2025-2026
Department of Mathematics, Applied Mathematics, & Statistics
Graduate Student Handbook

Case Western Reserve University
Department of Mathematics, Applied Mathematics, &
Statistics 10900 Euclid Avenue
2145 Adelbert Rd
Cleveland, OH 44106-7058

Office: 216.368.2880
Fax: 216.368.5163

mathstats.case.edu

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Program Overview

Department Overview

The Department of Mathematics, Applied Mathematics, and Statistics at Case Western Reserve University is an active center for mathematical research. Faculty members conduct research in algebra, analysis/applied analysis, Bayesian statistics, continuum and fluid mechanics, convex and differential geometry, dynamical systems, imaging and inverse problems, life sciences and biomedical research, mathematical physics, numerical analysis and scientific computing, probability and stochastics processes, spatial statistics, and uncertainty quantification.

The MAMS Department offers doctoral degrees and master's degrees in Mathematics, Applied Mathematics, and Statistics. The department currently has a total of 39 faculty members, 23 of which are tenured and tenure-track, 41 doctoral students, 9 master's students, and over 300 undergraduate students. Students have many opportunities to interact with faculty members one-on- one, as well as to gain experience in research and teaching.

Mission Statement

The Department of Mathematics, Applied Mathematics and Statistics provides a broad and solid educational program designed for the dual goals of transferring of mathematical knowledge and advancing the state of the art through outstanding research. Students, both graduate and undergraduate, engage in research and educational activities within the department and across disciplines. The department will promote demographic diversity with respect to age, gender, and ethnicity to create a welcoming atmosphere to all its members.

More information about the MAMS department can be found at mathstats.case.edu.

Title IX Notice of Nondiscrimination

Case Western Reserve University prohibits sex- and gender-based discrimination in its education programs and activities, as well as retaliation for asserting the right to be free from such discrimination, in accordance with federal law, including Title IX of the Education Amendments of 1972 (20 U.S.C. § 1681). Sex- and gender-based discrimination includes discrimination based on sex, pregnancy, parental status, gender identity or expression, transgender identity, and sexual orientation. Sex- or gender-based discrimination also includes sexual harassment, sexual assault, sex-based stalking, sexual exploitation, and dating violence or domestic violence.

The Title IX Coordinator in the Office of Equity is responsible for implementing the policy prohibiting sex- and gender-based discrimination.

Anyone impacted by sex- or gender-based discrimination, or who knows of others impacted by sex- or gender-based discrimination, and who would like to report discrimination or seek support for themselves or others, may contact the Title IX Coordinator by telephone, email, text message, or in person during regular business hours, or through the online Office of Equity forms below.

Title IX Coordinator: Rachel E. Lutner
Main Office Phone: 216-368-3066
Text or Call Title IX Coordinator: 216.327.4160 Email: titleix@case.edu

Online forms to report sex- or gender-based discrimination:
Online form for CWRU community members to report and request support
Online form for CWRU community members to report anonymously
Online form for non-CWRU community members to report
Webpages for more information

Departmental Information

Contact Information

Business Hours: Monday-Friday, 8:00 a.m. – 4:30 p.m.

Website: mathstats.case.edu

Weihong Guo, Professor and Chair

- Email: weihong.guo@case.edu
- Office: 2145 Adelbert Rd Room 205B
- Phone: 216.368.5107

Keesha Sellars, Department Administrator

- Email: keesha.sellars@case.edu
- Office: 2145 Adelbert Rd Room 202B
- Phone: 216.368.0463

Catherine Tong, Graduate Student Service Manager

- Email: catherine-tong@case.edu
- Office: 2145 Adelbert Rd Room 202A
- Phone: 216.368.2880

Dawn Philpotts, Department Assistant

- Email: dawn.philpotts@case.edu
- Office: 2145 Adelbert Rd Room 105G
- Phone: 216.368.2874

Facilities and Services

The department is housed in 2145 Adelbert Rd, and Sears on the fifth floor. Various services to support academic and research efforts are offered.

Computer Lab

The department maintains a computer lab in 2145 Adelbert Rd Room **BC01** for student use. Windows and Linux desktops are available with MATLAB, Mathematica, R, and SAS, as well as black and white and color printers.
Computers are maintained by University Technology (UTech) in consultation with the department.

Mail Room

The department mailbox is located in 2145 Adelbert Rd Room 103. All faculty, staff, and graduate students are given mailboxes in this area, and mail is distributed daily by 12:30 p.m. Outgoing mail (with appropriate postage) may be left in the outgoing mailbox for transfer to the university mail sorting center. The MAMS Department has one mail drop number, **7058**, which should be added in a separate line or at the end of the zip code: 44106-7058.

Office Space

Office space is assigned to all professors, instructors, lecturers, PhD students, and staff. The department provides a desk, chair, and computer for each occupant of each office.

Printers and Copiers

The department has three copy machines with printing, copying, and scanning capabilities, as well as three color laser printers. Members of the department may set up access to department printers and copiers on department-owned computers. Additionally, printer and copier use is restricted to research- and teaching-related purposes (e.g., teaching and grading).

Lockers

Lockers can be issued to Ph.D. students upon request. The lockers are located in Room B02G at 2145 Adelbert Road. Students may pick an available locker and will be given a lock. The locker and the lock are property of Case Western Reserve University. The locker is subject to law enforcement and university search if probable cause. If something is leaking from or near the lockers, you will be notified and we will remove the items if you are not available. Do not put a lock on the locker that is not assigned by the Department of Math, Applied Math, and Statistics. If a lock is found not to be a MAMS Master Lock it is subject to removal and locker privileges may be suspended. Do not put perishable items in the lockers. The locks should be returned to MAMS staff or left on the locker after your defense and graduation, if the lock is not returned you may be subject to a $25 charge.

Room Reservations

The department has two rooms available for reservation 105F and 201D, based on availability (please contact a staff member for assistance). In addition, the department can request a room reservation through rooms@case.edu or through this website for other rooms on campus. Details for the department-controlled rooms are as follows:

- **2145 Adelbert 205A**: Seminar room with a projector, podium with built-in, touchscreen computer, whiteboard, video conferencing equipment, and tables and chairs. Comfortably seats approximately 18 people. Additional approval from the department administrator is required to reserve this room.

Building Service Requests

The Facilities Office manages all building maintenance and upgrades on campus. Services include, but are

not limited to, heating/cooling repair, leaks, large spills, light bulb replacement, electrical work, lock and key repair, and pest removal. If your office or a common area needs a repair, please contact a department staff member to submit a request.

Email Aliases

The department maintains mailing lists for official business use. You will receive emails from the relevant lists at your CWRU email address. The list details are as follows:

- mams-all-faculty: all faculty members
- mams-tt-faculty: all tenure track faculty members
- mams-ntt-faculty: all non-tenure track faculty members
- mams-instructors: all instructors
- mams-lecturers: all lecturers
- mams-all-grad: all graduate (PhD and Masters) students
- mams-phd-grad: all PhD students
- mams-ms-grad: all Masters students
- mams-all: include all faculty, graduate and undergraduate students
- mams-all-undergrad: include all undergraduate majors
- mams-staff: include all staff members

Mass emails to these aliases should originate from the department faculty or staff. Graduate students holding officer positions with MGSA are permitted to circulate emails via the mams-grad alias.

IT Requests

If you require assistance with an IT issue, please contact **help@case.edu,** or call **216.368.HELP (4357),** or submit a ticket online: https://cwru.teamdynamix.com/TDClient/126/Portal/Home/. You can also visit the Care Center in KSL: https://case.edu/utech/help/utech-care-center

The Graduate Committee

Purpose

The Graduate Committee serves as the governing body within the department for all matters related to graduate education. The committee interprets the policies set forth by the School of Graduate Studies and the College of Arts & Sciences, monitors student progress, and provides guidance on academic and administrative issues, and reviews applications.

Members

Members of the Graduate Committee are assigned annually by the department chair. The 2025-2026 members of the Graduate Committee are as follows:

- Anirban Mondal (Committee Chair)
- Weihong Guo (Department Chair, ex-officio member)

Mathematics Graduate Subcommittee

- Eva Belmont (Subcommittee Chair)
- Elisabeth Werner
- Nick Gurski

Applied Mathematics Graduate Subcommittee

- Longhua Zhao (Subcommittee Chair)
- Anuj Abhishek
- Erkki Somersalo (Fall 2025)
- Julia Dobrosotskaya (Spring 2026)

Statistics Graduate Subcommittee

- Jenny Brynjarsdottir (Subcommittee Chair)
- Abdul Nasah Soale
- Patricia Williamson

Petitions

Students who wish to apply for an exception to established policies must **first** submit a petition to the graduate committee before submitting their requests to the School of Graduate Studies. The student should prepare a letter explaining their request and include rationale to reinforce the request. All petitions should contain signature lines for the Department Chair, Graduate Committee Chair, and Advisor(s). The student should then submit this letter to the Graduate Student Service Manager (cxt345@case.edu), who will then forward the request to the graduate committee. Petitions are reviewed during regular meetings of the graduate committee, except in special circumstances that

require an emergency meeting for review. Students should submit petitions as soon as they become aware that they wish to request a policy exception, as this will allow ample time for processing.

