

Portland State University
Fariborz Maseeh Department of Mathematics and Statistics
Ph.D. in Mathematical Sciences
Student Handbook

The Fariborz Maseeh Department of Mathematics and Statistics (the department) has adopted rules for the doctoral program in mathematical sciences (the program) that are in effect as of Fall 2018. This document provides a comprehensive description of the program in the form of a handbook. A summarized version is provided on the department website. The current Portland State University (PSU) Bulletin provides the rules that have been approved by the Faculty Senate for this program as well as the general Graduate School procedures governing doctoral programs. Students are responsible for knowing the regulations stated in these locations as well as those in this document. Note that the program rules may be more stringent in some instances than those dictated in the general Graduate School rules for doctoral programs.

- Program website (<https://www.pdx.edu/math/ph-d-mathematical-sciences>)
- PSU bulletin (<https://www.pdx.edu/academic-affairs/psu-bulletin>). Select the latest available bulletin.
- Graduate School procedures (<https://www.pdx.edu/ogs/summary-of-procedures-for-doctoral-degrees>)

I. Program Overview

We provide here a convenient summary of key milestones in the program, a brief description of various advisors and committees related to the program, and the course/credit requirements.

Milestones.

1. Qualifying Exams. The qualifying exams consist of two written Master-level exams, and a Mathematical Literature and Problems course (MTH 501 or STAT 501). *These must be successfully completed by the end of the second year of enrollment in the program.*
2. Comprehensive Exam. This is an oral exam based on the primary and secondary concentrations of study and *must be successfully completed by the end of the fifth year of enrollment in the program*, though the expectation is that it would typically be completed within the second or third years.
3. Advancement to Candidacy. After passing the comprehensive exam, the student will form a dissertation committee and present their dissertation proposal. The student is advanced to candidacy for a Ph.D. upon the recommendation of the

dissertation committee. *Students have a maximum of three years from the completion of the comprehensive exam to advancement to candidacy.*

4. Dissertation Defense. After the written dissertation has been prepared, and a date has been agreed upon by the dissertation committee, the candidate will give an oral defense of their research before this committee and any members of the public who wish to attend. *The candidate has a minimum of four months and a maximum of five years from the effective date of advancement to candidacy to complete all requirements for graduation, including defense of the dissertation and its final acceptance by the Graduate School.*

Advisors and Committees.

- Ph.D. Program Committee (program committee). This committee is responsible for admission decisions, assigns academic advisors, plays a key role in fellowship and graduate assistantship decisions, validates comprehensive exam committees and syllabi, validates dissertation committees, and oversees various other aspects of the program as detailed elsewhere in this document. The chair of the program committee is the Program Director. This committee is appointed on a yearly basis by the department chair.
- Graduate Program Administrator (program administrator). The graduate program administrator is the member of the department staff who oversees the application process for admission to the program, maintains student records, and interacts directly with the Graduate School by submitting official forms required for the program.
- Academic Advisor. The student will be assigned an academic advisor from among the department's tenure-stream faculty by the program committee during their first term in the program. The student should meet with their academic advisor at least once per term for guidance on navigating the program until the student has a research advisor, who will then take over these duties. A request to change the academic advisor can be submitted by the student to the program committee, who will be in charge of providing an alternative academic advisor.
- Research Advisor. It is the responsibility of the student to find a research advisor from among the department's tenure-stream faculty before a dissertation committee can be formed, and *the student must have a research advisor before the end of the third year of the program.* This arrangement is by mutual agreement between the student and research advisor, who are to inform the program committee, *in writing*, of their agreement. This advisor will guide the student in conducting original research, completing their dissertation, and fulfilling the remaining requirements for the Ph.D. If it becomes necessary to change the research advisor, the program committee must be promptly notified of the

intended change, and may need to be involved in the process. In this case, the student has two terms in which to secure a new research advisor.

- Comprehensive Exam Committee. This committee is composed of three or more PSU faculty members, a majority of which hold a primary appointment in the department. This committee, which must be approved by the program committee, works with the student to prepare an acceptable syllabus for the comprehensive exam and evaluates their performance on this exam. Although it is not necessary that the comprehensive exam committee has members in common with the dissertation committee, it is common to have some overlap.
- Dissertation Committee. This committee, which is headed by the research advisor and must be approved by the program committee and the Graduate School, provides research guidance and evaluates both the dissertation proposal and dissertation defense.

