



# **University of Vermont Handbook for Graduate Studies in Mathematics**

Department of Mathematics and Statistics  
November 30, 2023

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# 1 Preamble

This Handbook contains information about the Graduate Program in Mathematics at the University of Vermont. It is useful for potential students, current students, advisors, and professors. Questions, comments or suggestions may be relayed to the Mathematics Graduate Program Director, listed below. The department phone number is (802) 656- 2940. Additional information can be found at the department website at <https://www.uvm.edu/cems/mathstat> and an online, up-to-date version of this document can be found here.

The Department of Mathematics and Statistics offers programs towards the Master of Science (M.S.) and Doctor of Philosophy in the Mathematical Sciences (Ph.D.) degrees. We also offer an Accelerated Master's Program (A.M.P.) which combines studies towards the Bachelor of Science (B.S.) and Master of Science degrees into one 5-year program. The Statistics Program also offers Master's Degrees in Biostatistics and Statistics. This handbook does not cover those degrees.

Statistics students should contact the Statistics Graduate Program Director. The curriculum for all degrees has two main streams: pure mathematics and applied mathematics, and in addition our PhD offers a stream in statistics. This handbook only covers the mathematics streams.

## 2 List of Contacts

The following is an up-to-date list of relevant people in the department, college and graduate college for the academic year 2023-2024. The remainder of this document will refer to them by role, not by name.

### Department of Mathematics and Statistics

Title	Name	Email
Department Chairperson	Jianke Yang	<a href="mailto:Jianke.Yang@uvm.edu">Jianke.Yang@uvm.edu</a>
Vice Chairperson	Helen Read	<a href="mailto:Helen.Read@uvm.edu">Helen.Read@uvm.edu</a>
Grad. Prog. Dir. (Math.)	Joan Rosebush	<a href="mailto:jrosebus@uvm.edu">jrosebus@uvm.edu</a>
Grad. Prog. Dir. (Stat.)	Richard Single	<a href="mailto:Richard.Single@uvm.edu">Richard.Single@uvm.edu</a>
Department Administrator	Emily Cummings	<a href="mailto:Emily.Cummings@uvm.edu">Emily.Cummings@uvm.edu</a>

### College of Engineering and Mathematical Sciences

Title	Name
Dean of the College	Linda Schadler
Assistant Dean	Douglas Dickey
Executive Asst. to the Dean	Jennifer Main

Current students should use [info@cems.uvm.edu](mailto:info@cems.uvm.edu) for all CEMS questions.

### Graduate College

Title	Name
Dean of the College	Holger Hoock
Associate Dean	Alicia Ebert
Assistant Dean	Dan Harvey
Student Services (Academic)	Bethany Sheldon
Student Services (Financial)	Sean Milnamow

Current students should use [gradcoll@uvm.edu](mailto:gradcoll@uvm.edu) for all Graduate College questions.

### 3 Mathematics Graduate Faculty

The mathematics faculty at UVM has strengths in several areas (see below), and members are actively involved in research in their areas of expertise. The department and university have a friendly, collegial atmosphere in which students have ample opportunity to talk with professors on an informal basis. We strive to offer an education that is comprehensive yet tailored to the individual needs of our students. Students are invited to participate in the ongoing research seminars in number theory, applied mathematics, complex systems and combinatorics. These include participants from St. Michael's College, Middlebury, and other institutions.

A list of all mathematics and statistics faculty members is available from the department's homepage. There you will also find links to personal web pages of individual faculty members and graduate students. These webpages contain much more information about the individuals including, in many cases, complete copies of their recent publications.

#### 3.1 The Graduate Faculty and Their Interests

Name	Interests
James Bagrow	Network/Data Science, Complex Systems, and Machine Learning
Daniel Bentil	Applied Mathematics, Modeling, Biomathematics
Chris Danforth	Chaos, Modeling, Complex Systems, Computational Social Science
Taylor Dupuy	Arithmetic Geometry, Differential Algebra, Applied Model Theory
Taras Lakoba	Stability of Numerical Methods, Perturbation Theory, Nonlinear Waves, Fiber Optics
Michael Miller Eismeier	Geometric Topology, Homological Algebra, Gauge Theory, Geometric Analysis
Alice Patania	Computational Topology
Puck Rombach	Combinatorics and Graph/Network Theory
Christelle Vincent	Number Theory and Arithmetic Geometry
Greg Warrington	Combinatorics
Mike Wilson	Fourier Analysis
Jianke Yang	Non-Linear Waves, Non-Linear Optics, Numerical Methods
Jun Yu	Applied Mathematics, Modeling, Biomathematics

In addition to the mathematics faculty listed above, students may draw upon the statistics faculty: Jeff Buzas, Bernard (Chip) Cole, Abigail Crocker, Rich Single, and Jean-Gabriel Young.

Faculty with secondary appointments in our department are: Peter Callas, Laurent Hébert-Dufresne and George Pinder.

Our department also includes lecturers, adjunct faculty, and emeritus faculty who can play valuable roles in graduate education and training. See the department webpage for a complete list.

## 4 University Information

The Department of Mathematics and Statistics (656-2940) is situated administratively in the College of Engineering and Mathematical Sciences (CEMS). College offices are located in Votey Hall.

The Graduate College (656-3160), located in the Waterman building, coordinates graduate studies across the University. Its staff can help resolve difficulties that cannot be managed within our department. Along with the Mathematics Graduate Director, they will be able to help you with such things as: format of theses and dissertations, your progress through the program requirements as you near graduation, changes in your program, transfer credits, and academic standing. We encourage you to familiarize yourself with their timeline for graduation.

CEMS hosts a Graduate Student Orientation the week prior to the beginning of the fall semester. The Graduate College sponsors a Graduate Teaching Assistant of the year competition. They administer Summer Research Fellowships, and Travel Mini-Grants for students to present research at professional meetings.

The Center for Teaching and Learning offers workshops on various aspects of teaching, grading and the Blackboard course management software used at UVM. These are open to teaching assistants.

A majority of our students, and about half of our undergraduate majors, are from the College of Arts and Sciences (CAS), also located in Waterman.

The Office of International Educational Services (656-4296) coordinates programs, events, and services of special interest to international students. This includes Language and Writing Workshops, assistance in academic and cultural adjustment, and immigration and employment help. Much valuable information can be found online at <http://www.uvm.edu/oie/>. They also assist applicants and new students with obtaining I-20 forms, Statements of Support, etc.

The Graduate Catalogue contains a wealth of essential information, such as degree requirements, university policies, and student rights and responsibilities. The latter includes academic honesty, sexual harassment, and grievance procedures. The catalogue is linked to the Graduate College website at <http://www.uvm.edu/~gradcoll>. For another view of departmental services and of our undergraduate programs you may wish to consult a copy of our Handbook for Majors, which can be found on the department website.



## **5 Information for Applicants**

### **5.1 The Application Process**

A student interested in graduate studies in mathematics should contact the Director of the Mathematics Graduate Program. Students interested in statistics should contact the Director of the Statistics Graduate Program. Complete applications include a statement of purpose, three reference letters, and college transcripts. International students whose native language is not English must take the Test of English as a Foreign Language (TOEFL) exam. A TOEFL score of 90 is required for admission and 100 for Teaching Assistantship consideration.

Application forms may be found on the Graduate College's web pages at: <http://www.uvm.edu/~gradcoll>.

Students with prior graduate study may, with the permission of the Graduate College, transfer up to 9 hours of credit (for the M.S. Program) and up to 24 hours of credit (for the Ph.D. Program) from another university. For both programs, an additional 6 hours of UVM graduate credit, taken prior to admission to the graduate program, may be transferred towards the degree.

Decisions on admissions to both the Masters and Ph.D. Programs are made on a continuing basis; students may be admitted for the fall semester during the summer just preceding it. Students may also apply to be admitted at the beginning of a spring semester, although this is not generally recommended. See the subsequent section on Funding for Graduate Students for information about applying for GTA support.

Well-qualified applicants with a bachelor's degree may be admitted directly into the Ph.D. program. Students may also apply directly to the Master's program. We strongly suggest that applicants to the Ph.D. program contact potential thesis advisors in the department during the application process well before admissions decisions are made. See also the subsequent section on Concurrent Credit for M.S. and Ph.D. programs.

