Name of Program/Department:	Mathematics Program
Year:	**2017-2018**
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Program Mission Statement

A primary purpose of the Department of Mathematics at Francis Marion University is to offer all University students a varied and well-balanced curriculum of undergraduate education in mathematics. In the liberal-arts tradition, the courses in the curriculum teach students to think logically, to analyze problems and solve them appropriately, and to communicate their ideas clearly.

The department also provides a broad range of entry-level courses in order to meet the needs of students with widely varying mathematical backgrounds and to provide them with skills appropriate for their selected majors. The mathematics courses that satisfy the General Education requirement in mathematics are designed to help students achieve *Goal 5: The ability to use fundamental mathematical skills and principles in various applications.*

Equally important, the curriculum provided by the Department leads to baccalaureate degrees in two distinct but overlapping areas: mathematical sciences and teacher licensure in mathematics. These courses prepare students for careers in education, business, industry, and government. They also prepare those students of sufficient interest and ability for further study of mathematics at the graduate level.

Program Learning Outcomes

1. Students should be able to analyze problems involving various applications and solve them using appropriate mathematical skills, principles, and technology.
2. Students should be able to present oral and written solutions in a structured format that can be understood by a general audience.
3. Students should recognize and appreciate the applicability, beauty, and power of mathematics.
4. Students should be confident in their abilities to use mathematics to solve various problems.

Executive Summary

The Department of Mathematics uses several assessment tools, such as a calculus performance rubric, an elementary proof performance rubric, a technology usage performance rubric, a communication performance rubric, and a senior survey. Values for Student Learning Outcome (SLO) 1.0 (Outcomes 1-4), SLO 2.0 (Outcomes 1-2), SLO 3.0 (Outcomes 1-2), and SLO 5.0 (Outcomes 1-2) are the percentages of students who met or exceeded faculty expectations. Values for SLO 1.5[†], SLO 2.3, SLO 3.3, SLO 4.1-4.2, and SLO 5.4 are percentages of students who are confident in their skills and abilities or have an appreciation for the beauty of mathematics as a singular discipline and its applications.

Academic year 2017-18 assessments show targets were achieved in 13 of 16 outcomes that were assessed during the year. SLO 5.3 was not assessed this academic year because no students enrolled in student teaching. Since assessments of student confidence in their skills and abilities or appreciation for the beauty of mathematics as a singular discipline and its applications have exceeded the target for this year and last year, the target goals for these outcomes (SLO 1.5, 2.3, 3.3, 4.1-4.2, and 5.4) will be increased to 95.0 in 2018-19.

Targets were not achieved in three of 16 assessed outcomes. The three assessments of elementary computational techniques in the calculus course sequence (SLO 1.1-1.3) were not as high as expected for a third year in a row. While instructional time will continue to be devoted to computational techniques in the calculus sequence, the assessment process of these outcomes will be revised to more accurately measure student performance by considering factors such as the quantity of problems in each outcome, the timing of the assessment of student performance during the semester, and the suitability of the calculus performance rubric.

† SLO 1.5 is an abbreviation for SLO 1.0 Outcome 5.

Student Learning Outcomes

SLO 1.0: Students in Math 201, 202, 203, 306, and 499 will be proficient in the elementary computational techniques in the calculus course sequence.   Students in Math 499 will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence.

> Outcome 1: Students will demonstrate competence to calculate derivatives and use them in one or more applications, such as optimization or related rates problems (Math 201/499).
> Outcome 2: Students will demonstrate competence to calculate integrals and use them in various applications, such as area, volume, or average value of a function over an interval (Math 202/499).
> Outcome 3: Students will demonstrate competence to calculate convergence of series and use them in various applications, such as polynomials to approximate functions (Math 203/499).
> Outcome 4: Students will demonstrate competence to calculate gradients and partial derivatives and use them in various applications (Math 306/499).
> Outcome 5: Students will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence (Math 499).

SLO 2.0: Students in Math 230 and 311 will develop the ability to understand and construct elementary proofs. Students in Math 499 will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs.

> Outcome 1: Students will be able to read and understand elementary proofs and be able to determine what constitutes a mathematical proof (Math 230/311).
> Outcome 2: Students will be able to write elementary proofs (Math 230/311).
> Outcome 3: Students will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs (Math 499).

SLO 3.0: Students in Math/CS 212 will be able to use appropriate technology to solve mathematical problems. Students in Math 499 will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems.