All official communications via e-mail between students and PSU employees are to be done using PDX e-mail addresses.

Credit requirements.

The program requires a minimum of 81 credit hours, distributed as follows:

a) Approved graduate-level courses [42 credits]

a.1) Primary concentration: 600-level Mathematics and Statistics courses [18 credits].

a.2) Secondary concentration: 600-level Mathematics and Statistics courses, or 500- and 600-level courses in another discipline [9 credits].

a.3) Other 500- and 600-level courses in Mathematics and Statistics [15 credits].

For students entering the program with a Master's degree in Mathematics or Statistics from another university, up to 9 graduate-level mathematics and statistics credits for that degree can be transferred.

The primary and secondary concentrations shape the content of the Comprehensive Exam (see Section IV). The primary concentration typically consists of two three-term sequences whose content might naturally be considered as a complementary pairing. The secondary concentration could consist of a single three-term sequence whose content is distinct enough from that of the primary concentration that it can be naturally considered as a different area. The secondary concentration courses can also be taken in another department, an "allied area". Some courses taken might be four-credit courses. Nevertheless, at least 9 credits are needed for qualifying as a secondary concentration. The primary and secondary concentrations are formally declared as part of the Comprehensive Exam Proposal, which must be approved by the

program committee. Questions concerning whether or not a collection of courses constitutes acceptable primary and secondary concentrations should be directed to the program committee. In particular, research courses MATH/STAT 601 are not appropriate for the primary and secondary concentration and reading and conferences courses MTH/STAT 605 should be considered only exceptionally in case a sought 600-level course is not regularly offered.

MTH/STAT 601 credits are not allowed prior to satisfying the qualifying examination requirements.

Courses taken outside the department must be approved by the program director and must be part of a clear plan for the secondary concentration. Before registering for such courses, the student should contact the instructor(s) of these courses and determine that at least one of them is willing and able to be an examiner for the Comprehensive Exam.

b) Mathematical/Statistical literature and problems course (MTH/STAT 501) [3 credits].

This requirement can be waived in full or partially in case of a Master's thesis or a similar exercise performed in another university. For such a waiver to be granted, the student must submit a brief written request to the program committee explaining why they believe the waiver is warranted, and the program committee must approve this request. If a partial waiver is granted, the student will give an oral presentation of their Master's thesis or similar exercise under the rules of the MTH/STAT 501 course. If a full or partial waiver is granted, 3 of the 9 permitted transfer credits (see a.3) are applied to fulfilling this credit requirement.

c) Cooperative Education/Internship (MTH/STAT 604) or Seminar (MTH/STAT 607) [9 credits]. To enroll for MTH/STAT 604 or MTH/STAT 607 credits, the student must have passed the qualifying exams.

d) Dissertation (MTH 603) [27 credits]. To enroll for MTH 603 credits, the student must have passed the comprehensive exams. No more than 12 MTH 603 credits can be taken in a term, and typically no more than 9 are taken. Graduate School policy dictates that, after advancement to candidacy, the student may *only* register for MTH 603 credits, even if this ultimately results in more than 27 MTH 603 credits.

In addition to course requirements, it is expected that students will attend and participate in departmental colloquia and appropriate research seminars.

Tracking Your Progress. The Graduate School has an auditing system for tracking student progress toward the degree, the Degree Audit Reporting System (DARS). This system is used to determine when key program requirements have been satisfied, and which requirements still remain for completion of the degree. Although the Graduate School will send a DARS report to the graduate program administrator and program director at certain stages of the student's time in the program so that we may check it against our internal records for accuracy, students are also encouraged to use the system to track their own progress. Information about DARS, including FAQs and how to access your own information, can be found at (<https://www.pdx.edu/ogs/dars>). The graduate program administrator or program director notifies the Graduate School when certain degree requirements have been met via official forms that are submitted to their office. Although these forms are typically handled solely by the program administrator or program director, it may be useful to be aware of their content. The most relevant of these forms are:

- Report on Passing Comprehensive Examinations (GO-22)
- Appointment of Doctoral Dissertation Committee (GO-16D)
- Doctoral Request for Advancement to Candidacy (GO-23)
- Recommendation for the Degree (GO-17D)

These forms and others that may be of use can be found at (<https://www.pdx.edu/ogs/forms>). Additionally, deadlines for the submission of some of these documents, as well as other key deadlines related to the Graduate School may be found at (<https://www.pdx.edu/ogs/graduate-candidate-deadlines>).

