**2012-2013 Assessment Report**  
**Department/Unit: Applied Mathematics, MAM**

**College of Sciences & Mathematics**

**Mathematics & Statistics**

**Applied Mathematics, MAM**

**Expected Outcome 1: Career Preparedness**
Graduates should have the mathematical knowledge and problem-solving skills appropriate for a range of professional careers or further graduate studies.

**Assessment Method 1: Evaluation by Advisory Committees (Direct Evidence)**

**Assessment Method Description**
The student’s advisory committee determined during the preparation of the project and during the final exam whether the student’s mathematical knowledge and problem-solving skills are appropriate for a range of professional careers or further graduate studies. The members of the committee summarized their evaluation by judging the student’s performance as one of the following:

- **Excellent:** The student’s is ready for a professional career or further graduate studies.
- **Good:** The student is ready for a professional career, but needs some additional training for further graduate studies.
- **Satisfactory:** The student is ready for a professional career, but not for further graduate studies.
- **Unsatisfactory:** The student is not ready for a professional career.

**Findings for Mathematical Knowledge**

<table>
<thead>
<tr>
<th>Number of Evaluations</th>
<th>Excellent</th>
<th>Good</th>
<th>Satisfactory</th>
<th>Unsatisfactory</th>
<th>Not Rated</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0 (0%)</td>
<td>4 (57%)</td>
<td>2 (29%)</td>
<td>0 (0%)</td>
<td>1 (14%)</td>
</tr>
</tbody>
</table>
Findings for Problem Solving Skills

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<tr>
<th>Number of Evaluations</th>
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**How did you use findings for improvement?**
While the revised evaluation forms allowed obtaining more direct evidence than before, it became apparent that more fine grain evidence has to be collected to evaluate students’ communication skills. The GPO contacted the Graduate Studies Committee to develop an evaluation form to be used by the faculty during the exam to gain further direct evidence. The GSC investigated the relatively low level of career readiness ratings, and encouraged faculty to pay more attention to career readiness then their students prepare the plan of study.

**Additional Comments**
Faculty need to be educated about the purpose of this process, in order to improve ratings returns rates.

**Assessment Method 2: Program Evaluation by Graduating Students**

**Assessment Method Description**
Graduating students are encouraged to complete exit surveys after passing the final exam to assess their experience in the master's program and, in particular, their level of career preparedness and their ability to conduct independent research.

- **(5):** The students rate their level of appropriate expertise very high.
- **(4):** The students rate their level of appropriate expertise high.
- **(3):** The students rate their level of appropriate expertise adequate high
- **(2):** The students rate their level of appropriate expertise sufficient.
- **(1):** The students rate their level of appropriate expertise insufficient.
Findings

<table>
<thead>
<tr>
<th>Expertise</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of Knowledge Needed for Career</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Ability to Work Independently in Career</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

How did you use findings for improvement?
Although the revised survey resulted in improved fine grain evidence in the MS program, the data obtained for the MAM program are too limited to draw any conclusion.

Additional Comments
Return rates need to be improved!

Expected Outcome 2: Mathematical Communication Skills
Graduates should be able to communicate advanced mathematical concepts and technical material orally and in writing.

Assessment Method 1: Evaluation by Advisory Committees (Direct Evidence)
Assessment Method Description
Each student in this program has to complete a project and present this project in an oral exam. These two tasks allow the advisory committee to assess the student’s oral and writing communication skills in detail based on the generally accepted standards for publications in the field. The members of the committee summarized their evaluation by judging the student’s performance during the final exam and during the preparation of the project as one of the following:

Excellent: The student's communication skills allow him/her to present research at mathematical conferences and publish his/findings in professional.

Good: The student is able to communicate his/her research, but some additional work is required to present orally or in writing in a
professional setting.

Satisfactory: Although the student is able to communicate his/her research, significant additional work is required before the student will be able to present orally or in writing in a professional setting.

Unsatisfactory: The student is unable to communicate mathematical concepts orally or in writing.

### Findings

<table>
<thead>
<tr>
<th>No Evaluations</th>
<th>Excellent</th>
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<th>Satisfactory</th>
<th>Unsatisfactory</th>
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</thead>
<tbody>
<tr>
<td>Writing: 7</td>
<td>1 (14%)</td>
<td>2 (29%)</td>
<td>3 (43%)</td>
<td>0 (0%)</td>
<td>1 (14%)</td>
</tr>
<tr>
<td>Oral: 7</td>
<td>2 (29%)</td>
<td>1 (14%)</td>
<td>3 (43%)</td>
<td>0 (0%)</td>
<td>1 (14%)</td>
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</tbody>
</table>

**How did you use findings for improvement?**

While the revised evaluation forms allowed us to obtain more direct evidence than before, it has become apparent that more fine grain evidence has to be collected to evaluate students’ communication skills. The GPO contacted the Graduate Studies Committee to develop an evaluation form to be used by the faculty during the exam to gain further direct evidence. The reasons for the high number of “satisfactory” ratings for the writing and oral communication skills was investigated by the GSC, and faculty was encouraged to pay more attention to these during the preparation of the project.

**Additional Comments**

Faculty need to be educated about the purpose of this process, in order to improve ratings returns rates.

**Assessment Method 2:** Program Evaluation by Graduating Students (Indirect Evidence)

**Assessment Method Description**

Graduating students are encouraged to complete exit surveys after their final exam to assess their experience in the master’s program and, in particular, their level of communication skills.

(5): The students rate their level of appropriate expertise very high.

(4): The students rate their level of appropriate expertise
The students rate their level of appropriate expertise inadequately high.

The students rate their level of appropriate expertise sufficient.

The students rate their level of appropriate expertise insufficient.

**Findings**

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</thead>
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<tr>
<td>Oral Communication</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Written Communication</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
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**How did you use findings for improvement?**

Although the revised survey resulted in improved fine grain evidence in the MS program, the data obtained for the MAM program are too limited to draw any conclusion.

**Additional Comments**

Return rates need to be improved!

**Expected Outcome 3: Mathematical Knowledge and Understanding**

Graduates will have an adequate understanding of a range of advanced mathematical subjects relevant to their area of specialization and will be able to comprehend related technical content.

**Assessment Method 1:** Evaluation by Advisory Committees (Direct Evidence)

**Assessment Method Description**

A graduate degree in Applied Mathematics offers a student a large
amount of flexibility in choosing classes. Since there are no required classes, any assessment method concerned with direct evidence has to concentrate on the only common elements, namely the required project and the final oral exam. The student’s mathematical knowledge and understanding was individually assessed by the members of the student’s advisory committee during the preparation of the project and during the final oral exam. The members of the committee then summarized their evaluation by judging the student’s performance as one of the following:

Excellent: The student shows complete mastery of his/her chosen subject area.

Good: The student shows a general mastery of his/her chosen subject area but some additional studies of the more difficult topics are necessary.

Satisfactory: The student shows mastery of his/her chosen subject area adequate for completing his/her degree, but significant additional studies are necessary.

Unsatisfactory: The student has failed to gain enough knowledge in the chosen area of specialization to complete a project.

**Findings for Mathematical Knowledge**

<table>
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<tr>
<th>No Evaluations</th>
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**Findings for Understanding**

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**How did you use findings for improvement?**

While the revised evaluation forms allowed us to obtain more direct evidence than before, it has become apparent that more fine grain evidence has to be collected to evaluate students’ content.
knowledge. The GPO contacted the Graduate Studies Committee to develop an evaluation form to be used by the faculty during the exam. The GSC discussed the drop in students’ content knowledge in relation to last year’s data, and encouraged faculty to pay particular attention to this issue.

**Additional Comments**
Faculty need to be educated about the purpose of this process, in order to improve ratings returns rates.

**Assessment Method 2: Program Evaluation by Graduating Students (Indirect Evidence)**

**Assessment Method Description**
Graduating students are encouraged to complete exit surveys after their final exam to assess their experience in the master's program and, in particular, their level of mathematical knowledge.

- **(5):** The students rate their level of appropriate expertise very high.
- **(4):** The students rate their level of appropriate expertise high.
- **(3):** The students rate their level of appropriate expertise adequate high
- **(2):** The students rate their level of appropriate expertise sufficient.
- **(1):** The students rate their level of appropriate expertise insufficient.

**Findings**

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<tbody>
<tr>
<td>Breadth of Knowledge</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Depth of Knowledge</td>
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<td>0 (0%)</td>
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**How did you use findings for improvement?**
Although the revised survey resulted in improved fine grain evidence in the MS program, the data obtained for the MAM program are too limited
to draw any conclusions.

Additional Comments
Return rates need to be improved!

Expected Outcome 4: Mathematical Reasoning and Problem-Solving Skills
With proper guidance, graduates should be able to apply advanced mathematical techniques and rigorous logical reasoning to prove theorems, implement algorithms, or analyze mathematical models.

Assessment Method 1: Evaluation by Advisory Committees (Direct Evidence)
Assessment Method Description
Although a graduate degree in Applied Mathematics offers a student a large amount of flexibility in choosing classes, there is a general agreement in Mathematics what constitutes a valid proof of a mathematical theorem, on how to implement algorithms or how to analyze a mathematical model. The student’s ability to perform these tasks was individually assessed by the members of the student’s advisory committee during the preparation of the project and the final oral exam. The members of the committee then summarized their evaluation by judging the student’s performance as one of the following:

Excellent: The student shows complete mastery of these tasks.

Good: The student shows a general mastery of these tasks but needs some guidance when dealing with more difficult situations.

Satisfactory: The student shows mastery of these tasks with guidance.

Unsatisfactory: The student has failed to gain sufficient mastery of these tasks in order to complete a project.

Findings for Implementation of Algorithms

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<th>No Evaluations</th>
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Findings for Implementation of Algorithms

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How did you use findings for improvement?
While the revised evaluation forms allowed us to obtain more direct evidence than before, it has become apparent that more fine grain evidence has to be collected to evaluate students’ mathematical skills. The GPO will contact the Graduate Studies Committee to develop an evaluation form to be used by the faculty during the exam. The fine grain evidence collected indicates that the GSC needs to discuss the drop in students’ mathematical skills in relation to last year’s data.

Additional Comments
Faculty need to be educated about the purpose of this process, in order to improve ratings returns rates.

Assessment Method 2: Program Evaluation by Graduating Students
(Indirect Evidence)
Assessment Method Description
Graduating students will be encouraged to complete exit surveys to assess their experience in the master's program and, in particular, their level of problem-solving skills.

(5): The students rate their level of appropriate expertise very high.

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<tbody>
<tr>
<td>Reasoning</td>
<td>1 (100%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
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How did you use findings for improvement?
Although the revised survey resulted in improved fine grain evidence in the MS program, the data obtained for the MAM program are too limited to draw any conclusion.

Additional Comments
Return rates need to be improved!