### **5.2 Current M.S. Students Who Apply to the Ph.D. Program**

Students currently enrolled in the M.S. program who wish to apply for admission to the Ph.D. program must communicate this in writing to the Director of the Mathematics Graduate Program by January 15 of their final year in the M.S. program.

The letter of application must contain the names of at least three faculty members who may be contacted for letters of recommendation. These three references should include an individual who potentially may serve as the student's doctoral advisor. (The faculty members need not all be associated with UVM.)

The application letter must also contain a preliminary plan and timetable for completing the Ph.D., including a possible research area, a potential thesis advisor, and course work (including reading courses) that might be needed to carry out the plan.

Admission criteria will include: the quality and level of graduate work done at UVM or other institutions, fit of the applicant's research plan within the areas of expertise of the UVM faculty, prognosis for completion of the applicant's plan, consideration of funding for the student (where applicable) during their doctoral studies, and comparisons with the pool of external applicants (who are also subject to these criteria). Students accepted to the doctoral program do not need to retake any UVM mathematics qualifying exams they have already passed at the PhD level; however, they must pass both written qualifying exams at the PhD level prior to January of their 2nd year in the PhD program. Ideally, current MS students looking to transition into the PhD program will have passed the qualifying exams at the PhD level during their time in the MS program, but this is not a requirement.

Applications will be reviewed by the Mathematics Graduate Committee and will be informed of their status by no later than April 15 following their application.

### **5.3 Funding for Graduate Students**

The Mathematics Graduate Program currently has 15 Graduate Teaching Assistantships (GTAs), and, on average, about 3 of these become available to new incoming full-time students each year. Current stipend rates can be found at [https://www.uvm.edu/graduate/funding\\_your\\_graduate\\_degree](https://www.uvm.edu/graduate/funding_your_graduate_degree). These assistantships also carry a scholarship covering up to 9 credit hours of graduate credit per semester during the period of the award. Graduate Teaching Assistantships are usually awarded (and renewed) for an academic year beginning with the fall semester. Applicants whose files are complete by January 15 will receive full consideration for a GTA beginning the next fall semester. Applications that become complete after January 15 will be evaluated on a continuing basis for GTA support until all assistantships have been awarded.

Duties of a Teaching Assistant usually involve teaching one section of an elementary mathematics course per semester (normally 3 teaching hours per week) and

conducting help sessions (1 to 2 hours per week). Occasionally, one or more GTA positions will become available at the start of the spring semester. In such a case, all unsupported students currently in Mathematics Graduate Program as well as applicants who have indicated they wish to begin that spring will be considered for the award(s). Master's students serving as GTAs in their first year will normally be renewed for a second year based on good performance as a teacher and a student. Doctoral students may be supported on faculty research grants, but are also funded by GTA positions to provide them with important teaching experience.

GTAs are open to all applicants, domestic and international, with preference given to PhD candidates.

## **5.4 Fees for Graduate Students**

Graduate students are responsible for certain fees (some are not covered by a GTA stipend). The major ones are combined in a Comprehensive Fee. Complete information about all fees may be obtained from the Graduate College's web pages.

## 6 Information for New Students

The college runs an orientation for new students during the week before fall classes begin. Students are strongly encouraged to attend, and new recipients of Graduate Teaching Assistantships are required to attend.

There are also departmental orientation activities during that week. During the orientation, you will learn your way around the department and meet the faculty, staff, and other graduate students. You will be given office assignments, computer accounts, and student identification cards. We will help you register for your courses and give you an introduction to the University computing system, including how to use UVM e-mail.

Graduate Teaching Assistants (GTAs) will find out their teaching assignments by the week before classes at the latest, with the goal of scheduling the assignment to accommodate courses the GTAs will enroll in themselves. Course syllabi and teaching methodology will be discussed during orientation. Generally, GTAs teach one course per semester or assist a specific faculty member. GTAs control their own course, planning and giving lectures, designing, and grading examinations, and assigning the final grade. In some multi-section courses, there are common syllabi and exams, supervised by a course leader. Usually, GTAs teach an entry-level course. Typical topics involve elementary algebra, trigonometry, finite mathematics, and an introduction to calculus. We provide a sample syllabus and a textbook. GTAs must attend our teacher-training sessions during orientation. These sessions include delivering practice lectures and discussing common issues that arise.

