Program Assessment Report 2017-2018

Program Name: Applied Mathematics

Program Learning Outcome: 1).Demonstrate college-level knowledge in foundational mathematics

1. Identify the artifact(s) (i.e. student work or outputs) that you used to assess the PLO. [Projects, papers, presentations, portfolios, exam questions, specific assignments, capstone work]

Artifacts: Applied Mathematics Senior Exit Exam and Survey

Other artifact(s) n/a

Each student graduating from the Applied Mathematics program is required to take an exit exam and an exit survey. For the survey, the students are asked to indicate their perceived level of knowledge in foundational mathematics and their perceived level of knowledge in applied mathematics. They are also asked to indicate which mathematics courses contributed to their level of knowledge in either foundational or applied mathematics. The possible responses for the exit survey are know nothing, know little, know adequately, or know well. For the applied mathematics exit exam, the students are asked to answer fortythree multiple choice questions covering content from the eight mathematics courses required for all students in the Applied Mathematics program. The mathematics courses taken by students in the Applied Mathematics program are listed along with their classification as either foundational or applied. (Courses appearing in red are electives that are not necessarily taken by all Applied Mathematics students.)

Foundational: Math 114 - Calculus I, Math 221 - Calculus II, Math 222 - Calculus III, Math 351 - Linear Algebra

Applied: Math 310 - Applied Probability and Mathematical Statistics, Math 320 - Chaos and Fractals, Math 341 - Differential Equations, Math 360 - Coding Theory, Math 361 - Numerical Analysis, Math 368 - Cryptography, Math 371 - Applied Combinatorics, Math 410 - Stochastic Processes, Math 441 - Partial Differential Equations

Based on the student responses to the exit survey, the majority of students indicate know adequately or know well for their perceived level of knowledge in foundational mathematics. Furthermore, the majority of students indicate that the courses Math 114, Math 221, Math 222, and Math 351 contribute to their perceived level of knowledge in foundational mathematics. This is inline with the Mathematics Department mission and those courses have been identified by the members of the Department as representing foundational mathematics.

Based on the student performance results on the Applied Mathematics exit exam, the majority of students graduating from the Applied Mathematics program demonstrate that they know well or know adequately foundational mathematics represented by content from the courses Math 114, Math 221, Math 222, and Math 351. As shown below, the majority of students get at least fifty percent of questions from Calculus and at least fifty percent of questions from Linear Algebra correct on the Applied Mathematics Exit Exam. This appears to aline reasonable well with students perceived level of knowledge in foundational mathematics.
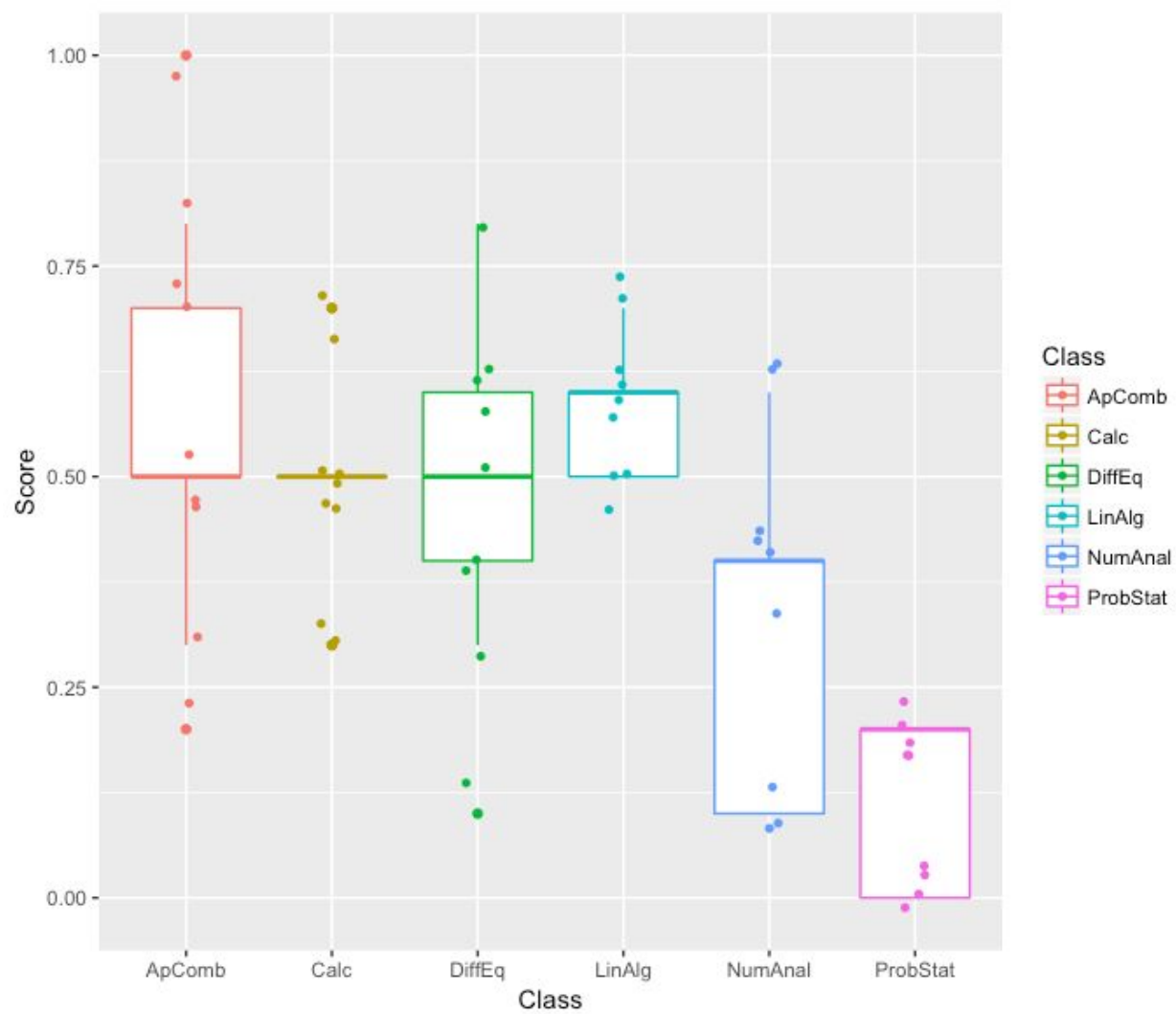
2. Identify the instruments (e.g. rubrics, surveys, spreadsheets, statistical software) used to assess the artifact(s) (i.e. the way in which student output are analyzed).

Instruments: Survey, spreadsheet and statistical software.

Other instruments Used n/a

Nine Students Total
Four in 2016
Three in 2017
Two in 2018

	AppliedCombinatorics	Calculus	DifferentialEquations	Linear Algebra	Numerical Analysis	Probability Stats
Min	0.2	0.3	0.1	0.5	0.1	0
1st	0.5	0.5	0.4	0.5	0.1	0
Median	0.5	0.5	0.5	0.6	0.4	0.2
Mean	0.578	0.5	0.478	0.589	0.33	0.11
3rd	0.7	0.5	0.6	0.6	0.4	0.2
Max	1	0.7	0.8	0.7	0.6	0.2

3. Describe program collaboration to plan, implement and use the results of assessment.

We plan to use the results of assessment to pinpoint specific concepts in foundational mathematics courses, e.g. Calculus and Linear Algebra, that we may wish to reinforce in the Applied Mathematics program. The results will be shared with the entire department and be up for discussion at department meetings.

Explain the results of the assessment activities.

All Applied Mathematics students take Calculus I-III and Linear Algebra. Furthermore, many of the concepts from Calculus and Linear Algebra are reinforced in other courses that students in the Applied Mathematics Program take, e.g. in Differential Equations and Numerical Analysis. Thus, there is good reason to expect that a majority of students graduating from the Applied Mathematics Program will have a reasonable level of knowledge in foundational mathematics as represented by Calculus and Linear Algebra courses. However, it should be noted that only a very small number of students have graduated from the Applied Mathematics program partly due to the fact that the Applied Mathematics Program has only very recently come to exist. Thus, a much greater volume of data should be collected before any conclusive results can be drawn.

4. Where applicable, outline the steps you will take to make improvements to the program based on the results of assessment activities identified in #3.

We will continue to collect assessment on students in the Applied Mathematics Program. Additionally, we will discuss modifying the program learning outcomes to make them more measurable.

