

## Institutional Effectiveness Report

2020-21

**Programs:** Mathematics MS

**College and Department:** College of Arts & Sciences - Mathematics

**Unit Contact:** Michael Allen

**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*

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*

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*

Assessment of MS student breadth 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: Common questions in the areas of Algebra and Analysis were asked on all comprehensive exams by all committee chairs in the areas of Algebra and Analysis. Students were to answer both questions correctly.

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

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

Threshold of Acceptability: A passing score on both comprehensive exams for the non-thesis students or a passing score on the oral exam and defense for the thesis students.

**Results:***PG 1: Average 5 graduates per year*

The MS in MATH program graduated 5 students during the 2020-21 academic year which is on target of for our goal of graduating 5 students each academic year. For the most recent five academic years the program has an average of 4.6 graduates per year. Along with the undergraduate program, the department has already started discussing ways to increase enrollment.

Number of Degrees Awarded July 1-June 30

	2016-17	2017-18	2018-19	2019-20	2020-21
Male	2	1	2	3	5
Female	4	3	1	2	0
Total MS in MATH	6	4	3	5	5

*PG 2: Participation in extracurricular activities*

During Spring Semester 2021, four of the five graduates had presented in our graduate seminar series. The one who did not had graduated earlier and had presented the previous year. As for other activities, COVID protocols unfortunately kept students from presenting at conferences.

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

All five graduates of the 2020-21 academic year demonstrated a breadth of knowledge of mathematics by completing Math 6110-Abstract Algebra and a 6000-level course in Analysis. They also correctly answered the Algebra and Analysis questions posed to them during their oral exams. For Math 6110, there were three A's, one B and one C. For the Analysis courses, there was one B while the rest were A's.

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

All five 2020-21 graduates completed a thesis and demonstrated a depth of knowledge by defending his thesis and having it approved by an advisory committee. The attached files contain the rubric used by thesis committees to assess student mastery of thesis topics and the oral exam portion of the thesis defense. The students names have been removed for anonymity.

**Modifications for Improvement***PG 1: Average 5 graduates per year*

The Math Department desperately needs to recruit more graduate students. The program goal of an average of 5 graduates per year needs to be doubled.

*PG 2: Participation in extracurricular activities*

Second, the extracurricular activities have been limited. The faculty advisors will be encouraged to have their students present more at conferences, Research day, etc.

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

Two graduate courses were created last year to give our graduate students the academic credit for teaching and research seminars we already require of them. The two courses are Math 6001 and Math 6002. Math 6001 provides the graduate students with the practical training in the teaching of mathematics. Math 6002 provides the graduates students with the training in writing, typesetting, and presentation of mathematical research.

Because of a curriculum error, we were not able to offer these courses officially but have been offering them unofficially for the last year. Dr. Alexander Shibakov created an online version of Math 6002 of which all the graduate students last year participated. Also, Dr. Amy Chambers, our graduate coordinator, has been teaching Math 6001 by having guest lecturers come in and discuss their teaching methodologies. Our goal this semester to fix the curriculum issue.

**Appendices**

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

**Appendix 1: Math MS Curriculum Map**

<b>MS in MATH Curriculum Map</b>				
	<b>Courses &amp; Degree Requirements</b>			
<b>Student Learning Outcomes</b>	<b>MATH 6110 (3 cr hours of Algebra)</b>	<b>MATH 6410, 6310 or 6010 (3 cr hours of Analysis)</b>	<b>Minimum of 30 graduate credit hours in MATH</b>	<b>3 Required Sequences and passing 2 comprehensive exam or 2 Required Sequences &amp; Thesis</b>
<b>Students will demonstrate breadth of mathematical knowledge</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
<b>Students will demonstrate depth of mathematical knowledge</b>			<b>X</b>	<b>X</b>

**Appendix 2: Rubric for Master's Defenses/ Oral Exam**

**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: