Institutional Effectiveness Report

2018-19

Programs: Mathematics MS

College and Department: College of Arts & Sciences - Mathematics

Unit Contact: Allan Mills

Mission: All undergraduate degree programs at Tennessee Tech require at least one course in mathematics and many require several courses. The Department of Mathematics provides a variety of general education courses, introductory and advanced undergraduate courses in support of STEM majors, and graduate-level courses for the MS in mathematics and other graduate programs.

As a central part of a STEM-infused comprehensive institution, the Department of Mathematics strives to create successful learners of the subject of mathematics in the university community and in the community where we live. Learning opportunities are provided to students of all disciplines to advance their understanding of mathematical concepts and their effective use of analytic practices and critical thinking as useful in their studies and everyday life. The departmental faculty conduct research in mathematics and as part of interdisciplinary teams and provide service to the department, college, University, and mathematical community.

The mission of the TTU Department of Mathematics is to promote the learning of mathematics through effective teaching, research, and public service. Such learning opportunities are provided to students of all disciplines in support of the mission of the University.

Program Goals:

PG 1: The MS in Mathematics degree program will average at least 5 graduates per year.

PG 2: Mathematics graduate students will participate in extracurricular activities related to mathematics.

Student Learning Outcomes:

SLO 1: All MS in Mathematics graduates will demonstrate knowledge of graduate-level Algebra and Analysis.

Mathematics MS graduates will demonstrate knowledge of graduate-level Algebra and Analysis by earning grades of B or better in Math 6110-Abstract Algebra and a 6000-level course in Analysis (Math 6010-Functional Analysis, Math 6310-Complex Analysis, or Math 6410-Real Analysis).

SLO 2: All MS in Mathematics graduates will demonstrate a depth of knowledge in an area of mathematics.

A departmentally developed curriculum map can be found in Appendix 1 that shows the connections between courses and student learning outcomes.

Assessment Methods:

PG 1: Average 5 graduates per year

1. Count of the number of MS in Mathematics graduates in the previous July 1-June 30 time period: The number of students earning the MS in Mathematics in the previous year is determined and trends are tracked using a 5-year average of the number of graduates.

   Threshold of Acceptability: Five-year running average of 5 graduates per year.

PG 2: Participation in extracurricular activities

1. Count of the number of presentations by graduate students and guest speakers: The number of presentations during the previous year by graduate students (in the Graduate Seminar and Teaching Seminar, at Student Research Day, or at a conference) is counted. A count of the number of presentations by guest speakers is also made.

   Threshold of Acceptability: Each graduate assistant should actively participate in the Teaching Seminar and present at least 1 talk in the Graduate Seminar.

SLO 1: Demonstrate knowledge of graduate-level Algebra and Analysis

1. Assessment of MS student <u>breadth</u> of knowledge*:* A student's knowledge of Algebra and Analysis is assessed by course grades in Math 6110-Abstract Algebra and the required 6000-level course in Analysis (one of Math 6010-Functional Analysis, Math 6310-Complex Analysis, or Math 6410-Real Analysis) and the course grades in the year-long course sequences on the student's program of study.

   Threshold of Acceptability: Students should earn a grade of B or better in all classes

SLO 2: Demonstrate a depth of knowledge in an area of mathematics

1. Assessment of MS student <u>depth</u> of knowledge: Non-thesis students' depth of knowledge is assessed by comprehensive exams covering 2 of the 3 year-long course sequences such students are required to take. The exams are prepared and scored by the instructors of the course sequences.

   Threshold of Acceptability: A passing score on both comprehensive exams.

   Thesis students' depth of knowledge is assessed by their written thesis and their oral thesis defense.

   Threshold of Acceptability: A majority of thesis committee members assess the student as having passed the thesis defense and demonstrated understanding of the material in the thesis.

Results:

PG 1:   Average 5 graduates per year

The MS in MATH program graduated 3 students during the 2018-19 academic year which is below our target of graduating 5 students each academic year. For the most recent five academic years the program is averaging 5.6 graduates per year. We anticipate having 6 graduates for the upcoming 2019-20 academic year.