Program Assessment Report 2017-2018

Program Name: Applied Mathematics

Program Learning Outcome: 2).Demonstrate college-level knowledge in applied mathematics

5.   Identify the artifact(s) (i.e. student work or outputs) that you used to assess the PLO. [Projects, papers, presentations, portfolios, exam questions, specific assignments, capstone work]

Artifacts: Applied Mathematics Senior Exit Exam and Survey

Other artifact(s) Math 371 Applied Combinatorics exam questions and Math 361 Numerical Analysis exam questions.

Each student graduating from the Applied Mathematics program is required to take an exit exam and an exit survey. For the survey, the students are asked to indicate their perceived level of knowledge in foundational mathematics and their perceived level of knowledge in applied mathematics. They are also asked to indicate which mathematics courses contributed to their level of knowledge in either foundational or applied mathematics. The possible responses for the exit survey are know nothing, know little, know adequately, or know well. For the applied mathematics exit exam, the students are asked to answer fortythree multiple choice questions covering content from the eight mathematics courses required for all students in the Applied Mathematics program. The mathematics courses taken by students in the Applied Mathematics program are listed along with their classification as either foundational or applied. (Courses appearing in red are electives that are not necessarily taken by all Applied Mathematics students.)

Foundational: Math 114 - Calculus I, Math 221 - Calculus II, Math 222 - Calculus III, Math 351 - Linear Algebra

Applied: Math 310 - Applied Probability and Mathematical Statistics, Math 320 - Chaos and Fractals, Math 341 - Differential Equations, Math 360 - Coding Theory, Math 361 - Numerical Analysis, Math 368 - Cryptography, Math 371 - Applied Combinatorics, Math 410 - Stochastic Processes, Math 441 - Partial Differential Equations

In addition, artifacts in the form of exams from Math 361 and Math 371 were collected for students in the Applied Mathematics program over the 2017 - 2018 academic year.

Based on the student responses to the exit survey, the majority of students indicate know adequately or know well for their perceived level of knowledge in applied mathematics. A variety of different mathematics courses were identified by the students as contributing to their perceived level of knowledge in applied mathematics. No clear pattern emerges to suggest that any of the applied mathematics courses contribute more than others to students perceived knowledge

Based on the student performance results on the Applied Mathematics exit exam, the majority of students graduating from the Applied Mathematics program demonstrate that they know well or know adequately some areas of applied mathematics, e.g. represented by content from the courses Math 341 and Math 371, but that students have a lower level of knowledge in other areas of applied mathematics, e.g. represented by content from the courses Math 310 and Math 361. As shown below, the majority of students get at least fifty percent of questions from Applied Combinatorics

