WEAVE - Assessment Report

MS in Applied Mathematics and Computer Science – Applied Mathematics Concentration

(assessed in 2013-1014 based on 2012-2013 data)

I. Mission

The Master in Applied Mathematics and Computer Science (MS in AMCS) degree program is jointly offered by the Department of Mathematical Sciences and the Department of Computer and Information Sciences. This program provides students with advanced education in sophisticated quantitative and computational skills beyond undergraduate program proficiencies.

The applied mathematics (AM) concentration of the program provides the training in analytical rigor, quantitative professional competencies, unstructured problem solving techniques, and statistical analysis techniques that are needed for individuals seeking industrial and governmental positions in, but not limited to, quantitative disciplines and risk management, or seeking to further their education.

Additional Information

Students work with their advisers to select a schedule of courses tailored to their personal interests and goals. Students may select their focus in one of the following three areas:

1) Applied Mathematics
2) Computer Science
3) Interdisciplinary of Applied Mathematics and Computer Science

Thesis and non-thesis options are available.
II. Goals

1. **Knowledge of Applied Mathematics and Statistics.** Students will acquire both a conceptual and operational understanding in the areas of applied mathematics and statistics beyond undergraduate level.

2. **Analytical Skills.** Students will demonstrate analytical skills and have the ability to abstract general principles from examples.

3. **Modeling and Problem Solving Skills.** Students will have advanced techniques and skills in mathematical and statistical modeling and problem solving.

4. **Mathematical and Statistical Application Skills.** Students will have advanced skills of applications and relevance of mathematical and statistical ideas to other disciplines.

5. **Communication Skills.** Students will have the ability to communicate mathematical and statistical ideas clearly and effectively.

6. **Use of Technology.** Students will be able to use appropriate technology to explore and solve mathematical problems

III. Learning Outcomes

1) **Mathematical Modeling.** (G1, G2, G3, G6) Students are able to apply mathematical techniques in analysis to translate complicated real-world scenarios into mathematical models. Courses: M448, M463, M560, M577

2) **Advanced Statistical Techniques.** (G1, G2, G3, G4, G6) Students are able to apply statistical techniques to select appropriate statistical methodologies and models based on properties of particular data sets, perform analysis and draw inferences from models. Courses: M466, M562, M565, M574, M575, M576.

3) **Problem Solving.** (G1, G2, G4, G6) Students are able to apply mathematical and statistical thinking to new settings; work with complicated problems in a variety of subject areas and to synthesize solutions to such problems. Courses: M448, M463, M466, M551, M562, M565, M571, M574, M575, M576, M577.

4) **Communication Skills.** (G5) Students are able to give clear and organized explanations of mathematical and statistical ideas, to precisely articulate arguments, and to interpret the results. Courses: M448, M463, M466, M551, M560, M562, M565, M571, M574, M575, M576, M577
IV. Mapping – Level of Instruction

We characterize each graduate course by the level of instruction. There are two possible levels, Introduced (I) and reinforced (R). We emphasize that both “I” and “R” are judged at graduate levels. The curriculum map that connects learning outcomes with levels of instruction is given below.

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<thead>
<tr>
<th>Course</th>
<th>Mathematical Modeling</th>
<th>Advanced Statistical Techniques</th>
<th>Problem Solving</th>
<th>Communication Skills</th>
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<td>M448/M590</td>
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Mathematical Modeling: Students are able to apply mathematical techniques in analysis to translate complicated real-world scenarios into mathematical models.
Advanced Statistical Techniques: Students are able to apply statistical techniques to select appropriate statistical methodologies and models based on properties of particular data sets, perform analysis and draw inferences from models.
Problem Solving: Students are able to apply mathematical and statistical thinking to new settings; work with complicated problems in a variety of subject areas and to synthesize solutions to such problems.
Communication Skills: Students are able to give clear and organized explanations of mathematical and statistical ideas, to precisely articulate arguments, and to interpret the results.
V. Measure and Findings

- Direct measures: items and/or questions selected from assignments, quizzes, exams, project and thesis
- Findings - assessed in 2013-1014 based on 2012-2013 data

Five 500 level graduate courses, MATH-M551, M577, M574, and two sections of M590 (with variable/different course titles) were offered during 2012-2013 academic year. We use course grade as a direct measure of program assessment.

