progress by the Graduate Director after each semester. A student who, in the determination of the Graduate Director, is not making satisfactory progress may receive a suspension or termination of financial support, suspension of registration status, or dismissal from the program. Students may appeal the Director's decision to the rest of the Graduate Committee and then to the Chair of the department.

4. Assessment

All graduate programs in the Department of Mathematical Sciences are designed to take high-quality students, with a strong background in mathematics, and transform them into full-fledged practitioners of the discipline of mathematics. For students seeking the M.S. we seek to broaden and deepen their knowledge of mathematics and properly train them for a mathematics related career. For students seeking the Ph.D. we again seek to broaden and deepen their knowledge of mathematics and also to train them as practitioners so that they may impact the discipline in a deep and meaningful way.

4.1. Learning objectives

Our program focuses on five key learning objectives, or outcomes. These are:

- Graduates should be able to conduct original, quality research in particular area of specialization.
- Graduates should be able to synthesize and critically analyze important issues in their field and understand and appreciate how their work fits into the larger body of science.
- Graduates should be able to communicate mathematical proofs, ideas, and concepts orally.
- Graduates should be able to communicate mathematical proofs, ideas, and concepts in writing.
- Graduates should be able to demonstrate both breadth and depth of mathematical knowledge.

4.2. Assessment Plan

In order to ensure that our graduate programs are meeting the objectives stated above, our learning outcomes are continually monitored. Changes resulting from this assessment are implemented periodically. For each of the five learning objectives, we rely upon a variety of direct and indirect measurement tools. A sample is listed below for each objective.

Objective	Information sources	Measuring instruments
Are graduates conducting original, high quality research within their field of specialization?	Student thesis or dissertation, student publications, and conference presentations.	Rubrics that quantify student research work for a thesis, dissertation, or conference presentation. Results are used to compare and contrast student work.
Are students able to synthesize and critically analyze important issues in their field and understand and appreciate how their work fits into the larger body of science?	Student theses, oral candidacy examinations, and oral theses defenses.	Rubric used by faculty serving on thesis committees.
Are students able to communicate mathematical proofs, ideas, and concepts orally?	Student evaluations of their performance as teaching assistants, oral candidacy examinations, oral theses defenses, talks in the Graduate Student Seminar, and talks at conferences.	Rubrics for oral communication used by faculty for student presentations and a teaching observation form.
Are students able to communicate mathematical proofs, ideas, and concepts in writing?	Preliminary examinations, publications by students and a written thesis.	Common rubric for evaluating student writing.
Are students able to demonstrate both breadth and depth of mathematical knowledge?	Results of preliminary examinations, results of oral candidacy examinations, and theses defenses.	Rubric to evaluate preliminary examinations, candidacy examinations, and faculty feedback on these examinations.

5. Financial Aid

Financial aid for study in the department takes several forms, including Research Assistantships, Departmental and University Fellowships, Teaching Assistantships, Graduate Assistantships, and Tuition Scholarships. These forms of financial aid are awarded by the department on a yearly basis. Continuation of financial support is not automatic; it is dependent upon maintaining satisfactory progress, as defined in Section 3.2.5. All students receiving support of any kind may be required to perform assigned supplemental tasks, such as proctoring of examinations.

All students on departmental or university funding (that is, exclusive of Research Assistantships, external fellowships, and non-departmental Teaching Assistantships) receive the same stipend for fall and spring semesters, at an amount set by the Graduate Director not less than the university's minimum.

The department encourages students to compete for nationally advertised graduate fellowships. Information on what fellowships are currently available can be obtained from the Graduate Studies assistant. It is expected that all graduate students prepare themselves for classroom teaching. All new students are required to participate in the university's TA Conference and in the department's TA training program, both of which take place in the week before the start of fall classes. In addition, new teaching assistants are required to attend teaching workshops and other training sessions when scheduled by the department.

For foreign students, preparation for classroom duties includes mandatory participation in the English Language Institute (ELI) training in the month before the fall or spring term, as appropriate. ELI must certify that a foreign student has a sufficient command of English and teaching basics (Category II based on SPEAK and UDIA scores) before the Department can make a classroom assignment. It is departmental policy that no foreign student be supported more than two semesters without being certified for classroom assignments by ELI.

5.1. Support for student travel

The department encourages graduate students to attend national meetings and workshops and supports this by providing funding for student travel. Students should note that additional funds are often available from the Office of Graduate & Professional Studies, their dissertation advisers, and other travel fellowship opportunities.

Students who have met the Preliminary Examination requirement (Section 3) and who receive financial aid are eligible for $500 of travel support. Those who have moved into sustaining student status are eligible for an additional $500. It is not necessary to use the first travel award amount before becoming eligible for the additional amount.

Guidelines for use of these funds are as follows:

1. The student must have completed the relevant examination requirement(s) before applying for the use of travel funds.
2. The student must be registered as a full-time student in good standing in the department's graduate program for at least the two consecutive semesters before the time period in which travel is to occur.

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3. The student's stipend must be paid by departmental or university sources at the time of application for the use of travel funds.
4. Travel must be fully completed before the completion of the terminal degree to be granted by the department.
5. The student must use the travel money to pay the costs associated with attending scientific meetings or other educational or academic events.
6. The student must fill out a travel approval form obtained from the Graduate Studies secretary. The form must be completed and approved before travel commences. In no case will students be reimbursed for travel without prior approval of this form.
7. The Director of Graduate Studies makes the decision to approve every travel request.

The Office of Graduate & Professional Education offers matching travel funds that students are advised to apply for. Students may be eligible to receive additional funds from the department to visit their undergraduate school (in North America) to help recruit new graduate students, or for extraordinary additional opportunities. Requests for these funds should be made to the Graduate Director.

5.2. Summer support

Graduate student contracts for teaching assistantships and fellowships are for fall and spring semesters. (Research assistantships and external fellowships may be negotiated differently.) There are typically opportunities for summer teaching and research contracts. In addition the department offers summer support as follows:

1. Continuing students with financial support who have completed the first year of full-time study in the department's graduate program are eligible for summer support at the rate specified in their offer letter. These funds are not available to 4+1 B.S./M.S. students. Students are expected to be in residence during a six-week period (typically, the first summer session) and meet any other expectations set by the Graduate Studies Committee. Students may request to have this summer stipend postponed until the second summer.
2. Students who have met the Candidacy Examination requirement (Section 4) are eligible for an additional six weeks of summer support at the current rate determined by the department.
3. Students receiving either type of stipend may not teach, receive funding for research, or be otherwise employed during the time period for which they are receiving the stipend.

6. Teaching for the department

Two semesters of in-classroom teaching, including both teaching assistant (TA) and instructor assignments, are a requirement for the Ph.D. The department teaches a substantial fraction of all undergraduate students on campus each year and expects a high level of performance from all who contribute. Keep in mind that satisfactory progress towards your degree includes acceptable performance of all required duties.

All teaching is assigned and overseen by the Associate Chair of the department, who maintains a detailed description of duties and expectations for TAs. Contact the Associate Chair if you have not received a copy of those guidelines. Course instructors and coordinators also play important roles in TA oversight.

Some courses, including many of those that use TAs, are taught in a lecture/discussion format. The TA duties in such a course often include running one or more discussion sessions each week for relatively small numbers of students. Other TA duties might include grading homework, holding office hours, proctoring and grading exams, answering email questions, and more. **It is the TA's responsibility to determine and follow the instructor's specific expectations for each section assigned**.

Plan to be on campus during the entire semester for your teaching assignment, except for official breaks in the academic calendar. Absences during the semester must have authorization from the Associate Chair *in advance.* **Never schedule a long departure from Newark before the last day of the final exam period.** You must attend all the classroom meetings and office hours that you are required to conduct. Notify the department staff as soon as possible if you must miss a section meeting or office hours due to illness or emergency.

Your contract states that you may be required to perform up to 20 hours of work per week as a TA. In addition to the activities listed above, you will need to budget time for preparation and for thoughtful development of your teaching. You may also be required to proctor exams in other courses by the Associate Chair. If you are consistently devoting more than 20 hours per week to your TA duties, first speak with your supervising instructor(s) or course coordinators, and then speak with the Associate Chair if the situation still cannot be resolved.

Students who perform TA duties well may get opportunities to teach as instructor of record during Winter or Summer sessions. These assignments are made by the Associate Chair. If you are instructor for a section that has fewer than ten students after the first meeting, notify the Associate Chair immediately.

In addition to offering extra income, instructor assignments should be seen as critical professional development opportunities. You may need to show a proven track record of development in your teaching to obtain an academic job. Consider requesting a classroom observation from faculty or the campus' teaching effectiveness center.

7. Miscellaneous information

Contact information. Please be sure that your phone number and local address, and an emergency contact phone number, are on file with the university or Graduate Studies secretary. Keep this information up to date at all times.

Class supplies. TA classroom supplies (as opposed to personal supplies) may be secured from the workroom supply cabinet. These supplies are for the classes you are *teaching*, not the classes you are *taking*.

Computer accounts. As students you are automatically given a university email account (udel.edu address). For instructions on activating the account, see www.udel.edu/help. You will also get a departmental network account and email address (math.udel.edu address). See the computing staff in Ewing to sign up for your account, and to ask questions about other available computing resources for specialized research needs. *It is important that you check both the udel.edu and the math.udel.edu accounts for communications about university and departmental business.* One recommended method is

to have one of the accounts automatically forward all incoming email to your preferred account. Use your computer account responsibly and for work-related tasks only, or your computer account may be limited or revoked.

Typing of tests. Department staff do *not* type or typeset exams or any other materials for students.

Keys. The keys issued to you will be for your office in Ewing Hall and outside entrances to Ewing Hall. Your office key opens Ewing public areas: work room, computer terminal room, and the conference room.

Pay. You are paid twice monthly, on the 15th and the last day of the month. In order to receive your first check, you will need to fill out a W--4 form and an I--9 form for tax purposes. Foreign students who receive temporary Social Security Numbers will need to fill out a second W--4 form when they receive their permanent Social Security Numbers. These students must also change their UD ID cards. All graduate students must use direct deposit, which requires filing a form that you can obtain from the staff. Your pay stub can be viewed online. Your stipend is automatically paid continuously through all nine months of the academic year, including the period between fall and spring semesters. If you are paid through an additional winter session contract, the amount will be added to your other stipend over the winter session period. Summer session payment is handled through separate contracts for additional work duties. Notify the Associate Chair if you are interested in teaching in winter or summer sessions.

Telephone. Any calls from your office phone that incur charges (long distance or international) must be paid for by the caller.

Textbooks. Desk copies may be obtained in the main office for courses in which you are a teaching assistant or instructor. These books must be returned to the department immediately after the course is over.

Copying. Photocopying is available at no charge *only* for work in any course in which you are a teaching assistant or instructor. Students must reimburse the department for the cost of any photocopying for personal or research use. The photocopy machines should not be used for large copy jobs. Please see the office staff for any copy job exceeding 150 total pages.

Catalog: Current	Catalog: Proposed
Program Overview The Department of Mathematical Sciences offers programs of study leading to the degrees of Master of Science and Doctor of Philosophy in Applied Mathematics or Mathematics. The department also offers a 4+1 BS/MS program that allows students to complete both the Bachelor of Science degree in any undergraduate major administered by the department and the MS degree in a total of five years of full-time study. Many of the major areas of mathematics are included among the research interests of the faculty of the department. There are numerous active seminars on these and other mathematical topics, as well as a steady stream of visiting scientists from all over the world. The department is committed to providing individualized attention and guidance to every student in the program.	**Program Overview** The Department of Mathematical Sciences offers programs of study leading to the degrees of Master of Science and Doctor of Philosophy in Applied Mathematics or Mathematics. The department also offers a 4+1 BS/MS program that allows students to complete both the Bachelor of Science degree in any undergraduate major administered by the department and the MS degree in a total of five years of full-time study. Many of the major areas of mathematics are included among the research interests of the faculty of the department. There are numerous active seminars on these and other mathematical topics, as well as a steady stream of visiting scientists from all over the world. The department is committed to providing individualized attention and guidance to every student in the program.
Requirements for Admission Admission to the graduate programs in Applied Mathematics and Mathematics is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and have a sound preparation in linear algebra and advanced calculus. On a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE Aptitude Test and a GRE Subject Test (not necessarily in mathematics). To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by scoring at least 600 on the paper-based TOEFL exam, at least 100 on the TOEFL iBT, with a minimum score of 20 in each section, or at least 7.5 on the IELTS, with a minimum score of 6.0 in each subsection. Students applying to the 4+1 BS/MS program must be in their junior year of study at the University of Delaware, enrolled in a Bachelor of Science degree program administered by the Department of Mathematical Sciences, must have a cumulative GPA of at least 3.2, a GPA of at least 3.4 in their major, and must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation and academic transcripts are required as part of the application process. The letters of recommendation must be from University of Delaware faculty.	**Requirements for Admission** ==Admission is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and who have a sound preparation in linear algebra and advanced calculus.== In a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE ==General== Test and a GRE Subject Test (not necessarily in mathematics). To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by scoring at least 600 on the paper-based TOEFL exam, at least 100 on the TOEFL iBT, with a minimum score of 20 in each section, or at least 7.5 on the IELTS, with a minimum score of 6.0 in each subsection. Students applying to the 4+1 BS/MS program must be in their junior year of study at the University of Delaware, enrolled in a Bachelor of Science degree program administered by the Department of Mathematical Sciences, must have a cumulative GPA of at least 3.2, a GPA of at least 3.4 in their major, and must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation and academic transcripts are required as part of the application process. The letters of recommendation must be from University of Delaware faculty.
Financial Aid Students holding assistantships are expected to perform satisfactorily in their assigned duties and to make good progress in their academic work. Renewal of financial aid is not automatic. Due to the size of our program, we can only offer financial aid for up to 10 semesters for students entering with a Bachelor's degree; those entering with a Master's degree for up to 8 semesters. The department, however, will make every attempt to provide some form of funding for qualified students. First year teaching assistants are required to attend teaching workshops scheduled by the department. For continued support beyond the 3rd year, a student entering with a Master's degree must pass the Candidacy Exam by the	**Financial Aid** ==We offer financial aid, including tuition waiver and a stipend, for up to ten consecutive semesters. These semesters include assistantships and fellowships from all sources. Annual renewal of financial aid is not automatic. Students holding assistantships are expected to perform satisfactorily in their assigned duties and to make satisfactory progress in their academic work.== ==For support to continue past the second year, a student must pass the Preliminary Examination requirement by the start of==

beginning of his/her 4th semester in order to be offered continued support beyond the 2nd year. For a student who does not pass the Candidacy Examination on the first try, there is no guarantee for support for the following academic year. However, a student may make a second and final attempt to pass the Candidacy Examination, and if the attempt is successful, the department will make every effort to secure funding for such a student.

the fourth semester. For support to continue beyond the third year, a student must complete the Candidacy Examination requirement by the start of the sixth semester.

Requirements for the Master's Degree

To be eligible for the degree an M.S. candidate must complete 30 hours of course work beyond the Bachelor's degree. Students must maintain a GPA of 3.0 or better. These thirty hours of course work must be at or above the 600 level excluding **Math 607**. Students may take 3 credit hours worth of coursework outside of the department. Any additional course work taken for credit outside of the department requires approval of the Graduate Studies Committee.

Of the 30 credit hours required for an MS, at most 3 credits can be from a reading course unless an exception is granted by the Graduate Studies Committee.

Requirements for the Master's Degree

To be eligible for the degree an M.S. candidate must complete 30 credits of coursework beyond the Bachelor's degree. The student must maintain a GPA of 3.0 or better. The thirty hours of coursework must be at or above the 600 level, exclusive of certain courses designated in the catalog.

Students may count 3 credits of coursework at the 600 level or above taken outside of the department, and may count up to 3 credits from a reading course (MATH 870). Exceptions to these restrictions require permission of the Graduate Studies Committee.

All requirements above must be fulfilled by a student enrolled in the 4+1 B.S./M.S. program. However, the student may count up to six credits of graduate courses in the mathematical sciences towards both the B.S. and the M.S. degrees.

The thesis option for the M.S. degree consists of 24 credit hours of course work plus 3 credit hours of research via **Math 868** and 3 credit hours of thesis via **Math 869**, leading to a Master's Thesis. The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her Thesis Advisor and the Thesis Committee. The Thesis Committee shall consist of three faculty; it is not required that a member of the committee be from outside mathematics. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages). An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis.

The thesis option for the M.S. degree consists of 24 credit hours of course work plus 3 credit hours of research via **Math 868** and 3 credit hours of thesis via **Math 869**, leading to a Master's Thesis. The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her Thesis Advisor and the Thesis Committee. The Thesis Committee shall consist of three faculty; it is not required that a member of the committee be from outside mathematics. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages). An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis.

All requirements above must be fulfilled by any student enrolled in the 4+1 BS/MS program. However, a student may count up to six credit hours of graduate courses in the mathematical sciences earned while the student was an undergraduate toward the total unit requirement for the MS degree.

Requirements For The PhD Degree

Students with no prior graduate course work must complete 48 credit hours of courses including:

– At least 27 credits of MATH courses at the 600 level or above, excluding **MATH 607** and **MATH660**.

Requirements for the Ph.D. Degree

To obtain the Ph.D., the student must meet a coursework requirement, a Preliminary Examination requirement, and a Candidacy Examination requirement.

Coursework: The student must complete 48 credits of courses at the 600 level or above, exclusive of certain courses designated in the catalog, subject to these restrictions:

– A maximum of 27 credits of MATH courses at the 600 level.
– A maximum of 6 credits of **MATH 868** (Research).

– A maximum of 6 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Studies Committee.

Candidates for the Ph.D. degree must also:

- Maintain a GPA of 3.0 or better.
- All Applied Mathematics and Mathematics students must complete the requirements for MS and pass the **Preliminary Examination** based on **MATH 600**, **MATH 602**, (Advanced Calculus) and **MATH 672** (Linear Algebra) or **MATH 612** (Numerical Linear Algebra). Students entering with Bachelor's degrees are required to pass the Preliminary Examination by the beginning of their 4th semester. Students entering with a Master's degree must complete this requirement by the end of the second semester of study. Students who do not meet this requirement are recommended for dismissal.Pass the oral Candidacy Examination.
- Select a Dissertation Committee, subject to the approval of the Graduate Committee.
- Complete two semesters of experience in teaching undergraduate students, or obtain a waiver from the Graduate Committee.
- Complete 9 credits of **MATH 969** (Doctoral Dissertation) after admission to candidacy.
- Complete and successfully defend a dissertation.

– A maximum of 27 credits of MATH courses at the 600 level.
– A maximum of 12 credits of **MATH 868** (Research) and MATH 870 (Reading) combined.
– A maximum of 6 credits at the 600 level or above in non-MATH courses.

An alternative accelerated coursework requirement is available to students who arrive with an M.S. degree and complete the Preliminary Exam requirement upon arrival. For these students the requirement is 30 credits at the 600 level or above, subject to these restrictions:

– MATH 600, MATH 602, and MATH 672 may not be counted.
– A maximum of 9 credits of MATH courses at the 600 level.
– A maximum of 12 credits of **MATH 868** (Research) and MATH 870 (Reading) combined.
– A maximum of 3 credits at the 600 level or above in non-MATH courses.

Preliminary Examination: The Preliminary Exam consists of two mandatory components, Analysis and Linear Algebra. The Linear Algebra component allows the selection of one of two options, Vector Spaces and Numerical Linear Algebra. Each component may be attempted up to two times. Both components of the Preliminary Exam must be successfully completed before the start of the fourth semester of study in order to maintain eligibility for the Ph.D.

Candidacy Examination: The Candidacy Exam is conducted by a committee of four faculty chosen by the student. The student first publicly presents a research plan or survey, after which the examiners orally assess the student's preparation to conduct research. The Candidacy Exam may be attempted up to two times. It must be completed successfully before the start of the sixth semester of study in order to maintain eligibility for the Ph.D.

Other requirements: The student must maintain a GPA of 3.0 or better; complete two semesters of experience in teaching undergraduate students; select a Dissertation Committee and be admitted to candidacy; complete 9 credits of **MATH 969** (Doctoral Dissertation) after admission to candidacy; and complete and successfully defend a dissertation.

Exceptions to the degree requirements can occur only with the permission of the Graduate Studies Committee.

Graduate Policies: Current	Graduate Policies: Proposed
1. The Academic Program **History** Mathematics was present at the University of Delaware right from the start. The founder of the university, Francis Alison, wrote of his new school in 1768, "The Languages are carefully taught, along with arithmetic, geometry, practical branches of mathematics, and logic." By 1773, the fledgling academy employed two professors--a philosopher and a mathematician. By 1826, the department structure had arrived at U.D., with a separate room set aside for a "Mathematical and English Department." In 1832, mathematics became part of a new department of "Mathematics and the Natural Sciences." Over the next century, both the university and the department underwent significant growth, but it wasn't until the late 1950's that doctoral programs were established at the University of Delaware. In 1965, the Department of Mathematical Sciences created the seventh doctoral program hosted by the university. By 1969, the department had awarded its first Ph.D. degree. Over the last forty years, well over one hundred students have received doctoral degrees in Mathematics or Applied Mathematics from the University of Delaware. Graduates from our program have gone on to prestigious postdoctoral positions at institutions such as Oxford University, the University of Arizona, and the University of Minnesota. They hold or have held academic positions worldwide and they work in industry, commerce, and government, at organizations such as DuPont, Merck, and the National Security Agency. Today, with active research groups in numerous areas of pure and applied mathematics, the department continues to train high-quality mathematics researchers destined to impact the future of mathematics and its applications worldwide. **Introduction** The Department of Mathematical Sciences offers programs of study leading to Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Applied Mathematics and Mathematics. The department also offers a 4+1 BS/MS program allowing students to complete both a Bachelor of	**History and Overview** Mathematics was present at the University of ==Delaware from== the start. The founder of the university, Francis Alison, wrote of his new school in 1768, "The Languages are carefully taught, along with arithmetic, geometry, practical branches of mathematics, and logic." By 1773, the fledgling academy employed two professors--a philosopher and a mathematician. By 1826, the department structure had arrived at U.D., with a separate room set aside for a "Mathematical and English Department." In 1832, mathematics became part of a new department of "Mathematics and the Natural Sciences." Over the next century, both the university and the department underwent significant growth, but it wasn't until the late 1950's that doctoral programs were established at the University of Delaware. In 1965, the Department of Mathematical Sciences created the seventh doctoral program hosted by the university. By 1969, the department had awarded its first Ph.D. degree. Over the last forty years, well over one hundred students have received doctoral degrees in Mathematics or Applied Mathematics from the University of Delaware. Graduates from our program have gone on to prestigious postdoctoral positions at institutions such as Oxford University, the University of Arizona, and the University of Minnesota. They hold or have held academic positions worldwide and they work in industry, commerce, and government, at organizations such as DuPont, Amazon, and the National Security Agency. Today, with active research groups in numerous areas of pure and applied mathematics, the department continues to train high-quality mathematics researchers destined to impact the future of mathematics and its applications worldwide. The Department of Mathematical Sciences offers programs of study leading to Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees in Applied Mathematics and Mathematics. The department also offers a 4+1 BS/MS program allowing students to complete both a Bachelor of

Science and Master of Science degree in five years of full-time study. Requirements for the degrees in the various programs are detailed in Section 3.

Many of the major areas of mathematics are included among the research interests of the faculty of the department. The department offers a wide range of regularly scheduled seminars and colloquia, including the Hallenbeck Graduate Student Seminar, Rees Distinguished Lecturers, and numerous seminar series organized by the faculty around research interests in the department. Students should attend the Graduate Student Seminar each week and departmental colloquia, in addition to sampling other available seminars during their first year. By the second year of study, doctoral students should have become a regular attendee at one or more research-oriented department seminars.

Getting Started
The authority for administering the program rests with the Graduate Studies Committee. The Director of Graduate Studies serves as adviser to all students until such time as a supervisor for the thesis or dissertation is appointed. The Director of Graduate Studies will help you formulate your plan of study through twice yearly scheduled meetings prior to preregistration, and through additional meetings as needed. New students, as part of the usual orientation program, will meet with the Director of Graduate Studies to plan their first year of study in the program.
Before each semester, you must obtain your advisor's permission to register for courses. During advisement, you will be given help with course selection based your interests and record. You will have a progress sheet on which the courses taken, grades, and progress toward the degree are noted. The department is committed to providing individualized attention and guidance to every student in the program. If at any time you have concerns, questions, or difficulties, you are encouraged to discuss them with any faculty member.
It is recommended that incoming students with an M.S. take the Preliminary Exams prior to

This material has been moved or deleted. Some was out of place, duplicated, or obsolete.

beginning courses. Well prepared students with a B.S. may also take the Preliminary Exam in the August prior to beginning course work. Sample exams will be sent on request. Exams are usually given the week before classes begin in fall and spring semesters. Please see the website for details.

General Plan of Study

In making your plan of study, you should pay particular attention to the timing of course offerings and your background and interests. It is not unusual that you may want to change your plan as your experience in the department grows. Nevertheless, having even a tentative plan will serve to ensure progress toward your degree. As you develop your plan of study, you should keep the following points in mind:

- Students holding Graduate Assistantships (GA), Research Assistantships (RA), or Teaching Assistantships (TA) must register for a minimum of 9 credits of coursework.
- It is expected that the requirements for a Master's degree be completed by the end of the fourth semester for full-time students.
- A student must pass the Preliminary Exams by the beginning of the fourth semester in order to continue his/her studies beyond the Master's degree.
- The Office of Graduate & Professional Education (OGPE) defines standards of adequate academic progress. A minimum cumulative GPA of 3.0 (B) is required. Credit hours and courses for which the grade is below "C-" do not count toward the degree

By the time you become a candidate in the Ph.D. program, you will have identified an area in which you wish to write your dissertation. The department will work with the OGPE at that time to certify that all requirements have been met after a review of your record. Waivers of requirements will be at the discretion of the Graduate Studies Committee.

Transfer of credit from other U.S. institutions is available only for courses at the graduate level that have not counted towards the requirements of any other academic degree. Permission is required from the student's advisor and the Chair of the

These regulations are moved to Section 3.

Transfer of credit moved to Section 3.

department. A form and instructions are available from the website of the OGPE. Transfers of credit should be requested in a timely manner so that the student's plan of study is clear. Transfer of credit from non-U.S. institutions is generally not possible.