Financial Assistance

Overview

All PhD applicants are evaluated for department support for the duration of their studies. Department support includes a tuition waiver and a stipend for living expenses for the academic year (AY support). The department does not currently provide AY support to MS students. Students who are accepted with an offer of AY support will continue to receive financial assistance for the duration of their PhD study, provided they maintain satisfactory academic progress and fulfill their departmental obligations, as stated in their offer letters.

Department Funding

The department and advisor determine the number of credit hours a student is approved for and the annual stipend amount based on student progress and guidelines set forth by the College of Arts & Sciences and the School of Graduate Studies. Full time registration is 9 hours. Students who wish to register for more credit hours than they have been approved for will be expected to finance the additional expense independently.

Students who have not yet advanced to candidacy are typically approved to register for nine credit hours of coursework each semester. PhD candidate credit hour approval is determined by the student's progress toward fulfilling his or her degree requirements and estimated date of graduation. Plans to take a specific course, where available in advance, are also taken into consideration.

All students who receive department funding are expected to perform teaching-related duties, which may include grading, tutoring, or teaching a class. Please see the Departmental Duties section on page 8 for more information on departmental duties.

Grant Funding

Students engaging in research with a faculty advisor may be supported by their advisors' external research grants. A student supported by a faculty grant is expected to perform research duties related to his or her advisor's project. All research effort must be certified annually to maintain compliance with the funders' stipulations.

The Memorandum of Assistance (MOA)

The Memorandum of Assistance, or MOA, is an administrative form used to offset tuition charges. It is also used to determine a student's eligibility for federal financial aid. The department normally submits the MOA after the drop/add period ends. If a student has a discrepancy between the credit hours reflected on the MOA and the student's actual registration, the department must submit a revised MOA to reflect the correct registration information.

Graduate Student Payroll

All student stipends are disbursed through the CWRU Payroll system. Paychecks are issued monthly on the last business day of each month during the academic year. Provided all paperwork is received by the cutoff date, your first payment will be made at the end of September. The final payment is disbursed at the end of May. Information on dispersed paychecks and W2 forms can be found at hcm.case.edu.

In addition to stipends, grant-funded tuition payments are made by tuition-deduct through payroll. Tuition deduct payments are made monthly. Because of this, students who are set up for monthly tuition payments through the department receive an exemption from past-due balances in SIS. If you are on tuition deduct and notice that your account is accruing late fees, please contact the student coordinator immediately.

Summer Stipends

Students who work for the department as graduate student instructors or graduate student researchers will receive a summer stipend. These are usually paid in a lump-sum at the end of July, but other arrangements may be made. The stipend amount is dependent upon several factors, including the funding source's budget and the duration and nature of the work.

Student Loans

Federal and private loan options are available for graduate students. Students who wish to apply for loans should contact Student Financial Services. More information is available on their website.

Taxes

Each student is responsible for completing tax paperwork at the beginning of his or her academic career, as well as for filing a tax return at the appropriate time. *The MAMS department does not provide tax advice.* If you have tax-related questions, you are encouraged to seek the advice of a financial professional. International students may seek assistance with filing their federal tax returns through Sprintax (more information here).

Travel Reimbursements

The department has limited funds and availability for graduate students to travel to conferences, which vary by year. Students interested in requesting travel reimbursement will be expected to present a poster or give a research talk at their chosen conference in order to be eligible. Please speak with your research advisor and the department administrator to determine appropriateness of the conference and availability of funds *before* registering for a conference or booking travel arrangements.

Additionally, the School of Graduate Studies has funds allocated for graduate student travel. Students interested in taking advantage of this opportunity are required to apply for the funds at least two weeks before they plan to travel. Please visit the School of Graduate Studies' Fellowships and Awards Webpage for more information on the Graduate Student Travel Award, as well as other fellowship opportunities.

Departmental Duties

Overview

All PhD students who receive department or grant funding are expected to perform teaching- or research-related duties, which may include grading, tutoring, or teaching a class, in exchange for their academic year stipends. The commitment will be up to 20 hours each week.

Grading

Graduate student graders will be assigned to grade for one or more sections of an undergraduate class taught by a MAMS department faculty member. All mathematics and applied mathematics students should be prepared to grade for multivariate calculus or differential equations. All statistics students should be prepared to grade basic statistics for social and life sciences or basic statistics for science and engineering courses. Students with the appropriate background may be asked instead to grade for upper-level undergraduate or graduate courses as deemed appropriate.

Grading assignments may include grading homework, quizzes, and/or exams, as directed by the instructor of the course. Occasionally, students may also be asked to proctor exams.

Graders are expected to **contact their assigned instructors weekly at minimum**, and to **respond to their requests within 24 hours**. Turnaround time for graded assignments should be established with the course instructor at the beginning of the term. If an issue arises that will make it difficult or impossible for the student to fulfill his or her grading obligation as expected, the student should inform the instructor as soon as possible and establish a plan for covering and completing the work. Students should **never** seek grading assistance from any entity not affiliated with the Department of Mathematics, Applied Mathematics, and Statistics, or the CWRU community. Similarly, graduate students should not solicit the assistance of a non-PhD student to assist in grading. In all cases, if a student is unable to complete grading assignments after speaking with the instructor, the student should seek assistance from administration. Any student in violation of the policy noted above violates FERPA. If a student violates FERPA, further University action will be taken.

In general, students may grade for fewer than the assigned hours per week one week and greater than the assigned hours another week, so long as the overall time spent grading averages to the assigned hours per week. If a student's grading load is taking more time per week than assigned on a regular basis, the student should first discuss his or her work load with the instructor of the course. Graders may also address any concerns regarding their grading assignments with the student coordinator, department administrator, or department chair.

Tutoring

The MAMS department offers drop-in help sessions for several undergraduate courses each semester. Offerings vary based on demand, but sessions are normally offered for multivariate calculus, differential equations, statistics and – frequently – in linear algebra and analysis. Graduate students who are assigned to tutor will develop a weekly schedule in coordination with the student coordinator. While students' schedules are taken into account when determining availability, students should make an effort to offer tutoring hours throughout the week in the late afternoon, early evening, and on Fridays to accommodate undergraduate student needs.

Tutors should assist session attendees with working through solutions to problems and general concepts. Tutors **should not** do students' homework for them. It may be beneficial to work through occasional problems together with the students to help them through the thinking process, but students seeking help are expected to make an effort to learn.

The department understands that unexpected events may arise that will affect a student's predetermined tutoring schedule. Students are expected to notify the department of any upcoming changes to their tutoring schedules as soon as they become aware of them, preferably **two business days in advance**, so that undergraduates have a chance to alter their plans as needed. Students are allowed two absences each month. A replacement should be found in the event that a student is unable to hold a tutoring session. If the student is unable to find a replacement, makeup sessions should be arranged with the student coordinator **within no more than three business days** for missed hours.

Teaching

Students who matriculate after completing a master's degree elsewhere, or who have completed coursework equivalent to a master's degree (30 credit hours), are eligible to teach undergraduate courses. In addition to this requirement, all students must complete UNIV 400 before being appointed as a Graduate Student Instructor. Course assignments may include pre-calculus, calculus I, II, or III, differential equations, introductory linear algebra, basic statistics for social and life sciences, and basic statistics for science and engineers .

Graduate student instructors are responsible for all aspects of their assigned courses, including syllabus creation, lesson planning, giving lectures, holding recitation sessions, and grading student assignments. Students are encouraged to seek guidance on any of these functions from the department chair and other faculty as needed. If any incident arises where an instructor suspects a student is breaking the Academic Integrity policy, concerns should be made with the Department Chair and Student Coordinator to begin the investigation process. The process will then escalate to the Undergraduate Dean's Office.

Research

All PhD students who have advanced to candidacy are expected to perform research as a requirement of their doctoral programs. Students who are supported by faculty grants will perform research related to the projects that fund their studies. As mentioned in the Financial Assistance section on page 6, all research effort must be certified annually to maintain compliance with the funders' stipulations. Grant funded students should seek direction on their research efforts from their research advisors.

International Students

International students who hold F-1 or J-1 visas are permitted to work **no more than 20 hours per week** during the semester, or 40 hours per week during breaks. If an international student in our department wishes to hold a job in addition to his or her departmental duties, he or she must adhere to the following restrictions:

- The student must not work more than 5 hours per week during the semester.
- The student must disclose his or her 5 hour commitment to the MAMS Department to International Student Services when submitting a Permission to Work form for the second job.
- The student must file an annual tax return for all income from all jobs worked, including his or her departmental appointment.

More details regarding student employment for international students can be found here.

Degree Requirements

University Requirements

Doctoral Students

CWRU imposes the following requirements upon all PhD students:

- Completion of 36 credit hours of coursework, at least 24 of which must be graded.
- Completion of 18 credit hours of dissertation research (MATH 701).
- Submission and approval of a Planned Program of Study (PPOS) by the end of the second semester of study.
- Passage of a comprehensive qualifying exam, administered by the department, and advancement to candidacy.
- Maintenance of a cumulative GPA of 3.0 or greater.
- Successful defense and submission of a dissertation.