GTAs should be aware that the first paycheck does not arrive until the middle of September (the last paycheck is at the end of May, after the end of spring semester). Students may request an advance on their salary under extreme circumstances. For more information, please see the Department Administrator.

New graduate students need to see the Department Administrator for course materials, including a textbook if they are teaching a course. The Administrator can also point out where the mailboxes and graduate student offices are located. The Administrator is available to take phone messages and in general help keep the department running smoothly.

Networked computers are available at many locations around campus. All graduate students have accounts on the UVM network. These accounts are maintained by the University's Information Technology department. They provide access to the Internet and a variety of installed software. Students are encouraged to acquaint

themselves with the system and its capabilities. For example, one can access computer algebra systems (Mathematica, MATLAB), packages for mathematical computing (PARI, SAGE, MATLAB), mathematical typesetting software (LaTeX), and various tools for doing mathematical research.

Each graduate student receives both a postal and an electronic mailbox which are used for Department, College, and University Communications.

## 7 Graduate Student Responsibilities

### 7.1 As a Member of the Community

Graduate students are strongly encouraged to attend the department colloquia and seminars and engage with the community mathematically as much as possible. At seminars and colloquia, invited speakers present topics of current interest in mathematics, and often provide introductory talks especially suited for graduate students. Watch for the announcements! These are great opportunities to engage with researchers.

Also, students should be looking to attend conferences in their area. Here are some places you can find conferences and seminars:

<https://researchseminars.org>

<https://www.mathmeetings.net>

Conferences often have funding available for graduate students to attend, so if you see something that interests you, you should contact the organizers and politely ask if they have funding for graduate students to attend. Funding for such conferences usually includes funding for airfare and travel (often funding can be partial). There may also be limited funding available from the Graduate College and the Department.

### 7.2 As Teachers

Attend the training sessions offered by the department for first-time GTAs and perform your teaching duties responsibly. In particular, hand out a syllabus the first day of classes detailing what material will be covered, the exam schedule, and the criteria for grading. A special rule here at UVM: you may not schedule an exam during the last 5 days of classes, so plan ahead. A very helpful listing of standard teaching practices at UVM is available on the department website.

GTAs should not cancel classes without first making every effort to find a substitute teacher. The Graduate Director should be notified of all substitute teaching and any required class cancellations. GTAs need to hold regularly scheduled office hours, a total of at least 3 hours per week, and inform the department of when they are (forms for this purpose are distributed at the beginning of each term). These hours should also be posted on course websites and on office doors.

Graduate Teaching Assistants are required to staff the Help Sessions. This responsibility is just as important as classroom teaching. Any GTA who cannot be

present must find a substitute. GTAs should encourage their students to visit the Help Sessions for help outside of classes.

The graduate director, the course coordinators, and other mentors will be closely monitoring and evaluating TAs' teaching effectiveness. They are available to help TAs if any questions related to teaching should arise.

## 8 Code of Conduct

Students are responsible for their behavior at University of Vermont or any time they are representing the University of Vermont. This especially includes while they are on campus, at department functions, visiting other institutions, or at conferences. In particular, we expect students not to harass others, not to abuse drugs or alcohol, and to uphold a high standard of academic integrity.

Violations of the Code of Conduct include but are not limited to:

- Any form of harassment. This includes but is not limited to: attacking others (verbally or physically), coercion, persistent disrespectful behavior; any form of sexual harassment; issuing threats; ignoring individuals requests to stop a certain behavior; disorderly and disruptive conduct in classes, seminars, meetings, conferences, or any other professional or university function (for example yelling at another student or professor in an aggressive manner is not acceptable); doxing; spamming emails or abusing other university systems;
- Academic dishonesty. This includes but is not limited to cheating on exams and coursework, including the comprehensive and qualifying exams; plagiarism; misrepresenting yourself or your work.
- Destructive behavior. This includes but is not limited to intentional destruction property of the university, department, or others; removing or stealing furniture, blackboards, or equipment from offices or other university spaces; graffiti etc.