Regulations for the Master's and Ph.D. Programs

1   In order to graduate with a Master's Degree in Mathematics, a student must satisfy the general academic requirements of the Office of Graduate Studies and must have a 3.0 or better GPA in all courses.
2   Under normal circumstances a student with a ``C'' or lower in 3 courses will be advised to leave the graduate program.
3   A student who has not passed the Candidacy Exam for the Ph.D. is not allowed to register for Ph.D. dissertation or noncontractual research.
4   Two semesters experience in the teaching of undergraduates is required of all candidates for a Master's Degree and Ph.D. candidates. Students may petition the Graduate Studies Committee for a waiver of this requirement.
5   The OGPE requires that those graduate students holding GAs, RAs and TAs register for a minimum of 6 credits. However, it is the policy of the department that all such students who are not yet in sustaining status must register for at least 9 credits each semester. When approved by the Graduate Studies Committee, 3 of these credits may be taken as a listener. The Graduate Studies Committee strongly discourages students in their first three years of study from registering as a listener. Students may register for up to 12 credits without special permission, but a student wishing to carry 13 credits or more must first get permission from the Director of Graduate Studies and the OGPE.
6   Students enrolled in the M.S. program who wish to continue on to the Ph.D. program must file a Change of Classification Form no later than the start of their fourth semester.

7 Students enrolled in the 4+1 B.S./M.S. program must satisfy regulations number one and number two from this list. In particular, students in the 4+1 B.S./M.S. program are not required to obtain teaching experience.	
2. Program Descriptions Admission Requirements Admission to the graduate programs in Applied Mathematics and Mathematics is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and who have a sound preparation in linear algebra and advanced calculus. On a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE General Test and one GRE Subject Test. It is not required that the GRE Subject Test be in mathematics. To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by meeting at least one of the following criteria: ● Score at least 600 on the paper-based TOEFL exam. ● Score at least 100 on the TOEFL iBT, with a minimum score of 20 in each section. ● Score at least 7.5 on the IELTS with a minimum score of 6.0 in each subsection. Admission to the graduate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths. Admission to the graduate program is selective and competitive, based on the number of well-qualified applicants and the limits of available faculty and facilities. Those who meet stated minimum academic requirements are not guaranteed admission, nor are those who fail to meet those requirements necessarily precluded from admission if they offer other appropriate strengths. Students who wish to be admitted to the 4+1 B.S./M.S. program should submit an application during their junior year of academic study toward	2. Admission Admission to the graduate programs in Applied Mathematics and Mathematics is open to students who have completed the equivalent of a baccalaureate degree in mathematics or related fields, and who have a sound preparation in linear algebra and advanced calculus. On a 4.0 system, applicants should have a GPA of at least 2.5 and an average of at least 3.0 in mathematics and related areas. Applicants who have completed an advanced degree must have done so with a GPA of at least 3.0. In addition, applicants must take the GRE General Test and one GRE Subject Test. It is not required that the GRE Subject Test be in mathematics. To be eligible for admission, students from a country where English is not a primary language must demonstrate proficiency in English by meeting at least one of the following criteria: • Score at least 600 on the paper-based TOEFL exam. • Score at least 100 on the TOEFL iBT, with a minimum score of 20 in each section. • Score at least 7.5 on the IELTS with a minimum score of 6.0 in each subsection. Admission to the graduate program is competitive. Those who meet stated requirements are not guaranteed admission, nor are those who fail to meet all of those requirements necessarily precluded from admission if they offer other appropriate strengths. ==Repeated paragraph removed.== Students who wish to be admitted to the 4+1 B.S./M.S. program should submit an application during their junior year of academic study toward

an undergraduate degree at the University of Delaware. Such students must be enrolled in a Bachelor of Science degree program administered by the Department of Mathematical Sciences. At a minimum, the applicant must have a cumulative GPA of 3.2 and a GPA of 3.4 in their undergraduate major. The applicant must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation from University of Delaware faculty and academic transcripts must be submitted. Neither the GRE nor the TOEFL exam is required. Meeting minimum requirements is not a guarantee of admission. Similarly, those who fail to meet minimum requirements are not precluded admission if they offer other appropriate strengths.	an undergraduate degree at the University of Delaware. Such students must be enrolled in a Bachelor of Science degree program administered by the Department of Mathematical Sciences. At a minimum, the applicant must have a cumulative GPA of 3.2 and a GPA of 3.4 in their undergraduate major. The applicant must have completed at least two mathematics courses at or above the 400 level. Two letters of recommendation from University of Delaware faculty and academic transcripts must be submitted. Neither the GRE nor the TOEFL exam is required. Meeting minimum requirements is not a guarantee of admission. Similarly, those who fail to meet minimum requirements are not precluded admission if they offer other appropriate strengths.
	3. Academic Regulations ***Moved here from the old Section 1.*** The authority for administering the program rests with the Graduate Studies Committee. The Director of Graduate Studies serves as academic advisor to all students until such time as a supervisor for the thesis or dissertation is selected. New students, as part of the orientation program, will meet with the Director of Graduate Studies to plan their first year of study in the program. Before each semester, you must obtain your advisor's permission to register for courses. During advisement, you will be given help with course selection based your interests and record. You will have a progress sheet on which the courses taken, grades, and progress toward the degree are noted. The department is committed to providing individualized attention and guidance to every student in the program. If at any time you have concerns, questions, or difficulties, you are encouraged to discuss them with the Director. In making your plan of study, you should pay particular attention to the timing of course offerings and your background and interests. It is not unusual that you may want to change your plan as your experience in the department grows. Nevertheless, having even a tentative plan will serve to ensure a timely completion of your goals. You should consult Section 3.2.5 often to ensure that you continue to make satisfactory progress.

Requirements for the M.S. in Mathematics and Applied Mathematics	Transfer of credit from other U.S. institutions is available only for courses at the graduate level that have not counted towards the requirements of any other academic degree. Permission is required from the student's advisor and the Chair of the department. A form and instructions are available from the website of the Graduate Office. Transfers of credit should be requested in a timely manner so that the student's plan of study is clear. Transfer of credit from non-U.S. institutions is generally not possible.

3.1. Requirements for the M.S. in Mathematics and Applied Mathematics

The M.S. degree in Mathematics or Applied Mathematics can be earned through one of two options: 30 credits of graduate level coursework; or 24 credits of graduate level coursework, six credits for research and thesis in the final semester, and a successfully completed and defended Master's thesis.

3.1.1. Coursework

To be eligible for the degree, an M.S. candidate (including 4+1 B.S./M.S. students) must complete 30 credits of course work beyond the Bachelor's degree, subject to all of the following conditions except where granted a waiver after petition to the Graduate Studies Committee. Credit hours for which the grade is below C-minus do not count toward a graduate degree.

GPA requirement moved to 3.1.3. The rest is just reorganized.

To be eligible for the degree, an M.S. candidate must complete 30 credits of course work beyond the Bachelor's degree, subject to all of the following conditions:

1. The student must maintain a GPA of 3.0 or better.
2. Coursework must be at or above the 600 level and exclusive of courses that the catalog designates as not counting towards mathematics graduate degrees.
3. Students in the 4+1 B.S./M.S. program only may count up to six credits of course work in the mathematical sciences, at or above the 600 level and exclusive of courses that the catalog designates as not counting towards mathematics graduate degrees, toward both their B.S. and M.S. degrees.

1. Coursework must be at or above the 600 level and exclusive of courses that the catalog designates as not counting towards mathematics graduate degrees.
2. A maximum of 3 credits of course work at the 600 level or above in non-MATH courses may be applied.
3. A maximum of 3 credits may be from a reading course (MATH 870).
4. For students who select the thesis option for the M.S., the 30 credit total must include 3 credit hours of research (MATH 868) and 3 credit hours of thesis (MATH 869), leading to a successfully defended Master's Thesis. Note that MATH 869 is normally taken for 6 credits. See Section 3.1.2.

