Assessment Report

MS Program in Applied Mathematics and Computer Science – Computer Science Concentration

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

I. Mission/Purpose

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 computer science (CS) concentration provides the graduate students with depth and breadth of knowledge, in areas such as advanced database systems, parallel and distributed systems, advanced computer graphics, artificial intelligence, computer vision, and software engineering necessary to keep pace with a rapidly changing industry, to assume leadership positions in the field, and to make positive contributions to society.

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. **Problem Solving Skills.** Students will acquire complex problem solving skills that can be applied to the field of computer science beyond undergraduate level.

2. **Analytical and Quantitative Skills.** Students will demonstrate analytical skills and have the ability to design complex and efficient algorithms.

3. **Ability to work independently and as part of a team.** The students will be able to write programs effectively on their own and as part of a team.

4. **Application to Real Life Problems.** Students will be able to apply skills and concepts they have acquired to real life problems.

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

III. Learning Outcomes

1) **Proficiency in problem solving.** (G1, G2) Students demonstrate proficiency in solving advanced problems requiring the use of programming skills and the use of advanced software tools. Courses: B524, B538, B551, B553, P565, B581, B583.

2) **Ability to Design Efficient Algorithms.** (G2) Students are capable to choose an efficient algorithm to solve a problem and based on practical and theoretical aspects. Courses: B503, B524, B538, B551, B553, B561, P565, B581, B583.

3) **Advanced Development Skills.** (G3) Students have the ability to work individually and in a team and lead a software project from the concept stage to the finished product. Courses: B524, B538, B551, B553, B561, P565, B581, B583.

4) **Communication Skills.** (G5) Students are able to give clear and organized written and verbal explanations of computer science ideas, and to precisely articulate arguments. Courses: B538, B551, B553, B561, P565, B581, B583.

5) **Proficiency with the Latest Technologies.** (G4) The students have learned to program applications for the latest technologies such as database, software engineering, embedded and mobile systems, robotics, and web applications. Courses: B538, B551, B553, B561, P565, B581, B583.

6) **Real Life Applications.** (G4) The students can solve real-life problems by applying algorithms and tools learned in class. Courses: B524, B538, B551, B553, B561, P565, B581, B583.
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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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 in computer science, CSCI-A510, B503, B524, B561, B581, 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, we have identified a problem of low enrollment. We work diligently 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, 91.2% of students who completed the course scored B or higher (77.5% of the total). The main issue is 15% withdrawal rate, mainly due to lack of prerequisites.
- Action Plan: Provide more/better advising to students if they come in with deficiencies, particular to those who show signs of low performance and/or withdrawal. Check prerequisites more carefully in week before each semester starts to make sure that enrolled students have required prerequisites.
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, CSCI-A506, B561, B503, B524, B581, offered during 2012-2013 academic year. We use course grade as a direct measure of program assessment. The data indicate that the success rate (B or above) is 77.5%.

Responsible Person/Group:

- Development of mission statement, goals, and outcomes for M.S. in Applied Mathematics and Computer Science with computer science concentration: Raman Adaikkalavan, Murli Nair, and Dana Vrajitoru

- Instructors of B561, B503, B524, B581, 2012-2013: Hossein Hakimzadeh, Dave Surma, and Dana Vrajitoru.
VIII. Analysis Questions and Answers

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 computer science reflects that of IU South Bend as a whole. Our program provides the graduate students with depth and breadth of knowledge, in areas such as advanced database systems, parallel and distributed systems, advanced computer graphics, artificial intelligence, computer vision, and software engineering necessary to keep pace with a rapidly changing industry, to assume leadership positions in the field, and to make positive contributions to society.

   This is the first time we worked on details of assessment for our MS degree program. 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 process this year is 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.