For more detail please see
https://bulletin.case.edu/graduate-studies/academic-requirements/#text

Master's Students

CWRU imposes the following requirements upon all MS students:

- Completion of 30 credit hours of coursework, at least twelve of which must be graded.
- Submission and approval of a Planned Program of Study (PPOS) by the end of the second semester of study. Masters students in the Integrated Programs will complete the physical PPOS.
- Passage of a comprehensive exam, administered by the department, OR completion of 6 credit hours of research and successful defense of a master's thesis.
- Maintenance of a cumulative GPA of 3.0 or greater.

For more details, please see
https://bulletin.case.edu/graduate-studies/academic-requirements/#text

Department Requirements

The doctorate is conferred not merely upon completion of a stipulated course of study, but rather upon clear demonstration of scholarly attainment and capability of original research work in mathematics or statistics. A doctoral student may plan a traditional program of studies in mathematics (mathematics track), a program of studies oriented toward applied mathematics (applied mathematics track), or a program of studies in statistics. In each program, a student must take 36 credit hours of approved courses with a grade average of B or better. For students entering with a master's degree in a mathematical subject compatible with our program, as determined by the graduate committee, this requirement can be reduced to 18 credit hours of approved course. A student must request advanced standing from the graduate committee for a reduction to 18 credit hours of approved course.

In addition to the course work, all PhD students in both tracks must complete the following specific requirements:

Qualifying Exams

Each student will be required to take two written qualifying exams. The exams will be in analysis and algebra for the mathematics program, in numerical analysis and modeling for the applied mathematics program, and in theoretical statistics and applied statistical modeling for the statistics program. Syllabi for the exams are available to students, links to which can be found in the Written Qualifying Examinations section. Exams will be offered twice a year, usually in January and May. Students may attempt each exam up to two times. Departmental policy is that students take both exams on their first attempt. Under normal circumstances, students are expected to have passed both exams by the end of their fifth semester.

Area Exam

Each student will be required to pass an oral examination showing knowledge of the background and literature in the chosen area of specialization. The exam will be administered by the student's advising committee, chaired by the principal advisor. The exam should normally take place within one year after final passage of the qualifying examinations and at least one year before the defense takes place. A student may retake the required exam once.

A written syllabus, with a list of the papers for which the student will be responsible, should be prepared and agreed upon by the student and advising committee at least two months before the exam takes place, at which time a specific date and time for the exam should be decided. Both the syllabus and the scheduled date of the exam should then be reported to the graduate committee. Once the syllabus and exam date have been reported to the graduate committee, the student will advance to PhD candidacy.

Yearly Progress Reports

After passing the area exam, students will present yearly progress reports to their advising committees, usually in April. These reports can consist of both a written summary of progress and an oral presentation delivered to the advising committee.

Dissertation, Expository Talk, and Defense

Students are required to produce a written dissertation and present an oral defense. The dissertation is expected to constitute an original contribution to mathematical knowledge. It must be provided to the defense committee (the composition of which is discussed below) at least 10 days prior to the defense. Students are required to give a colloquium-level presentation of their thesis work, open to all students and faculty, followed by an oral defense of the thesis work to the defense committee. The committee consists of at least four faculty members, including the student's principal advisor and at least one outside faculty member.

Deadlines for the thesis defense and approval of the dissertation are determined by the School of Graduate Studies. It is the student's responsibility to be aware of deadlines and make sure they are met.

Program-Specific Requirements

Applied Mathematics PhD

A student in the applied mathematics program must demonstrate knowledge of scientific computing, mathematical modeling, and differential equations. Students must take 36 credit hours of approved courses with a grade average of B or better. For students entering with a master's degree in a mathematical subject compatible with our program, as determined by the graduate committee, this requirement is reduced to 18 credit hours of approved courses. This includes taking qualifying examinations in the areas of computational mathematics and mathematical modeling, and taking certain courses in these areas, as specified below.

Qualifying Examination

Students are required to take qualifying examinations in the areas of computational mathematics and mathematical modeling.

Area Examination

A doctoral student in the applied mathematics program must take an oral area examination in his or her chosen area of specialization. The subjects for the area exam will be determined by the student and their advising committee. Past topics have included fluid mechanics, statistical mechanics, epidemiology, neuroscience, inverse problems, and imaging.

Course requirements

MATH 431	Introduction to Numerical Analysis I	3
MATH 432	Numerical Differential Equations	3
or MATH 433	Numerical Solutions of Nonlinear Systems and Optimization	
MATH 441	Mathematical Modeling	3
MATH 435	Ordinary Differential Equations	3
or MATH 445	Introduction to Partial Differential Equations	
Approved Courses*		2
		4
Total Units		**36**

** Must include at least 9 credit hours of MATH courses and at least 9 credit hours of non-MATH courses.*

Applied Mathematics PhD students are subject to the same breadth requirements as students pursuing the MS degree in Applied Mathematics (see above). For students entering with a master's degree, this can be modified, as described below.

A student with a master's degree in a mathematical subject compatible with our program, as determined by the graduate committee, must take 18 credit hours of approved courses, which must include at least 6 credit hours of courses offered outside the Department of Mathematics, Applied Mathematics, and Statistics and at least 9 credit hours offered by the Department of Mathematics, Applied Mathematics, and Statistics. The graduate committee will determine which of the specific course requirements stated above have been satisfied by the master's coursework.

Sample study plans for students with concentrations in scientific computing, imaging, mathematical biology, and stochastics follow. Alternate study plans may also be approved by the graduate committee.

See more information here

Mathematics PhD

A student in the traditional mathematics program must demonstrate knowledge of the basic concepts and techniques of algebra, analysis (real and complex), and topology. This includes taking all courses in the three basic areas and successfully completing qualifying examinations in algebra and analysis. Mathematics PhD students must take 36 credit hours of approved courses with a grade average of B or better. For students entering with a Master's degree in a mathematical subject compatible with our program, as determined by the graduate committee, this requirement is reduced to 18 credit hours of approved courses.

Qualifying Examination

Each student will be required to take two written qualifying exams in real analysis and abstract algebra. Syllabi for the exams are available to students. Exams will be offered twice a year, usually in January and May. Students may attempt each exam up to two times. Under normal circumstances, students are expected to have passed both exams by the end of their fifth semester.

Area Examination

A doctoral student in the mathematics program must pass an oral area examination in his or her chosen area of specialization. The subjects for the area exam will be determined by the student and their advising committee. Past topics have included complex analysis, control and calculus of variations, differential equations, dynamical systems, functional analysis, geometry, probability, and topology.

Course requirements

Abstract Algebra:		6
MATH 401	Abstract Algebra I	
MATH 402	Abstract Algebra II	
Analysis:		9
MATH 423	Introduction to Real Analysis I	
MATH 424	Introduction to Real Analysis II	
MATH 425	Complex Analysis I	
Geometry and Topology:	Choose one of the following	3
MATH 461	Introduction to Topology	
or MATH 462	Algebraic Topology	
or MATH 465	Differential Geometry	
or MATH 467	Differential Manifolds	
Approved Coursework		18
Total Credit Hours		**36**

See more information here

Statistics, PhD

A student in the statistics program must demonstrate knowledge of the theoretical foundations of statistics and a wide range of statistical modeling and computational methodology. This includes taking qualifying examinations in the areas of theoretical statistics and applied statistical modeling, and taking certain courses in these areas, as specified below. Statistics PhD students must take 36 credit hours of approved courses with a grade average of B or better. For students entering with a master's degree in a mathematical subject compatible with our program, as determined by the graduate committee, this requirement is reduced to 18 credit hours of approved courses.

Qualifying Examination

Each student will be required to take two written qualifying exams in theoretical statistics and applied statistical modeling. Syllabi for the exams are available to students. Exams will be offered twice a year, usually in January and May. Students may attempt each exam up to two times. Under normal circumstances, students are expected to have passed both exams by the end of their fifth semester. There are three ratings of the exam: (1) Pass at the Ph.D. level; (2) Pass at the M.S. level; (3) Fail. Students who fail to pass at the Ph.D. level after two attempts will be given the opportunity to obtain an M.S. degree provided the student passes both exams at the M.S. level.

Area Examination

Each student will be required to pass an oral area examination showing knowledge of the background and literature in the chosen area of specialization. The exam will be administered by the student's advising committee, chaired by the research advisor. The exam should normally take place within one year after final passage of the qualifying examinations at the PhD level and at least one year before the defense takes place. A student may retake the area exam once.

A written syllabus, with a list of the papers for which the student will be responsible, should be prepared and agreed upon by the student and advising committee at least two months before the exam takes place, at which time a specific date and time for the exam should be decided. Both the syllabus and the scheduled date of the exam should then be reported to the graduate committee. The student is required to submit to the advising committee a written report on the predetermined research topic at least two weeks before the exam date. Once the syllabus and exam date have been reported to the graduate committee, the student will advance to PhD candidacy.

Course requirements

STAT 445	Theoretical Statistics I	3
STAT 446	Theoretical Statistics II	3
STAT 425	Data Analysis and Linear Models	3
STAT 426	Multivariate Analysis and Data Mining	3

STAT 455	Linear Models	3
STAT 448	Bayesian Theory with Applications	3
STAT 495	Statistical Consulting and Collaboration	3
STAT 545	Advanced Theory of Statistics I	3
Electives		12
Total Credit Hours		**36**

A student with a master's degree in a mathematical subject compatible with our program, as determined by the department graduate committee, must take 18 credit hours of approved courses. The department graduate committee will determine which of the specific course requirements stated above have been satisfied by the master's coursework.