4	A maximum of 3 credits of course work taken outside of the mathematical sciences may be applied. The use of any additional course work taken for credit outside of the department requires approval of the Graduate Studies Committee.	Students in the 4+1 B.S./M.S. program may count up to six credits of coursework in the mathematical sciences, at or above the 600 level and not otherwise restricted by the catalog, toward both their B.S. and M.S. degrees.
5	A maximum of 3 credits may be from a reading course (MATH 870). The use of additional reading course credits requires approval of the Graduate Studies Committee.	**3.1.2. Thesis (option for the M.S. degree)** The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her thesis advisor and the Thesis Committee. The Thesis Committee shall consist of three faculty and is chaired by the advisor. It is not required that a member of this committee be from outside the department. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages). The student is responsible for following the Graduate Office deadlines and procedures relating to the thesis, defense, and application for the degree. An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis. This defense will be open to the academic community.
6	For students who select the thesis option for the M.S., the 30 credit total must include 3 credit hours of research (MATH 868) and 3 credit hours of thesis (MATH 869), leading to a Master's Thesis. Note that MATH 869 is normally taken for 6 credits. The purpose of this option is to assess the student's ability to conduct and report original research on a particular area within the field of specialization and/or synthesize and critically analyze important issues in the field of specialization. The particular form of the thesis project (e.g., report of original research or critical review of and exposition on the literature) will be determined by the student in consultation with his or her Thesis Advisor and the Thesis Committee. The Thesis Committee shall consist of three faculty; it is not required that a member of the committee be from outside the department. After the topic(s) and project format have been determined, the student will have a maximum of one year to complete the written thesis (typically 50 to 60 pages). An oral defense will be scheduled following the Thesis Committee's evaluation of the thesis.	*We have consolidated and clarified these non-course requirements.* **3.1.3. Timetable and satisfactory progress** All students are subject to the regulations of the Office of Graduate and Professional Education. The OGPE sets specific policies regarding probationary status and satisfactory progress. In particular, a student must maintain a cumulative GPA of 3.0 or better or risk dismissal. A student must have a cumulative GPA of 3.0 or better in order to receive a graduate degree.

In addition to the Graduate Office regulations, the following regulations are specific to the Department of Mathematical Sciences. Except where noted otherwise, students seeking a waiver of any these regulations must petition the Graduate Studies Committee.

1.   Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), or departmental or university fellowships must observe the following course registration conditions each semester until reaching sustaining (candidacy) status:

a) A minimum of nine credits of graded coursework (not as "listener") is required. The sole routine exception is for students in the last semester, who may register for a minimum of six credits.

b) No more than nine credits of graded coursework may be taken without the permission of the Graduate Director. Students are permitted to register as "listener" for up to three credits beyond the nine graded credits.

2.   Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), and departmental or university fellowships may not be enrolled in any other degree program, at the University of Delaware or elsewhere, while receiving such support.

3.   Students receiving support through Graduate Assistantships or Teaching Assistantships must perform all required duties satisfactorily, as determined by the Associate Chair of the department or his/her designee. Satisfactory progress for the M.S. degree is defined as meeting all minimum registration and grade requirements. Those who wish to take the thesis option should have selected a thesis advisor and Thesis Committee before the start of the fourth semester of study.

Full-time students should meet the requirements for the M.S. after four semesters of study. Financial aid is normally not extended to terminal M.S. students past four semesters.

Requirements for the Ph.D. in Mathematics and Applied Mathematics	3.2. Requirements for the Ph.D. in Mathematics and Applied Mathematics An outline of the degree requirements for the Ph.D. is as follows. 1. Meet the coursework requirement (section 3.2.1). 2. Pass the Preliminary Examination requirement (section 3.2.2). 3. Select a Dissertation Committee and pass the Candidacy Examination (see section 3.2.3). 4. Complete two semesters of experience in teaching undergraduate students, either as teaching assistant or as instructor of record. 5. Complete 9 credits of MATH 969 (Doctoral Dissertation). These credits are not included in the coursework requirement. 6. Complete and successfully defend a dissertation (section 3.2.4). 3.2.1. Coursework There are two options for the coursework requirement: standard and accelerated. 3.2.1.1. Standard requirement Complete 48 credits, subject to the following conditions:
1 Complete 48 credits of coursework, including: a At least 27 credits of MATH courses at the 600 level or above, exclusive of courses designated in the catalog as not counting towards graduate degrees in mathematics. b A maximum of 27 credits of MATH courses at the 600 level. c A maximum of 6 credits of MATH 868 (Research). d A maximum of 6 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Committee. 2 Maintain a GPA of 3.0 or better.	1. At least 42 credits in MATH courses at the 600 level or above, exclusive of courses designated in the catalog as not counting towards graduate degrees in mathematics. 2. A maximum of 27 credits of MATH courses at the 600 level. 3. A maximum of 12 credits total from MATH 868 (Research) and MATH 870 (Reading) combined. 4. A maximum of 6 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Committee. *2,3,4 moved below. 5-8 moved above.*

3 Fulfill the Preliminary Examination requirement (see Section 4). Students entering with only a Bachelor's degree must complete this requirement by the beginning of the fourth semester of study. Students entering with a Master's degree must complete this requirement by the end of the second semester of study. 4 Pass the oral Candidacy Examination (see Section 5). 5 Select a Dissertation Committee, subject to the approval of the Graduate Studies Committee. 6 Complete two semesters of experience in teaching undergraduate students, or obtain a waiver from the Graduate Studies Committee. 7 Complete 9 credits of MATH 969 (Doctoral Dissertation) after admission to candidacy. These credits are not included in the 48-credit requirement. 8 Complete and successfully defend a dissertation. The coursework requirements are a superset of those for the Master's degree. An M.S. degree is awarded once the requirements for it have been met. The University's Graduate Catalog specifies additional regulations for the Ph.D.	These coursework requirements are a superset of those for the Master's degree. An M.S. degree is awarded once the requirements for it have been met. ***The accelerated requirement is entirely new. Please see the rationale on the Faculty Senate form.*** 3.2.1.2. Accelerated requirement This option is available only to those who enter the program with a Master's degree in Mathematics or Applied Mathematics. To qualify for the accelerated coursework requirement, the student must successfully complete the entire Preliminary Exam requirement (section 3.2.2) before the start of the first semester (that is, by passing all required exams on the first possible date). Such an attempt at the exams counts as one of the student's regular allowed attempts. Upon successful completion of the accelerated Preliminary Exam requirement, the accelerated course requirement is 30 credits, subject to the following conditions. 1. MATH 600, MATH 602, and MATH 672 may not be counted towards the requirement. 2. At least 24 credits of MATH courses at the 600 level or above, exclusive of courses designated in the catalog as not counting towards graduate degrees in mathematics. 3. A maximum of 9 credits of MATH courses at the 600 level.

	4. A maximum of 12 credits total from MATH 868 (Research) and MATH 870 (Reading) combined. 5. A maximum of 3 credits at the 600 level or above in non-MATH courses, unless special permission is granted in advance by the Graduate Committee.
	Dissertation moved to 3.2.4.
Dissertation Students are advised to select a thesis adviser by no later than the end of the fifth semester of study. The thesis adviser will guide the student's research and preparation of the dissertation. The dissertation is expected to reflect the results of original, significant research written in a literate and scholarly manner worthy of publication. The student must defend his or her dissertation before a thesis committee consisting of the student's thesis adviser and no less than three and no more than five additional members. One member of the thesis committee must be from a different academic unit, or from outside of the University of Delaware. The student's dissertation must be submitted to the department's graduate office at least two weeks prior to the oral defense. The time, date, and place of the oral defense will be announced to the faculty, and the oral defense will be open to the academic community. *Sustaining status* Once a student has completed all the course requirements, passed the Preliminary and the Candidacy Examinations, and registered for 9 credits of dissertation (MATH 969), the student is required to maintain his/her matriculation in the degree program by registering for Doctoral Sustaining (UNIV 999). A student must be registered in the semester in which the degree is awarded.	*Moved to 3.2.5.*
Preliminary Examination requirement	3.2.2. Preliminary Examination

All students who wish to obtain a Ph.D. degree must take a written examination called the Preliminary Examination. The Preliminary Examination contains two subject areas: Real and Complex Analysis, which covers material from MATH 600 and MATH 602, and either Linear Algebra, which covers material from MATH 672, or Numerical Linear Algebra, which covers material from MATH 612. Note that material outside the course syllabi may be on the syllabus for the exams, as given below.

The Preliminary Exam is given twice each year, generally in the weeks just before the start of the fall and spring semesters. For students entering with a Bachelor's degree, it is required that the Preliminary Exam be passed by the beginning of the fourth semester of study. Providing it is before the beginning of the 4th semester, a student may take each subject area of this exam up to two times. Only the area not passed needs to be repeated. Students who fail to pass both subject areas of the Preliminary Exam by the beginning of the fourth semester will be asked to leave the graduate program.

Student's entering with a Master's degree must pass the Preliminary Exam by the start of the third semester of study. Providing it is by the start of the third semester of study, a student with a Master's degree may take each subject area of this exam up to two times. Only the area not passed needs to be repeated. Students entering with a Master's degree who fail to pass both subject areas of the Preliminary Exam by the end of the second semester will be asked to leave the graduate program.

The syllabus to be covered by each examination is included in the following subsections. You may obtain copies of past examinations and the syllabus from the Graduate Program Secretary in the department's graduate office. Note also that the references cited on the following pages are intended to indicate the material to be covered. It is not necessarily intended that the student study all the references.

Real and Complex Analysis

All students who wish to obtain a Ph.D. degree must take a written examination called the Preliminary Examination. The Preliminary Examination contains two subject areas: Real and Complex Analysis, which covers material from MATH 600 and MATH 602, and either Linear Algebra, which covers material from MATH 672, or Numerical Linear Algebra, which covers material from MATH 612. Note that material outside the course syllabus may be on the syllabus for the exam.