> Outcome 1: Students will be able to read computer programs that model various mathematical applications (Math/CS 212).
> Outcome 2: Students will be able to write computer programs that model various mathematical applications (Math/CS 212).
> Outcome 3: Students will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems (Math 499).

SLO 4.0: Students in Math 499 will appreciate the beauty of mathematics as a singular discipline and its applications.

> Outcome 1: Students will respond to a statement concerning their appreciation for the beauty of mathematics as a singular discipline (Math 499).
> Outcome 2: Students will respond to a statement concerning their understanding of the importance of mathematics in real world applications (Math 499).

SLO 5.0: Students in Math 499 and Student Teaching will be able to effectively communicate mathematics in written form and oral presentations.

> Outcome 1: Students will communicate mathematics in a written presentation (Math 499).
> Outcome 2: Students will communicate mathematics in an oral presentation (Math 499).
> Outcome 3: Secondary education students will demonstrate applications of various strategies and tools in the teaching of mathematical concepts (Student Teaching).
> Outcome 4: Students will respond to a statement concerning their confidence in their ability to develop and effectively communicate mathematics in written form and oral presentations (Math 499).

Assessment Methods

SLO 1.0: Students in Math 201, 202, 203, 306, and 499 will be proficient in the elementary computational techniques in the calculus course sequence.   Students in Math 499 will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence.

> For outcomes 1-4, instructors of Calculus sequence courses (Math 201, 202, 203, 306) and Mathematics Capstone Course (Math 499) will provide samples of student solutions to problems or other work that call for students to demonstrate proficiency of basic computational techniques in the calculus sequence. Student solutions will be evaluated based on a calculus performance rubric (1 = does not meet faculty expectations; 2 = meets faculty expectations; 3 = exceeds faculty expectations). The target is for 70% of students to meet or exceed faculty expectations. For outcome 5, students will complete a senior survey in the Mathematics Capstone Course (Math 499) with responses of disagree, agree, and strongly agree. The target is for 90% of students to agree or strongly agree.

SLO 2.0: Students in Math 230 and 311 will develop the ability to understand and construct elementary proofs. Students in Math 499 will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs.

> For outcomes 1-2, instructors of Discrete Mathematics I (Math 230) and Transition to Higher Mathematics (Math 311) will provide samples of student solutions or relevant problems of other work to demonstrate the ability to understand and construct elementary proofs. Student solutions will be evaluated based on a proof performance rubric (1 = does not meet faculty expectations; 2 = meets faculty expectations; 3 = exceeds faculty expectations). The target is for 70% of students to meet or exceed faculty expectations. For outcome 3, students will complete a senior survey in the Mathematics Capstone Course (Math 499) with responses of disagree, agree, and strongly agree. The target is for 90% of students to agree or strongly agree.

SLO 3.0: Students in Math/CS 212 will be able to use appropriate technology to solve mathematical problems. Students in Math 499 will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems.

For outcomes 1-2, instructors of Introduction to FORTRAN (Math/CS 212) will provide samples of student solutions to relevant problems or other work to demonstrate the ability to use appropriate technology to solve mathematical problems. Student solutions will be evaluated based on a programming performance rubric (1 = does not meet faculty expectations; 2 = meets faculty expectations; 3 = exceeds faculty expectations). The target is for 70% of students to meet or exceed faculty expectations. For outcome 3, students will complete a senior survey in the Mathematics Capstone Course (Math 499) with responses of disagree, agree, and strongly agree. The target is for 90% of students to agree or strongly agree.

SLO 4.0: Students in Math 499 will appreciate the beauty of mathematics as a singular discipline and its applications.

Students will complete senior surveys in the Mathematics Capstone Course (Math 499) with responses of disagree, agree, and strongly agree to statements concerning their appreciation for the beauty of mathematics and their understanding of the importance of mathematics. The target is for 90% of students to agree or strongly agree.

SLO 5.0: Students in Math 499 and Student Teaching will be able to effectively communicate mathematics in written form and oral presentations.