While our program works well in terms of student learning outcomes, the program has a serious problem of low enrollment. We work hard to retain the current students and to encourage prospective students sending in application. However, we do not have the manpower and resources to do marketing and need help from campus administration.

VI. Action Plan Tracking

- Target: 85% of graduate students will achieve grade B or higher.
- Findings: The target is met, 96.2% of students scored B or higher.
- Action Plan: Provide more/better advising to students, particular to those who show signs of low performance and/or withdrawal.
VII. Planned/In-progress/Finished (finished for the cycle of 2013-2014 academic year)

Description:

- Required by the Senate Assessment Committee, the Graduate Committee of MS program in Applied Mathematics and Computer Science planned to develop a mission statement, a set of goals and a set of outcomes for each of the following two concentrations of the MS program:
  - Applied Mathematics
  - Computer Science

- Collect and study the program assessment data from all 500 level graduate courses offered during 2012-2013 academic year.

Implementation Description:

- We drafted statement, goals and outcomes; submitted to the Senate Assessment Committee for feedback; revised mission statement, goals and outcomes based on feedback.

- We collected grades from five 500 level graduate courses, MATH-M551, M577, M574, and two sections of M590 (with variable/different course titles) offered during 2012-2013 academic year. We use course grade as a direct measure of program assessment. The data indicate that the success rate is 96.2%.

Responsible Person/Group:

- Development of mission statement, goals and outcomes for M.S. in Applied Mathematics and Computer Science with applied mathematics concentration:
  Shanqin Chen, Anna Savvopoulou, Morteza Shafii-Mousavi, Yi Cheng

- Instructors of MATH-M551, M577, M574, and two sections of M590, 2012-2013:
  Anna Savvopoulou, Zhong Guan, Morteza Shafii
VIII. Analysis Questions

1. In light of, but not limited to your assessment findings, how has your department contributed in the overall mission of IU South Bend? Please attach supporting document(s).

**IUSB Mission Statement.** IU South Bend is the comprehensive undergraduate and postgraduate campus that serves north central Indiana and is a regional campus of Indiana University. The campus values excellence in teaching, student-faculty interaction, research and creative activity, diversity and inclusivity, a global perspective, and collaboration in life-long learning. IU South Bend develops engaged citizens prepared to build strong communities.

The mission of the MS program in Applied Mathematics and Computer Science with concentration in applied mathematics reflects that of IU South Bend as a whole. We endeavor to provide the training in analytical rigor, quantitative professional competencies, unstructured problem solving techniques, and statistical analysis techniques that are needed for individuals seeking industrial and governmental positions in, but not limited to, quantitative disciplines and risk management, or seeking to further their education.

This is the first time we worked on details of assessment for our MS degree program. 96.2% success rate in applied mathematics concentration is certainly encouraging. We will continue our effort, such as providing better advising to students with difficulties and encouraging more graduate students to participate in research activities.

2. How did the results of last year's assessment process direct this year's assessment? Please attach supporting document(s).

The assessment processes this year are quite different from those of the last year. We feel this year’s assessment is mainly directed by the new assessment setting of WEAVE items, and not much has continued from last year’s assessment. Moreover, this is the first time in our program that we collected assessment data of direct measures. The graduate committee members in Applied Mathematics and Computer Sciences program invested large amount of energy and time on the WEAVE assessment items.

3. Looking at this year's assessment, what does your department plan to do differently from this point forward? Please attach supporting document(s).

For the academic year 2012-2013, we collected assessment data from 500 level courses. Since the program allows maximum up to 6 credit hours of 400 level courses counting toward the MS degree, we intend to collect and study assessment data from graduate students in these courses as well for the future years starting from 2013-2014.