See more information here

Applied Mathematics MS

The department offers specialized programs in applied mathematics. For each of the programs, there is a minimum requirement of 30 credit hours of course work, at least 18 of which must be at the 400 level or higher. Students in the program must complete course work requirements in each of the following groups:

- At least 15 hours offered by the Department of Mathematics, Applied Mathematics, and Statistics
- At least 6 hours of courses offered outside the Department of Mathematics, Applied Mathematics, and Statistics
- 6 hours of thesis work (see below) or successful completion of a comprehensive exam

Given the great diversity of topics used in applications, there cannot be a large common core of requirements for the MS in applied mathematics. Still, all students pursuing this degree are strongly advised to take MATH 431 Introduction to Numerical Analysis I and MATH 441 Mathematical Modeling. In addition, to add breadth to the student's education, the set of courses taken within the department must include three credit hours of approved course work in at least three of the following seven breadth areas. (The list includes suitable courses for each area. Please note that a course may be used to satisfy only one breadth area requirement.)

Applied Mathematics Breadth Areas

Analysis and Linear Analysis:

MATH 405	Advanced Matrix Analysis	3
MATH 423	Introduction to Real Analysis I	3
MATH 425	Complex Analysis I	3
MATH 428	Fourier Analysis and Applications	3

Probability and its Applications:

MATH 419	Applied Probability and Stochastic Processes for Biology	3
MATH 439	Integrated Numerical and Statistical Computations	3
MATH 482	High Dimensional Probability	3

Numerical Analysis and Scientific Computing:

MATH 431	Introduction to Numerical Analysis I	3
MATH 432	Numerical Differential Equations	3
MATH 433	Numerical Solutions of Nonlinear Systems and Optimization	3

Differential Equations:

MATH 435	Ordinary Differential Equations	3
MATH 445	Introduction to Partial Differential Equations	3
MATH 449	Dynamical Models for Biology and Medicine	3

Inverse Problems and Imaging:

MATH 439	Bayesian Scientific Computing	3
MATH 440	Computational Inverse Problems	3
MATH 473	Introduction to Mathematical Image Processing and Computer Vision	3

Logic and Discrete Mathematics:

MATH 406	Mathematical Logic and Model Theory	3
MATH 408	Introduction to Cryptology	3

Life Science:

MATH 419	Applied Probability and Stochastic Processes for Biology	3
MATH 441	Mathematical Modeling	3
MATH 449	Dynamical Models for Biology and Medicine	3
MATH 478	Computational Neuroscience	3

MATH 444	Mathematics of Data Mining and Pattern Recognition	3
MATH 492	Probability II	3
MATH 424	Introduction to Real Analysis II	3
MATH 425	Complex Analysis I	3
MATH 427	Convexity and Optimization	3

Additional Approved Courses:

The student must pass a comprehensive oral examination on three areas, two of which must be on the list of breadth areas (although no particular courses are specified). The third area for the examination may be any approved subject.

A student in the MS program in applied mathematics may substitute the comprehensive examination requirement with an expository or original thesis, which will count as 6 credit hours of course work. The thesis will be defended in the course of an oral examination, during which the student will be questioned about the thesis and related topics. These two variants correspond to the graduate school's Plan A and Plan B.

See more information here

Mathematics MS

A minimum of 30 credit hours of approved coursework, at least 18 of which must be at the 400-level or higher, is required for the Master of Science degree in Mathematics. The 30 credit hours required for graduation must include 6 credit hours each from two of the following three basic areas:

Abstract Algebra:		6
MATH 401	Abstract Algebra I	
MATH 402	Abstract Algebra II	
Analysis		6
MATH 423	Introduction to Real Analysis I	
MATH 424	Introduction to Real Analysis II	
MATH 425	Complex Analysis I	
Geometry and Topology:		6
MATH 461	Introduction to Topology	
MATH 462	Algebraic Topology	
MATH 465	Differential Geometry	
MATH 467	Differentiable Manifolds	

The student must pass a comprehensive examination on three areas, two of which must be selected from the basic ones listed above (although no particular courses are specified). The third area for the examination may be any approved subject.

A student in the MS program in Mathematics may substitute an expository or original thesis, which will count as 6 credit hours of coursework, for the comprehensive examination requirement. The thesis will be defended in the course of an oral examination, during which the student will be questioned about the thesis and related topics. These two variants correspond to the graduate school's Master's Thesis and Master's Non-Thesis options.

See more information here

Statistics MS

The dual core of the Master of Science program in Statistics is mathematical statistics and modern data analysis, with the option of a special Entrepreneurial Track. Expanding from this core, students develop technical facilities in a variety of statistical methodologies. This breadth of competence is designed to equip graduates to go beyond the appropriate choice of method for implementation and to be able to adapt these techniques and to construct new methods to meet the specific objectives and constraints of new situations. The MS degree in statistics requires a minimum of 30 credit hours of approved coursework in statistics and related disciplines, at least 18 of which must be at the 400-level or higher. Each student's program is developed in consultation with a faculty mentor.

STAT 425	Data Analysis and Linear Models	3
STAT 426	Multivariate Analysis and Data Mining	3
STAT 445	Theoretical Statistics I	3
STAT 446	Theoretical Statistics II	3
STAT 455	Linear Models	3
STAT 495	Statistical Consulting and Collaboration	3
Total Units		**18**

The student must pass a comprehensive written exam. In conjunction with a faculty mentor, the student may substitute the comprehensive examination requirement with an expository or original thesis, which will count as 6 credit hours of coursework for STAT 651. This thesis would be defended in the course of an oral examination, during which the student would be questioned about the thesis and related topics. These two variants correspond to the graduate school's Master's Non-Thesis and Master's Thesis options.

Entrepreneurial Track

The Master of Science in Statistics – Entrepreneurial Track (MSS-ET) is a professional degree designed to provide training in statistics focused on developing data analysis and decision-making skills in industrial, government, and consulting environments where uncertainties and related risks are present. It expands our master's program in statistics by creating a professional track that includes some business training. The Entrepreneurial Track provides instruction and real-world business experience to students who have a background in statistics and a vision for new and growing ventures. The MSS – ET program requires a minimum of 30 hours.

The required New Venture Creation and Technology Entrepreneurship courses will be offered by the Weatherhead School of Management. Students on internships will sign up for the consulting forum sequence. In addition, students are required to participate in an intensive (up to 30 hours) one-week annual workshop on the industrial use of statistics from the management perspective. This non-credit

workshop will take place during the fall or spring undergraduate breaks.

See more information here

Timeline of Milestones and Deadlines for the PhD

Year 1

Fall

- Complete UNIV 400

Spring

- First opportunity to attempt written qualifying exams (January)
    - See the Written Qualifying Examinations section for more details
- Create and submit first Planned Program of Study (PPOS) in SIS
- First annual progress report due (May)
    - See the Annual Progress Reports section for more details

Year 2

Fall

- Begin contacting faculty regarding doctoral research options

Spring

- First teaching assignment (must have completed UNIV 400 and a minimum of 30 credit hours of coursework)
- Complete minimum required credit hours of coursework
- Progress report due (May)

Year 3

Fall

- Final opportunity to pass written qualifying exams (January)
- Choose research advisor
- Schedule area exam and advance to candidacy
    - Register for MATH 701 in the first available semester after advancing to candidacy and each semester thereafter

Spring

- Area exam
    - See the Oral Candidacy (Area) Examinations section for more details
- Progress report due (May)

Year 4

Fall

- Contribute to scholarly publications (may be co-authored with research advisor and other collaborators)
- Final opportunity to pass the area exam (January)

Spring

- Attend a conference in area of research (discuss options with research advisor) • Progress report due (May)

Year 5

Fall

- Prepare draft of dissertation for defense committee

Spring

- Dissertation Defense (March-April)
    - See the Dissertation Defense section for more detail
- Conferral of doctoral degree and graduation (May)

Advisors and the Advising Committee

Overview

All graduate students are assigned an academic advisor prior to matriculation to assist with initial registration. Depending on faculty availability, students may be reassigned to new academic advisors after the first drop/add period ends. Students will work with their academic advisors until they pass their written qualifying examinations, at which point they will be expected to identify faculty research advisors.

Additionally, all graduate students must select an advising committee, in consultation with their assigned academic advisors, to oversee their progress through their academic programs. At a minimum, students are expected to meet with their advising committees annually to discuss their academic and research progress. The committee members will assess student progress annually, administer oral examinations, and provide guidance on academic and research matters as needed.

Academic Advisors

After a new graduate student accepts his or her offer of admission, the department will assign a faculty advisor to the student to provide initial registration instructions and answer any academic questions the student might have. New students may be assigned to different academic advisors during their first semesters of study based on faculty availability and students' areas of interest.