For outcomes 1-3, instructors of the Mathematics Capstone Course (Math 499) and supervisors of student teachers will provide samples of student work and will attend presentations that call for students to effectively communicate mathematics. Student work and presentations will be evaluated based on a communication performance rubric (1 = does not meet faculty expectations; 2 = meets faculty expectations; 3 = exceeds faculty expectations). The target is for 70% of students to meet or exceed faculty expectations. For outcome 4, students will complete a senior survey in the Mathematics Capstone Course (Math 499) with responses of disagree, agree, and strongly agree. The target is for 90% of students to agree or strongly agree.

Assessment Results

SLO 1.0: Students in Math 201, 202, 203, 306, and 499 will be proficient in the elementary computational techniques in the calculus course sequence. Students in Math 499 will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence.

Outcome 1: Almost half (46.1%) of the students did demonstrate competence to calculate derivatives and use them in one or more applications, such as optimization or related rates problems (Math 201/499). Therefore, this target was not achieved.
Outcome 2: Over half (56.1%) of the students did demonstrate competence to calculate integrals and use them in various applications, such as area, volume, or average value of a function over an interval (Math 202/499). Therefore, this target was not achieved.
Outcome 3: Just over half (51.2%) of the students did demonstrate competence to calculate convergence of series and use them in various applications, such as polynomials to approximate functions (Math 203/499). Therefore, this target was not achieved.

Outcome 4: Almost nine out of ten (88.2%) of the students did demonstrate competence to calculate gradients and partial derivatives and use them in various applications (Math 306/499). Therefore, the target was achieved.

Outcome 5: Students did respond that they were confident in their computational techniques in the calculus course sequence (Math 499). Therefore, this target was achieved.

SLO 1.0 Outcomes 1 and 3 were below the target of 70% but showed improvement.
SLO 1.0 Outcome 2 was below the target of 70% and decreased slightly.
SLO 1.0 Outcomes 4 and 5 achieved the targets of 70% and 90% respectively.
SLO 1.0's overall target was not achieved.

SLO 2.0: Students in Math 230 and 311 will develop the ability to understand and construct elementary proofs. Students in Math 499 will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs.

Outcome 1: Just over three of every four (76.5%) students did show ability to read and understand elementary proofs and be able to determine what constitutes a mathematical proof (Math 230/311). Therefore, this target was achieved.

Outcome 2: About eight of every ten (82.4%) students did show ability to write elementary proofs (Math 230/311). Therefore, this target was achieved.

Outcome 3: Students did respond that they were confident in their ability to understand and construct elementary proofs (Math 499). Therefore, this target was achieved.

SLO 2.0's overall target was achieved.

SLO 3.0: Students in Math/CS 212 will be able to use appropriate technology to solve mathematical problems. Students in Math 499 will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems.

Outcome 1: Just over three of every four (76.5%) students did show ability to read computer programs that model various mathematical applications (Math/CS 212). Therefore, this target was achieved.

Outcome 2: Just over seven of every ten (70.6%) students did show ability to write computer programs that model various mathematical applications (Math/CS 212). Therefore, this target was achieved.

Outcome 3: Students did respond that they were confident in their ability to use appropriate technology to solve mathematical problems (Math 499).

SLO 3.0's overall target was achieved.

SLO 4.0: Students in Math 499 will appreciate the beauty of mathematics as a singular discipline and its applications.

Outcome 1: Students did respond that they had an appreciation for the beauty of mathematics as a singular discipline (Math 499). Therefore, this target was met.

Outcome 2: Students did respond that they had an understanding of the importance of mathematics in real world applications (Math 499). Therefore, this target was achieved.

SLO 4.0's overall target was achieved.

SLO 5.0: Students in Math 499 and Student Teaching will be able to effectively communicate mathematics in written form and oral presentations.

Outcome 1: More than 8.5 of every ten (85.7%) students did communicate mathematics effectively in a written presentation (Math 499). Therefore, this target was achieved.
Outcome 2: Just over seven of every ten (71.4%) students did communicate mathematics effectively in an oral presentation (Math 499). Therefore, this target was achieved.
Outcome 3: No students participated in student teaching.
Outcome 4: Students did respond that they were confident in their ability to develop and effectively communicate mathematics in written form and oral presentations (Math 499). Therefore, this target was achieved.

SLO 5.0's overall target was achieved.