Number of Degrees Awarded July 1-June 30

	2014-15	2015-16	2016-17	2017-18	2018-19
Male	4	7	2	1	2
Female	2	2	4	3	1
Total MS in MATH	6	9	6	4	3

PG 2:   Participation in extracurricular activities

One graduate student presented a research poster at a national conference.

The departmental Graduate Advisor arranged weekly meetings of the Graduate Seminar. The faculty typically present talks each week in the fall, while the graduate students present talks in the spring. All graduate assistants gave a talk in the Graduate Seminar. In addition, three students studying algebra regularly presented talks in an Algebra Seminar during the academic year.

The leader of the Teaching Seminar arranged for weekly meetings. All graduate teaching assistants participated in the Teaching Seminar including classroom visits to watch experienced instructors teaching lower division mathematics classes.

	Teaching Seminar		Graduate Seminar	
Academic Year	Graduate Student Presentations	Guest Presentations	Graduate Student Presentations	Guest Presentations
2014-2015	14	0	10	0
2015-2016	12	0	12	4
2016-2017	8	0	8	2
2017-2018	32	2	11	1
2018-2019	15	0	12	12

SLO 1: Demonstrate knowledge of graduate-level Algebra and Analysis

Each 2018-19 graduate demonstrated a breadth of knowledge of mathematics by completing Math 6110-Abstract Algebra and a 6000-level course in Analysis with a grade of B or better.

SLO 2: Demonstrate a depth of knowledge in an area of mathematics

All three 2018-19 graduates completed a thesis and demonstrated a depth of knowledge by defending his/her thesis and having it approved by an advisory committee. The attached file contains the rubric used by thesis committees to assess student mastery of thesis topic and the oral exam portion of the thesis defense.

Modifications for Improvement

PG 1: Average 5 graduates per year

As of 2019, the MS program is graduating a 5-year moving average of 5.6 students per year. Although this is above the program goal of graduating 5 students per year, steps are taken to ensure the moving average stays well above 5 per year. First, faculty are being encouraged to recruit students from their classes for the program. Second, Math majors with a GPA above 3.5 are being told about the new Fast-track to Masters program.

SLO 2: Demonstrate a depth of knowledge in an area of mathematics

The Graduate Faculty will consider ways to improve the thesis defense rubric. The faculty believe our assessment rubric can be improved to better assess student performance in the thesis defense.

Appendices

1. Math MS Curriculum Map
2. Rubric for Master's Defenses/Oral Exams

Appendix 1: Math MS Curriculum Map

<table>
<tr>
<td colspan="5" align="center">MS in MATH Curriculum Map</td>
</tr>
<tr>
<td></td>
<td colspan="4" align="center">Courses & Degree Requirements</td>
</tr>
<tr>
<td>Student Learning Outcomes</td>
<td align="center">MATH 6110

(3 cr hours of Algebra)</td>
<td align="center">MATH 6410, 6310 or 6010

(3 cr hours of Analysis)</td>
<td align="center">Minimum of 30 graduate credit hours in MATH</td>
<td align="center">3 Required Sequences and passing 2 comprehensive exam or 2 Required Sequences & Thesis</td>
</tr>
<tr>
<td>Students will demonstrate breadth of mathematical knowledge</td>
<td align="center">X</td>
<td align="center">X</td>
<td align="center">X</td>
<td align="center">X</td>
</tr>
<tr>
<td>Students will demonstrate depth of mathematical knowledge</td>
<td></td>
<td></td>
<td align="center">X</td>
<td align="center">X</td>
</tr>
</table>

Rubric for Master's Defenses/Oral Exams

Student demonstrated knowledge of general graduate-level mathematics in

- Area 1 Outside Specialty:

  Question(s) asked during oral

  exam:

  Student generally answered these questions

  ___ completely_____satisfactorily_____unsatisfactorily_____not at all

- Area 2 Outside Specialty:

  Question(s) asked during oral

  exam:

  Student generally answered these questions

  ___ completely_____satisfactorily_____unsatisfactorily_____not at all

Student demonstrated knowledge of his or her mathematical area of emphasis

- student explained the ideas contained in his or her thesis

  ___ completely_____satisfactorily_____unsatisfactorily_____not at all

  Comments:

- student answered questions related to his or her thesis

  ___ completely_____satisfactorily_____unsatisfactorily_____not at all

  Comments: