



**2014-2015 CSCI EETF Assessment Year End Report, June, 2015**

Program Name(s)	EETF Faculty Rep	Department Chair
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**A. Program Student Learning Outcomes**

Masters of Science in Mathematics

Students graduating with a Masters of Science in Mathematics will be able to:

1. Students will be able to apply the fundamental definitions and theorems of pure mathematics
2. Students will be able to apply the fundamental definitions and theorems of applied mathematics
3. Students will be able to apply advanced techniques of mathematical analysis
4. Students will be able to apply techniques of advanced algebra
5. Students will be able to apply advanced techniques of geometry and topology
6. Students will be able to use mathematical algorithms

Students taking Option B or C for the Masters in Mathematics receive focused emphasis on particular PLOs as follows:

- The Applied Mathematics Option emphasizes PLOs #2, 3 & 6 above.
- The Mathematics Teaching Option emphasizes #1, 2, 4 & 5 above.

**B. Program Student Learning Outcome(s) Assessed**

SLO 1: Apply the fundamental definitions and theorems of pure mathematics

SLO 2: Apply the fundamental definitions and theorems of applied mathematics

**C. Summary of Assessment Process**

For each graduate course used in our assessment, a final exam question was identified as a typical problem for the course that assessed the given SLO. Each problem was scored by the graduate committee for readability, validity and fluency using the rubric below. The results were organized and discussed by the graduate committee.

## SLO 1 RVF Rubric – Readability, Validity, Fluency

	Missing (0)	Emerging (1)	Developing (2)	Mastering (3)
Readability	Informal or non-mathematical language is used. There is misuse of notation/symbols.	Some improper mathematical language or notation is used.	Mostly proper mathematical language and notation is used.	Proper mathematical language and notation is used.
Validity	Significantly inaccurate or irrelevant statements in definitions, techniques and/or theorems are present. Important information is missing.	Mostly accurate statements in definitions, techniques and/or theorems are present. May include some irrelevant or unjustified statements.	Statements in definitions, techniques and/or theorems are accurate and relevant.	Statements in definitions, techniques and/or theorems are accurate and relevant and connected/deduced correctly.
Fluency	No coherent flow of ideas  Listing facts without a sense of how to link them to obtain or apply a valid definition, technique or proof of a theorem.	Partially coherent and organized, but inconsistent. Appeals to intuition. Some unjustified or improperly justified statements/ conclusions in definitions, techniques or proofs of theorems are present.	A correct and essentially complete definition, solution, or proof given. Logic and flow overall sound. Some small gaps in presentation may require “benefit of the doubt.”	A correct and complete definition, solution, or proof given. Elegance or mathematical maturity present.

## D. Summary of Assessment Results

### Courses Assessed

Math 6151, 6200, 6349 and 6842

### SLO's Assessed

SLO 1: Apply the fundamental definitions and theorems of pure mathematics

SLO 2: Apply the fundamental definitions and theorems of applied mathematics

D = developed in this course

M = mastered in this course

### Math 6151 Graph Theory, SLO 2/D (6 students)

	Missing	Emerging	Developing	Mastering
Readability	0%	17%	33%	50%
Validity	17%	0%	0%	83%
Fluency	0%	17%	17%	67%

These scores indicate half of the students have mastered and 33% have developed writing a readable solution using fundamental definitions and theorems of applied mathematics, 83% have mastered writing a valid solution, 17% have developed and 67% of the students have mastered the ability to write a fluent solution.

### Math 6200 Introduction to Topology, SLO 1/M (10 Students)

	Missing	Emerging	Developing	Mastering
Readability	0%	0%	40%	60%
Validity	0%	10%	20%	70%
Fluency	0%	0%	50%	50%

These scores indicate 100% of the students have developed or mastered writing a readable proof using the fundamental definitions and theorems of pure mathematics, 90% have developed or mastered writing a valid proof, and 100% of the students developed or mastered the ability to

write a fluent proof.

**Math 6349 Theory of Functions of a Real Variable, SLO 1/M (13 Students)**

	Missing	Emerging	Developing	Mastering
Readability	0%	8%	62%	31%
Validity	0%	31%	62%	8%
Fluency	0%	15%	54%	31%

These scores indicate 93% of the students have developed or mastered writing a readable proof using the fundamental definitions and theorems of pure mathematics, 80% have developed or mastered writing a valid proof, and 85% of the students developed or mastered the ability to write a fluent proof.

**Math 6842 Advanced Topics in Optimization, SLO 2/M (13 students)**

	Missing	Emerging	Developing	Mastering
Readability	0%	8%	23%	69%
Validity	0%	0%	31%	69%
Fluency	0%	8%	46%	46%

These scores indicate 69% of the students have mastered and 23% have developed writing a readable solution using fundamental definitions and theorems of applied mathematics. Also, 31% have developed and 69% have mastered writing a valid solution. Additionally, 17% have developed and 67% of the students have mastered the ability to write a fluent solution.

This was our first attempt at using rubrics to score authentic student work for attainment levels of PLOs. We learned that

- a) developing a rubric to be used for a variety of courses forced/allowed us to examine common features of successful student work that was not exclusively looking for the "right answer = validity."
- b) identifying appropriate problems for scoring takes some care as the dimensions of the rubric (readability, validity, flow) were not really required and/or were too interdependent on some types of problems.

- c) we will continue to refine the rubrics for greater ease of use and applicability.
- d) we will consider sharing the rubrics with math graduate students to further emphasize the importance of each dimension of successful student work.
- e) we will consider how the different levels/scores via the rubrics may (or may not) align with I/D/M levels of attainment of PLOs.
- f) it was not always easy for instructors unfamiliar with course content to score student work....even with the RVF rubric.

#### **E. Suggestions and Recommendations for the CSCI EETF in the Future**

None at this time.