Assessment Report (2011-2012)

Central Connecticut State University
Department of Mathematical Sciences
Assessment for the M.A. Program in Mathematics – General Concentration

Preamble:

The Master of Arts in Mathematics - General provides an abstract introduction to mathematics at an advanced level. This program is suitable for students wishing to improve their mathematics backgrounds before applying to doctoral programs, for candidates interested in teaching at the community-college level, and for high school teachers looking both to broaden and deepen their understanding so as to advance their teaching.

Section 1: Program Learning Outcomes

http://www.math.ccsu.edu/hive/pdf/Learning%20Outcomes/Mathematics_MA_LearningOutcomes.pdf

Students in this program will be expected to:

1) deeply understand analytic arguments, using such common notions as epsilon/delta, infinite sums, and limits, as well as considerations for more general spaces than the real numbers, such as spaces of functions;
2) develop a basic understanding of measure theory and use it to study the Lebesgue integral;
3) deeply understand basic algebraic and discrete notions, such as facts about vector spaces and counting arguments, and expand this to include ideas about rings and fields;
4) develop a basic understanding of Galois theory;
5) follow and create analytic proofs involving abstract metric spaces;
6) follow and create algebraic proofs, with an understanding of groups, rings, and fields; and
7) independently investigate advanced topics in mathematics and present results to others in a clear way.

Section 2: Findings

Data for the MA Program in Mathematics (Concentration: General) was collected for six of seven students from Fall 2011 to Fall 2012. One student had no data. The reason behind the omission of data is not known at this time. Professors teaching the associated courses (See Appendix A: Part I) for each learning outcome scored students using the following levels of performance:
2 – Strong performance of the Course Objectives and Program Learning Outcomes
1 – Acceptable performance
0 – Unacceptable Performance or Does Not Meet the Objective or Learning Outcome

Table 1. Data Reported for Student Learning Outcomes in Related Courses.

Student	Term	LO1	LO2	LO3	LO4	LO5	LO6	LO7	Mean
Student1	Sp11	2	2	2	2	2	2	2	2
Student2	F11	2	NR	NR	NR	2	NR	2	2
Student3	Sp12	1	1	2	2	1	2	2	1.57
Student4	Sp12	2	NR	2	NR	2	2	2	2
Student5	Sp12	2	2	NR	NR	2	NR	NR	2
Student6	F12	2	2	2	2	2	2	2	2

*Student 7 had no data.

Section 3: Analysis

According to Table 1, all students demonstrated at least an acceptable level of performance for all learning outcomes (means of 1.57 – 2). Students were strongest in learning outcomes # 1, #5 and #7. Based on the small number of data points available, a clear weakness was not seen; however learning outcomes #2 and #4 had the fewest number of students that performed with a strong performance. At least one student was reported as having presented her research at the Colloquium of Mathematical Sciences. This student's work adds to the knowledge base in mathematics by providing insight into the complexity of the problem she researched about the extension of nonperfect matchings to Hamiltonian cycles.

The department has not yet established a clear rubric for the capstone experience or comprehensive exams. Currently the rubric (see Appendix A: Part II) included in the Master's Thesis Handbook is used as a guide to assess students who choose the Thesis as their capstone experience. The assessment committee for the MA assessment report will meet to develop assessment tools for the two capstone experiences.

Section 4: Use of Results

Data has been collected for the first time for this program. The MA Assessment Committee will meet to discuss the results of this initial data and propose any preliminary changes to the program based on the needs of the program.

Section 5: General Education is non-applicable to this program.

APPENDIX A (Part I)

The levels of performance for each learning outcome is scored by Professors as:

2 – Strong performance of the Course Objectives and Program Learning Outcomes
1 – Acceptable performance
0 – Unacceptable Performance or Does Not Meet the Objective or Learning Outcome

Learning Outcomes for the MA in Mathematics (with a General Concentration)

Students in this program will be expected to:

1. deeply understand analytic arguments, using such common notions as epsilon/delta, infinite sums, and limits, as well as considerations for more general spaces than the real numbers, such as spaces of functions;
   (ANALYSIS: MATH 519, 529, 525, & MATH 523: TOPOLOGY)

2. develop a basic understanding of measure theory and use it to study the Lebesgue integral;
   (ANALYSIS: MATH 519, 529, 525)

3. deeply understand basic algebraic and discrete notions, such as facts about vector spaces and counting arguments, and expand this to include ideas about rings and fields;
   (ALGEBRA: MATH 515 & 516)

4. develop a basic understanding of Galois theory;
   (ALGEBRA: MATH 515 & 516)

5. follow and create analytic proofs involving abstract metric spaces;
   (ANALYSIS: MATH 519, 529, 525, & MATH 523: TOPOLOGY)

6. follow and create algebraic proofs, with an understanding of groups, rings, and fields; and
   (ALGEBRA: MATH 515 & 516)

7. independently investigate advanced topics in mathematics and present results to others in a clear way.
   (ALL COURSES LISTED ABOVE)

The courses listed are the courses where each learning outcome can be assessed.

