

**Marshall University**

**Graduate Program Assessment  
2007 Report**

**M.A. in Mathematics**

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## I. Assessment Activities

### A. Program Goals

The M.A. in Mathematics is designed to prepare students for a variety of career and education options. Newly admitted students must have an undergraduate degree with a major in the mathematical sciences or in a related field with sufficient coursework in mathematics to enable them to begin graduate work. Occasionally, students are provisionally admitted with the understanding that undergraduate coursework will be needed.

The M.A. in Mathematics has the following program goals as indicated in its Program Assessment Plan:

1. **Mathematical Reasoning** – *Students should be able to perform intellectually demanding mathematical tasks.*
2. **Personal Potential** – *Students should be able to undertake independent work and possess an advanced level of critical thinking, analytic skills, and mathematical maturity.*
3. **Nature of Mathematics** – *Students should expand their experience of the breadth of the mathematical sciences and of the fundamental dichotomy of mathematics as an object of study and a tool for application.*
4. **Mathematical Modeling** – *Students should be able to apply mathematics to a broad spectrum of complex problems and issues.*
5. **Communication and Resourcefulness** – *Students should be able to write, listen, and speak mathematically and contribute to group efforts.*
6. **Content Specific Goals** – *Students should be able to apply the theory of advanced calculus and attain a depth of knowledge in other areas of study such as abstract algebra, real and complex analysis, and statistics.*

### B. Learning Outcomes/Data Collection

The program goals given above and in the Program Assessment Plan include the following associated student learning outcomes:

1. a. ability to construct proofs of statements not encountered previously  
b. ability to use a wide variety of techniques for proving statements, including direct, contrapositive, contradiction, and mathematical induction
2. a. ability to research a mathematical topic  
b. ability to assimilate and apply knowledge of advanced topics to solve problems and prove statements
3. a. develop a deep understanding of the real number system and its properties  
b. develop a deeper appreciation of mathematics as a unique discipline that is both an art and a science
4. a. ability to read, interpret, organize, analyze, and solve complex multi-step mathematical problems  
b. ability to apply advanced concepts to real-world applications

5. a. ability to research and make written and oral presentations on various advanced topics
- b. ability to work effectively in a team to organize and analyze various approaches to solving mathematical problems and proving mathematical statements
6. a. ability to use knowledge of advanced calculus to study more advanced topics in analysis
- b. ability to expand and apply knowledge from undergraduate courses and beginning graduate courses to study advanced topics

### C. Results

Percentages of students achieving usable course grades (A, B, C) in courses that are either required or elective for majors in mathematics were collected and are reported below. Percentages are reported including withdrawals.

**Percentage of Usable Course Grades (A, B, C, CR)**

	01-02	02-03	03-04	04-05	05-06	06-07	Mean
MTH 591	100	100	80	100			95
MTH 610		100		100			100
MTH 530/630	89						89
MTH 560/640		100		100			100
MTH 650	100		100		100	100	100
MTH 661	83		100		67		83
MTH 662					100		100
MTH 681			100	100	100	100	100
Comp. Exam	100	100	100	100	100	100	100

The data collected indicates satisfaction of the goals of this program as enumerated in section A, as measured by the indicators for the various outcome criteria that are detailed above. See the attached Assessment Chart in conjunction with the Percentage of Usable Course Grades table. (Note that MTH 589 does not use letter grades; every student registered in MTH 589 earned CR during the reporting period.) All measures in the Assessment Plan have been positive during the assessment period. (Note that MTH 630 and MTH 640 were renumbered in 2005 to MTH 530 and MTH 560 respectively.)

New graduation requirements were approved in 2006-2007. These are indicated below:

1. The “breadth” requirement for graduation is made uniform at 33 credit hours (*i.e.*, 11 courses) and excludes thesis hours.
2. All graduates must either pass a comprehensive oral examination or write an approved thesis; this “depth” requirement is unchanged. Adjustment of graduate assistant stipends mentioned in previous reports seems to have stabilized the balance between students choosing the thesis and comprehensive examination options.
3. All graduates must now complete MTH 552 or its equivalent as an undergraduate. This equalizes the requirements among advanced calculus (MTH 528 and MTH

528), probability and statistics (MTH 545 and MTH 546), and modern algebra (MTH 550 and MTH 552).

Besides equalizing the attractiveness of the thesis and comprehensive exam options, it is expected that more steady student progress towards their degrees will result. (Theses frequently delay graduation by at least one semester.)

Two additional goals are indicated in the Program Assessment Plan: Faculty Development and Curriculum Development.