Students are also subject to the Graduate College code of conduct.



## **9 Department and University Awards**

There are several awards programs in the department and university for graduate students.

Each year at Honors Day, the department gives the John F. Kenney Award to the outstanding graduate student in mathematics. The department also gives the Sang Kil Nam Scholarship Award to an outstanding undergraduate or graduate student in mathematics and statistics.

The department has one free one-year membership in the Mathematical Association of America and several one-year memberships in the American Mathematical Society. The Director of the Mathematics Graduate Program awards these to the most qualified eligible graduate students. No student will receive the award more than once.

Each year, the Graduate College holds a university-wide competition for the Graduate Teaching Assistant of the Year. The department may nominate up to two students for this award (one in mathematics, one in statistics).

Each summer, the Graduate College offers a number of Graduate Student Summer Research Fellowships. For details, please see the Graduate College website. Each April, the Graduate College and other offices on campus host the UVM Student Research Conference. Students engaged in research projects are strongly encouraged to participate.

## 10 Master's and Doctoral Degree Requirements

The following description of our degree requirements is included for your information. The online Graduate Catalogue (<https://catalogue.uvm.edu/graduate/>) contains the formal requirements including rules and regulations, e.g., those concerning residency for in-state tuition.

The Course Catalogue (<https://catalogue.uvm.edu/graduate/courses/courselist/math/>) contains formal course descriptions, credit hours, and prerequisites for all graduate courses.

### 10.1 Doctor of Philosophy in the Mathematical Sciences

The Ph.D. degree requires 75 semester hours in coursework, including a minimum of 30 credits of course work, at least 15 of which must be graded and may not count towards a master's degree. In addition, they must take at least 20 credits Doctoral Dissertation Research (Math 7491). Students must maintain a 3.0 GPA. Students are required to take either the Math 6444/6441 pair or two of the 5230/6737/6230 triplet. Students are required to pass two written qualifying exams and an oral examination based on written dissertation proposal; for details see the subsequent section on Doctor of Philosophy Qualifying Exams. Following successful completion of these exams, the student is admitted to candidacy for the degree. The candidate must then write a doctoral dissertation and pass a final oral defense of that dissertation. At least one semester of college teaching experience is required.

### 10.2 Master of Science Degree Requirements

Each student must complete one of the following options:

- A. Twenty-four hours of acceptable graduate credits in advanced mathematics courses; six credit hours of thesis research (Math 6391) culminating in a master's thesis, or
- B. Thirty semester hours of acceptable graduate credits in advanced mathematics courses; no thesis required.

Under either option, Students are required to take either the Math 6444/6441 pair or two of the 5230/6737/6230 triplet. Under either option, students must select a major concentration which is either Pure or Applied Mathematics. The concentration shall consist of at least nine approved credit hours in advanced mathematics courses in the respective area; students in option a. may count the six hours of thesis credit towards these nine hours. With approval of the student's advisor, up to

six credit hours of courses outside mathematics may be used to fulfill the degree requirements.

To complete the MS degree, students must maintain a 3.0 cumulative GPA. They must also pass a written comprehensive exam and either pass a second written comprehensive exam or successfully defend a thesis. The exams are offered in January and August: details can be found later in the handbook. This program usually requires two years (full-time) to complete.

### 10.3 Concurrent Credit for M.S. and Ph.D. Programs

Up to 30 credit hours of course work for which graduate credit is earned at UVM in a Master's degree program, whether a Master's degree is received or not, may be applied toward a Ph.D. at UVM, provided they are appropriate for the Ph.D. program. A student may thus potentially complete both the M.S. and Ph.D. degrees with a minimum of 75 credit hours of course and thesis work. Note that at least 15 credits counted towards the Ph.D. requirements must be graded and may not count towards a master's degree.

Note that an M.S. in Statistics or Biostatistics can be earned with the Ph.D. in Mathematical Science. Advising for the M.S. would be arranged through the Statistics Graduate Program Director in close coordination with the student's Ph.D. advisor.

### 10.4 Core Courses

Graduate students in are (usually) expected to take the "first year sequence". As such, students preparing to enter the graduate program should take the appropriate courses to prepare for these course. For Pure Mathematics these could include two semesters of real analysis, two semesters of abstract algebra, point set topology, and complex analysis.

