

# A Guide to Graduate Study in Applied Mathematics

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## 1 Introduction

The Center for Applied Mathematics was created in 1964 “to encourage the application of mathematical knowledge in the physical, biological, and social sciences.” The first director was Bill Sears, an aerodynamicist educated under von Karman at Caltech, who was returning to academia after time spent in industry at Northrup. The center started with 20 members from math, engineering, physics, and chemistry. Today, we have over a hundred members, from an even broader array of disciplines, but still are guided by that original mission of

encouraging the application of mathematical knowledge across a wide range of disciplines.

The range of possibilities for graduate study encompasses the areas of specialization of all of the faculty members in the field, who currently number more than one hundred. The faculty members are drawn from fourteen departments in the College of Engineering, the College of Arts and Sciences, the College of Agriculture and Life Sciences and the Samuel Curtis Johnson Graduate School of Management. There is opportunity for further diversification on the choice of minor subjects.

Graduate students are admitted to the Field of Applied Mathematics from a variety of educational backgrounds that have a strong mathematics component. Generally, only students who wish to become candidates for the Doctor of Philosophy Degree are considered. About 40-50 students are enrolled in the program, which usually requires 4-6 years to complete. A typical CAM class size is about eight students, though the target size depends on funding, advising capacity, and space.

## 2 Application to the program

Applications to the CAM PhD program are due in January. Applications are only accepted for the fall semester. The online application system is managed by the Graduate School, and a non-refundable application fee of \$105 is required at the time you submit your application to cover the cost of processing. Fee waivers are available for students with financial need and for students who have participated in a variety of programs designed to provide educational and/or career support to students from historically underrepresented identities. A list of eligible programs is available on the Graduate School application fee page.

As part of the application, you will be asked for:

- *Basic information:* Typical application information such as nationality, GPA, schools attended, etc.
- *Transcripts:* Accurate unofficial transcripts for each school you have attended. There is space in the field for listing three schools; if you have attended more than three, you must upload those transcripts in the writing sample portion of the application.
- *Statement of purpose:* A statement of purpose is required and can be uploaded directly into the application. The statement should ideally include information about areas of mathematics that interest you and field members who you might like to work with.
- *Personal statement:* The Personal Statement is optional for domestic applicants who wish to be considered for Fellowships in Support of Diversity. The personal statement is not used to evaluate applicants for admission; rather, once the applicant is deemed admissible, it will be used to evaluate the applicant for Fellowships in Support of Diversity nomination.

- *Letters of recommendation:* At least three letters of recommendation are required. Additional letters are allowed. Recommenders may submit their letters online. Once an application is submitted, recommenders receive an automated email soliciting their letter. You will be prompted to provide their contact information before you submit your application.
- *Test scores:* Submitting GREs is *optional*. The GRE subject test in mathematics is also not required, but is particularly useful for students for whom math is a secondary field at the time of application. If submitting scores, the University code is 2098.
- *Language scores:* With very few exceptions, international applicants must demonstrate English language proficiency by submitting IELTS (International English Language Testing System) Academic or TOEFL (Test of English as a Foreign Language) scores to the graduate school. Scores are valid only if dated within two years of the application deadline. Minimum scores and exception policies are detailed on the Graduate School web page.
- If you have supplemental documents such as undergraduate research papers, awards, etc, upload them in the writing sample of the application.

The admissions committee begins reviewing applications in mid-January and continues throughout February. Decisions are communicated to applicants until the end of March. Applicants offered admission will receive an admission letter and a deadline for when they need to inform CAM about their enrollment decisions (usually April 15). When international students respond that they will enroll at Cornell, they are sent an I-20 form.

## 3 Program timeline and milestones

A PhD in Applied Mathematics typically takes 4-6 years depending on several factors. These factors include the level of preparation prior to beginning the program, graduate committee recommendations, motivation to end graduate study quickly, and faculty availability, among other issues. Students begin their program with primarily taking classes and end it with primarily research, with the years in between being a mix of the two. During the first two years a student typically takes two or three classes a semester.

