

Department of Mathematical Sciences  
Program Assessment

Third Year Review

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(draft)

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# **I. Department of Mathematical Sciences Degree Program Assessment Plan**

## 1. Goals

The major goal of our program is to give students seeking degrees in mathematics a broad understanding of the field of mathematics.

- Students should have the ability to read and understand technical mathematical writing, including proofs, in such areas as algebra and analysis.
- Students should have the ability to communicate mathematical ideas, both in written and verbal form, to others.
- Students should be able to model complex problem situations in equivalent mathematical form and, once a solution is found, be able to translate the solution into the original problem context.
- Students should be able to use appropriate technology to explore and solve mathematical problems.
- Students should be able to apply mathematical knowledge in non-academic contexts.

## 2. Procedure

The Department of Mathematical Sciences uses several methods to assess students of mathematics. A major instrument of assessment is the use of student portfolios, containing representative work from all 400 level Mathematics courses taken by a student. Depending on the desires of the instructor, the representative work may include such items as final examinations, homework assignments, projects, papers, etc. Student research projects are also included in their portfolios.

Two surveys are also chief instruments of assessment. Every third year, a survey is taken of current students majoring in mathematics or secondary mathematics education; the last such survey was done in Fall 2001. A survey of alumni is also taken every third year; the last such survey was done in Fall 2002.

Other components of our assessment plan include records of student applications to graduate schools, and student performances on the Putnam and other competitive examinations.

## **II. Changes in the Assessment Plan since Last Review**

There were no changes to the assessment plan during this period.

## **III. Program Changes and Their Intended Effects on Student Outcomes**

### **Degree Requirement Changes**

#### **BA:**

We have continued to revise the requirements for the BA in Mathematics degree. The new course M451 has been added to the this of upper level courses which can be used by our students to fulfill their major concentration. This list now reads:

M343, M344, M360, M365, M366, M380, M404, M405, M414, M415, M420,, M435, M447, M448, M451, M471, and M472.

Students now have two options in courses numbered 300 or above to obtain this degree: M380, T336, and one other from the above list, or any two from the list, provided that at least one is at the 400-level.

Adding M451 allows students to take a mathematics course which connects them directly to the mathematics of finance: interest, derivatives, lending, and banking. Creating the second option will allow more majors in secondary mathematics education to also major in mathematics.

#### **BS:**

Following a recommendation from the Computer Science department, we have made C101 a required course instead of C201. M403 and M451 were added as possible elective courses. M451 is, as said above, a course allowing direct application of mathematics to uses in finance and banking; M403 is a pure mathematics course.

*Proposed Changes in the BA and BS programs:* A new course, M347 (Discrete Mathematics), has been developed that will, if approved, eventually replace M400 as a requirement for both our BA and BS degrees. The course will also be required of secondary mathematics education majors, and was designed to also meet the discrete mathematics needs of computer science majors. In addition, the Department is planning to replace M360 and M366 with M463 and M467; this change will better represent the level of content of the material and will allow more time for fuller development of some topics.

#### **BS in Actuarial Science:**

The department received approval for this degree in November 2002, and has students beginning in the program. Students receiving this degree will be able to find employment in occupations using actuarial science; it is hoped that this degree will also increase enrollments in those mathematics courses leading toward the degree.

#### **Master in Applied Mathematics and Computer Science:**

The department received approval for this degree in 2001-2002. We currently have 27 students enrolled

in the program, and new courses are being designed for the program. At this time, M571 (Analysis of Numerical Methods I), M551 (Market and Asset Pricing), and M575 (Simulation Modeling) are being offered this spring semester.

The following courses are currently being developed for this degree:

- M5xx Transform Methods
- M5xx Sampling Methods
- M546 Control Theory
- M562 Statistical Design of Experiments
- M569 Statistical Decision Theory
- M572 Analysis of Numerical Methods II
- M576 Forecasting
- M577 Operations Research

We are finding that students wishing to concentrate in computer science are increasing our undergraduate mathematics enrollments.

#### **Service Courses:**

In cooperation with the Purdue Technology program and Computer Science department, we have developed a new calculus sequence, M208 and M209, to better meet their needs, and we are currently developing a statistics sequence, M260 and M266, to meet the statistics needs of computer science majors. Our Connections program is a very successful cooperative effort with the English department, focusing upon first-year courses for students with developmental needs in both mathematics and writing. We also have a cooperative effort with the Business School to teach M118 from a project-based perspective; this project has earned its instructors teaching awards and publication awards.

#### **Teaching Education:**

We are currently developing and implementing two new courses for students wishing to obtain certification in elementary, middle or secondary education. One course, T201 (Problem Solving), was created in 2000 as a course for students wishing to obtain middle school mathematics certification and also as an elective for mathematics secondary education majors specializing in English, Social Studies, or Foreign Languages to address the mathematics content of the Pre-Professional Skills Test (PPST) now required of all education majors. T436 (Secondary Mathematics: An Advanced Perspective) is now being developed for secondary mathematics education majors, to better enable these students to connect the advanced mathematics taught in college to the mathematics they will be teaching; the course will also provide a deeper analysis of the problems of secondary mathematics and serve as a capstone course for these students. Moreover, our T101, T102, T103 and T336 courses have been carefully examined and modified to help education students meet the new Professional Licensing Standards.

