Annual Academic Assessment Report

Department of Mathematical Sciences

MATHPH

2023-2024

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Across the many programs within the Department of Mathematical Sciences (BA/BS, MS, PhD) there are common learning objectives recognized by the faculty. While the program requirements show differences in the skills and tools employed within the various options, the learning objectives are stated broadly to apply to each.

- Critical and analytical thinking
- Effective communication of abstract and technical information
- Logical reasoning
- Mastery of computational tools for analyzing data and/or mathematical structure
- Problem solving
- Understanding of algorithms and processes

The data below is from the Office of Strategic Analytics & Insights and records the number of Doctorate degrees awarded in the last seven years (average: 4).

2017	2018	2019	2020	2021	2022	2023
4	2	6	4	2	6	6

Note: data from 2024 not available yet.

Several of these students go onto academic positions either as postdocs or tenure-track assistant professors.

Analysis of Assessment of Student Learning Outcomes

The Department of Mathematical Sciences employs four main tools for assessing the student learning outcomes of the phd-level graduate students in our department.

A. Course work
B. Qualifying Examination
C. Candidacy Examination
D. Thesis

A. *Course Work*: Students complete a rigorous program of courses that is routinely monitored and updated by the department's Graduate Committee. Courses include assignments that assess the previously mentioned learning outcomes by means of written work (both

computational and theoretical) and presentations (both formative and summative). The assignments involve a mix of individual work and work in groups.

B. *Qualifying Examination*: Students must pass three 4-hour long examinations in accordance with the department's Qualifying Examination policy. One of these exams may be substituted by receiving an "A" in a year-long qualifying sequence.

Each exam is co-written by faculty that most recently taught the course and graded separately by the pair to assess the student's knowledge of advanced level mathematics and statistics. Graduate faculty can look at a student's examination post grading. Students may sit for a Qualifying Examination in August or in January.

To date in 2024, four students took at least one Qualifying Examination for a total of 5 examinations given. Of these 5 examinations, 3 were passed at PhD level, 1 was passed at the Masters level, and 1 was failed. One student was able to replace a Qualifying Examination with an "A."

In 2023, eight students took at least one Qualifying Examination for a total of 15 examinations given. Of these 15 examinations, 10 were passed at the PhD level, 2 were passed at the Masters level, and 3 were failed. Three students replaced a Qualifying Examination with an "A."

In 2022, five students took at least one Qualifying Examination for a total of 14 examinations given. Of these 14 examinations, 7 were passed at the PhD level, 5 were passed at the Masters level, and 2 were failed. Four students replaced a Qualifying Examination with an "A."

C. *Candidacy Examination*: After completing the Qualifying Examination, a student pursuing a PhD must take and pass an Oral Candidacy Examination according to the department's policy. The student's performance is evaluated by a committee consisting of the student's intended PhD advisor and two other graduate faculty chosen in consultation with the advisor.

The format is decided by the advisor and consists of either a presentation followed by questions, or an oral examination over advanced course work.

One student successfully passed their Oral Candidacy exam to date in 2024. Four students successfully passed their Oral Candidacy Examination in 2023. Two students passed their Oral Candidacy Examination in 2022.

D. *Thesis*: A thesis must be written and successfully defended before a committee consisting of the PhD advisor and two other graduate faculty chosen in consultation with the advisor. The thesis and its defense are assessed by the committee for its contribution to and significance in the relevant discipline.

To date in 2024, there have been three successful PhD thesis defenses. The titles of these are stated below along with the name of the defending student:

- *Generalizations of the Hardy Spaces and the Schwarz Boundary Value Problem*, William Blair

- *Neural Networks for Approximating the Heat Equations*, Shakil Rafi

- *Derived jet schemes and arc spaces, and arithmetic arc representability*, Eric Walker

Changes To Degree Planned or Made Based on Assessment

The Department made some recent changes to policy regarding the Qualifying Examinations. Rather than requiring students to take the examinations in three consecutive examination periods, now students may take them however they wish so long as they complete the requirement by the end of their fifth semester in the program. A most robust change to policy regarding the Qualifying Examinations is under discussion.

Changes To the Assessment Process Planned or Made

An "Exit Interview" survey has been informally conducted in recent years to some of our graduating graduate students. A Exit Interview was created for formalize this procedure and distributed recently. There is insufficient data at this point to include in this report.