Five years is the average time period for completion of PhD, with many students continuing into their sixth year. Below is a time table based on five years.

### 3.1 Year 1

Take classes both semesters. A normal course load for a beginning graduate student is three courses per term.

Begin to consider who you would like to ask to be on your Graduate Committee.

Before you arrive in the fall, you will have been assigned a temporary advisor.

Choose your first semester courses after meeting with your temporary advisor.

Ideally, you should select an advisor to replace your temporary one in the spring. Choose this faculty member with the idea that this person will likely be your Committee Chair for your Graduate Committee.

### **3.2 Year 2**

Take classes both semesters.

By the end of your fall semester, you must have chosen your full committee (minimum of three members including your Chair). You will need to submit this request online in Student Center. Your advisor, the DGS, and GFA will receive an email to sign off on the request. Begin exploring research topics for the coming spring and/or summer.

During the spring semester your research should now be underway.

### **3.3 Year 3**

Prepare for the Admissions to Candidacy (A) exam and consult with your Chair which classes you should be taking before becoming more involved in research. During the spring or summer (must be before semester 7 begins) you must take the A exam.

### **3.4 Year 4**

Research and finish up any remaining classes.

Begin thinking about and pursuing employment opportunities.

### **3.5 Year 5**

Research.

Actively pursue employment opportunities during the fall semester. Don't wait until spring to start! Take the B exam (thesis defense).

## **4 First-Year Mentoring**

The first year of graduate school is a critical period for students as they learn to navigate Cornell and to manage competing demands from coursework, research, and teaching duties. In addition to the start-of-year orientation activities, first-year students are matched with both faculty and peer mentors who can help provide guidance throughout the year.

## 4.1 First-Year Faculty Advising

All first-year graduate students are formally advised by the CAM director. This means that the CAM director is responsible for signing the “advisor” slot in any university forms that a first-year student might need signed. CAM students (first year and beyond) are also welcome to come to the director to ask questions or seek advice.

Beyond the director, each incoming CAM student is assigned a provisional advisor for the first year. The provisional advisor should check in with the student at least twice a semester until the student finds a permanent advisor (which may or may not be the provisional advisor). Some topics of discussion for these meetings might include:

- Course selection
- Time management
- Seminars and colloquia
- Applying for fellowships
- Seeking advisors
- TA duties
- Adjusting to life in Ithaca
- Physical and mental health
- Relating to other students
- Any concerning behavior encountered (unethical behavior, biased speech)

For mental health resources we have CAPS (counseling and psychological services in Gannett Health Center), EARS (peer counseling), and Let’s Talk (drop-in consultation; the nearest is in Sage Hall Thursdays 2:30-4:30pm). And for any concerns about unethical behavior, biased speech, etc, resources students should know about are the Office of Institutional Equity and Title IX, Office of the University Ombudsman (<[www.ombudsman.cornell.edu](http://www.ombudsman.cornell.edu)>) and the bias reporting center (255-1426, [report\\_bias@cornell.edu](mailto:report_bias@cornell.edu)).

## 4.2 Peer Mentoring Program

The Peer Mentoring Program offers formal support to CAM students in their first year by pairing them with established CAM students who can help them navigate their transition into CAM. First-year students are matched with one or two peer mentors before the beginning of their first semester. The role of the mentors is to enhance the first-year experience by providing support, encouragement and information to their mentees. Mentors may have suggestions about work-life balance, adjusting to life in CAM or Cornell, advisor/advisee relationships and more. Mentors may serve as both personal and professional support for their mentees. In addition, Peer Mentor Program group events are held throughout the year and include fun activities as well as practical workshops.

Over the summer, a match-up survey is sent out to all incoming CAM students and to prospective peer mentors. In mid-August a welcome email is sent out to

mentors and mentees with their matches. Mentors and mentees meet throughout the year, and larger group activities are organized 1-2 times per semester. After each semester, a feedback survey is sent to mentors and mentees. Questions or comments can be sent to the program coordinators

#### **4.2.1 Peer Mentor Expectations**

- Make a good faith effort to meet with your mentee in-person at least once per semester.
- Attend at least one group activity per semester.
- Direct your mentee to the Director of Graduate Studies (David Bindel) or the Administrative Manager (Erika Fowler-Decatur) for answers to questions you cannot answer.
- Check in on your mentee's morale and progress or goals, both academic and research-related, at least twice per semester.
- Facilitate connections and build community between your mentee and other graduate students and faculty when appropriate.
- Respond to your mentees and the mentoring program coordinators in a timely fashion.