#### Pure mathematics first year sequence

Fall	Spring
Measure Theory (Math 6444)	Complex Analysis (Math 6441)
Abstract Algebra III (Math 6551)	Abstract Algebra IV (Math 6555)
Algebraic Topology (Math 6344)	Topics in Combinatorics (Math 6678)

### Applied mathematics first year sequence

Fall	Spring
Differential Equations (Math 5230)	Partial Differential Equations (Math 6230)
Gr Intro Numerical Analysis (Math 5737)	Numerical Analysis (Math 6737)
Methods of Applied Mathematics	Elective

## 10.5 Leave of Absence and Continuous Registration

On occasion a graduate student may desire to postpone or suspend studies for a period of time. Students may apply for up to one year's leave of absence, a semester at a time. Application forms are available at the Graduate College.

A student who has finished all coursework but not yet graduated can sign up for Continuous Registration. This option maintains one's full-time student status while minimizing tuition costs. This is done by registering for a semester of GRAD. Updated information on continuous registration can be found on the Graduate College Webpage ([https://www.uvm.edu/studentfinancialservices/graduate\\_tuition\\_and\\_fees](https://www.uvm.edu/studentfinancialservices/graduate_tuition_and_fees)).

## **11 Qualifying and Comprehensive Examinations**

The nature and timing of the written comprehensive examinations depend on your degree objective and whether you've concentrated on pure or applied mathematics.

### **11.1 Master's Comprehensive Examinations**

All students in the non-thesis version of the M.S. degree are required to pass 2 written comprehensive examinations. These written exams are given during the week prior to the beginning of the semester in August and January. M.S. students must pass both exams by January of the student's second year. Two attempts for each exam are allowed.

Any student planning on taking a written examination should contact the Director of the Mathematics Graduate Program at the end of the prior semester. In consultation with the Graduate Committee, the Director will appoint a committee to author the written examination. The exam are designed to require three hours, and four hours are given.

Students completing the thesis option of the M.S. will be examined in their major concentration as part of their (required) thesis defense; therefore, they only need to pass a single written comprehensive exam.

The guidelines for the M.S. written examination only require that the student has knowledge of the material; it does not require that the student has taken the corresponding courses. Thus, a student who has entered the program with a strong background may not need to take the courses listed above.

Specific examination topics are listed below, as the exams are the same as those offered to PhD students, but with different passing criteria.

### **11.2 Doctor of Philosophy Examinations**

Doctoral candidates are required to pass two qualifying exams and a comprehensive exam.

Students will take written qualifying examinations in a total of two areas. Topics offered are

1. Real Complex Analysis (3468, 3472, 6441, and 6444)

2. Algebra (3551, 3555, 6551, and 6555)
3. Combinatorics and Graph Theory (5678 and 6678)
4. Differential Equations (5230 and 6230).
5. Numerical Analysis (3737 and 6737),

These exams are offered twice a year: at the start of the Fall semester (August), and at the start of the Spring semester (January). Separate syllabi are available in each area. The syllabi as well as previous exams are available online.

Students are encouraged to try their first qualifying exam by the middle of the first year of study. They must pass both qualifying exams at the PhD level by January of their second year of study.

One to two months in advance of each exam date, the Mathematics Graduate Program Director will send out an email reminder, which will give a deadline for students to inform the Director of their intention to take an exam. The Graduate Committee will prepare, administer, and grade the exams. Students can expect to hear the results two weeks after taking the exam.

After a student has passed two qualifying exams, they must pass their comprehensive exam. In order to take the comprehensive exam, the student must first write a dissertation proposal. The comprehensive exam consists of a “mini-defense”, where the student presents their proposed research to their Graduate Studies Committee. The written proposal as well as the presentation are evaluated based on student preparedness to perform research in their chosen area at the level expected of a Ph.D. dissertation. Upon successful completion of the Comprehensive Exam, the student advances to candidacy for the Ph.D. degree. If a student does not pass their comprehensive exam on their first attempt, they are allowed only one subsequent attempt. Note that students are required, by the Graduate College, to pass their comprehensive at least six months before defending their dissertation. However, we recommend that students plan to complete their comprehensive exam by January of their third year.