Appendix I

Capstone Rubric

Student's Name _____ CCSU ID # _____

Faculty Assessors _____

Capstone Rubric (Plans A/C/E)	Does Not Meet Expectations	Meets Expectations	Exceeds Expectations
1. Definition of Project/Introduction Or Statement of Hypothesis	Introduction does not clearly explain the nature and structure of the capstone, its rationale and relevance to discipline.	Introduction clearly presents the capstone, its nature, relevance and structure.	Introduction makes strong case for the value the capstone provides to the discipline, as well as presenting its nature and structure.
2. Thesis/Argument	Argument is unclear, inconsistent, inappropriate, or not suitably original.	Argument is appropriate, clearly presented, consistently applied, and suitably original.	Argument is clear, consistent, sophisticated, and strikingly original.
3. Familiarity with/ Grounded in Literature. Knowledgeable of the current state of discipline	Does not indicate familiarity with literature; has large gaps and shows little grounding of the capstone in the literature. No substantive engagement.	Displays familiarity with reasonably full range of literature; demonstrates an appropriate grounding and engagement with the literature.	Displays impressive familiarity with full range of and grounding in literature; engages with it substantively and productively.
4. Methodology or Plans for the Project	Methodology is not clearly presented, not appropriate or not adequately applied to capstone.	Methodology is clearly presented, relevant and appropriately applied to capstone.	Methodology and project are mutually enriching.
5. Results/Findings/ Demonstration of Thesis Argument and Claims	Outcomes minimally address research questions and fail to demonstrate its claims persuasively. Presentation minimally addresses research questions; structure reflects a lack of organization, detail, understanding and/or accuracy.	Outcomes address research questions. Presentation of evidence uses argumentation and is reasonably persuasive in making connections with research ideas.	Outcomes thoroughly address research questions. Presentation of evidence conveys a mastery of argumentation. Structure provides a coherent and clear focus of new understandings.
6. Summary/ Conclusion or closing argument	Capstone summary is minimally supported by results and/or findings; exhibits a lack of original ideas, personal interpretation of findings, and/or an inability to draw an inventive synopsis.	Summary sufficiently supported by results and/or findings while adequately and accurately summarizing the capstone.	Summary presents carefully analyzed information to present inventive and originally developed decisions and/or conclusions supported by results and/or findings.
7. Bibliography/ References	Lack of proper format and limited details with many sources missing or incomplete.	Bibliography/References are mostly complete and correctly formatted. Capstone contains a variety of sources.	Bibliography/References are complete (all sources shown) and correctly formatted; inserted to validate evidence.
8. Writing	Writing is unclear, distracts from meaning, is not at appropriate level, or contains excessive errors.	Writing is clear and appropriately sophisticated, with virtually no errors, and supports meaning.	Writing is at or near professional level, has no errors, and enhances meaning.

Totals _____ _____ _____

Overall Score: _____

APPENDIX B

Course and Capstone Requirements (30 credits):

Requirements (18 credits):

MATH 515	Abstract Algebra I	(3 credits)
MATH 516	Abstract Algebra II	(3 credits)
MATH 519	Principles of Real Analysis I	(3 credits)
MATH 520	Principles of Real Analysis II	(3 credits)
MATH 523	General Topology	(3 credits)
MATH 526	Complex Variables	(3 credits)

Electives as approved by faculty advisor (12 credits).

These may include 3 credits for the thesis for a student electing Plan A. No more than 9 credits may be earned from 400-level courses.

Capstone Experience:

Plan A: Thesis (MATH 599, 3 credits). Students electing this option must also pass one qualifying examination* in an area not related to the thesis topic.

Plan B: Comprehensive Exam. Students selecting this option must pass two of three qualifying examinations* (in the areas of algebra, analysis, or topology) and also give oral presentations on topics approved by their advisors.

* Students must apply for qualifying examinations after completing appropriate coursework with the approval of their advisors. Applications are available in the School of Graduate Studies or on the web at under Graduate Forms (Degree Candidacy/Non Capstone Qualifying Form).