The Preliminary Exam is given twice each year, generally in the weeks just before the start of the fall and spring semesters. The Preliminary Exam requirement must be successfully met by the beginning of the fourth semester of study. Providing it is before the beginning of the fourth semester, a student may take each subject area of this exam up to two times. Only the area not passed needs to be repeated. Students who fail to pass both subject areas of the Preliminary Exam by the beginning of the fourth semester will not be permitted to become a PhD candidate and may lose financial aid support after the fourth semester. However, such students are still eligible for the M.S. degree.

The different timeline for those entering with M.S. is deleted.

The syllabus to be covered by each examination, including suggested references, is kept by the department and available on the web and by request. You may obtain copies of past examinations and the syllabus from the Graduate Program Secretary.

Topics covered on the exam include the following. Many of these topics are discussed in Math 600 and Math 602. References are given below.

1. Metric Spaces: open and closed sets, compactness, connected sets, complete sets, continuous functions on metric spaces ([1], Chapters 3 and 4).

2. Continuity and Differentiation: mean value theorem, Rolle's theorem, Taylor's formula, derivatives of vector valued functions, uniform continuity, monotonic functions, functions of bounded variation ([1], Chapters 5 and 6).

3. Integration: Sets of measure zero, Lebesgue's criterion for the existence of Riemann integrals, the Lebesgue integral in $R1$, convergence theorems, measurable functions. Fubini's theorem, measurable sets, the space $L2(I)$, the Riesz-Fischer theorem. ([1], Chapter 10)

4. Infinite Sequences and Series: Limit superior and limit inferior, monotonic sequences, alternating series, absolute and conditional convergence, power series, tests for convergence of series, rearrangement of series ([1], Chapter 8).

5. Sequences of Functions: Pointwise convergence, uniform convergence, uniform convergence and continuity, differentiability and integration ([1], Chapter 9).

6. Functions of Several Variables: Directional derivatives, the total derivative, Jacobians, inverse function theorem, implicit function theorem, extrema problems ([1], Chapters 12 and 13).

7. Vector Calculus: Line integrals, Green's theorem, surface integrals, Stokes theorem, the divergence theorem ([2], Chapters 10, 11 and 12).

8. Analytic Function Theory: Analytic functions, Cauchy's theorem, Cauchy's integral theorem, the maximum principle, the identity theorem, Taylor and Laurent series, the residue theorem, elementary conformal mappings ([1], Chapter 16).

References:

1. Tom Apostol, *Mathematical Analysis*, 2nd edition, Addison Wesley, 1974.

2   Tom Apostol, *Calculus*, Vol. 2, 2nd
     edition, John Wiley, 1969.

Linear Algebra

Topics covered on the exam include the
following. Most of these topics are discussed in
Math 672. References are given below.

1   Subspaces, bases and dimension
    (Chapters 1 - 2, [1]).
2   Linear transformations and matrix
    representations (Chapter 2, [1]; Chapters
    III - IV, [3]).
3   Determinants and rank (Chapter VI,
    Section V.3, [3]).
4   Inner products and inner product spaces
    (Chapter 6, [1]).
5   Linear functionals, adjoints, and dual
    spaces (Chapter 6, [1]).
6   Bilinear forms, Hermitian forms, and
    quadratic forms (Chapter V, [1]; Sections
    IV.A - IV.C, [2]).
7   Eigenvalues, eigenvectors, and
    characteristic polynomials (Sections
    VIII.1 - VIII.2, [3]).
8   Cayley-Hamilton Theorem (Sections X.1
    - X.2, [SL]; Sections III.A - III.C, [2]).
9   Operators on inner product spaces and
    Spectral Theorems (Chapter 7, [1];
    Section VIII.3 - VIII.6, [3]; Section III.D,
    [2]).
10 Jordan Canonical Form (Chapter XI, [3];
    Section III.E, [2]; Chapter 8, [1])

References:

1   Sheldon Axler, {\it Linear Algebra Done
    Right, Second Edition}, Springer-Verlag,
    1997.
2   Morton L. Curtis, {\it Abstract Linear
    Algebra}, Springer-Verlag, 1990.
3   Serge Lang, {\it Linear Algebra, Third
    Edition}, Springer-Verlag, 1987.

Numerical Linear Algebra

Direct and iterative methods for the solution of
linear systems, LU factorization, row pivoting,
stable QR factorization, solution of linear least
squares problems by normal equations and QR,
stability and conditioning issues, power and
inverse iterations, QR iteration, singular value
decomposition, simple iterations for sparse
matrices, conjugate gradients and other Krylov
subspace iterations.

References:

1. L.N. Trefethen and D. Bau, III, *Numerical Linear Algebra*, SIAM (see I, II, III)
2. J.W. Demmel, *Applied Numerical Linear Algebra*, SIAM (Sections 2.1-2.4, 3.1-3.3, 4.4, 6.5, 6.6)
3. A. Quarteroni, R. Sacco and F. Saleri, *Numerical Mathematics*, Springer (Sections 3.1, 3.3, 4.1-4.3, 5.2-5.5, 5.8)

Candidacy Examination requirement

This oral examination can take place at any time mutually agreed upon by the Examining Committee and student. A student entering with a Bachelor's degree must pass the Candidacy Examination by the beginning of his or her sixth semester of study. A student entering with a Master's degree must pass the Candidacy Examination by the end of his or her fourth semester of study.

The student should take the following steps to organize a Candidacy Examination and is advised to allow ample time for the process:

1. Contact four faculty to act as an Examining Committee. Since the student must be examined on two topics, normally two faculty will be expert in each area. The thesis adviser should be a member of the committee if the student has already chosen one. Students are strongly encouraged to choose a thesis adviser prior to forming an Examining Committee.
2. After the faculty agree to serve as examiners the student should contact the Director of Graduate Studies at least six weeks in advance of the proposed examination date and supply the following information:
   a. Date of the exam.
   b. Names of the examiners making up the Examining Committee.
   c. Choice of topics. Note that the topics must contain material from at least one 8xx level course.

3.2.3. Candidacy Examination

This exam has changed a great deal, but does not apply to MS students.

The purpose of the Candidacy Examination is to assess the student's readiness to undertake and complete a research project for the doctoral thesis. Each student must pass the Candidacy Examination by the beginning of his or her sixth semester of study. For students using the accelerated coursework requirement, the Candidacy Exam should be completed before the start of the fourth semester. After passing the exam, students are encouraged to pursue Admission to Candidacy with the Office of Graduate Studies. A student who fails the Candidacy Examination twice will be eligible for the M.S. degree but not the Ph.D.

Prior to taking the Candidacy Examination, the student must choose a PhD advisor and research area. The Examination consists of two parts: (1) a public presentation (not to exceed 30 minutes) about the research area, including a summary of a relevant published paper, and (2) an oral examination (not to exceed two hours) by members of the student's Examining Committee. The student should take the following steps to organize a Candidacy Examination and is advised to allow ample time for the process.

1. Contact four faculty members to act as an Examining Committee. The thesis advisor must be the Chair of the committee. The choices of committee members should be discussed with the thesis advisor.
2. Complete and submit the Candidacy Exam Proposal at least eight weeks before the

3   Final approval of the Examining Committee and topics rests with the Graduate Studies Committee. Only after the Graduate Studies Committee has approved the Examining Committee and topics may the exam take place.

The scheduling, topics and composition of the Examining Committee will be announced to the faculty. It is the responsibility of the examining committee to decide the duration of the exam (typically 2-3 hours). Each member of the Examining Committee should report the results of the exam and a recommendation of Pass or Fail with written justification to the Director of Graduate Studies within two days of the exam. A final decision on the outcome of the exam is the responsibility of the Graduate Studies Committee. A student must choose 2 topics from the following table:

Topic	Relevant courses
Algebra	MATH650 and MATH845
Applied Mathematics	MATH616, MATH617, and MATH810/MATH835
Combinatorics	MATH688 and MATH888
Numerical Analysis	MATH611, MATH612, and MATH817/MATH838
Probability	MATH630, MATH631, and MATH850
Functional Analysis & PDE	MATH806 and MATH836

Another subject area may be substituted for one in the table above by petition to the Graduate Studies Committee. The substituted subject area must be based on at least two graduate level courses, and this petition must be supported by at least one faculty member who is also a member of the student's Examining Committee.

A second and final attempt is permitted following a failed attempt. Should a candidate fail only one topic of the Candidacy Exam, the candidate need only retake the failed topic. In no case will a candidate be allowed to take the Candidacy Examination more than twice. Students who fail the Candidacy Examination are eligible for the M.S. degree.

requested examination date (or two weeks before a second attempt). The proposal must include:
a) Date of the exam.
b) A list of up to ten specific topics relevant to the student's research area, to be used as a guide to the oral examination. Typically these will be topics chosen from the catalog descriptions or syllabi of the courses taken by the student.
c) Full reference (author, title, publication data) of the research paper that will be presented by the student.
d) Names and signatures of the thesis advisor and all other members of the Examining Committee.
3.   Receive approval or a request for revisions from the Graduate Studies Committee. Only after the Graduate Studies Committee has approved the proposal may the exam take place. The scheduling and composition of the Examination will be announced to the faculty. Once the Examination has taken place, each member of the Examining Committee shall report the results, including a recommendation of Pass or Fail with written justification, to the Director of Graduate Studies within two business days.