## IV. Impact and Actual Effects of Program Changes

### 1. Program Growth

One anticipated result of the changes in the programs offered by the Department of Mathematical Sciences has been a growth in the number of students in upper-level (300 & 400) mathematics courses. The chart below gives numbers of students enrolled in such courses during the fall and spring semesters (combined) of the indicated academic years, and shows a definite and significant rise in 300-level enrollments, and a steady enrollment in 400-level courses, with a suggestion of rising levels in the future.

Enrollment Data in Upper Level Mathematics Courses

	1997- 1998	1998- 1999	1999- 2000	2000- 2001	2001- 2002	2002- 2003
300-level	89	80	113	110	134	131
400-level	49	52	37	48	48	76

Similar growth can be seen in the number of mathematics majors over the same period. The chart below shows, for each fall, the number of majors in mathematics (AA, BA, and BS) as reported by the College of Liberal Arts and Sciences. The total number of majors in these degree programs has grown from a total of 53 reported for years 1997-2000 (used in the last third-year assessment report) to 66 for the years 2001-2003. The chart does not include those students seeking a BS/BA in Mathematics Education; the department this year has 25 students with such majors. In the future, the department will also be counting students majoring in actuarial science.

Mathematics Majors

1997	1998	1999	2000	2001	2002
14	15	24	25	24	17

### 2. Student Success in Graduate Schools

(The following is anecdotal, as the Department does not maintain data on its graduates.)

Joan Ackerman (BA in Mathematics) completed her doctorate in mathematics in 2001 at the University of Nebraska and is now ending a two-year postdoctoral study at the University of Georgia.

Amanda Serenevy (nee Schermer) (BA in Mathematics) is enrolled in the doctoral program at Boston University, soon will be taking oral comprehensive examinations, and

then will commence to write a doctoral dissertation in mathematics.

Dean Serenevy (nee Johnson) (BA in Mathematics) is enrolled in the doctoral program at Northeastern University in Boston, Massachusetts, and is currently doing research in mathematics for his doctoral dissertation.

William Zech (BS in Mathematics) has begun a doctoral program at the University of Notre Dame, choosing to do graduate work in physics.

Scott Michaels (BS in Mathematics) has begun a doctoral program at the Bloomington campus of Indiana University, choosing to do graduate work in physics.

Jonathan Darnel (minor in Mathematics) has begun a doctoral program at the University of Wyoming, choosing to do graduate work in physics.

### **3. Student Success in Mathematical Careers**

(The following is anecdotal, as the Department does not maintain data on its graduates.)

Shannon Eversole and Jeff Perkins have launched successful careers in the insurance industry with the firm Partners Health Plan.

Ernest Mudis and Angela Matthews have launched successful careers in the insurance industry with the firm American Life Insurance.

Mary Curic has a successful career working for the St. Joseph County (Indiana) Courthouse.

## V. Future Changes to the Assessment Plan

In the report prepared for the Third Year Review conducted in 2000, the Department indicated that the assessment plan would need to be changed to better assess those parts of the program which serve students majoring in mathematics secondary education. Recognition of the need for this change has led to a desire within the Department to better assess its success in service courses for all other disciplines and departments of the South Bend campus of Indiana University. Last fall, the Department was awarded an Assessment Grant to develop necessary tools and procedures for such an extension of the assessment process. The following is excerpted from the proposal for the grant:

“Many if not most degree programs at IUSB need students to have mathematical training above that required for admission; most of these degree programs address these needs by making courses offered by the Department of Mathematical Sciences prerequisites for courses in their own programs. The matter of how well these prerequisite mathematics courses meet the needs of the various client degree programs has been traditionally assessed by student course evaluations and, depending upon the other disciplines, contacts between administrators and/or faculty groups. The latter technique has most recently been used by the Department of Mathematical Sciences in interaction with the School of Education and with the Department of Computer and Information Sciences.

The Department of Mathematical Sciences would like to add more systematic and objective tools to actively update information about our client department/programs needs and use these to aid in our assessment of how well these service courses are meeting the needs of the client departments. The Department envisions developing these tools in a series of steps. The first will be to survey the various client disciplines/departments to determine which mathematics courses are prerequisites for their programs and what mathematical skills and knowledge they expect students to have gained from those courses. The second step will be to plan regular and/or periodic meetings with instructors from the client programs to discuss their perceptions of the success of the prerequisite mathematics courses, and to develop a questionnaire for the client programs addressing the success/failures of the prerequisite mathematics courses. The third step will be to build a database tracking student grades in the prerequisite mathematics courses and grades in subsequent client courses, to enable our department and the client programs to make accurate estimators of future success, and to identify problem areas.”

A second change in the assessment plan under discussion is to maintain portfolios for upper division mathematics courses (as well as student portfolios). Having such course portfolios will better enable the Department to monitor content and level within these courses.

(Report prepared by Michael Darnel – retyped by Dean Alvis.)