Assessment Report: Applied Mathematics Learning Outcomes 2016-2017

Spring 2017 Assessment Results

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According to the below description of Applied Mathematics Program Learning Outcomes and Assessment, 4 students were assessed for Outcomes 1 and 2 in M442. (These outcomes were assessed in M 442 this year, rather than across both M 441 and M 442 as indicated in the schedule below._

Outcome: There were a total of 17 students in the Spring 2017 M442 class. Four of those students were majoring in Mathematics - Applied Mathematics option. Problems 1 and 5 in the final exam were used as the assessment tool. More specifically, Problem 1 was designed to test the basic understanding of numerical methods. Problem 5 was designed to test the ability of implementing fundamental numerical methods to solve differential equations. Two (2) students achieved the level of Excellent performance, and two (2) student achieved the level of Acceptable performance.

Recommendations: I have no program recommendations at this time. In future years, both courses should be assessed.

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Program Learning Outcomes

Students demonstrate the ability to:

1) Derive numerical methods for approximating the solution of problems of continuous mathematics (M 441, M 442).
2) Implement a variety of numerical algorithms using appropriate technology (M 441, M 442).
3) Set up mathematical models and critically interpret their results (M 450, M451).
4) Select and implement an appropriate mathematical technique needed to analyze and validate mathematical models (M 450, M 451).

Curriculum Map and Assessment Schedule

	Outcomes					Assessment Schedule
	1	2	3	4		
M 441, Numerical Linear Algebra and Optimization	X	X				Even Fall Semesters
M 442, Numerical Solution of Differential Equations	X	X				Odd Spring Semesters
M 450, Applied Mathematics I			X	X		Odd Fall Semesters
M 451, Applied Mathematics II			X	X		Even Spring Semesters

Rubric

Learning Outcome	Unacceptable	Marginal	Acceptable	Excellent
1) *Use rigorous mathematical reasoning or computations to establish fundamental applied mathematics concepts.*	The work is not correct and complete because either concepts are used improperly or key ideas are missing or the organization is unlikely to work even if a few more ideas were inserted.	The work is not correct and complete because one or two significant ideas are missing, but the terms are properly defined and the work shows a type of organization that might well work if the right ideas were inserted in the proper places. Also, the work is "marginal" if most of the work is leading toward a correct argument, but a false statement is inserted.	The work is almost correct with relevant concepts used and ideas that could work, but not well-organized, for example, with some steps out of order, or with something relatively minor incomplete.	The work is fully correct and complete, with the relevant concepts properly employed and ideas that work, and the steps well-organized into a proper sequence
2) *Set up mathematical models and critically interpret their results.*	If the work is not correct and complete because either there are fundamental gaps in understanding of the underlying scientific principles in the understanding of the appropriate technique and its implementation.	The work is not correct and complete because one or two significant ideas are missing, but the majority of the ingredients are present.	The work is almost correct with relevant scientific concepts and mathematical techniques that could work, but not well-organized, with a minor omission, misunderstanding, or inadequate choice of mathematical technique.	The work is fully correct and complete, with the complete understanding of the scientific principles of the modeled problem and with employment of the appropriate mathematical techniques.
3) *Select and implement an appropriate mathematical technique needed to analyze and validate a mathematical model.*	The work is not correct and complete because either there are fundamental gaps in understanding of the underlying mathematical assumptions or in the understanding of the appropriate technique and its implementation.	The work is not correct and complete because one or two significant components of the analysis or of the implementation are missing, but the majority of the ingredients are present.	The work is almost correct with relevant assumptions addressed and the correct algorithm chosen with an implementation that could work, but is implemented with a minor misunderstanding of a technique or a minor error in other elements of the computations.	The work is fully correct and complete, with a full understanding of the underlying mathematical assumptions that deem a particular mathematical technique applicable to a given model and with an appropriate knowledge of the main principles and techniques related to the implementation of a particular form of analysis, mathematical or numerical.
4) *Evaluate a working knowledge of the technological tools needed to solve problems from applied mathematics. Student work will be evaluated against four criteria:* *a. A choice of the appropriate software for a given problem.* *b. A proper implementation of the software.* *c. Proper documentation.* *d. Presentation and the output of results.*	If less than half of the criteria are completed.	If at least half of the criteria are completed.	If three of the above are adequately addressed.	If all four criteria are adequately addressed.

Threshold

At least half of the majors in each of the courses are assessed as "excellent" or "acceptable" for all the learning outcomes.