#### **4.2.2 Peer Mentee Expectations**

- Make a good faith effort to meet with your mentor in-person at least once per semester.
- Attend at least two group activities per semester.
- View your mentor as your go-to person for questions or concerns but also feel free to reach out to other CAM students.
- Respond to your mentors and the mentoring program coordinators in a timely fashion.

## **5 Forming the Special Committee**

A committee chair (thesis advisor) must be selected by each Ph.D. student before the end of the second semester (i.e., before the end of Academic Year 1). Students are then expected to select a permanent full committee by the end of the third semester. Students submit a "Special Committee Change and Selection Form" to the Graduate School to indicate their selection. Students may change committee members at any time by submitting a new form to the Graduate School. However, if they are post A-exam or three months within Ph.D. exam (B-exam), they must petition. Exceptions to the above requirements must be approved by the Director of Graduate Studies (DGS).

The Special Committee consists of a Chair/thesis advisor and at least one member for each of two minor subjects. One of the minor subjects must be mathematics. The other minor field can be from any area chosen by the student that is relevant to their doctoral research.

## 5.1 Finding a permanent advisor

Because applied math is an “orphan” graduate field without an associated department, the faculty affiliated with applied math have a wide range of departmental homes; and our PhD students are integrated with exciting initiatives across campus in biology, engineering, computing, finance, and more. Because our PhD program touches so much of campus, choosing an advisor can be an intimidating task! Fortunately, there are several formal and informal mechanisms to help students find an appropriate advisor:

- *Discussion with faculty mentors:* The director and the provisional advisor are meant to serve as a resource for students looking for possible advisors. In many cases, faculty members may have some idea who is looking for students (and who is not), and can help point a student to a few prospective matches.
- *Discussion with CAM students:* The first-year mentors and other CAM students often know how field members have worked out as advisors for other students, and can be a valuable source of information.
- *Bill Sears Blitz:* The Center has a fall poster session and “blitz session” of one minute talks from students and faculty about their current research. This can be a good opportunity for new students to learn about prospective advisors (and vice-versa), as well as giving older students a peek into the broader CAM research portfolio.
- *CAM events:* Students and faculty have opportunities to socialize at post-colloquium refreshments, picnics, and other CAM events.
- *Classes and seminars:* One standard way that students get involved in research is to take a class from a prospective advisor, or to get to know a prospective advisor from interactions in a colloquium or area seminar.
- *Knocking on doors:* Even without any other excuses for interacting, it’s possible to send an email to a faculty member expressing interest in their research! If the email gets ignored, it’s also possible for a student to show up at the faculty’s office (particularly if it is during advertised office hours).

Finding a good advising match is important, and it takes time. It is fine not to match advisors immediately, and it is fine not to work with the first advisor attempted. Cornell provides extensions to give students a way to take the time they need — but at the same time, it’s best not to delay the search too much!

## 5.2 Special committee constitution

The committee chair will aid the graduate student in selecting a Special Committee, which shall consist of a minimum of three faculty members and which will directly supervise the graduate study and research of a student. The committee chair, who is also the thesis advisor, represents the major field of applied mathematics. The other faculty members represent two minor fields; one of these must be mathematics and the other is a field outside mathematics. This committee must be formed before the end of the third semester.

A Special Committee Selection and Change form must be submitted to the Graduate School to establish a committee or change/add committee members. This can be done online through Student Center.

Selection of a Special Committee (including the thesis advisor) is a mutual agreement between a student, the chosen faculty members and the DGS. During the pursuit of the degree, changes in circumstances may cause the student and/or faculty members to desire the termination of this commitment. Students may make changes to their special committee any time before the A exam; changes after an A exam require special approval.