Research Advisors

Once a student passes the written qualifying examinations, it is his or her responsibility to identify a faculty advisor with whom the student would like to conduct research. Students should contact faculty members directly to discuss their interests and preparation. Once a student has reached an agreement with a potential research advisor, the student and the new advisor should establish a plan for the student's research and remaining coursework, as well as begin preparations for the student's area examination. Both parties should also inform the student coordinator so that the student's advisor can be updated in SIS.

Establishing an Advising Committee

A student's academic or research advisor will serve as the chair of the advising committee. Additional members should be chosen from the department's tenured and tenure-track professors. Students should consult their advisors for suggestions of appropriate committee members. The advising committee provides a student with formal guidance on academic and research matters. This committee is separate from the dissertation defense committee; see the Dissertation Defense section on page 30 for more information.

Expectations

Specific expectations regarding a student's program of study and research output should be established when a student and a faculty member decide to enter into a mentoring relationship. Students are expected to keep their advisors informed of their academic and research progress on a regular basis, and to provide annual progress reports to their advising committees. When questions arise, students should contact their advisors for guidance first.

Advisors are expected to provide academic and research guidance to their students, as well as serve as professional mentors. Advisors may suggest professional development opportunities that are in line with their students' post-graduation plans as applicable. While some advisors may choose to assist students in securing employment opportunities after graduation, this is not a requirement of the mentoring relationship. Ultimately, students will be responsible for finding their own employment.

If a student or his or her advisor does not find the mentoring relationship to be meeting the expectations established at the onset, both parties reserve the right to terminate the relationship.

Planned Program of Study (PPOS)

Purpose

The Planned Program of Study (PPOS) is a list of all coursework a student intends to take or has taken throughout the course of his or her graduate career, excluding MATH 701 for PhD students. It is intended to confirm that the student will meet all degree requirements by the time he or she graduates.

Requirements

According to Graduate Studies policy, all graduate students are required to complete and submit a PPOS in SIS by the end of their second semesters (see here for more details). Students who fail to do this will have registration holds placed on their accounts in SIS, which can only be removed by submitting an approved PPOS.

Creating a PPOS

Before submitting the online PPOS, students are expected to meet with their academic advisors to discuss their academic and professional goals. Advisors are able to offer course suggestions and academic guidance. Instructions on creating and submitting a PPOS are available on the University Registrar's website here.

After a student submits a PPOS, his or her advisor must approve or deny the document. If the PPOS is approved, it will move on to Graduate Studies for final approval. Once this happens, any registration holds on the student's account will be lifted within 24 hours.

If the PPOS is not approved by the advisor, the student is expected to make the necessary updates and submit a new PPOS for approval. It is recommended that the student meet with their advisor to discuss why their PPOS was denied so that future delays can be avoided.

Revising a PPOS

As the PhD program is expected to take 5 years to complete, it is understandable that a student's actual coursework may be different than what he or she originally proposed at the start of his or her academic career. Students are able to make revisions to their PPOS as often as needed to ensure that it accurately reflects their completed coursework. **Your PPOS must match the coursework you have taken before you are able to graduate.** Instructions for revising an approved PPOS can be found here.

Written Qualifying Examinations

Overview

The written qualifying examinations in Mathematics , Applied Mathematics, and Statistics are meant to assess our students' proficiency in the material deemed necessary for their successful conduct of research in their chosen areas. Exams are normally offered in January and May, and students may attempt each exam up to two times. Syllabi for each exam are available to students on the department website via this link.

Statement of Policy

As stated on the MAMS Department website:

> *Each student will be required to take two written qualifying exams. The exams will be in analysis and algebra for the mathematics track, in numerical analysis and modeling for the applied mathematics track, and in theoretical and applied statistics for the statistics track. Syllabi for the exams are available to students. Exams will be offered twice a year, usually in January and May. Students may attempt each exam up to two times. Under normal circumstances, students are expected to have passed both exams by the end of their fifth semester.*

Requirements

All PhD students are expected to pass their written qualifying examinations by the end of their fifth semesters of study. A student may attempt the qualifying examinations as early as his or her first semester. Specific requirements for each PhD program are detailed below.

Applied Mathematics

PhD students in applied mathematics will take one exam each in mathematical modeling (syllabus link) and numerical analysis (syllabus link). Students are encouraged to take the following courses, as appropriate, in preparation for their qualifying exams:

- MATH 423-Real Analysis I
- MATH 431-Introduction to Numerical Analysis I
- MATH 432-Numerical Differential Equations
- MATH 441-Introduction to Mathematical Modeling

Mathematics

PhD students in mathematics will take one exam each in abstract algebra (syllabus link) and real analysis (syllabus link). Students are encouraged to take the following courses, as appropriate, in preparation for their qualifying exams:

- MATH 401-Abstract Algebra I
- MATH 402-Abstract Algebra II
- MATH 423-Real Analysis I
- MATH 424-Real Analysis II
- MATH 425-Complex Analysis

Statistics

PhD students in statistics will take one exam each in theoretical statistics (syllabus link) and applied statistical modeling (syllabus link). Students are encouraged to take the following courses, as appropriate, in preparation for their qualifying exams:

- STAT 425-Data Analysis and Linear Regression Models
- STAT 426-Multivariate Analysis and Data Mining
- STAT 445-Theoretical Statistics I
- STAT 446-Theoretical Statistics II

Preparation

Dependent upon availability, some faculty members may host review sessions prior to the exams at the request of interested students. However, it is each student's responsibility to study and prepare for his or her qualifying examinations. Course materials from the courses listed above, as well as the texts listed in the syllabus for each exam, will be helpful resources. All graduate students have access to previous exams on box.

Oral Candidacy (Area) Examination and Advancement to Candidacy

Statement of Policy

Per the General Bulletin:

> *Each student will be required to pass an oral examination showing knowledge of the background and literature in the chosen area of specialization. The exam will be administered by the student's advising committee, chaired by the principal advisor. The exam should normally take place within one year after final passage of the qualifying examinations and at least one year before the defense takes place. A student may retake the required exam once.*
>
> *A written syllabus, with a list of the papers for which the student will be responsible, should be prepared and agreed upon by the student and advising committee* at least two months before the exam takes place*, at which time a specific date and time for the exam should be decided. Both the syllabus and the scheduled date of the exam should then be reported to the graduate committee and student coordinator. Once the syllabus and exam date have been reported to the graduate committee, the student will advance to PhD candidacy.*

Scheduling

Students should contact the department assistant who manages room reservations to secure a room for their area exams. 2145 Adelbert Road Room 205A, the most often used room for this purpose, requires additional approval from the Department Administrator. Therefore, students should allow extra time for their room requests to be processed. Area exams normally take one to two hours to complete.

Exam Content

Students should discuss the proposed content of their area exams with their research advisors and advising committees. Area exam syllabi normally consist of three to five papers and/or book chapters related to the proposed area of research. Students will be questioned on this material to determine their readiness to make significant contributions to their proposed fields.

Advancement to Candidacy and MATH/STAT 701 Registration

After a student has scheduled his or her area exam and submitted his or her syllabus to the student coordinator, the department will submit the student's Advancement to Candidacy paperwork to the School of Graduate Studies. Processing can take up to two weeks, so students should submit the

necessary information as far in advance of the beginning of the semester as possible. Students will not be able to register for MATH or STAT 701 until they advance to candidacy. However, after a student advances to candidacy, he or she will be expected to register for at least one credit hour of MATH/STAT 701 every semester until graduation. Starting from the first semester in which a student registers for MATH/STAT 701, he or she will have five consecutive calendar years to graduate. The official policy, as stated in the School of Graduate Studies Academic Policies, is as follows:

> *All the requirements for the master's degree must be completed within five consecutive calendar years after matriculation as a graduate student, including any leaves of absence. Doctoral students have five consecutive calendar years from the semester of the first credited 701 registration, including leaves of absence, to complete all requirements for the doctorate. Any graduate student who fails to complete the requirements within the five-year limit for his or her degree program will be subject to separation from further study unless granted an extension by the School of Graduate Studies with the recommendation of the faculty advisor or advisory committee and approval by the department chair. An extension may be granted if the student and his or her advisor work out a plan of action for degree completion within a specified time frame which must be endorsed by the department chair. Students will be expected to meet all the specified deadlines outlined in the plan of action. The minimum acceptable registration during this extended period for each semester until graduation is three credit hours of 651 or 701. Plan B master's students must register for at least three credits of appropriate course work.*

Publications

Overview

As students make progress in their research, they will be encouraged to publish their work in scientific journals. The MAMS Department does not require students to publish their work as a formal prerequisite for graduation, but publication may be helpful to students' academic and professional careers. Students should discuss all aspects of publication, including journal selection, content, formatting, etc., with their research advisors.

Authorship

Students who contribute to any portion of the research published in a journal article or other publication may be eligible to be listed as a primary author or co-author of the work. Order of authorship will be discussed and agreed upon between the student, his or her research advisor, and any collaborators involved in the work.