Table 1.0: Assessment Results

Assessment		$2015\text{-}16^3$	2016-17	2017-18
SLO 1.0	Outcome 1	24.5^2	34.3	46.1
	Outcome 2	64.3^2	58.7	56.1
	Outcome 3	34.5^2	48.1	51.2
	Outcome 4	40.0^2	68.8	88.2
	Outcome 5	100.0	100.0	100.0
SLO 2.0	Outcome 1	53.8	86.4	76.5
	Outcome 2	53.8	63.6	82.4
	Outcome 3	100.0	100.0	100.0
SLO 3.0	Outcome 1	75.0	73.9	76.5
	Outcome 2	50.0	73.9	70.6
	Outcome 3	100.0	100.0	100.00
SLO 4.0	Outcome 1	100.0	100.0	100.0
	Outcome 2	100.0	100.0	100.0
SLO 5.0	Outcome 1	100.0	81.8	85.7
	Outcome 2	100.0	81.1	71.4
	Outcome 3	*1	*1	*1
	Outcome 4	100.0	100.0	100.0

*1 No students participated in student teaching during the academic year.
2. Outcomes 1-4 of SLO 1 were mistakenly not assessed in Math 499.
3. Data is only from Spring 2016.

Action Items

SLO 1: Students in Math 201, 202, 203, 306, and 499 will be proficient in the elementary computational techniques in the calculus course sequence.   Students in Math 499 will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence.

Outcome 1: Students will demonstrate competence to calculate derivatives and use them in one or more applications, such as optimization or related rates problems (Math 201/499).
Outcome 2: Students will demonstrate competence to calculate integrals and use them in various applications, such as area, volume, or average value of a function over an interval (Math 202/499).
Outcome 3: Students will demonstrate competence to calculate convergence of series and use them in various applications, such as polynomials to approximate functions (Math 203/499).
Outcome 4: Students will demonstrate competence to calculate gradients and partial derivatives and use them in various applications (Math 306/499).
Outcome 5: Students will respond to a statement concerning their confidence in their computational techniques in the calculus course sequence (Math 499).

The assessment process of Outcomes 1-3 will be revised in Fall 2018 to more accurately measure student performance. The target of Outcome 5 will be increased to 95.0.

SLO 2: Students in Math 230 will develop the ability to understand and construct elementary proofs. Students in Math 499 will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs.

Outcome 1: Students will be able to read and understand elementary proofs and be able to determine what constitutes a mathematical proof (Math 230/311).
Outcome 2: Students will be able to write elementary proofs (Math 230/311).
Outcome 3: Students will respond to a statement concerning their confidence in their ability to understand and construct elementary proofs (Math 499).

Due to achieved targets in Outcomes 1-2, instructors of mathematical proofs courses will continue to allocate instructional time to the construction of elementary proofs by including more in-depth content and assessment. The target of Outcome 3 will be increased to 95.0.

SLO 3: Students in Math/CS 212 will be able to use appropriate technology to solve mathematical problems. Students in Math 499 will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems.

Outcome 1: Students will be able to read computer programs that model various mathematical applications (Math/CS 212).
Outcome 2: Students will be able to write computer programs that model various mathematical applications (Math/CS 212).
Outcome 3: Students will respond to a statement concerning their confidence in their ability to use appropriate technology to solve mathematical problems (Math 499).

Due to achieved targets in Outcomes 1-2, instructors of programming courses will continue to allocate instructional time to the construction of programs by including programming assignments for various mathematical applications. The target of Outcome 3 will be increased to 95.0.

SLO 4.0: Students in Math 499 will appreciate the beauty of mathematics as a singular discipline and its applications.

Outcome 1: Students will respond to a statement concerning their appreciation for the beauty of mathematics as a singular discipline (Math 499).
Outcome 2: Students will respond to a statement concerning their understanding of the importance of mathematics in real world applications (Math 499).

The target of Outcomes 1-2 will be increased to 95.0.

SLO 5.0: Students in Math 499 and Student Teaching will be able to effectively communicate mathematics in written form and oral presentations.

Outcome 1: Students will communicate mathematics in a written presentation (Math 499).
Outcome 2: Students will communicate mathematics in an oral presentation (Math 499).
Outcome 3: Secondary education students will demonstrate applications of various strategies and tools in the teaching of mathematical concepts (Student Teaching).
Outcome 4: Students will respond to a statement concerning their confidence in their ability to develop and effectively communicate mathematics in written form and oral presentations (Math 499).

Due to achieved targets in Outcomes 1-2, instructors will continue to provide written and oral presentations. Outcome 3 was not assessed. The target of Outcome 4 will be increased to 95.0.