Different students have different levels of engagement with their special committees. The field of applied math does not require any formal meetings of the committee except at A exams and B exams, and some students have little interaction with their committee members outside of these exams. For other students, the committee members may act as collaborators or co-advisors, helping jointly mentor the student along with the thesis committee chair.

### **5.3 Mentoring beyond your committee**

Your advisor may be an important mentor on the path through graduate school, but you will ideally have other mentors as well. Different mentors can provide different perspectives and functions in your life: from broadening your research network, to helping you become a better teacher, to helping you define your future career goals. You will want to form relationships with faculty members who can recommend you for positions, senior students who can help you navigate Cornell and CAM, postdocs who can provide another perspective from their own PhD experiences, and others. Your advisor and special committee play an important formal role in guiding you through the PhD program, but it is worthwhile cultivating a broader network of mentors beyond your committee as well.

## **6 A and B exams**

To be admitted formally to candidacy for the Ph.D. degree, the student must pass the oral admission to candidacy examination or A exam. This must be completed before the beginning of the student's seventh semester. The admission to candidacy examination is given to determine if the student is "ready to begin work on a thesis." The content and methods of examination are agreed on by the student and their committee before the examination. The student must be prepared to answer questions on the proposed area of research, and to pass the exam, they must demonstrate expertise beyond just mastery of basic mathematics covered in the standard first-year graduate courses.

The A-Exam should be scheduled well in advance of the exam and the appropriate form (Schedule of Examination form) MUST be submitted to the Graduate School at least 7 calendar days ahead. CAM graduate students are eligible for a



Non-Thesis Masters Degree upon completion of the A-Exam. In order for this to be awarded, the Committee Chair must check the relevant box on the Results of Examination Form. The form must be turned into the Graduate School within 3 days after the exam.

The candidate must write a thesis that represents creative work and contains original results in that area. The research is carried on independently by the candidate under the supervision of the chairperson of the Special Committee. When the thesis is completed, the student presents their results at the thesis defense or B exam. The B-Exam (thesis defense) is scheduled with the same form as the A-Exam and must be submitted to the Grad School at least 7 calendar days ahead.

## **7 Courses**

A normal course load for a beginning graduate student is two or three courses per term. The Director of Graduate Studies in conjunction with the student's temporary committee chair will assist first-year students in determining the appropriate courses to meet individual needs. All requirement courses must be taken for a letter grade.

### **7.1 Enrollment expectations**

Students on ordinary status (e.g.~not on leave of absence) are required to enroll in a minimum of 12 credits per semester. Students not enrolled in sufficient courses must be enrolled for research using either Graduate School or, if available, departmental course numbers assigned for that purpose. Graduate School research courses will be automatically adjusted at the end of the drop period to bring total credits to 12.

### **7.2 Prerequisite Courses**

Prerequisite to the graduate program are familiarity with analysis and algebra at the advanced undergraduate level (e.g., MATH 4130-4140 and MATH 4330-4340). Students lacking either prerequisite (which may be determined by their special committee chair and/or the CAM Director of Graduate Studies), should take the appropriate courses within their first two years of study. No more than two of these courses can count towards meeting other CAM degree requirements.

### **7.3 Responsible Conduct in Research (RCR)**

Every graduate student is required to complete a short course on Responsible Conduct of Research, to be finished by the end of the second registered semester. This online training addresses issues of authorship, peer review, plagiarism, and research misconduct. Students who are supported on NSF funding are required to take a longer course on RCR within 60 days of the start of the support period.

## 7.4 CAM Core Courses

For advancement to candidacy, students are required to take at least eight courses in mathematics and its applications that are approved by her/his special committee, at least 4 of which must be numbered 6000 or above. Suggested areas for these courses are given in the list of Focal Areas for Applied Mathematics. The courses must include an advanced course in computational methods (focal area (a)). In order to achieve breadth in Applied Mathematics, courses from at least three other Focal Areas should normally be included. Should a course be listed under more than one focal area, then it will count towards only one such area as chosen by the student's Special Committee.