**Faculty Development** – *Program faculty should maintain an effective level of professional activity.*

The Mathematics faculty has been active, as indicated in the table below. The data is from annual faculty reports that cover academic years (August 17-August 16) through 2002–03, calendar years beginning January 1, 2005, and a 16.5-month transitional period from August 17, 2003 to December 31, 2004. There has clearly been a heightened and sustained increase in scholarly activity in the Department since 2002-2003.

**Number of Peer-Reviewed Publications Per Year**

98-99	99-00	00-01	01-02	02-03	03-04	2005	2006	Average
6	3	1	6	14	21	13	12	9.1

Note: 21 publications over the 16.5 month 2003–04 annualizes as 15 publications.

**Curriculum Development** – *Faculty should adjust the curriculum to serve the needs of students and society.*

The department regularly monitors the curriculum. This is done through our assessment process and other anecdotal evidence, as well as comparison with the curricula at our peer institutions.

There were several minor changes that were made to the courses in 2006-2007.

- MTH 540, Graph Theory and Combinatorics, was added as previously planned.
- MTH 552 was changed to MTH 663, Time Series Forecasting. The content was revamped and the title changed to reflect the content change.
- MTH 591, Master’s Essay, was deleted. It had not been offered in several years and there is no plan to offer it again.
- The official title of MTH 550 was corrected to Modern Algebra I and MTH 552, Modern Algebra II, was reactivated.
- MTH 610 was renamed Advanced Modern Algebra as a third course in the sequence starting with MTH 550 and MTH 552.
- MTH 630 was renamed Advanced Topology as a third course in the sequence starting with MTH 530 and MTH 531.

- MTH 640 was renamed Advanced Complex Analysis as a third course in the sequence starting with MTH 560 and MTH 561.
- MTH 641 was deleted since it duplicated the reactivated MTH 561.
- MTH 650 was renamed Real Variables I to reflect the beginning of a sequence and the description of MTH 651 was changed to reflect this sequence.

We implemented the change in the comprehensive examination as previously approved. Since this examination (or the thesis) represents the depth component of the program, the number of different topics of examination were reduced from all of a student's courses to five courses.

## **II. Plans for the current year**

Our graduation numbers are slowly increasing. This reflects the increase in the number of graduate assistants that we have been able to support. There are 13 graduate assistants at the beginning of the Fall 2007 semester.

### **Graduation Counts**

93- 94	94- 95	95- 96	96- 97	97- 98	98- 99	99- 00	00- 01	01- 02	02- 03	03- 04	04- 05	05- 06	06- 07	Average
5	8	7	4	5	2	4	2	3	5	3	3	8	3	4.4

In light of the reactivations and new courses at the 500 level, our offerings at the 600 level will be examined and modified, if necessary.

## **III. Assistance Needed**

Graduate assistant stipends remain low as compared with our peer institutions. While the department has unilaterally increased stipends, there has been no college- or university-led effort to improve stipends. This puts our program at Marshall at a serious disadvantage in recruiting graduate students. Stipends at other institutions are often twice or triple our stipends.

## **IV. What one most important thing has the department learned through this process?**

The program is healthy; students graduate with a good education enabling them to pursue further graduate work at excellent universities or to find satisfactory employment.

**Marshall University**  
**Assessment of Student Outcomes: Component/Course/Program Level**

**Component Area/Program/Discipline: M.A. Mathematics**

<b>Component / Course / Program Level</b>					
Student Outcome	Person or Office Responsible	Assessment Tool or Approach	Standards/ Bench-mark	Results/ Analysis	Action Taken
1. Mathematical Reasoning	Faculty	MTH 610, 620, 630, 640, 650 course grades	usable grades for 70% of students	all are above 70% and nearly all are 100%	continue to track usable grades
2. Personal Potential	Faculty	MTH 610, 620, 630, 640, 650, 681, 691 course grades; comprehensive exams	usable grades for 70% of students; passing exams	all are above 70% and nearly all are 100%; all comprehensive exams passed	continue to track usable grades
3. Nature of Mathematics	Faculty	MTH 610, 620, 630, 640, 650, 661, 662, 681, 691 course grades	usable grades for 70% of students	all are above 70% and nearly all are 100%	continue to track usable grades
4. Mathematical Modeling	Faculty	MTH 610, 640, 650, 661, 662 course grades	usable grades for 70% of students	all are above 70% and nearly all are 100%	continue to track usable grades
5. Communication and Resourcefulness	Faculty	MTH 691 course grades; comprehensive exams; credit in MTH 589	usable grades for 70% of students; passing exams	all are above 70% and nearly all are 100%; passing for all comprehensive exams and MTH 589	continue to track usable grades
6. Content Specific Goals	Faculty	MTH 610, 640, 650, 661, 662, 681, 691 course grades	usable grades for 70% of students	all are above 70% and nearly all are 100%	continue to track usable grades