Our program also has an Annual Degree Progress and Planning Form, that serves as an additional means for students and their advisors to track their progress in the program (see discussion below).

II General rules:

Continuous Enrollment. Students are expected to enroll for at least one graduate credit each term - excluding the summer term - after they are admitted, until all requirements for the degree are completed. If a student is unable to do so, approval for a leave of absence must be obtained from the Graduate School. The official request to the

Graduate School is made via the Graduate Leave of Absence Request form (https://www.pdx.edu/ogs/sites/www.pdx.edu.ogs/files/Leave_of_Absence.pdf).

Before submitting this form, which requires a recommendation from either the department chair or the program director, the program committee must be notified in writing of the student's intention to request a leave of absence, with this notification including the number of terms of expected absence and the reason(s) for the requested leave. University admission is canceled after an absence of three years, see <http://pdx.smartcatalogiq.com/en/2019-2020/Bulletin/Graduate-School/Enrollment/Cancellation-of-admission-to-graduate-program>. In any term in which the student uses University facilities, services, or staff, the student must enroll for an appropriate number of credit hours.

Residency Requirement. The doctoral residency requirement can be satisfied in one of the following ways:

- Three terms of full-time enrollment (minimum 9 graduate credits applicable to the degree program each term) during the first two years after admission to the program. This may include one or more summer terms.
- Six terms of part-time enrollment (minimum 1 graduate credit applicable to the degree program each term) during the first two years after admission to the program. This may include one or more summer terms.
- A doctoral student who was enrolled in the same major at PSU and whose matriculation to the doctoral program immediately follows (within one calendar year) the master's degree program, may fulfill the residency requirement during the period in which the student was enrolled in the master's program.

Annual Degree Progress and Planning Form. No later than the fourth week of the winter term, the student will provide the program administrator with a self-assessment report explaining the progress they have made to complete the requirements of the degree, highlighting what was done the previous year and their plans for the year ahead. These annual reports are intended to help the student plan for efficiently completing the requirements for the degree, and as an aid to their advisor(s). Even students in their first year in the program are required to submit this form, though they may not have much to write at this stage. The Progress and Planning Form may be found at (<https://www.pdx.edu/math/program-forms>).

Application for Graduation. The student must file an application for graduation with the Graduate School no later than the first week of the anticipated term of graduation; this is typically the term in which the dissertation defense takes place. This application is

submitted through the university's on-line information system, Banweb (<https://banweb.pdx.edu>). After logging in, choose the Student Services tab, click the "Apply for Graduation" button, and follow the instructions given there.

Satisfactory Academic Progress (SAP) and Dismissal Policy.

Students must maintain satisfactory academic progress during the course of the PhD program. Failure to do so may result in dismissal from the program. In order to maintain satisfactory academic progress:

- Students must enroll in and satisfactorily complete at least one credit per term, apart from summer terms, unless on an approved leave of absence. Such credits must be in MATH or STAT, unless the program committee has approved, in advance, courses outside the department.
- Students must earn a B- or higher (or a P) in each course taken within the department, must maintain a term GPA of at least 3.0, and a cumulative GPA of at least 3.25 for all courses taken within the department. The student has the first 12 credit hours to attain this GPA. Note that these standards are higher than those set by the Graduate School to maintain good academic standing. Even if the term and cumulative GPAs are acceptable, grades of X, I, W, and NP will be considered when determining SAP.
- Students must receive positive progress reports by their advisors and the program committee. The program committee will conduct annual reviews of each student, in consultation with the student's advisor (see Annual Degree Progress and Planning Form). The student's advisor may initiate additional reviews.
- Students must have a research advisor by the end of the third year after admission to the program. If it is necessary to change research advisors, the student has two terms in which to secure a new research advisor.
- Students must satisfy the program's timeline and criteria for each of the program milestones.

Failure to satisfy the program's timeline and criteria for each of the program milestones will result in automatic dismissal from the program. Failure to satisfy the other SAP criteria will result in a written statement explaining the criteria that have been violated and an explanation of what must be done, and within what timeframe (typically one or two terms), to restore proper SAP status. This statement will be prepared after a meeting involving the student, their advisor, and at least one of the members of the program committee; other faculty members may also be present. If the student fails to satisfy the conditions given in this statement, they will be dismissed from the program.

In case of dismissal, the student and Graduate School will be notified in a written statement that includes the basis for dismissal.

III Qualifying Examinations:

The qualifying exams serve to establish that a student has achieved a basic level of proficiency in two areas of mathematics, and shows an aptitude for understanding mathematics research as it is typically presented in journal articles. They consist of two Master's level written examinations, as well as a MTH 501 or STAT 501 course.

Master's exams are given twice per year, once just before Fall term begins, and once in the Spring term. Exams are offered in the following subject areas, although not all exams are offered in each session.

- Algebra
- Analysis
- Discrete Math
- Geometry
- Numerical Methods
- Ordinary Differential Equations
- Partial Differential Equations
- Set Theory/Topology
- Applied Statistics
- Mathematical Statistics

A typical, but not mandatory, choice of exams would be one that also satisfies the requirements for a Master's degree in either Mathematics or Statistics. These requirements may be found at <https://www.pdx.edu/math/ms-exam-policy>, together with further information about the exams. For example, an MS in Statistics requires both the Mathematical Statistics and Applied Statistics exam; whereas an MS in Mathematics requires at least one of the Algebra and Analysis exams, and any other exam except Applied Statistics. Syllabi for each exam, as well as copies of previous exams in each topic, are available on the department website, see <https://www.pdx.edu/math/ms-exam-policy>.

The MTH/STAT 501 is a Literature and Problems Research course during which the student is advised individually by a faculty member. The evaluation includes a write-up as well as an oral presentation. This course provides an introduction to the research activity which is intended to help the student prepare for the oral comprehensive examination as well as the doctoral thesis. The student must complete the MTH 501 or STAT 501 course under the usual rules for these courses

(<https://www.pdx.edu/math/501-guidelines>) and register for 3 credits of the appropriate 501, at least one of these credits must be registered for during the term in which the presentation is given. The MTH/STAT 501 requirement can be waived in full or in part if a Master's thesis or equivalent in mathematics or statistics was already obtained by the student, within the five years prior to entering our program. It is up to the discretion of the program committee whether a complete or partial waiver is provided in this case, and it is the student's responsibility to make the case that such a waiver is warranted. When a partial waiver is granted, the student is asked to give an oral presentation of their Master's thesis (or equivalent). If a full or partial waiver of the 501 requirement is granted, three of the nine allowed "transfer" credits (see Course Requirements in Program Overview) are applied to fulfilling these credit requirements.

The qualifying examinations must be successfully completed before the end of the second year after enrollment in the program.

IV. Comprehensive Examination

Scope: The comprehensive exam committee evaluates during an oral exam the student's preparedness and potential to carry out a research program. This exam is divided into three sections corresponding to the student's primary concentrations (two sections) and secondary concentration (one section), and is typically about two hours in duration. The scope of each section is determined by a syllabus prepared by the student and approved by the comprehensive exam committee and the program committee. Passing the comprehensive exam requires passing each section. If the student fails the entire comprehensive exam or any section thereof, the exam committee will decide if the student must repeat the entire examination, or just the section(s) failed, after a minimum of three months. The results of the second examination are final.

Nature and timing: After completion of the qualifying exams, the student must form a Comprehensive Examination Committee with the help of their academic or research advisor. The student is allowed to take this exam at most twice and **must pass this exam within five years after entering the program**. Students must be registered for a minimum of one graduate credit during the term comprehensive exams are taken. Comprehensive exams can only be offered during regular academic terms, i.e., not between terms.

The Comprehensive Examination Proposal: The student must prepare with the help of their advisor a statement to be addressed to the program committee requesting approval. This statement must contain:

1. The chosen primary and secondary concentrations, together with lists of the supporting courses.
2. The proposed Comprehensive Examination Committee, composed of three or more PSU faculty members, a majority of which hold a primary appointment in the department.
3. Two syllabi corresponding to the primary concentration and one syllabus corresponding to the secondary concentration. Each syllabus must be signed by a member of the Comprehensive Examination Committee. Each member can sign at most one syllabus.

This information will enable the program committee to assess the appropriateness of the student's coursework and syllabi as preparation for the dissertation research. The proposal form may be found at (<https://www.pdx.edu/math/program-forms>), and should be *submitted to the program committee at least four weeks prior to the date of the exam*.

When the exam is passed, the program committee will notify the Graduate School that the student has passed the comprehensive exams by submitting the GO-22 form.

V. Internship (MTH/STAT 604) or Seminar (MTH/STAT 607)

To enroll for MTH/STAT 604 or MTH/STAT 607 credits, the student must have passed the qualifying exams. The research advisor would typically be the instructor for the 604/607 and will sign the By Arrangement form(s) (<https://www.pdx.edu/math/program-forms>). However, in case a research advisor has not been identified, the academic advisor would take the role of the instructor for the 604/607 credits. Precisely 9 credits of either MTH/STAT 604 or MTH/STAT 607 are required, and these credits must be completed before the dissertation is defended.

Internship. If this option is chosen, the student works with their advisor to arrange an internship, which may take place during the summer or during regular academic terms, and must involve at least one term's worth (9 credits) of effort on the part of the student. Such internships typically take place within companies or research centers, but other arrangements are possible, and the student and advisor should contact the program committee if there is a doubt about the legitimacy of an internship. The student provides a written report of their internship activities to their advisor and the program committee and gives an oral presentation, typically in one of our seminar series.

The internship credits may be distributed over up to three terms, during the internship activities. If the credits are distributed over more than one term, grades for the final credit(s) will not be submitted until written and oral presentations are completed.

Seminar. If this option is chosen, the student organizes regular seminar meetings during three academic terms under the supervision of their advisor. This work would include at least one oral presentation per term by the student, as well as active participation in the practical organization of the seminar. A final written and oral presentation will be provided by the student. If the credits are distributed over more than one term, grades for the final credit(s) will not be submitted until written and oral presentations are completed.

VI. Dissertation Proposal, Proposal Defense and Advancement to Candidacy:

After passing the comprehensive examination and choosing a dissertation topic under the guidance of the research (dissertation) advisor, a dissertation committee is appointed to evaluate the proposed research. The student and research advisor will determine eligible faculty who are willing to serve on the dissertation committee. The dissertation committee will consist of between four and six members, including:

- The research advisor, who must be a tenure-track member of the department.
- Two other tenure-track members of the department.
- A Graduate School Representative, who must be PSU tenure-track faculty outside the department.

Any additional members of the committee must have a doctoral degree. It is allowed for one committee member not to be affiliated either with PSU nor with OHSU. However, if such a committee member is desired, a curriculum vitae for the proposed member must be submitted with the GO-16D form.

The dissertation committee must be approved by the Graduate School using the Appointment of Doctoral Dissertation Committee form (GO-16D). The GO-16D form should be submitted to the Graduate School ***at least six weeks prior to the anticipated date of the proposal defense.***

Preparing the dissertation proposal:

Students may enroll in MTH/STAT 601 (non-dissertation Research) while preparing the Dissertation Proposal. These credits are not allowed prior to satisfying the qualifying examination requirements.

Dissertation Proposal:

The proposal submitted to the committee for approval should be sufficiently detailed and clear to provide a blueprint for the study to follow. The proposal is expected to include the following:

1. General nature and present status of knowledge of the problem.
2. The theoretical and empirical framework within which the proposed problem exists.
3. The significance of the proposed research and its likely contributions.
4. The research methodology to be used.

The student must provide a draft of the dissertation proposal to all members of the committee at least two weeks before the proposal defense.

Dissertation Proposal Defense.

The dissertation proposal defense must take place in a meeting with the student and the entire dissertation committee. While it is expected that all members of the dissertation committee are physically present for this meeting, remote participation by some committee members is permitted under specific conditions outlined by the Graduate School (<https://www.pdx.edu/ogs/remote-thesisdissertation-participation>).

The student provides an oral presentation of the written proposal for discussion, evaluation and suggested modifications by the committee.

Advancement to Candidacy.

When the dissertation proposal has been approved by the dissertation committee and all course work required for the degree - with the possible exception of seminar and internships - have been completed, a student can be advanced to candidacy. The program committee requests the advancement to candidacy by submitting the GO-23 form to the Graduate School. The Dean of the Graduate School retains final approval authority for advancement to candidacy.

VII Dissertation Defense:

Registration: Students must complete a minimum of 27 credits of MTH 603, Dissertation Research. A student may register for not more than 12 credits of MTH 603 in any given term. During the term in which the Dissertation defense occurs, the student must be enrolled for a minimum of one credit hour.

Progress in Dissertation: Minor deviations from the original proposal may be permitted, at the discretion of the dissertation committee. Major deviations from the approved Dissertation Proposal, however, may require a change in the student's Dissertation

Committee and submission and defense of a new dissertation proposal. The principal dissertation advisor will keep the Dissertation Committee abreast of the student's progress, and, as appropriate, schedule meeting(s) for the Committee with the student for discussion, evaluation, and suggested modifications of work in progress. Students are encouraged to plan their schedules realistically, as it is easy to underestimate the amount of time it takes for this phase of the Ph.D. program. This is especially true for the "final stage" of writing up the results of the dissertation research, as the writing process may reveal that a substantial amount of unanticipated and additional research work is actually required before the dissertation can be properly completed.

When the student and their research advisor agree that the dissertation is essentially in its final form, the student is responsible for providing a copy to each of the Dissertation Committee members, at least two weeks before the scheduled defense. The Dissertation Committee members *may require this copy even sooner*, up to four weeks before the scheduled defense, and it is the student's responsibility to determine from the members when the copy is required.

Defense of the dissertation:

After the preparation of the written dissertation, the candidate's dissertation committee will conduct a dissertation defense. A dissertation defense may be scheduled only during the regular academic terms, no later than five weeks prior to the close of the term of application for graduation in which the degree will be granted (i.e., must be completed four weeks before the beginning of finals week). For summer term graduation, deadlines apply to the regular eight-week summer session dates. Later completion will result in graduation in a subsequent term. The student must deliver a final draft of the dissertation to all members of the approved committee no fewer than 14 days before the dissertation defense.

The dissertation defense, which is open to the public, is the culminating experience in doctoral studies. The candidate is expected to prepare an oral presentation on the research methodology and results. The oral presentation should not exceed 60 minutes. Following the oral presentation, the candidate must defend the dissertation as a worthy contribution to knowledge in its field and must demonstrate a mastery of the field of specialization as it is related to the dissertation. The questioning and discussion are for the purpose of: (1) further enlightenment of the candidate and the committee of the significance and limitations of the research, and (2) demonstration that the candidate has met the high expectations of the University for the awarding of the doctoral degree.

A dissertation defense must take place in a meeting with the student and the entire appointed committee. While it is expected that all members of the dissertation committee are physically present for this meeting, remote participation by some committee members is permitted under specific conditions outlined in (<https://www.pdx.edu/ogs/remote-thesisdissertation-participation>). For dissertation approval, there may be no more than one dissenting vote on the dissertation defense. If the student fails the dissertation defense, the doctoral program may dismiss the student from the program or permit the student to hold a second defense after a minimum of three months. The results of the second defense are final.

The final dissertation must be submitted to the Graduate School no later than three weeks prior to the close of the term of application for graduation. See the Graduate Candidate Deadlines at <https://www.pdx.edu/ogs/graduate-candidate-deadlines> for specific dates. For details about thesis formatting and submission, see the Thesis and Dissertation Information available from the Graduate School website at <https://www.pdx.edu/ogs/thesis-and-dissertation-information>

Regulations and time limitations:

A doctoral candidate has a minimum of four months and a maximum of five years from the effective date of advancement to candidacy to complete all requirements for graduation, including defense of the dissertation and its final approval by the Graduate School. Candidates must be continuously enrolled during that period, excluding the summer terms. Failure to meet this time limit will result in the cancellation of admission to the doctoral program.