The program allows great flexibility in the selection of courses. Most students design their own course sequences, subject to requirements, to meet their own interests. Courses are typically chosen from the math department and many applications departments.

The seven major Focal Areas for the field of applied mathematics are listed below, along with examples of recommended courses for completing the requirements in each focal area. In addition to the listed example courses, appropriate courses containing substantial mathematical content, offered by any department, may be taken to satisfy field requirements in mathematics and its applications, subject to approval by the student's Special Committee.

### 7.4.1 A. Computational Methods

- CEE 5745/6745, 6300, 6720
- CS 6210, 6220, 6241
- MAE 6230

### 7.4.2 B. Mathematical Analysis

- MATH 6110, 6120, 6210, 6220, 7130 (not both 6110 and 6210; not both 6220 and 7130)

### 7.4.3 C. Differential Equations and Dynamical Systems

- CEE 5735/6736
- CHEME 7530
- MAE 6010, 6110, 6330, 6840, MAE 5790/MATH 4210
- MATH 6260, 6180, 6150, 6160, 6230, 6280, 6520, MATH 6270/MAE 7760

### 7.4.4 D. Stochastic Methods

(Probability, Stochastic Processes, Statistics, Machine Learning, Signal and Image Processing, etc.)

- BTRY 7180 (note: most 6000-level courses not suitable)
- CS 6780, 6783, 6784, 6788

- ECE 5555, 5620, 5630
- MATH 6710, 6720, 6730, 6740, 7740
- ORIE 6500, 6510, 6540, 6570, 6580, 6700, 6710, 6720, 6750, 6780
- STSCI 6520, 7170

#### **7.4.5 E. Optimization and Discrete Mathematics**

- MATH 4410, 4420, 6230
- ORIE 6300, 6310, 6320, 6325, 6327, 6328, 6330, 6334, 6335

#### **7.4.6 F. Algorithms and Complexity**

- CS 4814, 6810, 6820, 6840
- ORIE 6350

#### **7.4.7 G. Algebra and Logic**

- CS 6117, 6764, 6766, 6860
- MATH 6310, 6320, 6340, 6390, 6810, 7880

### **7.5 Minor requirements**

Students are required to have minors in Mathematics and in another field relevant to their doctoral research. The Graduate School requires a representative of each minor on the student's committee; ultimately, it is up to the minor representative to judge whether the minor requirements are met. However, most fields provide guidance regarding the expected minor requirements.

The requirements for the Mathematics minor are specified on the web site for the Mathematics department. Briefly, this involves:

- Two graduate mathematics courses, at least one of which is 6000-level or higher, with an earned letter grade of B- or better. These should be taken from:
  - 5000-level: 5250 (Numerical Analysis and Differential Equations), 5410 (Intro to Combinatorics I), 5420 (Intro to Combinatorics II)
  - 6000-level: 6110 (Real Analysis), 6120 (Complex Analysis), 6150 (Partial Differential Equations), 6160 (Partial Differential Equations), 6210 (Measure Theory and Lebesgue Integration), 6310 (Algebra), 6320 (Algebra II), 6510 (Algebraic Topology), 6520 (Differentiable Manifolds), 6710 (Probability Theory I), 6720 (Probability Theory II), 6740 (Mathematical Statistics II), 6810 (Logic).
  - The Mathematics field member on the special committee may approve other 6000-level courses if they have graded homework or graded exams.
- Two additional mathematics courses at the 6000-level or higher.

Note that the course requirements listed above for the CAM core may suffice to satisfy the requirements for a graduate minor in Mathematics.

## 7.6 Note on eligible courses

The NY State Education Department policy indicates that

Credit toward an graduate degree shall be earned only through work designed expressly for graduate students. Enrollment ... of undergraduates in graduate courses, and of graduate students in undergraduate courses shall be strictly controlled by the institution.

Some CAM focal area courses will be offered with both 4000-level and 5000-level versions going forward, including MATH 4410-4420, MATH 4250-4260 (crosslisted as CS 4210-4220), and MATH 4210. Because of this policy, beginning in Fall 2021, courses taken to fulfill CAM requirements must be taken with the *graduate* course number (5000+).