Including Papers as Chapters in Your Dissertation

It is permissible to include reference to work you have published previously in your dissertation, provided it is done appropriately. Per the School of Graduate Studies:

> *If you have published an article or articles before you turn in your thesis or dissertation, and you desire credit for it with your graduate requirements, you have a number of options. These should be discussed with your committee, and possibly with your publisher. First, you can simply cite the publication in your references. Second, if the publisher has the publication online, you can link or point to it (with permission of the publisher, who usually has protection so that paying customers or subscribers are the only ones allowed access). Third, if the publisher gives you a signed release, you can include the publication in your thesis or dissertation as stated in the release. If the publisher restricts access in the release, possibly to your university, you may want to have two versions of your thesis or dissertation--one with and one without the chapter (e.g., published article) in question.*
>
> *This matter may be avoided if your thesis or dissertation talks about your research in a very different way from the published article. This often makes sense because articles are typically short, and your thesis or dissertation may be the only place where the details, data, tables, and other aspects of your research are made available.*

Copyrights and Intellectual Property

Students are responsible for familiarizing themselves with their rights and responsibilities with regard to copyright and intellectual property policies. Per the School of Graduate Studies:

> *Authorship automatically and implicitly confers a copyright to the author, without any additional fee. However, a copyright can be registered with the U.S. Copyright Office, which will provide additional legal protections for your rights regarding your dissertation, for an additional fee. The School of Graduate Studies is no longer processing these requests. If you choose to formally copyright, please insert a "copyright page" into your document. If you are not copyrighting, then leave out this page.*

Comprehensive information regarding CWRU's copyright and intellectual property policies is available through Kelvin Smith Library at https://case.edu/library/research-tools/publishing-and-copyright/copyright

To view the university's full intellectual property policy, visit: https://case.edu/research/sites/default/files/2024-03/Intellectual-Property-Policy.pdf. Students should seek professional legal advice if more in-depth assistance is needed.

Dissertation Defense

Establishing a Thesis Committee

The thesis committee is responsible for providing the student with guidance during the writing process, administering and evaluating the final, oral examination (defense), and ultimately providing a recommendation on the merit of a student's candidacy for a doctoral degree. This committee may include some or all of a student's advising committee members. Additionally, the thesis committee must include at least one faculty member from a different department at CWRU. Students may choose to include a committee member from another university as well, but this must be in addition to the four CWRU-affiliated members, and this person will not count as the outside committee member. Committee members should be faculty who are engaged in research related to a student's dissertation topic.

Students should consult their research advisors for suggested committee members.

Statement of Policy

From the General Bulletin:

> *The composition of each student's dissertation committee must have formal approval by the School of Graduate Studies on recommendation of the chair of the department, division, or curricular program committee. The dissertation committee must consist of a minimum of four members of the University faculty (any tenured or tenure-track Case Western Reserve University faculty member, and any CWRU full-time faculty member whose primary duties include research who is authorized to serve on a PhD dissertation committee by the school or college through which they are affiliated with the university). At least one of these CWRU faculty must hold a primary appointment that is outside of the student's department, program, or school. The chair of the committee must be a CWRU tenured or tenure-track faculty member in the student's program. The student's dissertation research advisor must be a member of the committee and may serve as chair if consistent with departmental policy.*
>
> *Persons who are not members of the University faculty may serve as additional members of the defense committee, subject to approval by the School of Graduate Studies. A petition with the rationale for the request must be submitted to the School of Graduate Studies along with the proposed member's curriculum vitae. Under special conditions, a former faculty member whose time of leaving the university has not exceeded 18 months may be approved as a committee member by the School of Graduate Studies.*
>
> *Throughout the development and completion of the dissertation, members of the dissertation advisory committee are expected to provide constructive criticism and helpful ideas generated by the research problem from the viewpoint of their particular expertise. Each member will make an*

assessment of the originality of the dissertation, its value, the contribution it makes, and the clarity with which concepts are communicated, especially to a person outside the field. The doctoral student is expected to arrange meetings and maintain periodic contact with each committee member. A meeting of the full committee for the purpose of assessing the student's progress should occur at least once a year until the completion of the dissertation.

Clarification on Outside Committee Members

Because the MAMS Department was formed when the Mathematics and Statistics Departments merged, some faculty members whose specialty is designated as statistics may serve as outside committee members for PhD students in mathematics or applied mathematics.

Additional Committee Members

As stated in the School of Graduate Studies' policy, "Persons who are not members of the University faculty may serve as additional members of the defense committee, subject to approval by the School of Graduate Studies." Specific examples include CWRU senior instructors and adjunct professors, emeritus professors, and tenured or tenure-track professors at other universities. All such additional defense committee members require department approval and a petition to the School of Graduate Studies.

Scheduling the Defense

Students should confer with their research advisors, defense committees, and the MAMS department to determine an appropriate date and time and book a department room for their defenses. The School of Graduate Studies requires that students schedule their dissertation defenses with them at least three weeks prior to the date of the defense. To do so, each student must complete the Notification for Scheduling the Final Oral Examination for the PhD form within the appropriate time frame (see the Forms section) to Graduate Studies.

Defending a Thesis

Students are required to provide each member of their defense committees with a copy of their theses at least 10 business days before their scheduled defense dates in order to allow adequate time for review. Per the General Bulletin,

It is expected that all members of the dissertation defense committee be present at the defense. Exceptions to this rule: a) must be approved by petition to the School of Graduate Studies and only under extraordinary circumstances; b) no more than one voting member can ever be absent; c) the absent member must participate through real-time video conferencing at the department's expense; however, if such video conferencing is not available, the absent member may participate through telephone conferencing; and d) the student must always be physically present.

The dissertation defense is similar to a colloquium talk and is broken into three stages:

1. **Welcome and presentation.**

a. All members of the university community and the public are invited to attend the first stage of the defense. In this stage, the student's advisor will introduce the student and his or her research topic, and the student will then proceed to give a presentation on his or her research at a level appropriate for public understanding.

2. **Public Questions.**

    a. After the student's presentation is completed, all attendees are allowed to ask general questions about the work.

3. **Final Oral Examination and Assessment.**

    a. After public questions have been entertained, all attendees who are not members of the defense committee are dismissed. The committee will then proceed to question the student on his or her research and dissertation until the members are ready to vote. At that time, the student will be excused briefly while the committee deliberates and votes. The student is then informed of the committee's decision, including any required corrections to the dissertation. If all voting committee members, or all but one, are in agreement that the student passes, the Final Certification for the PhD Degree form is completed and signed.

Submitting a Thesis for Online Publication

The School of Graduate Studies requires all PhD and Master's (Thesis) degree candidates to submit an Electronic Thesis/Dissertation (ETD) as part of their graduation requirements. The ETD must be submitted by the deadline posted on the School of Graduate Studies' calendar in order to qualify for graduation at the end of the term in which the dissertation is defended. Further information on formatting and submission are available here.

Annual Progress Reports

Overview

While students should seek feedback from their academic and research advisors informally throughout the academic year to ensure their own success, formal review of student progress is conducted annually. All doctoral students are required to submit an annual progress report each spring. This report is intended to monitor student success and attainment of necessary benchmarks. It is also an opportunity for students to voice formally any concerns they might have.

Statement of Policy

From the General Bulletin:

> *In order to achieve excellence in student mentoring in doctoral programs within the School of Graduate Studies at Case Western Reserve University, an annual review of student progress toward the degree is required for every doctoral student. This review has two purposes: i) to support mentoring of students by providing regular and timely feedback that will enhance their success at CWRU and their career goals and professional development, and ii) to evaluate progress toward completion of the degree. To achieve these goals, the review should evaluate the previous year's progress, detail the student's strengths and areas that need improvement, and make recommendations for future action to complete the degree.*
>
> *Each doctoral program shall develop its own annual review format and timing within these minimal guidelines:*
>
> *Every doctoral student will submit an annual progress report to their program, department, or school. The report should describe progress toward the degree in the past year, future plans for completing the degree, career goals and progress toward professional development.*
>
> *Faculty of the program, department, or school will review the student reports to evaluate student progress in the program. The review process shall include at least two faculty members, such as the faculty advisor, dissertation or thesis chair or committee, graduate student director, or other subset of faculty designated by the department. Additional faculty members may be asked to provide input to help the review process.*
>
> *The findings of the evaluation shall be communicated to the student in a written report and, whenever possible, discussed in person, that details the student's current status in the program, progress towards completion, career goals and professional development, and makes concrete suggestions for future actions.*
>
> *Master's level students may be evaluated in a similar fashion at the discretion of the program,*

department, or school. If a doctoral program already has an annual review policy in place, the program shall inform the School of Graduate Studies of what form that review takes. For programs that do not have an annual review policy, the School of Graduate Studies requests that they create an annual review policy within a year from the approval of the policy. This policy does not mandate the use of one student review format. Examples of existing formats for review of student progress will be posted on the Graduate Studies website. For some programs, the annual report can be coordinated with other reporting needs (e.g. NIH grants) so as to eliminate redundancy in reporting for the student.

Compliance with this policy will be monitored by SGS. Programs shall provide an annual list of names of students who have been reviewed by June 30th. A template of the department review form shall be provided to SGS. Copies of an individual student's annual reviews will be made available to SGS upon request.

The School of Graduate Studies shall conduct a process evaluation two years after implementation of this policy.

Process

To complete the annual progress report, each student should fill out the attached form, sign it, and submit it to his or her advisor for review within two weeks. Advisors will evaluate and sign their advisees' reports, as well as provide written feedback on their advisees' progress. Students must then submit their progress reports to an additional faculty member for further review. This faculty member may be a member of the student's advising committee, or the student may ask the chair of the graduate committee to serve as the additional reviewer. Students who have passed their area exams will also be required to provide written reports and oral presentations on their research progress as part of their annual progress reports.