### **11.3 Obtaining an M.S. degree on the way to a Ph.D.**

After successful completion of the qualifying exams, a doctoral candidate has the option to petition for awarding of an M.S. degree. A student will be awarded the M.S. degree upon request made to the Graduate Program Director provided they have met the degree requirements of the M.S. (usually in the form of exams).

## 12 Advising and Graduate Studies Committees

All graduate students should periodically check the Graduate College's web pages for current students (<http://www.uvm.edu/~gradcoll>) for relevant information. The director of the Mathematics Graduate Program will pair each student with an academic advisor from among the Graduate Faculty, who will assist in course selection and other administrative matters. Later, it is the student's responsibility to find a research advisor, who will supervise their dissertation (MS students are not required to have a thesis). Students are welcome to change advisors in accord with their interests.

Students who wish to do thesis work are responsible for finding an advisor. This applies to Ph.D. students as well as M.S. students who choose the thesis option. The department is in no way responsible for matching students with advisors nor are students guaranteed an advisor when entering the program. Once a student has an advisor, the student is able to switch advisors (and advisors are able to end the advisor advisee relationship). After termination of an advisor advisee relationship students are subject to the same deadlines for completion of their academic program. Students who have passed the qualifying exam at the level required for their degree may be dismissed from the program if they do not have an advisor for more than two semesters (if an advisor/advisee relationship is terminated, the semester in which the relationship was ended counts as the first semester).

Sometime before May of a Ph.D. student's first academic year, in consultation with the Graduate Program Director and identified academic advisor, the student should establish a Graduate Studies Committee. A graduate studies committee consisting of at least four regular members of the graduate faculty is and must be approved by the Dean of the Graduate College. It is the responsibility of the Studies Committee to supervise the graduate student's program and to review progress at yearly intervals. The student's academic advisor serves as the Chairperson of the Studies Committee.

The Studies Committee must meet with the student at least annually, and more frequent consultation is both highly recommended and encouraged. A brief report from these meetings certifying appropriate progress toward completion of the degree (e.g., timely completion of required Qualifying Exams, Comprehensive Exam, and Dissertation Defense) and indicating any items of importance (e.g., agreed-upon timelines for completion of thesis work) appropriate for the record should be prepared for the Graduate Program Director.

## 13 Accelerated Master's Program

The Accelerated Master's Program (AMP) in mathematics is designed so that students with strong ability and motivation can complete a bachelor's degree in mathematics, science, or engineering, as well as a master's degree in mathematics at UVM within five years. Interested students should also see the general description of Accelerated Master's Programs on the Graduate College and CEMS web pages.

The first four years consist of an undergraduate program that includes the core requirements for a minor in mathematics together with other courses that lay a solid mathematical foundation; this portion culminates in a bachelor's degree. During the fifth year, students take courses that complete the requirements for the master's degree in mathematics.

The AMP in mathematics integrates the undergraduate and graduate experiences so that students receive both the breadth and depth they would achieve had they completed the two degrees separately.

### 13.1 Requirements for Admission

The Accelerated Master's Program in mathematics is designed for students who are mathematics majors, or majors in science or engineering with a minor in mathematics. A student who is enrolled in this AMP may count 6 credits of Mathematics coursework at or above the 5000-level for both the undergraduate and the graduate degrees. If interested in the AMP in Mathematics, a student declares this interest in writing to the Director of the Mathematics Graduate Program before taking any courses that they would like to count towards both degrees and before taking either Math 3472 or 3766 (see below). If the courses in question are co-localized (i.e., have both 3000- and 5000-numbers), the student should also inform the course instructors that they wish to participate in these courses at the graduate level.

Formal application for the Accelerated Master's Program in mathematics is made during the spring pre-registration period of the student's junior year. The student carries out the usual procedure for admission to the M.S. Program in mathematics, including submission of letters of recommendation. Application forms are available online. The student's admissions essay must specifically address why the student wishes to enter the Accelerated Master's Program.