## 8 Life at the center

CAM today is a center of several applied math activities on campus. The core of the center is the graduate field of applied mathematics. But we also have a postdoc program, meant to foster interdisciplinary applied math collaborations across campus, and a colloquium series that brings a wide variety of applied mathematicians to campus. The physical heart of the program is a space on the sixth floor of Rhodes Hall where all our PhD students and postdocs have their desks.

### 8.1 CAM space

Each student is guaranteed an individual cubicle in a shared work space environment. This set up allows for more collaboration and mentoring among students while giving a space to work and store your materials.

CAM has several shared workstations in Rhodes 657 that have relevant software. Color and black and white printers are also available on the shared workstations. Students also have access to other computers in computer labs on campus, and especially Rhodes Hall. Print jobs with more difficult requirements can be accommodated by working with departmental staff.

### 8.2 Computing resources

Incoming CAM students are provided with their own computer. This can be either a laptop or a desktop, at the request of the student.

### **8.3 CAM Wiki**

The CAM student wiki is a website where students collaborate to gather advice and resources on careers, teaching, computing, and life in Ithaca. The wiki is only open to students.

### **8.4 Colloquium**

The applied math colloquium meets on Fridays from 3:30-4:30, with refreshments in the CAM space afterward. The colloquium usually (but not always) meets in Rhodes 657. The talks cover a wide range of applied mathematics, and are meant to be accessible to a broad applied math audience. Students are encouraged to show up even for talks outside their immediate interest!

In addition to the talk, speakers are invited to have lunch with the students (funded by CAM). The lunch meeting is not open to other faculty, and is meant to give students the chance to have a candid conversation with the speaker about mathematics, mathematical careers, and life more generally. Individual meetings are also sometimes available for students to have technical discussions with the speaker.

Colloquium invitations are coordinated by the colloquium committee, which includes a student representative. In addition to helping with the schedule more generally, the student representative is responsible for helping find student hosts to guide the student-speaker lunch. The student representative will also help coordinate the student-selected speaker colloquium, where the speaker is invited by the students rather than by the faculty.

### **8.5 Bill Sears Blitz**

The Bill Sears Blitz slide and poster session is an opportunity for CAM faculty and students and community members to mingle and learn about all the interesting things that CAM members are doing. Presenters are welcome to give a poster and/or a one-minute one-slide summary in a “poster blitz” talk. This event takes place in the fall semester, and is meant both as a way for new students to learn about prospective advisors and for the rest of CAM to keep up with what is going on in the center.

### **8.6 SIAM Student Chapter**

CAM is home to Cornell’s student chapter of the Society for Industrial and Applied Mathematics (SIAM). As members of the SIAM student chapter, students are also eligible to free SIAM student membership.

### **8.7 Other Events**

Throughout the year, CAM offers a number of social events for students and faculty, including fall and spring picnics, a holiday celebration, orientation for

new students, and a graduation ceremony. In addition to formal CAM events, the CAM students also organize a variety of events, including a coffee hour, the informal “CAM Colloquially” student seminar series, and others. CAM students also frequently attend seminars and colloquia held in peer units across campus, from mathematics to mechanical engineering.

## **9 Funding**

All full-time students in Applied Mathematics receive a full support package and are guaranteed five years of funding, subject to satisfactory academic progress. Upon availability, students in their sixth year are also funded. CAM does not admit students who are self-funded. Please contact the CAM office for any questions or clarifications.

It is important to note that while students are guaranteed funding for five years, the form of support may vary. Due to CAM’s interdisciplinary nature and faculty field structure, the actual dollars of guaranteed support often come from different departments across campus. This arrangement allows students to work closely with faculty, lab clusters, and students from different disciplines while still maintaining a home in CAM. For example, a student may hold a Teaching Assistant (TA) position for two years in Math, a Graduate Research Assistant (GRA) position for two years in Computer Science and a final year be on a Graduate School fellowship. While the funding comes from different sources, the student has received the guaranteed five years of support.