Students are expected to submit their completed progress reports, along with written faculty comments and required attachments, to the student coordinator no later than **May 17**. If you require an exception to this deadline, contact the student coordinator. Electronic signatures are acceptable for annual progress reports.

Time Off and Leaves of Absence

Statement of Policy

The School of Graduate Studies grants students time off for holidays, vacations, sick leave, and parental leave. Additionally, students may apply to take official leaves of absence due to medical or personal circumstances. The required form, which can be found in the appendix, must be approved by a student's advisor, the department chair, and the dean of graduate studies, and should be completed in consultation with the student coordinator and administrator.

Please note that students must continue to execute their departmental teaching duties, or make arrangements to make them up at a later date as appropriate, in order to continue receiving their monthly stipends. Inability to do so will cause a student to forfeit his or her stipend for the period of leave. Graduate Studies' policies, as detailed in the General Bulletin, are as follows:

> These policies apply to graduate students in the School of Graduate Studies who receive stipends that support their effort toward earning a degree during the period when they receive support. They represent the minimum to which graduate students are entitled.
>
> If a graduate student receives a stipend, they will receive support for holidays, vacations, sick leave, and parental leave as set forth below. The stipend support for those days will be at the same rate as for normal work days. For all anticipated leaves longer than two weeks, appropriate departmental approvals must be obtained and paperwork submitted to the School of Graduate Studies prior to the start of the leave.
>
> These policies do not supersede other university policies concerning attendance or residence at the university (e.g. participating in classroom activities as a student or teaching assistant). These policies only apply to student effort toward earning a degree.
>
> *Holidays*
>
> Graduate students are entitled to observe all university closings for holidays and other recognized events.
>
> *Vacations*
>
> Graduate students are allowed two weeks of vacation per calendar year (10 traditional work days) if they receive full support during a 12-month period. Students who receive less than 12 months of support are not entitled to vacation during the period of support. The dates of vacations must be approved in advance by the student's research mentor to ensure that time-sensitive work is not disrupted.

Vacation days can be accrued from one year to the next year only with the prior written approval of the Program and only up to a maximum of 20 traditional work days, to allow for international travel, for example. There is no terminal leave.

The times between academic terms and the summer are considered part of the active training period and are not to be regarded as vacation time.

Sick Leave

Graduate students are entitled to two weeks (10 traditional work days) of sick leave per year, with no year-to-year accrual. Sick leave may be used for medical conditions related to pregnancy and childbirth. Under exceptional circumstances, additional sick leave days may be granted following receipt of a written request from a physician, and prior written approval by the Program.

Parental Leave

Graduate students are entitled to paid parental leave for the adoption or birth of a child. The primary caregiver is entitled to 6 weeks leave and the other parent or domestic partner is entitled to 3 weeks leave. When both parents are supported graduate students, the leave may be used consecutively or together. The leave must be used within 12 months of birth or adoption. Parental leave must be approved in advance in writing by the Program. It is permissible to add parental leave and sick leave together for the adoption or birth of a child.

Unpaid Leave

Students who require additional leave beyond what is stipulated above must seek prior written approval from the School of Graduate Studies for an unpaid leave of absence. Approval for a leave of absence must be requested in advance by the student and the student should provide documentation for the leave request and obtain approval. Conditions for the leave and approval must be submitted to the School of Graduate Studies. Continued coverage of health insurance is allowable as permitted within the guidelines of University Health Services and with written approval by the Program and School of Graduate Studies.

Unused Leave

A student is not entitled to receive any form of compensation for any unused holidays, vacation days, sick leave, parental leave, and/or other accrued time off.

Disclaimers

These policies do not supersede any HR policy. In addition, these policies do not create a contractual relationship with any student and the policies may be amended at any time by the Faculty and the School of Graduate Studies.
The School of Graduate Studies policies regarding continuous registration and leave of absence still apply.

Maintenance of leave records is the responsibility of the academic department.

Leave of Absence from Graduate Study

Students undertaking graduate work are expected to pursue their studies according to a systematic plan each year whether registered for full or part-time study. Occasionally a student finds it necessary to interrupt his or her studies before completion of the graduate program. A leave of absence is not to be requested unless the circumstances are such that the student cannot continue graduate study.

Under such circumstances the student must request in writing a leave of absence for a period not to exceed two consecutive regular academic semesters. Forms can be found at the School of Graduate Studies website. In exceptional circumstances, the leave can be extended for another two semesters.

However, the maximum amount of leave permitted per graduate program is four semesters. The reason for the leave must be stated clearly, and the request must be submitted to the School of Graduate Studies with the written endorsement of the student's academic department. During a leave of absence, the student must not seek aid from faculty members or use of the facilities of the university. This means that students may not take exams or defend theses and dissertations while on a leave. A leave of absence does not extend the maximum time permitted for the completion of degree requirements, and a leave cannot be taken while students are on extension of the five-year limit. At the expiration of the leave the student must resume registration unless formally granted an extension of the leave. Retroactive leaves are not permitted. A student who fails to obtain a leave of absence, or who fails to register following an official leave, must petition the School of Graduate Studies for reinstatement in order to resume work as a student in good standing at the university.

A student who is granted a maternity or paternity leave of absence related to infant care, as well as those who must fulfill military duty obligations, can petition to extend the five-year time limit associated with completion of the degree. The length of the extension may not exceed two years. International students must check with the Office of International Student Services before petitioning for a leave of absence, as such a leave can affect their visa status.

Important Contacts

MAMS Department

Administrative office: 2145 Adelbert Road, Room 202B
Business Hours: Monday-Friday, 8:30 a.m. – 4:30 p.m.
Website: mathstats.case.edu

Graduate Studies

Office: Tomlinson Hall, Room 203
Phone: 216.368.4390
General Email: gradstudies@case.edu
Website: case.edu/gradstudies

Charles Rozek, Vice Provost and Dean of Graduate Studies

- Email: Charles.rozek@case.edu
- Phone: please call general Graduate Studies phone number for assistance

Lynmarie Hamel, Senior Associate Dean of Graduate Studies

- Manages academic administration for the School of Graduate Studies
- Email: lynmarie.hamel@case.edu

Natalie Cowan, Graduate Studies Coordinator

- Manages academic and administrative petitions, Planned Program of Study (PPOS), leaves of absence, doctoral defenses, and graduation
- Email: nataliecowan@case.edu
- Phone: 216.368.4401

Rachel Begley, Director, Professional Development Center

- Manages Professional Development Conference, resources for graduate students and postdocs, and support for national scholarship and fellowship applications
- Email: Rachel.begley@case.edu
- Phone: 216.368.8536

Access Services

Location: Crawford Hall Basement

Phone: 216.368.2273

General Email: access@case.edu or parking@case.edu

Website: case.edu/access-services

- Manages ID cards, parking services, campus transportation, key pickup and return, and discounted Cleveland RTA passes

Student Financial Services

Phone: 216.368.2226

General Email: studentaccounts@case.edu

Website: case.edu/studentaccounts

- Assists with account balance, payments, financial registration holds, SIS for financials, tuition, late fees, withdrawal refunds, account statements, third party credits, wire transfers, 529 and other prepaid college funds
- Reimbursement checks not set up for direct deposit can be picked up in the **Cashier's Office** in **Sears Library 210 and 210A**

University Counseling Services

Location: 220 Sears Building

Business Hours: Monday - Friday, 8:30 a.m. - 5 p.m.

Phone: 216.368.5872

General Email: counseling@case.edu

Website: students.case.edu/departments/counseling

- Provides wellness programs, counseling and psychiatric services, and prevention and recovery programs

University Health and Counseling Service

Location: 2124 Cornell Road (map)

Business Hours: Monday - Wednesday and Friday, 8:30 a.m. - 4:30 p.m., Thursday, 9:30 a.m. - 4:30 p.m.

Phone: Nurse on call: 216.368.2450, Counselor on-call 216.368.5872

General Email: uhcs@case.edu

Website: students.case.edu/departments/health

- Provides emergency and non-emergency healthcare for students and coordinates the Student Medical Plan

University Registrar

Location: Sears Library, Room 220

Phone: 216.368.4310

General Email: registrar@case.edu

Website: case.edu/registrar

- Supports SIS use, transcript requests, and degree verification

University Technology (UTech)

CARE Center Location: Kelvin Smith Library

Phone: 216.368.HELP (4357)

General Email: help@case.edu

Website: help.case.edu

- Manages Case Google Accounts, Blackboard, PeopleSoft Applications (SIS, HCM), Software Center, university internet and phone services, and personal computer service and support

Important Resources

- CWRU CARE (Campus Assessment, Referral, and Engagement) Report
- CWRU Office of Student Conduct and Community Standards
    - 216.368.3170
    - studentconduct@case.edu
- CWRU Office of the Dean of Students
    - 216.368.1527
    - deanofstudents@case.edu
- CWRU University Health and Counseling Services
    - 216.368.2450 (medical advice)
    - 216.368.5872 (counselor-on-call)
    - uhcs@case.edu
- CWRU Public Safety
    - 216.368.3333 (emergency)
    - 216.368.3300 (non-emergency)

University Services

Career Services

Career Exploration offers many services to help students prepare for and enter the workforce after graduation. Examples include providing resume and cover letter assistance, interview preparation, and networking opportunities, as well as holding biannual career fairs. A full list of available services can be found here.