and Differential Equations correct on the Applied Mathematics Exit Exam, but less than fifty percent of questions from Applied Probability and Mathematical Statistics and Numerical Analysis correct on the Applied Mathematics Exit Exam.
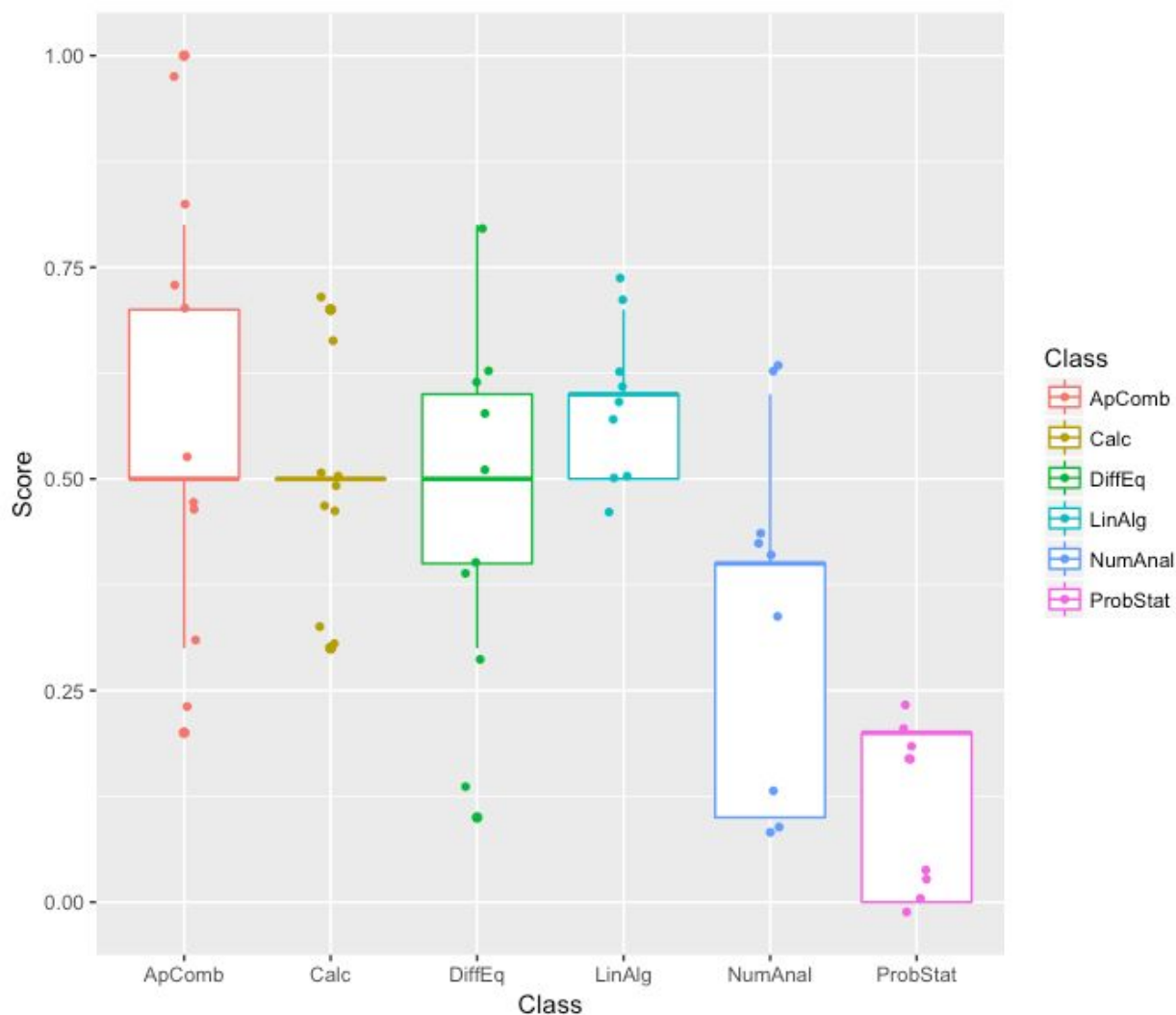
6. Identify the instruments (e.g. rubrics, surveys, spreadsheets, statistical software) used to assess the artifact(s) (i.e. the way in which student output are analyzed).

Instruments: Survey, spreadsheet and statistical software.

Other instruments Used n/a

Nine Students Total
Four in 2016
Three in 2017
Two in 2018

	AppliedCombinatorics	Calculus	DiferentialEquations	Linear Algebra	Numerical Analysis	Probability Stats
Min	0.2	0.3	0.1	0.5	0.1	0
1st	0.5	0.5	0.4	0.5	0.1	0
Median	0.5	0.5	0.5	0.6	0.4	0.2
Mean	0.578	0.5	0.478	0.589	0.33	0.11
3rd	0.7	0.5	0.6	0.6	0.4	0.2
Max	1	0.7	0.8	0.7	0.6	0.2

7. Describe program collaboration to plan, implement and use the results of assessment.

We plan to use the results of assessment to pinpoint specific concepts in applied mathematics courses, e.g. Probability and Numerical Analysis, that we may wish to reinforce in the Applied Mathematics program. The results will be shared with the entire department and be up for discussion at department meetings.

Explain the results of the assessment activities.

All applied mathematics students take Applied Probability and Mathematical Statistics, Differential equations, Numerical Analysis, and Applied Combinatorics. However, not all students take the same electives beyond this core and thus many of concepts from the above listed courses are not reinforced in follow-up courses. Thus, it is reasonable to expect that there is some variation in the level of knowledge of students in applied mathematics as represented by the content from the courses Math 310, Math 341, Math 361, and Math 371. Additionally, it should be noted that only a very small number of students have graduated from the Applied Mathematics program partly due

to the fact that the Applied Mathematics Program has only very recently come to exist. Thus, a much greater volume of data should be collected before any conclusive results can be drawn.

8. Where applicable, outline the steps you will take to make improvements to the program based on the results of assessment activities identified in #3.

We will continue to collect assessment on students in the Applied Mathematics Program. Additionally, we will discuss modifying the program learning outcomes to make them more measurable.