Applicants must achieve the following by the end of their junior year:

1. Completion of Math 1234, 1248, 2055, 2248, and 2544 or 2522 with an overall



GPA of 3.2 or higher;

2. Completion of Math 3468 and one of Math 3472 or 3766 (see a clarification below) with grades of B+ or better in each; and
3. Completion of a least two additional 3000 or higher-level mathematics or statistics courses with grades of B+ or better in each.

When selecting courses to satisfy conditions 2 and 3 above, the student needs to make sure that the courses prepare them for taking future courses to satisfy the requirements of the MS program in either the applied or pure track, as described in the section about the MS degree in this Handbook. In particular, the following clarifies condition 2 about either of Math 3472 or 3766 being required. When the student declares their intent to enter the AMP to the Graduate Director, they inform the Director whether they will pursue the pure mathematics or applied mathematics track in the MS program. In the former case they must take Math 3472; in the latter, Math 3766.

### **13.2 Requirements for Advancement to Candidacy in the AMP**

Students who have been admitted to the Accelerated Master's Program in mathematics normally advance to candidacy in this program at the end of their senior year. This marks the end of their undergraduate curriculum and the beginning of their graduate curriculum. The criteria for advancement to candidacy are:

1. Completion of a Bachelor's program in mathematics at UVM, or of a Bachelor's program in science or engineering at UVM with a minor in mathematics;
2. Completion of at least two additional mathematics, statistics or computer science courses at the 5000 or higher level with grades of B or better; and
3. Completion of a 6000-level course in Mathematics with a grade of B or better. This course may not be counted towards the student's undergraduate degree or GPA, and so must be taken as an overload.

Note that:

- All these criteria must be met by the end of the student's senior year.
- The two courses mentioned in criterion 2 above will be double counted towards both the undergraduate and graduate degrees.

Students who have been admitted to the AMP on the completion of their junior year but who later fail to meet the requirements for advancement to candidacy for the M.S. degree will only be permitted to continue towards their M.S. degree after review by the Graduate Program Committee and with the written approval of the Director of the Graduate Program in Mathematics.

### 13.3 Requirements for Completion of the M.S. Degree Portion

As the section on the requirements for the MS states, a total of 30 total credits are required for completion of that MS degree. Please refer to that section to make sure that you satisfy those requirements (ideally, by the end of your fifth year at UVM). Recall that 6 of those credits may be in mathematics courses at the 5000-level or above that were counted towards the Bachelor's degree, and 3 may come from a 6000-level course taken as an overload in the undergraduate years. Keep in mind that only one 3000-level course can count towards the MS degree.

#### Sample AMP Schedule for the pure mathematics track

Year	Semester	Courses	Credits
1	Fall	Math 1234, CS 1210, 3 Electives	16
1	Spring	Math 1248 (4hrs), Math 2055, 3 Electives	16
2	Fall	Math 2248 (4hrs), Math 2544/2522, 3 electives	16
2	Spring	Math 2678, Stat 1410, 3 Electives	15
3	Fall	Math 3468, Math 3551, 3 Electives	15
3	Spring	Math 3472, Math 3230, 3 Electives	15
4	Fall	Math 6444, Math 5678, 3 Electives	15
4	Spring	Math 4454, Math 6441, 3 Electives	15
5	Fall	Math 6454, Math 6551, (Math 3517 or 3456 or Stat 5510)	9
5	Spring	Math 6555, Math 6678, Math 3559	9

#### Sample AMP Schedule for the applied mathematics track

Year	Semester	Courses	Credits
1	Fall	Math 1234, CS 1210, 3 Electives	16
1	Spring	Math 1248 (4hrs), Math 2055, 3 Electives	16
2	Fall	Math 2248 (4hrs), Math 2544/2522, 3 electives	16
2	Spring	Math 2678, Stat 1410, 3 Electives	15
3	Fall	Math 3468, Math 3230, 3 Electives	15
3	Spring	Math 3766/5766, Stat 2510, 3 Electives	15
4	Fall	Math 3551, Math 5337, 3 Electives	15
4	Spring	Math 6337, Math 4788/5788, 3 Electives	15
5	Fall	Math 6701, Math 5230, (Math 3456 or Stat 5510)	9
5	Spring	Math 6230, (Math 5335 or Stat 3870)	9