### **9.1 What funding covers**

All full-time students receive a support package that includes the following:

#### **9.1.1 Tuition**

Fall and spring tuition is directly paid by the department supporting the student. The student is not responsible for any charge or duty in this process. The current tuition amount can be found on the Graduate School web site.

#### **9.1.2 Student Health Plan (SHP)**

The SHP premium is paid on a yearly basis by the department(s) supporting the student. The student is not responsible for any charge or duty in the process. Information may be found on the SHP web site. Please note that only the student’s health plan is covered in the support package. Optional dental and vision plans are available, but are not included as a part of SHP. Spousal/family insurance is available, but is the responsibility of the student. The student is also responsible for any copays or deductibles incurred as a result of using services while on the plan.

### **9.1.3 Stipend**

All full-time students receive a competitive academic year stipend. Payment amounts vary according to the funding source, as does the payment schedule. All admitted students are informed of the amount of funding (pre-tax) for their first year in their admission letter. Subsequent years of funding may increase or decrease depending on the funding source. The amount you receive after taxes depends on your individual circumstances. All international students are required to obtain an American social security card directly after having arrived in the United States in order to receive their stipend. Cornell University also offers free direct deposit into your bank account.

## **9.2 Types of funding**

There are typically three types of funding sources: fellowships, Teaching Assistantships (TA), and Graduate Research Assistantships (GRA). All three cover the above components described in a support package. However, stipend amounts and payment schedules will vary.

### **9.2.1 Fellowships**

Fellowships are highly desirable because they do not carry an extra work/effort requirement. There are numerous types of fellowships available, with most being competitive. Fellowship stipends are typically paid in two lump sums divided between the Fall and Spring semesters.

A number of fellowships are awarded by government agencies, such as National Science Foundation, Departments of Energy, Defense and Homeland Security, and others. There are also opportunities for fellowships from companies like Google, Microsoft, and Bloomberg; and there are opportunities from many nonprofits, such as the Sloan Foundation, the Ford Foundation, and the Simons Foundation.

CAM awards the prestigious Presidential fellowship to two new students every year at the discretion of the Admissions Committee. The Cornell Graduate School also offers a number of fellowships according to certain criteria. Whenever possible, the Admissions Committee (for new students) and CAM faculty and advisors (for current students) nominate appropriate candidates for these competitive fellowships.

### **9.2.2 Teaching Assistantships (TAs)**

A TA is responsible for assisting a faculty member in administering a class. Duties could include grading, managing a course web site, leading discussion sections, holding office hours, etc. There is a maximum limit to the number of hours a student can be expected to devote to their duties. Please consult the Cornell Policy on Graduate Assistantships for further details and expectations. TA positions are a very valuable piece of a student's experience. Being a TA

helps reinforce knowledge of material and is a very attractive item to colleges and universities when considering job applicants in academia, especially for tenure track positions. While TA positions require additional work, they have a large payoff and many students very much enjoy helping others learn and become more confident in mathematics. Stipends are typically paid in bi weekly paychecks.

### **9.2.3 Graduate Research Assistantships (GRAs)**

A GRA position allows a student to undertake research under the direction of a faculty member, usually the Committee Chair. Such a position allows a student to gain invaluable research experience that is helpful for their dissertation research and for finding a research or academic oriented position after earning the PhD. Stipends are typically paid in bi weekly paychecks.

## **9.3 Outside employment**

Students with a university-funded fellowship, external fellowship, or GRA position may accept employment of no more than eight hours per week, if allowed in the terms of the fellowship. Students working as TAs may work up to five hours per week, so long as the combined hours of the assistantship and work do not exceed 20 hours per week.

## **9.4 Summer support options**

There is no tuition charged if a student enrolls in research over the summer (June-August). However, the student is responsible for tuition if they enroll in a class and are expecting to receive a residency unit. CAM is not able to guarantee summer funding, though many students receive summer funding as a GRA or TA depending on faculty support. Many CAM students also take advantage of the summer period to pursue internships in industry, national labs, or elsewhere.

## **9.5 Conference and travel grants**

The Graduate School offers limited funding for presenting at conferences or undertaking research in other locations. Please refer to the Graduate School web site for details and procedures.