A decision on the outcome of the Examination is the responsibility of the Graduate Studies Committee. Following a failed attempt at the exam, a student is permitted a second attempt. The same procedures should be followed. The research advisor, research area, Examining Committee, and published paper for presentation should all be identical to those for the first attempt; changes will be made only after petition to and at the discretion of the Graduate Studies Committee.

	This material does not apply to the MS. 3.2.4. Dissertation Students must select a dissertation advisor before completing the Candidacy Examination. The dissertation advisor will guide the preparation for the examination, including selection of the examining committee. Notify the Graduate Studies assistant when you have selected a dissertation advisor, or to change your selection at any time prior to filing the Recommendation to Candidacy form. The dissertation is expected to reflect the results of original, significant research written in a literate and scholarly manner worthy of publication. The student must defend his or her dissertation before a Dissertation Committee consisting of the student's dissertation adviser and no less than three and no more than five additional members. One member of the Dissertation Committee must be from a different academic unit, or from outside of the University of Delaware. This committee must be designated, with members' signatures, on the Recommendation to Candidacy form. The form must be filed again if the student wishes to change the Dissertation Committee. The student is responsible for following the Graduate Office deadlines and procedures relating to the dissertation, defense, and application for the degree. The time, date, and place of the oral defense will be announced to the faculty, and the defense will be open to the academic community. *This material has been moved, but does not apply to the MS.* 3.2.5. Timetable and satisfactory progress All students are subject to the regulations of the Office of Graduate and Professional Education. The OGPE sets specific policies regarding probationary status and satisfactory progress. In particular, a student must maintain a cumulative GPA of 3.0 or better or risk dismissal. A student must have a cumulative GPA of 3.0 or better in order to receive a graduate degree. In addition to the Graduate Office regulations, the following regulations are specific to the

Department of Mathematical Sciences. Except where noted otherwise, students seeking a waiver of any these regulations must petition the Graduate Studies Committee.

1. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), or departmental or university fellowships must observe the following course registration conditions each semester until reaching sustaining (candidacy) status:

a) A minimum of nine credits of graded coursework (not as "listener") is required.

b) No more than nine credits of graded coursework may be taken without the permission of the Graduate Director. Students are permitted to register as "listener" for up to three credits beyond the nine graded credits.

More than one student has enrolled in M.S. programs in other departments while taking support for our Ph.D., without permission of the department or even the advisor.

2. Students receiving financial support through Graduate Assistantships (GA), Research Assistantships (RA), Teaching Assistantships (TA), and departmental or university fellowships may not be enrolled in any other degree program, at the University of Delaware or elsewhere, while receiving such support.

3. Students receiving support through Graduate Assistantships or Teaching Assistantships must perform all required duties satisfactorily, as determined by the Associate Chair of the department or his/her designee.

In addition to the regulations above, a timeline for satisfactory progress toward the Ph.D. is as follows.

Standard coursework option:

1. Pass the Preliminary Examination (both subjects) and file a Change of Classification form before the beginning of the fourth semester of study.

2. Complete the coursework requirements of the M.S. degree by the end of the fourth semester of study. The M.S. degree will be awarded at this time.

3. Select a dissertation advisor and Dissertation Committee, file a plan for the

	Candidacy Examination, and successfully complete the Candidacy Examination before the start of the sixth semester of study.
	4. Submit the Recommendation to Candidacy form and complete 9 credits of MATH 969.
	5. Once you have completed MATH 969, you are released from minimum course enrollment requirements. Instead, you will be enrolled in Doctoral Sustaining (UNIV 999). A student must be registered in the semester in which the degree is awarded.
	Accelerated coursework option:
	1. Pass the Preliminary Examination (both subjects) and file a Change of Classification form at the start of the first semester of study.
	2. Complete the coursework requirements of the M.S. degree by the end of the second semester of study. The M.S. degree will be awarded at this time.
	3. Select a dissertation advisor and Dissertation Committee, file a plan for the Candidacy Examination, and successfully complete the Candidacy Examination before the start of the fourth semester of study.
	4. Submit the Recommendation to Candidacy form and complete 9 credits of MATH 969.
	5. Once you have completed MATH 969, you are released from minimum course enrollment requirements. Instead, you will be enrolled in Doctoral Sustaining (UNIV 999). A student must be registered in the semester in which the degree is awarded.
	All students are reviewed for satisfactory progress by the Graduate Director after each semester. A student who, in the determination of the Graduate Director, is not making satisfactory progress may receive a suspension or termination of financial support, suspension of registration status, or dismissal from the program. Students may appeal the Director's decision to the rest of the Graduate Committee and then to the Chair of the department.
	==*Nothing changed in assessment.*==
Assessment All graduate programs in the Department of Mathematical Sciences are designed to take high-quality students, with a strong background in	Assessment All graduate programs in the Department of Mathematical Sciences are designed to take high-quality students, with a strong background in

mathematics, and transform them into full-fledged practitioners of the discipline of mathematics. For students seeking the M.S. we seek to broaden and deepen their knowledge of mathematics and properly train them for a mathematics related career. For students seeking the Ph.D. we again seek to broaden and deepen their knowledge of mathematics and also to train them as practitioners so that they may impact the discipline in a deep and meaningful way.

Learning Outcomes

Our program focuses on five key learning objectives, or outcomes. These are:

- Graduates should be able to conduct original, quality research in particular area of specialization.
- Graduates should be able to synthesize and critically analyze important issues in their field and understand and appreciate how their work fits into the larger body of science.
- Graduates should be able to communicate mathematical proofs, ideas, and concepts orally.
- Graduates should be able to communicate mathematical proofs, ideas, and concepts in writing.
- Graduates should be able to demonstrate both breadth and depth of mathematical knowledge.

Assessment Plan

In order to ensure that our graduate programs are meeting the objectives stated above, our learning outcomes are continually monitored. Changes resulting from this assessment are implemented periodically. For each of the five learning objectives, we rely upon a variety of direct and indirect measurement tools. A sample is listed below for each objective.

Objective	Information sources	Measuring instruments
Are graduates conducting original, high quality research within their field of specialization?	Student thesis or dissertation, student publications, and conference presentations.	Rubrics that quantify student research work for a thesis, dissertation, or conference presentation. Results are used

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1.2. Assessment Plan

In order to ensure that our graduate programs are meeting the objectives stated above, our learning outcomes are continually monitored. Changes resulting from this assessment are implemented periodically. For each of the five learning objectives, we rely upon a variety of direct and indirect measurement tools. A sample is listed below for each objective.

Objective	Information sources	Measuring instruments
Are graduates conducting original, high quality research within their field of specialization?	Student thesis or dissertation, student publications, and conference presentations.	Rubrics that quantify student research work for a thesis, dissertation, or conference presentation.

		to compare and contrast student work.
Are students able to synthesize and critically analyze important issues in their field and understand and appreciate how their work fits into the larger body of science?	Student theses, oral candidacy examinations, and oral theses defenses.	Rubric used by faculty serving on thesis committees.
Are students able to communicate mathematical proofs, ideas, and concepts orally?	Student evaluations of their performance as teaching assistants, oral candidacy examinations, oral theses defenses, talks in the Graduate Student Seminar, and talks at conferences.	Rubrics for oral communication used by faculty for student presentations and a teaching observation form.
Are students able to communicate mathematical proofs, ideas, and concepts in writing?	Preliminary examinations, publications by students and a written thesis.	Common rubric for evaluating student writing.
Are students able to demonstrate both breadth and depth of mathematical knowledge?	Results of preliminary examinations, results of oral candidacy examinations, and theses defenses.	Rubric to evaluate preliminary examinations, candidacy examinations, and faculty feedback on these examinations.

		Results are used to compare and contrast student work.
Are students able to synthesize and critically analyze important issues in their field and understand and appreciate how their work fits into the larger body of science?	Student theses, oral candidacy examinations, and oral theses defenses.	Rubric used by faculty serving on thesis committees.
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Guidelines for the Teaching Assistant

1. Teaching Assistants are expected to attend lectures in the course in which they are assisting, if asked to do so by the

instructor. They are expected to know the content of the course, methods of teaching used by the professor, and the relative importance of the subject matter.

2   Teaching Assistants are responsible for assisting the instructor in charge of the course in the formulation, administration and grading of quizzes and examinations given in the course. Specific responsibilities will be discussed with the professor in charge.

3   Quiz sections should be conducted along guidelines specified by the professor in charge of the course. The quiz sections are an integral part of each course and are expected to meet for the full 50 minutes in the assigned classroom. Teaching Assistants may not dismiss class early unless directed to do so by the professor in charge of the course.