Center for International Affairs

Within the Center for International Affairs, the Office of International Student (ISS) services deals with issues pertinent to international graduate students, including, but not limited to, visas, work eligibility, and Optional Practical Training (OPT). The office is located on the first floor of Tomlinson Hall, and students may seek guidance during drop-in hours, as posted on the ISS website, or by appointment.

Office for Campus Enrichment & Engagement

Student resources managed by this office can be found here, and a list of student organizations related to inclusion, diversity, and equal opportunity can be found here. If you feel you may have witnessed or been targeted by a bias-related incident, please visit the website of the Community Concerns Reporting System for details regarding your rights, expectations, and necessary processes.

Graduate Student Career Planning

The Division of Student Affairs provides graduate student career planning services, including career counseling services. The School of Graduate Studies manages several travel funds, fellowships, and grants for students, information about which can be found here. Interested students should contact graduate studies (gradstudies@case.edu) for more information.

Public Safety

Campus Police and Security works to maintain a safe environment for all members of and visitors to CWRU. Services include crime reporting, campus alerts, self-defense and active shooter (ALICE) training, safe rides and walking escorts, and lost and found. In the event of an emergency, please call 216.368.3333 for assistance. For non-emergency concerns, please call 216.368.3300 instead.

More information is available on the Public Safety website.

The Student Medical Plan and University Health Services

All students enrolled at CWRU are required to carry health insurance coverage that is compliant with

the Affordable Care Act's standards. CWRU offers student health insurance through Aetna for graduate students and their dependents (an additional, non-reimbursable fee applies for dependents). ***If a student wishes to utilize the university health plan, he or she must pay the premium at the beginning of each semester. Funded students are eligible for a subsidy for this fee, after they have paid it in full, from the College of Arts and Sciences.*** More information about the student medical plan can be found at students.case.edu/wellness/medicalplan/.

All students are eligible for health care through University Health Services. The full list of available services, which includes physical examinations, vaccinations (including flu shots), counseling, and women's health services, can be found here.

FAQ for New PhD Students

Financial

1. **When will my tuition be paid? Do I need to do anything?**

   Tuition is paid after the drop/add period ends. To ensure that we pay the accurate amount, you will need to register for all classes you plan to take by the first day of classes. If you make any changes to your registration after that date, please inform the department so that your tuition payment can be adjusted.

2. **What is the Memorandum of Assistance (MOA)? When will mine be submitted?**

   The Memorandum of Assistance (MOA) is an administrative form used to offset tuition charges. It is also used to determine your eligibility for federal financial aid. The department normally submits the MOA after the drop/add period ends.

3. **How do I get added to the payroll?**

   To receive your monthly stipend, you will need to fill out the I-9, W-4, and IT-4 forms and return them to the department office. You will also need to provide proof of citizenship and work eligibility, as explained in the instructions of the I-9 form. International students will also need to apply for a social security card after they have been in the country for 10 days before they will be added to payroll, if they have not already done so at a previous institution.

4. **When will I receive my first stipend payment?**

   Provided that your payroll paperwork is completed in a timely fashion, you will receive your first payment on the last business day of September. If you do not make the cutoff deadline, you will receive your first and second payments together on the last business day of October.

5. **Do I have to pay for health insurance?**

   While students are required to pay for their health insurance premiums if they wish to participate in the student health plan, funded PhD students are eligible for a subsidy in the full amount of the charge provided by the College of Arts & Sciences. Subsidies are normally processed in the first month of each semester. Please be sure to pay the health insurance charge by the end of the drop/add period if you wish to receive the subsidy.

6. **What charges am I responsible for?**

   Students are responsible for paying the student activity fee, the RTA Transportation Fee, the One-to-One gym membership fee and taxes, late registration fees, and any late fees which are incurred on any charges aside from tuition. Late fees should not be accrued on tuition which is paid through a faculty research grant, so please contact the graduate student services manager as soon as possible if one appears when it should not.

7. **I need a letter which verifies my student status and income. How do I get this?**

   For most purposes, your department admission letter or reappointment letter will be sufficient proof of your student status and stipend amount. You are also able to print pay stubs through the HCM system (case.edu/hcm) to verify your monthly income. If neither of these options is acceptable, please contact the graduate student services manager to discuss your needs.

Academics

8. **When and how do I register for classes?**

   To ensure that all classes you wish to take will be able to run, please register as early as possible. Open registration dates are available on the University Registrar's website. Please consult with your academic advisor each semester to discuss your planned and required coursework and to have your advising hold lifted in SIS. Instructions on how to register for classes in SIS are available on the School of Graduate Studies' website.

9. **How many classes should I register for? Which ones?**

   Students who have not yet advanced to candidacy are required to register for a minimum of 9 credit hours (3 classes) per semester to maintain full-time status. First- year students are approved for a total of 9 credit hours per semester. If you are unsure of how many credit hours you are approved for after your first year, or if you intend to register for more or fewer credits than you are allowed, please contact the graduate student services manager to discuss your registration options.

   You should discuss your planned coursework with your academic advisor. While you have some flexibility in your course selections, your advisor will be able to guide you in selecting an appropriate plan of study based on your program requirements and professional goals.

10. **Who is my academic advisor? How do I contact him/her?**

    Your academic advisor can be found on the main page of your SIS account. All incoming students are assigned to the department chair initially, and then they are reassigned to new advisors at the beginning of the semester. As you proceed through your program, you will be expected to identify a research advisor to supervise your dissertation research.

    All faculty contact information is available on the department website. You may also click on the "Details" link underneath your advisor's name in SIS to access his/her phone number and email address.

11. **I have already completed a master's degree. How do I receive advanced standing towards my doctoral degree?**

    Students who have completed a master's degree prior to matriculating in a PhD program in our department are eligible for a waiver of 18 credit hours of coursework. To obtain this waiver, you will need to discuss your previous coursework with your advisor and confirm that it is appropriate for advanced standing. He or she will be able to apply the waiver in SIS

during the process of approving your Planned Program of Study.

12. What is a Planned Program of Study? How do I create one?

A Planned Program of Study, also known as a PPOS, is a list of all courses you plan to take throughout your time in the PhD program. Instructions for creating a PPOS are located on the University Registrar's website. You should consult with your academic advisor to develop a preliminary PPOS based on your academic program, background, and interests. The PPOS should be updated periodically so that it accurately represents your coursework at Case. All students are required to complete a PPOS by the end of their second semester in the program.

Administrative

13. What will my departmental duties entail? When will I receive my assignment?

Most first-year students are assigned to grade coursework for undergraduate classes up to 15 hours per week. Grading assignments are based on course enrollment, department requests, and the graders' educational background. Some students may instead be assigned to hold drop-in tutoring sessions for calculus III, differential equations, or basic statistics help. You will receive your grading assignment in the first or second week of the semester.

More senior graduate students may be assigned to teach courses such as Pre-calculus, Calculus I and II, Differential Equations, and Introductory Linear Algebra, Basic Statistics for Social and Life Sciences, Basic Statistics for Science and Engineering courses, or to perform research as directed by their research advisor. As you progress through your program, you should discuss these options with your research advisor.

14. Where are the department copiers and printers located and how do I access them?

The department has black and white copy machines in 2145 Adelbert Road rooms 102M and 202 , and Sears Library 570 and Color laser printers in 2145 Adelbert Road rooms B01 and 102L and Sears Library 570. You may use the black and white copiers for approved printing jobs (i.e., those related to your assigned department duties), but students are only set up to print from the copier in 2145 Adelbert Road room 102M on personal and department-owned computers.

16. Will a computer be provided in my office?

For more intensive computing needs, it is recommended that you use the computers in the department computer lab located in 2145 Adelbert Road, Room 0B01, or contact your advisor about accessing the university's high performance computing cluster.

Student Life

17. **Does the university have housing for graduate students? Where will I live during my time in Cleveland?**

    Case does not directly manage any on-campus housing for graduate students. The university does own the Triangle Towers apartment complex, which is located on the northeastern edge of campus. Most students find apartments in nearby parts of Cleveland, Cleveland Heights, Shaker Heights, and University Heights.

18. **What activities are available on and around campus? How do I get involved?**

    Participating in the Mathematics Graduate Student Association (MGS) and the Graduate Student Council (GSC) are great ways to begin networking and learn more about available social and professional opportunities on campus. To learn more about activities on and around campus, visit the Division of Student Affairs' website. You will find information on local attractions, Cleveland neighborhoods, student discounts, and more.

19. **How do I contact other graduate students before the semester starts?**

    If you would like to contact all graduate students in the department, you can send an email to mams-all-grad@case.edu.

20. **How do I find out about department events?**

    All graduate students are added to the mams-grad mailing list. This is the department's primary means of communication for colloquium and seminar announcements, new course information, and other student opportunities. If you find that you are not receiving department emails through this list, please contact the Student Coordinator to be added.