# **10 Administrative matters**

The graduate field of Applied Mathematics is part of CAM; but, as with all graduate fields at Cornell, is administratively a part of the Graduate School. Many graduate fields are embedded in departments and colleges and interact with the broader leadership (the chairs and deans) of those units. Though CAM cooperates with several other colleges and their departments to provide funding for TA lines and postdoctoral scholars, it does not belong to any of Cornell's colleges. Instead, it is one of the centers governed by Cornell's Office



of the Vice Provost for Research and Innovation (OVPRI). Hence, most “local” administration that CAM students will see involves the CAM director and administrative manager.

The CAM Director (David Bindel) also serves as the Director of Graduate Studies (DGS) for the field of applied mathematics. Erika Fowler-Decatur serves as the Graduate Field Assistant (GFA). The GFA and DGS manage the affairs of the field and sign graduate student forms and petitions, as well as serving as the first point of contact between students and the Graduate School. The CAM administration is also generally the first point of contact between graduate students and the other academic units on campus, such as the departments that provide TA lines for CAM students.

## **10.1 Residency and leave**

To receive an advanced degree a student must fulfill the residence requirements of the Graduate School. One unit of residence is granted for successful completion of one semester of full-time study, as judged by the chair of the Special Committee. The Ph.D. program requires a minimum of six residence units. This is not a difficult requirement to satisfy since the program generally takes four to five years to complete. A student who has done graduate work at another institution may petition to transfer residence credit but may not receive more than two such credits.

Students may request leave of absence status during their program for a variety of reasons, whether personal (e.g. health reasons), professional (e.g. internships), or administrative (e.g. students working after filing their dissertation, but before conferral). Health leaves are available up to a maximum of four years; personal leaves are for up to 12 months, renewable for a maximum of four years. Parental accommodations are also available in the form of either six weeks of paid accommodation (eight weeks for the birth mother for a C-section) OR up to two semesters of reduced load status, depending on circumstances.

In absentia status is available for students conducting approved research 100 miles or more away from the Cornell campus while under the guidance of the special committee. This sometimes happens, for example, when students move with an advisor to a different institution (whether the move is permanent or for a sabbatical). To be eligible, students must first have completed two semesters of registration at a Cornell campus.

## **10.2 The Student Progress Review**

The Student Progress Review (SPR) is an annual exchange of written feedback where advisees are asked to reflect on recent accomplishments, identify challenges, and set goals. Committee chairs then review their students’ SPR forms and give constructive feedback. Chairs may rate student progress as excellent, satisfactory, needs improvement, or unsatisfactory. The SPR document is available to the

student, the special committee, and the DGS and GFA.

The SPR is required even if advisors already communicate on a regular basis. For students who usually only talk to their advisors about research, the SPR can be an opportunity to have a conversation both about progress through the program and about broader career goals.

### **10.3 Academic standing**

Students are expected to meet graduate school milestones or work through approved petition processes. Students who have formed a special committee are also expected to meet the expectations of their committee.

When a committee chair deems a student's progress less than satisfactory on the SPR (either "Needs Improvement" or "Unsatisfactory"), the DGS will work with the student and the advisor on a plan to address issues.

Students who receive an "Unsatisfactory" rating on their SPR have made little or no progress in the preceding one or two semesters, and are not considered to be in good academic standing with the Graduate School. In this case, the DGS will work with the student, advisor, and Graduate School on a detailed improvement plan, which is approved by (and then enforced by) the graduate school.

### **10.4 Petitions and other forms**

Petitions and other forms are available from the graduate school web site. These forms include standard processes used by every student (scheduling exams and registering the results of those exams, filing a dissertation), as well as petitions for change of status or for extensions on program milestones. For guidance on graduate school petitions and forms, students should communicate with the GFA (Erika Fowler-Decatur).

## **11 Other Cornell resources**

The Graduate School web page has a wealth of information for prospective and current students. In particular, the Graduate School resources page has pointers to numerous resources around Cornell for academics, health and wellness, safety, managing as an international student, student life, etc.