4   The Teaching Assistant will be informed what part he or she will play in the final exam process. The assignment of final course grades is the responsibility of the instructor in charge of the course. No Teaching Assistant may leave campus until final grades for their course have been turned in to the Registrar's Office, which may happen after the end of the final exam period.

5   At the beginning of the semester, instructors and Teaching Assistants together should plan office hours and then announce office hours to their classes.

6   Teaching Assistants are expected to spend no more than 20 total hours per week in their assistantship duties. Students who are asked to spend more than 20 hours per week should contact the Associate Chair.

7   The TA must not give out information on student performance (including grades) over the telephone to anyone, or by email to anyone except the student at his or her official university address. The TA cannot return graded final exams. A student who wishes to see their graded exam must make an appointment to meet with the teaching assistant.   Final exams

Two semesters of in-classroom teaching, including both teaching assistant (TA) and instructor assignments, are a requirement for the Ph.D. The department teaches a substantial fraction of all undergraduate students on campus each year and expects a high level of performance from all who contribute. Keep in mind that satisfactory progress towards your degree includes acceptable performance of all required duties.

All teaching is assigned and overseen by the Associate Chair of the department, who maintains a detailed description of duties and expectations for TAs. Contact the Associate Chair if you have not received a copy of those guidelines. Course instructors and coordinators also play important roles in TA oversight.

Some courses, including many of those that use TAs, are taught in a lecture/discussion format. The TA duties in such a course often include running one or more discussion sessions each week for relatively small numbers of students. Other TA duties might include grading homework, holding office hours, proctoring and grading exams, answering email questions, and more. It is the TA's responsibility to determine and follow the instructor's specific expectations for each section assigned.

Plan to be on campus during the entire semester for your teaching assignment, except for official breaks in the academic calendar. Absences during the semester must have authorization from the Associate Chair in advance. Never schedule a long departure from Newark before the last day of the final exam period. You must attend all the classroom meetings and office hours that you are required to conduct. Notify the department staff as soon as possible if you must miss a section meeting or office hours due to illness or emergency.

Your contract states that you may be required to perform up to 20 hours of work per week as a TA. In addition to the activities listed above, you will need to budget time for preparation and for thoughtful development of your teaching. You may also be required to proctor exams in other courses by the Associate Chair. If you are consistently devoting more than 20 hours per week to your TA duties, first speak with your supervising instructor(s) or course coordinators,

must be kept for one year after students take them. 8 Renewal of assistantships is not automatic. Continued support is contingent upon appropriate progress toward a degree and satisfactory performance of assigned duties as a graduate assistant. 9 Teaching Assistants may not be absent during any semester without permission of the Associate Chair.	and then speak with the Associate Chair if the situation still cannot be resolved. Students who perform TA duties well may get opportunities to teach as instructor of record during Winter or Summer sessions. These assignments are made by the Associate Chair. If you are instructor for a section that has fewer than ten students after the first meeting, notify the Associate Chair immediately. In addition to offering extra income, instructor assignments should be seen as critical professional development opportunities. You may need to show a proven track record of development in your teaching to obtain an academic job. Consider requesting a classroom observation from faculty or the campus' teaching effectiveness center.
Miscellaneous information **Contact information.** Please be sure that your phone number and local address, and an emergency contact phone number, are on file with the university or Graduate Studies secretary. Keep this information up to date at all times. **Class Enrollments.** Limits for all classes are established by the Department. For winter and summer sessions, if you are instructor for a section that does not have at least ten students after the first day, contact the Associate Chair. **Class Supplies**. TA classroom supplies (as opposed to personal supplies) may be secured from the workroom supply cabinet (obtain the key from 501 Ewing). These supplies are for the classes you are *teaching*, not the classes you are *taking*. **Computer Accounts**. As students you are automatically given a university email account (udel.edu address). For instructions on activating the account, see www.udel.edu/help. You will also get a departmental network account and email address (math.udel.edu address). See the computing staff in Ewing to sign up for your account, and to ask questions about other available computing resources for specialized research needs. *It is important that you check both the udel.edu and the math.udel.edu for communcations about university and departmental business.* One recommended method is to have one of the accounts	7. Miscellaneous information ==Some of this information was far out of date.== Contact information. Please be sure that your phone number and local address, and an emergency contact phone number, are on file with the university or Graduate Studies secretary. Keep this information up to date at all times. Class supplies. TA classroom supplies (as opposed to personal supplies) may be secured from the workroom supply cabinet. These supplies are for the classes you are teaching, not the classes you are taking. Computer accounts. As students you are automatically given a university email account (udel.edu address). For instructions on activating the account, see www.udel.edu/help. You will also get a departmental network account and email address (math.udel.edu address). See the computing staff in Ewing to sign up for your account, and to ask questions about other available computing resources for specialized research needs. It is important that you check both the udel.edu and the math.udel.edu accounts for communications about university and departmental business. One recommended method is to have one of the accounts automatically forward all incoming email to your preferred

automatically forward all incoming email to your preferred account. Use your computer account responsibly and for work-related tasks only, or your computer account may be limited or revoked.

Typing of Tests. Office staff do *not* type or typeset exams or any other materials for students.
Keys. The keys issued to you will be for your office in Ewing Hall and outside entrances to Ewing Hall. Your office key opens Ewing public areas: work room, computer terminal room, and the conference room.
Proctoring of Exams. You may be required to assist in the proctoring of midterm exams and final exams in courses with common exams (e.g. M010, M115, M221, etc.). Failure to do so as assigned will affect your winter/summer teaching assignments and will jeopardize future support from the department.
Pay. You are paid twice monthly, on the 15th and the last day of the month. In order to receive your first check, you will need to fill out a W--4 form and an I--9 form for tax purposes. Foreign students who receive temporary Social Security Numbers will need to fill out a second W--4 form when they receive their permanent Social Security Numbers. These students must also change their UD ID cards. All graduate students must use direct deposit, which requires filing a form that you can obtain from the staff. Your pay stub can be viewed online. Your stipend is automatically paid continuously through all nine months of the academic year, including the period between fall and spring semesters. If you are paid through an additional winter session contract, the amount will be added to your other stipend over the winter session period. Summer session payment is handled through separate contracts for additional work duties. Notify the Associate Chair if you are interested in teaching in winter or summer sessions.
Telephone. Any calls from your office phone that incur charges (long distance or international) must be paid for by the caller
Textbooks. Desk copies may be obtained in 501 Ewing by TA's for courses in which you are a teaching assistant. These books must be returned to the department immediately after the course is over.

account. Use your computer account responsibly and for work-related tasks only, or your computer account may be limited or revoked.
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Pay. You are paid twice monthly, on the 15th and the last day of the month. In order to receive your first check, you will need to fill out a W--4 form and an I--9 form for tax purposes. Foreign students who receive temporary Social Security Numbers will need to fill out a second W--4 form when they receive their permanent Social Security Numbers. These students must also change their UD ID cards. All graduate students must use direct deposit, which requires filing a form that you can obtain from the staff. Your pay stub can be viewed online. Your stipend is automatically paid continuously through all nine months of the academic year, including the period between fall and spring semesters. If you are paid through an additional winter session contract, the amount will be added to your other stipend over the winter session period. Summer session payment is handled through separate contracts for additional work duties. Notify the Associate Chair if you are interested in teaching in winter or summer sessions.
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Copying. Photocopying is available at no charge only for work in any course in which you are a teaching assistant or instructor. Students must reimburse the department for the cost of any

Copying. Photocopying is available at no charge for work in any course in which you are a teaching assistant or instructor. Students must reimburse the department for the cost of any photocopying for personal use. The photocopy machines should not be used for large copy jobs. Please see the office staff for any copy job exceeding 150 total pages.	photocopying for personal or research use. The photocopy machines should not be used for large copy jobs. Please see the office staff for any copy job exceeding 150 total pages.

Checklist for Curriculum Proposals

_X_. 1. Are all **signatures on the hard copy of the proposal?**

_X_. 2. Is the **effective date** correct?

_X_. 3. Is the **rationale** for the proposal consistent with the changes proposed?

_N/A 4. Does the proposed **number of credits** match the stated
        number?

N/A. 5. Have affected units been identified and contacted? Are required **support letters** attached?

N/A. 6. Is a **resolution** necessary? If so, is it attached?

(Necessary for: establishing a major; disestablishing a major; a name change to any program with permanent status; a name change to a department or college; a transfer or creation of any department; request for permanent status).

_Y_. 7. Are all **courses (required or referenced)** in the UDSIS Inventory or in the approval process?

N/A. 8. Are all **university requirements** correctly specified?

        ___. A. Breadth requirements.

        ___. B. Multicultural requirement.

        ___. C. Writing requirement.

        ___. D. DLE requirement.

N/A. 9. Are all **college requirements** correctly specified?

_Y_. 9. Is a **side-by-side comparison** provided?